U. S. DEPARTMENT OF AGRICULTURE

OFFICE OF EXPERIMENT STATIONS

A. C. TRUE, DIRECTOR

EXPERIMENT STATION RECORD

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Editor: E. W. ALLEN, Ph. D., *Assistant Director.*

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With the cooperation of the scientific divisions of the Department of Agriculture.

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DISEASES OF PLANTS.

EXPERIMENT STATION AND DEPARTMENT PUBLICATIONS ABSTRACTED.

EXPERIMENT STATION RECORD.

Vol. XIII. No. 1.

The loss of domestic animals from poisonous plants has long been recognized as a more or less serious obstacle to stock raisers, especially in the Rocky Mountain and Pacific coast regions. In the more thickly settled regions of the Eastern States the land is more extensively cultivated, and there are comparatively few areas left in their natural condition and covered with native vegetation. Under such circumstances the existence of poisonous plants in large areas is practically impossible. On the Western cattle ranges, however, cattle, sheep, and horses depend almost exclusively for their sustenance upon the native forage of the country, which includes a number of plants which have been found to be poisonous when eaten in large quantities.

A great difference of opinion has prevailed with reference to the identity of the plants which are responsible for stock poisoning and as to the best antidotes or remedies to be applied in actual cases of poisoning. Considerable work along these lines has been done by the Washington, Oregon, Colorado, South Dakota, and Montana stations, and during the season of 1900 an investigation of the poisonous plants of Montana was undertaken by the Division of Botany of this Department. The experiments conducted during this investigation, in the field and in the laboratory, established the poisonous nature of a number of common plants and indicated a convenient and effective remedy in most cases.

The problem of plant poisoning in a State like Montana is perhaps as important as any connected with stock raising, and has been only partially solved. A number of interesting and highly important lines of work remain for investigation by veterinarians and botanists of States which are most affected by plant poisoning. Among these may be mentioned a determination of the poisonous or nonpoisonous character of a considerable number of native plants which have been suspected of being poisonous by stockmen; experiments in the eradication of these plants by irrigation, displacement by means of aggressive forage plants, or other methods which may be practically applied with some hope of success under the local conditions which prevail in different cases; experiments on the nature and cause of "loco" disease; experiments on the exact localization of the poisonous principles contained in lupines and the time when these substances are most active; and experiments in perfecting simple and effective antidotes.

The investigations which were made during the season of 1900 indicated clearly that a considerable proportion of the loss by poisonous plants might easily be avoided by a more general diffusion of the knowledge which already exists concerning such plants. In general, however, stock could not at present be managed on any fixed basis with reference to poisonous plants, on account of the great difference of opinion which prevails not only among stockmen, but among veterinarians and botanists, as to the poisonous nature of particular species and as to the time of year when they are most dangerous. Further investigations along this line will probably show that many of the plants which at present are suspected of being poisonous are quite harmless, and that a few species of plants are responsible for nearly all of the serious stock poisoning.

In order to determine the poisonous or nonpoisonous character of a given plant, it is not sufficient to obtain positive or negative results from a few experiments on rabbits or guinea pigs. As is well known, rabbits are easily excited, and many peculiarities of their actions after being fed with extracts from plants are due to the fright or nervous excitement of the operation. Carefully controlled feeding experiments, either with extracts from poisonous plants or with the plants themselves, on sheep or cattle, and conducted under conditions as similar as possible to natural field conditions, should yield results which will be much more convincing to the practical stockman and to other investigators of this subject. In a sheep-raising region the animals necessary for such experiments are readily furnished by sheepmen, and feeding experiments, as well as experiments with remedies, could be conducted upon sheep at the same time that cases of poisoning occur under natural conditions, and therefore with plants in the stage of growth in which they are eaten by sheep or cattle on the ranges. Many feeding experiments with poisonous plants are open to the criticism that they were made with suspected plants in a different stage of growth from those which were eaten by the poisoned animals.

In future experiments with poisonous plants it would be well to bear in mind that the active principles of such plants may vary exceedingly in different stages of growth of the plant, and even during different hours of the day. The possibility of a plant being poisonous at one time and not at another must constantly be reckoned with if experiments with these plants are to yield conclusions which will be established beyond criticism.

Experiments during the season of 1900 showed pretty conclusively that potassium permanganate, if administered soon after the symptoms of poisoning develop, may be depended upon, as a rule, to oxidize and destroy the plant alkaloids contained in the stomach and to prevent the progress of the symptoms of poisoning. This substance was administered by direct injection through the body wall or by drench. Further experiments on a larger scale with potassium permanganate should be undertaken, for the purpose of determining the best method of applying it and the actual plant alkaloids toward which it is most destructive.

The account of the Hungarian experiment stations given in the present issue will be of interest to students of the experiment station systems of different countries, and will serve to show how well organized and efficient a system has been worked out for the benefit of the agriculture of Hungary. We are indebted for this account to Dr. Peter Fireman, who recently visited a number of the stations in that country, and to the kind assistance of Mr. Alajos Paikert, royal Hungarian commissioner, who represents the agricultural interests of his country in the United States.

Although still in their infancy, the Hungarian stations have become a recognized power for the promotion of agriculture and the improvement of agricultural practice in that country. The first station for plant culture was established less than ten years ago, and up to 1898 confined itself to conducting practical experiments in cooperation with farmers; and the plant-culture stations since established have been in operation only two or three years. The laboratories are not elaborate in their equipment, and have not made original research a prominent feature of their work. But the stations are, to a greater extent than those of most other European countries, on a practical basis, and are working in the direct interest of the farmers. Their aim has evidently been to promote the interests of agriculture in all proper ways, to assist the farmer in procuring pure seed and fertilizers and the best varieties of plants, and to work out better methods of practice. They are reported to have been successful in reaching the farming population and winning their confidence in a quite remarkable degree. In spite of the natural conservatism of the farmers in so old a country, they have not failed to profit by the teachings of the stations, and are putting the results of their work into practice. In their aims and tendencies and their relations to the practical agriculturists, Mr. Paikert declares that the Hungarian stations resemble those of the United States more closely than any other country.

Incidentally the Hungarian stations are carrying on an increasing amount of work which is of interest to investigators at large. The accounts of their work are published for the most part in the official organ of the stations (*Kisérletügyi Közlemények*), and the fact that this is printed only in the language of the country, and does not appear to be reviewed regularly by any German or French periodical, has caused much of their work to be lost sight of. It has been our desire to include reviews of the Hungarian work in the Record, but considerable difficulty has been experienced in obtaining the services of a translator competent to review the more or less technical articles. Arrangements have now been made, however, by which, it is hoped, the principal articles of general interest in the official publication may be noted in brief in these columns.

AGRICULTURAL EXPERIMENT STATIONS OF HUNGARY.

There are in Hungary 5 experiment stations corresponding to those in this country, each containing departments for agricultural chemistry and seed control, and often others. These stations are located at Altenburg (Magyar-Óvár), Debreczen, Kaschau (Kassa), Keszthely, and Klausenburg (Kolozsvár). Besides these there are the Central Chemical Experiment Station, the Station for Animal Physiology and Feeding, the Entomological Station, and the Seed-Control Station, each having only a single department, and all located at Budapest, the Station for Vegetable Physiology and Pathology at Altenburg, and the Chemical Station at Pressburg (Pozsony).

The different departments of the 5 stations mentioned first are each organized as separate institutions and are designated in the Hungarian official publications as individual stations, each with its own director. On this basis there are in Hungary 8 agricultural chemical stations, 6 seed-control stations, 1 entomological station, 1 plant-culture station, 1 station for vegetable physiology and pathology, 1 for tobacco culture, 1 for animal physiology and feeding, and 2 for agricultural machines, or 21 in all.

The experiment stations in Hungary are government institutions. Most of them are designed to promote the advancement of the agriculture of the country, mainly by practical experiments but also by original research, and to give advice to the farmers on various agricultural questions. In addition, the chemical and seed-control stations are called upon to examine agricultural supplies and agricultural products. The Central Commission of Experiment Stations exercises a directing and supervisory power over the individual stations, and acts as the representative of the Minister of Agriculture in matters relating to the organization and work of the stations. The commission consists of a president, secretary, and about a dozen permanent members, all appointed by the Minister of Agriculture. In this commission each branch of experiment station work is represented by a station director, the remaining members being prominent specialists in particular branches of agriculture. Since its creation in 1898 the commission has published a journal, *Kisérletügyi Közlemények*, embodying the reports of the work of the various stations.

CHEMICAL STATIONS.

All the chemical stations are charged with the examination of agricultural and other industrial products, both for the Government and private persons. Of the 8 stations, those at Pressburg, Klausenburg, and Fiume are occupied exclusively with control work, while the other 5 conduct scientific investigations along diverse lines pertaining to agriculture in addition to their control work. Of the latter the one at Budapest, designated as the Institute of the Hungarian Kingdom and Central Chemical Experiment Station, differs from the others in having a much larger staff of workers, a considerably wider field of action, and additional duties as an advisory agency to the Minister of Agriculture. All of the chemical stations except the Central chemical station at Budapest are intimately connected with educational (mostly agricultural) institutions, the professor of chemistry being the director of the station in all cases.

Chemical Experiment Station at Budapest.—This station was established in 1881 in connection with the Veterinary Institute, the professor of chemistry being the director of the station and performing all the work. As the work increased assistants were added, and in 1887 the station became independent of any educational institution, and is now located in the department building. Its present organization dates from 1892. The staff consists of a director, Dr. L. Liebermann, 2 chemists, 7 assistant chemists, including 3 agricultural chemists, and a number of laboratory helpers.

In addition to the analytical work growing out of the control and inspection duties in executing the law against falsification of agricultural and other industrial products the station examines the foreign wines subject to duty, as well as the wines destined for export; it examines the purity of sugars which receive the export bounty, and furnishes expert information to the Government on chemical questions relating to commerce, finance, and customs. The following table shows the number and kinds of materials analyzed by the station during the ten years from 1889 to 1899:

Food articles and spices	10,784
Other examinations in the interest of hygiene or ordered by the tribunals	381
Must of raisins and wine	7,693
Other alcoholic beverages and alcohol (beer, brandy, liquors, champagne, etc.)	931
Feeding stuffs	984
Soils and fertilizers	5,930
Agricultural plants	728
Products of agricultural industries (sugar, starch, dextrin, yeast, etc.)	12,122
Water analyses for hygienic and industrial purposes	2,139
Industrial and mining products	3,069
Lighting and heating materials	628
Expert opinions and miscellaneous examinations	4,737

The scientific activity of the station covers a large number of lines. Much attention is given to the elaboration of new methods of chemical analysis and to the testing of methods recommended by others. The methods adopted by the station become official in the sense that they must be employed by all the other chemical stations. The staff of the station has elaborated and published new methods for the analysis of milk, wine, whisky, meat, red pepper (paprika), soils, feeding stuffs, fertilizers, petroleum, lubricating oils, crude carbolic acid, caoutchouc, dextrin, and other materials. Numerous analyses of agricultural plants and feeding stuffs cultivated in Hungary, and of factory refuse materials which can be employed as feeding stuffs have been made and the results published. The station has, by a large number of analyses, ascertained the composition of the musts and wines of Hungary. It has examined the lime contents of the soil in many localities, and by a method elaborated by itself it has examined a large part of the sandy areas of Hungary which are suited to the cultivation of grapes, and established the fact of the immunity of these areas from the phylloxera. It has also devoted much attention to researches relating to physiological chemistry; a number of articles have been published on embryo-chemistry, on the determination of nucleins and the acid which they contain, on the chemistry of yeast cells, the formation of gastric juice, the secretion of urine, iodized starch, the so-called animal caoutchouc, etc.

Chemical Station at Altenburg.—This is the oldest station in Hungary, having begun its activity in 1873, and is next in importance to the Institute of Chemistry at Budapest. It is connected with the Agricultural Academy at Altenburg. The staff of the station consists of a director (now Prof. T. Kosutány) and three assistants. In the course of its existence it has made a thorough study of the chemistry of wine and of the methods of wine examination; has carried out a series of investigations relating to yeasts and their influence on fermentation; it has made contributions on the question of the formation of vegetable albumen, studying among other things the influences which affect the biological functions of plants. It has also conducted extensive and thorough researches with reference to the development and chemical composition of tobacco, and has published valuable works on the chemistry of certain agricultural plants, on oil cakes, and on the process employed in Hungary in the production of oils. Much attention has been given to the examination of fertilizers and soils.

Chemical Station at Kaschau.—This station was established in 1884 as a department of the Agricultural Institute at Kaschau. The scientific work of the station is mainly devoted to investigations in its experimental distillery, installed for that purpose. The staff consists of a chief and one assistant.

Chemical Station at Keszthely.—This was founded in 1889, and is immediately connected with the agricultural institute of that town.

The researches of this station relate to the plants cultivated in Hungary, their physiology, and need for fertilizers. The chief performs all the work of the station.

Chemical Station at Debreczen.—This was established in 1894, and is attached to the Agricultural Institute of Debreczen. The original investigations of the station relate to the composition of Hungarian flours, and to the methods of examining tobacco. The staff consists of the chief and one assistant.

Chemical Station at Klausenburg.—This station was founded in 1887 as a department of the university at Klausenburg. It is almost exclusively occupied with control work. The staff consists of the chief alone, who is occasionally assisted by the laboratory instructors of the university.

Chemical Station at Pressburg.—This was established in 1883 in connection with the Technical High School of Pressburg. It performs only control duties. The staff consists of the chief alone.

Chemical Station at Fiume.—This was established in 1900, especially for analysis of wines and other products imported through this seaport.

An indication of the activity of the control stations is furnished by the following table, showing the number of analyses made by several of them during the eight years from 1890–1897:

Number of analyses made by Hungarian control stations, 1890–1897.

Station.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.
Altenburg	126	266	107	182	425	277	215	699
Kaschau	139	72	66	53	80	167	98	397
Keszthely	293	218	235	125	229	175	85	118
Debreczen	....	....	....	....	....	....	412	702
Klausenburg	83	82	280	1,319	1,466	1,955	1,105	2,330

SEED-CONTROL STATIONS.

The beginning of seed testing in Hungary dates from 1871, the tests being made by the Agricultural Institute at Debreczen. In 1878 a special laboratory for seed testing was fitted up at the Agricultural Academy at Altenburg, and in 1882 a seed-control station was founded at Budapest in connection with the Veterinary Institute, which was made entirely independent in 1891. In 1884 similar institutions were established at Kaschau, Debreczen, Keszthely, and Klausenburg. The work of the seed-control stations received a great impetus in 1892 upon the enactment of a law prohibiting the sale of clover or alfalfa seed not entirely free from cuscuta (dodder), under penalty of a maximum fine of 200 crowns (1 crown = 20.3 cents); and again in 1895, when a new law was enacted against the adulteration or misbranding of food articles, providing heavier penalties.

It is the business of the seed-control stations, in the first place, to do all the seed testing required to safeguard the interests of the farmers, horticulturists and sylviculturists in the sense of the above laws, and, besides, to make experimental studies relating to the formation, maturity, germination, and germinative ability of seeds, to determine the noxious weeds of the country and their seeds; to disseminate information regarding protection against weeds and plant parasites, and regarding good apparatus and machines for purifying seeds; and to make botanical analyses of different kinds of hay and other feeding stuffs.

All the Hungarian seed-control stations, except the one at Budapest, are attached to agricultural institutes. The permanent staff of the station at Budapest, which is now known as the Central Seed-Control Institution, consists of the director (now Dr. Árpád de Degen), 3 assistants, 1 microscopist, and 4 helpers; to these are added in the winter 6 aids and 2 boys. The personnel of the other stations is limited to the director, who is professor of botany in the agricultual institute with which the station is connected.

Each station possesses a standard collection of the seeds of cultivated plants and weeds, a library, analytical and volumetric balances, a set of optical instruments, thermostats, farinometer, and a collection of feeding stuffs.

The number of samples of seeds tested has increased from 62 in 1881, to 32,487 in 1898, and is steadily growing. By far the largest number are tested at the Central Institution at Budapest.

The rules and regulations prescribed by the Minister of Agriculture for seed testing are practically identical with those adopted by the German Seed-Control Commission. The tariff for seed tests varies from 1 crown (20.3 cents) for single tests to 8 crowns for a complete analysis of sugar-beet seed.

As the sale in Hungary of clover or alfalfa seed which is not free from cuscuta is prohibited, merchants are required to keep the seed of these plants in bags provided by the stations, with tags showing their purity. The tags are also furnished to merchants, on application, for use on other seeds, provided they come up to the following prescribed standards of purity and germinative ability:

Hungarian standards for seeds.

	Purity.	Germinative ability.		Purity.	Germinative ability.
	Per cent.	*Per cent.*		*Per cent.*	*Per cent.*
Abies alba	85	29	*Lathyrus sativus*	90	80
Agrostis alba	70	80	*Lathyrus sylvestris*	95	80
Alopecurus pratensis	70	50	*Linum usitatissimum*	96	80
Anthyllis vulneraria	90	75	*Lolium italicum*	92	74
Avena sativa	98	90	*Lolium perenne*	95	77
Beta vulgaris	96	76	*Lupinus* spp	95	75
Brassica spp	95	80	*Medicago lupulina*	95	80
Bromus erectus	70	62	*Medicago sativa*	96	80
Bromus inermis	70	65	*Nicotiana* sp	90	70
Cannabis sativa	95	80	*Panicum miliaceum*	97	90
Cynosurus cristatus	85	65	*Phaseolus* sp	95	75
Dactylis glomerata	73	75	*Phleum pratense*	95	85
Daucus carota	80	50	*Picea excelsa*	92	65
Festuca pratensis	80	78	*Pinus austriaca*	90	65
Pinus sylvestris	90	55	*Sorghum* sp	92	75
Pisum sativum	92	85	*Trifolium hybridum*	95	70
Poa pratensis	85	50	*Trifolium incarnatum*	95	80
Poa trivialis	85	58	*Trifolium pratense*	96	80
Polygonum fagopyrum	96	70	*Trifolium repens*	95	70
Secale cereale	98	95	*Triticum* sp	98	95
Setaria germanica	90	75	*Vicia sativa*	93	80
Hordeum sp	98	95	*Zea mays*	95	80

EXPERIMENT STATION FOR AGRICULTURAL MACHINES AT ALTENBURG.

This station was established in 1869 in connection with the Agricultural Academy at Altenburg. Its object is to test newly invented agricultural machines and implements, or those already in use, from both the theoretical and practical points of view, to determine their fitness for the operations for which they are designed. The station examines all machines and implements referred to it by the Minister of Agriculture, or submitted by agricultural associations or private parties. It is further the business of the station to supply to the agricultural population as complete and detailed information as possible on all questions relating to agricultural machines in actual use. From 1870 to the present year (1900), the station has tested 241 machines. The duties of the director of the station devolve upon the professor of agricultural-mechanical engineering, now Prof. V. Thallmayer.

Another experiment station for agricultural implements is located at Budapest in connection with the Polytechnicum.

PLANT CULTURE EXPERIMENT STATION AT ALTENBURG.

This station is the only one in Hungary primarily designed for general culture experiments. It was established in 1891 as a department of the Agricultural Academy. Its work was at first limited to variety testing, but in 1895 fertilizer experiments were undertaken. Up to 1897 the work of the station was exclusively practical in its nature, but in that year it received an appropriation for the installation of pot culture experiments, and since the spring of 1899 it has been able to take up the investigation of a number of scientific agricultural problems.

In accordance with the practical and theoretical objects which the station pursues it is divided into two sections. One is charged with the direction of experiments carried out with the cooperation of farmers, while the other is occupied with experimental investigations. The staff of the station consists of the chief, Prof. A. Cserháti, three assistants, and a chemist.

In the experiments carried out with the cooperation of farmers the latter receive the seeds and fertilizers free of charge, and in return conduct the experiments and keep records of them in accordance with instructions from the station. In 1899 495 variety tests and 100 fertilizer experiments were carried out in cooperation with farmers.

The fertilizer experiments have shown that the Hungarian soils are mostly in need of phosphoric acid, whose application alone materially increases the yield.

The station has been successful in its endeavors to introduce the culture of sugar beets into Hungary. It has demonstrated that, contrary to the general opinion, the seed raised in Hungary is in no respect inferior to that raised abroad, and it has induced many farmers to take up the growing of beet seed.

EXPERIMENT STATION FOR TOBACCO CULTURE AT DEBRECZEN.

In contrast with the rather modest equipment of other Hungarian stations of a much wider scope, the tobacco station is generously appointed. It was founded in 1898. Its object is to promote the tobacco industry of Hungary, ascertain the best conditions for the cultivation and the most suitable methods for curing the plant, to aid tobacco growers in the selection of varieties and in the raising of tobacco seed, and to contribute to the improvement of the quality of the leaf. The station is further charged with the training of workmen and officials for the administration of the government tobacco monopoly, and with supplying the tobacco growers with information and instructions as to rational culture.

In order to conduct the experiments simultaneously on the two most typical Hungarian soils, a substation (branch station) has been established at Békés-Csaba, which is under the control of the station at Debreczen. The soil in the latter place is sandy, while that at the substation is black and compact. It is planned to increase the number of substations in the future. Many experiments are also carried out with the cooperation of tobacco growers.

The station occupies about 29 acres of land belonging to the estate of the Agricultural Institute of Debreczen. Of this area the buildings occupy about 7 acres, the hotbeds 1.4 acres, the botanical garden 2.9 acres, a culture garden (for experiments on a small scale) 2.9 acres, and the field for culture experiments on a larger scale about 14.5 acres. The substation at Békés-Csaba has about 9 acres.

The central station has at present a main building with a laboratory, buildings for gardeners (6 separate cabins), 7 curing barns, 4 of which are of the various Hungarian systems, 1 of a Dutch, 1 of a German, and 1 of an American type; appliances for the Macedonian air-cure process, 2 storage houses, and 1 building for sorting and handling the leaves. In the near future a building for fermentation will be added, and later a school building designed for training gardeners in the cultivation of tobacco, and tobacco manipulators.

The botanical garden presents on small plats 209 different varieties of tobacco, the aim being to include every kind of tobacco cultivated on the globe.

The personnel of the station consists of the director (Prof. K. Kérpely), 3 other officers, 1 foreman, and 4 gardeners.

ENTOMOLOGICAL STATION AT BUDAPEST.

The entomological station began its activity as the "Phylloxera Station," which was called into existence in 1880 to combat the phylloxera. When toward the end of 1899 the entomological study of the phylloxera was practically concluded and it became evident that protection against the insect was more a question of general viticulture, the phylloxera station was reorganized into an entomological station.

The station is concerned, in the first place, with the common injurious insects which are most prevalent. The life histories of these are studied and experiments conducted to ascertain the surest and cheapest means for their destruction.

Work is also conducted on the repression of injurious mammals, such as the *Arvicola* and the *Spalax typhlus*. Furthermore, when a new injurious insect suddenly appears which requires prompt action to prevent serious ravages, the director of the station is authorized to take the necessary steps promptly without waiting to obtain permission from the higher authorities before he acts, as is otherwise the case. Measures of this kind have been required in the case of outbreaks of the following insects: *Haplothrips*, *Tychea*, *Entomoscelis adonidis*, *Cleonus punctiventris*, *Zabrus gibbus*, *Heliothis dipsaceus*, *Botis nubitatus*, *Argas reflexus*, *Cecidomyia destructor*, *Oscinis frit*, *Chlorops tæniopus*, *Chortophila sepia*, *Cheimatobia crenata*, *Phryganidæ*, *Gryllotalpa vulgaris*, *Tipula maculosa*.

Another duty of the station consists in supplying to all persons interested information on all matters relating to protection against injurious insects. In order to disseminate information on this subject the station publishes popular bulletins from time to time.

The personnel of the station consists of the director (Prof. J. Jablonovszky), assistant director, and 3 assistant entomologists. The work of the station is made more effective by the services of permanent correspondents located in different parts of the country who report all cases of injuries coming under their notice, and also assist in disseminating practical information regarding their control. These correspondents are mostly farmers or agriculturists interested in economic entomology, who serve voluntarily and without compensation. In the case of the government forest agents, however, the duties of permanent correspondents are obligatory.

STATION FOR PLANT PHYSIOLOGY AND PATHOLOGY AT ALTENBURG.

This station was organized in 1897 by the chief of the Seed Control Station at Altenburg, and the two stations together have received the official name of Public Station for Seed Control and Plant Physiology and Pathology. Both stations are under the management of Prof. G. Linhart, as director, who is professor of botany in the agricultural academy.

The chief object of the Station for Plant Physiology and Pathology is the study of all questions relating to nutrition, growth, and propagation of cultivated plants, the breeding of high-grade sugar beets, the effect of unfavorable conditions of life on plants, the origin of parasitic fungi and the injuries which they cause to cultivated plants, the control of outbreaks of these injurious diseases, and the measures likely to prevent their attacks. Lastly, it is the duty of the station to supply to parties interested full information on this subject free of charge.

The station examines diseased plants sent in by agriculturists, horticulturists, viticulturists, and sylviculturists, furnishes a description of the disease and gives instructions for defense against it. The station also conducts investigations on the nature and cause of plant diseases, its researches on the bacterial disease of sugar beets being worthy of special mention.

The buildings of the station are situated in a garden occupying 7,500 square meters (nearly 2 acres), of which 4,800 meters are available for experiments. The main building includes, besides a working office of the director and a large room for the examination of seeds, etc., mycological and bacteriological laboratories. The station has a greenhouse for germination experiments, collections of diseased plants and seeds, photographic apparatus, etc.

The staff consists of the director and one assistant, temporary helpers being employed as necessary.

STATION FOR ANIMAL PHYSIOLOGY AND FEEDING AT BUDAPEST.

This station, which was established in 1896, pursues the study of the rational feeding of domestic animals, giving special attention to the local conditions, i. e., to the animals raised in Hungary and to the feeding stuffs there cultivated or manufactured. The station has stables for the animals used in the experiments and a laboratory. The stables are provided with scales for weighing the animals, and the laboratory is equipped with everything necessary for the analysis of feeding stuffs, feces, and urine. The chemical analysis is accompanied by determination of the fuel value by means of a Berthelot-Mahler calorimeter.

Experiments thus far have been made with horses, swine, sheep, and poultry. The personnel consists of the director, Prof. F. Tangl, who is professor of physiology in the Veterinary Institute, and 2 assistants.

It will be seen that Hungary has a comprehensive system of experiment stations, which are rendering efficient service to the agriculture of the country. In addition to these stations an agricultural museum is maintained at Budapest, somewhat on the plan of the Philadelphia Commercial Museum, but managed by the Government. This museum is for the convenience of purchasers of various kinds of agricultural supplies, and includes collections of photographs, implements, samples, etc.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

The determination of phosphoric acid in fertilizers, soils, and ash by direct weighing of the ammonium phosphomolybdate, N. von Lorenz (*Landw. Vers. Stat., 55 (1901), No. 3, pp. 183–220*).—Previous methods based on this principle are briefly discussed and the method proposed by the author described in detail, with an account of investigations of the principles on which it rests and tests of its operation in laboratory work. The reagents required are as follows: (1) Sulphate-molybdic solution, prepared by dissolving 100 gm. of pure, dry ammonium sulphate in 1 liter of nitric acid, specific gravity 1.36 at 15° C., and pouring into it a solution of 300 gm. of pure, dry ammonium molybdate in 1 liter of water, the volume being made up to 2 liters, allowed to stand 48 hours, and filtered; (2) nitric acid of specific gravity 1.2 at 15° C.; (3) a mixture containing 30 cc. of sulphuric acid of specific gravity 1.84 in 1 liter of nitric acid of specific gravity 1.2; (4) a 2 per cent solution of pure ammonium nitrate rendered slightly acid by a few drops of nitric acid; (5) alcohol of 90 to 95 volume per cent which leaves no residue on evaporation and is not alkaline; (6) ether which leaves no residue on evaporation, is alcohol-free, not alkaline, and contains little water. Solutions of the substances to be examined are prepared as follows: In case of water-soluble phosphoric acid in superphosphates, dissolve 20 gm. in 1 liter of water and use 10 cc. for the determination. With double superphosphates use 10 gm. per liter and 10 cc. of the solution for the determination. For the determination of citrate-soluble phosphoric acid in Thomas slag, prepare the solution according to Wagner's method and use 15 cc. of the solution for the determination of phosphoric acid; in case of superphosphates, precipitated phosphates, etc., follow Petermann's method, using 10 cc. of the solution for the determination. For citric-acid-soluble phosphoric acid in Thomas slag, prepare the solution according to Wagner's method and use 15 cc. for the determination. For total phosphoric acid in superphosphates and Thomas slag, dissolve 5 gm. in 35 cc. of concentrated sulphuric acid without addition of nitric acid, or in 100 cc. of nitric acid, make up the solution to 500 cc. and use 15 cc. for the determination. In case of bone meal, spodium, mineral phosphate, precipitated phosphate, double superphosphate, guano, and all other substances containing more than 10 per cent of phosphoric acid, dissolve 5 gm. in 50 cc. of concentrated sulphuric acid, or in 100 cc. of nitric acid, make the solution to 500 cc., and use 10 cc. for the determination. With ground horn and other fertilizers containing less than 10 per cent of total phosphoric acid, dissolve 10 gm. of the substance in 50 cc. of sulphuric acid, or 100 cc. of nitric acid, making the solution to 500 cc., and using 15 cc. for the determination. For soils and other substances with less than 1 per cent of total phosphoric acid, treat 25 gm. with not more than 200 cc. of nitric acid, then add about 200 cc. of water, cool, and add 10 cc. of concentrated sulphuric acid, make the volume to 500 cc., and use 50 cc. for the determination. If the solution is made with sulphuric acid the aliquot taken for the determination is made to a volume of 50 cc. with nitric acid of specific gravity 1.2. In all other cases, including water-soluble, citrate-soluble, citric-acid-soluble phosphoric acid, as well as solutions in nitric acid for total phosphoric acid, the volume is made up to 50 cc. by the addition of the sulphuric-nitric acid mixture described above. In case of soil solutions no further addition of acid is made.

The 50 cc. of phosphoric acid solution is heated until bubbles of gas begin to form, swung a few seconds so that the sides of the beaker are not overheated, and 50 cc. of the sulphate-molybdic solution is poured into the middle of the solution and the beaker covered. As soon as the larger part of the precipitate has settled, which usually requires not more than 5 minutes, the solution is vigorously stirred for half a minute with a glass rod. After 2 to 18 hours, the longer period being required for soil solutions containing less than 3 mg. of phosphoric acid, the solution is rapidly filtered through a platinum Gooch crucible according to the Kilgore method, using paper disks, and the precipitate washed about 4 times with 2 per cent ammonium nitrate solution. The crucible is then filled once full and twice about half full with alcohol, care being taken each time not to allow the alcohol to be entirely drawn out of the filter before a fresh supply is added. The precipitate is then treated in the same way with ether, the precaution noted in connection with the alcohol washing being especially important in this case, as the precipitate dries so quickly and is in form of such fine powder that it may be drawn through the filter. The precipitate is dried for 30 minutes in a vacuum desiccator containing no absorbents and weighed. The ammonium phosphomolybdate obtained by this method contains 3.295 per cent of phosphoric acid.

The results obtained by the method were found to agree very closely with those given by Wagner's molybdic method, but were uniformly somewhat lower than those yielded by Reitmair's citrate method.

The determination of clay in soils, A. Pagnoul (*Ann. Agron., 27 (1901), No. 2, pp. 94–96; Bul. Sta. Agron. Pas de Calais, 1900, pp. 1–4*).—The author describes a modification of Schloesing's method, which he has used with success, as follows: To an amount of the sifted soil, corresponding to 5 gm. of dry soil, in a small dish add a small portion of a solution of 1 cc. of ammonia in 100 cc. of distilled water, rub up the soil against the sides of the dish with the finger, and pour off the liquid after standing 10 to 15 seconds. Repeat this operation three times and collect the soil and the washings in a second dish and boil for 2 or 3 minutes. After cooling, add 1 cc. more of ammonia, and wash the soil and solution into a 100 cc. cylinder having a side tube with stopcock at the 20 cc. mark (from the base), complete the volume to 100 cc. of distilled water, shake vigorously, and allow to stand for 5 minutes. Then draw off by means of the stopcock 80 cc. of the muddy liquid free from coarse sand and containing the clay in suspension. Add 20 drops of acetic acid and allow to stand for 10 to 15 minutes for the clay precipitate to settle. Collect on a filter and wash until all lime is removed. Then dry and calcine the filter. In this method the coarse sand is eliminate by decantation, the lime by filtration, and the organic matter by calcination. The weight obtained is therefore considered to represent the clay in suspension in 80 cc. of the decanted liquid. From this data the percentage of clay in the original soil may be readily calculated.

On the Adie and Wood method for the determination of potassium, C. Baskerville and I. F. Harris (*Jour. Elisha Mitchell Sci. Soc., 1900, No. 1, p. 18*).—The authors report comparisons of this method (E. S. R., 12, p. 18) with the official method with very satisfactory results.

The testing of drinking water with the Erdmann reagent, A. Ferman (*Oesterr.-Ungar. Ztschr. Zuckerind. u. Landw., 29 (1900), pp. 861–863; abs. in Chem. Centbl., 1901, I, No. 8, p. 475*).—Attention is called to the unreliabilty of Erdmann's reagent (E. S. R., 12, p. 18), due to the fact that very small amounts of organic matter and other substances will give the nitrite reaction. The author recommends the use of m-phenylendiamin, for, while this reagent is less sensitive than Erdmann's, it is less likely to give misleading results on account of reaction with other substances besides nitrites.

Fitch's salt analysis, a rapid method for the estimation of salt in butter, A. Vivian (*Wisconsin Sta. Rpt. 1900, pp. 98–101*).—A method for the determination of salt in butter, designed for factory use. A standard solution of silver nitrate is made by dissolving 2 tablets prepared for this purpose in 100 cc. of water. The tablets as put up by a Chicago firm contain 0.0509 gm. of silver nitrate in combination with potassium nitrate and gum acacia. The indicator is prepared by dissolving 1 gm. of potassium chromate in 1 liter of water. The sample of butter, weighing 3.5 gm., is treated with 180 cc. of boiling water, and 17.6 cc. of the mixture, when cool, is taken for titration. The quantities used are such that each cubic centimeter of the standard solution corresponds to 0.1 per cent of sodium chlorid. The number of cubic centimeters of the standard silver nitrate solution used divided by 10 gives, therefore, the percentage of salt in the butter. Comparative determinations by this method and the official method gave closely corresponding results.

A quick method for estimating sodium chlorid in meat, F. Glage (*Ztschr. Fleisch u. Milchhyg., 11 (1901), No. 4, pp. 111–114*).—A practical method for obtaining quick results by the use of an ammoniacal solution of silver nitrate.

A comparison of the calculated with the analytical results in estimating the solids of milk, H. Lührig (*Molk. Ztg., 14 (1900), Nos. 50, pp. 869–871; 51, pp. 889–891*).—Results with milk from various sources and different degrees of freshness.

The estimation of dry matter, fat, and ash in milk, H. Timpe (*Ztschr. Oeffentl. Chem., 5 (1899), p. 413; abs. in Hyg. Rundschau, 10 (1900), No. 15, p. 748*).—In milk analysis the use of asbestos as an absorbent material is advocated in lieu of sand or filter paper.

Estimation of fat in milk, R. Lézé (*Répert. Pharm. et Jour. Chim. Med., 3. ser., 13 (1901), p. 1; abs. in Chem. Ztg., 25 (1901), No. 16, p. 52*).—A practical application of Ramchen's method, employing a solution of potash, ammonia, ethyl and amyl alcohols for separating the fat.

The guiac test for pasteurized and unpasteurized milk, F. Glage (*Milch Ztg., 30 (1901), No. 12, pp. 182, 183*).—A large number of tests were made of the color reaction produced in milk by the addition of guiac tincture. It was found that in pasteurized milk no blue color was produced. In the unpasteurized milk the results were variable. In some cases a dark-blue color was produced, in some a very light-blue color, and in others no color at all. Different preparations of the tincture were tested.

A modification of Ritthausen's method for the determination of albuminoid nitrogen, F. Barnstein (*Landw. Vers. Stat., 54 (1900), No. 5–6, pp. 327–336*).—The modification proposes the addition of a known quantity of soda solution after the addition of copper sulphate to the heated mixture to be tested. The operation is carried out as follows: To 1 to 2 gm. of the substance in 50 cc. of water heated on the water bath there is added 25 cc. of a copper sulphate solution made up of 60 gm. of crystallized copper sulphate and 1 liter of water. After stirring, 25 cc. of soda solution of the strength 12.5 to 1,000 is added. After settling, the supernatent liquid is run through a filter, the precipitate washed by decanting, brought on the filter and washed with warm water until the filtrate gives no precipitate with barium chlorid.

By this method of adding soda solution in excess the copper is thrown down as a hydrate and not as a basic salt. Quite a number of comparative analyses of different substances are shown of the method proposed and of the method of Stutzer. The results show a higher average nitrogen content in the proposed modification.

Tables for use in Kjeldahl method for determination of nitrogen, A. Vivian (*Wisconsin Sta. Rpt. 1900, pp. 261–265*).—Tables are given showing the percentage of nitrogen corresponding to any titration and for the conversion of nitrogen into ammonia and protein.

The chemistry of proteids, A. Cohenheim (*Chemie der Erweisskörper. Brunswick: F. Vieweg & Son, 1900; rev. in Oesterr. Chem. Ztg., 3 (1900), No. 21, p. 518*).—The chemical properties and behavior of albumen toward reagents, micro-organisms, metabolic processes, etc., are discussed.

The proteids of vetch, T. Osborne and G. Campbell, translated by V. Griessmayer (*Ztschr. Landw. Versuchsw. Oesterr., 3 (1900), No. 1, pp. 63–67*).—Abstracted from another publication (E. S. R., 10, p. 214).

The proteids of peas, lentils, horse beans, and vetch, T. Osborne and G. Campbell, translated by V. Griessmayer (*Ztschr. Landw. Versuchsw. Oesterr., 3 (1900), No. 1, pp. 68–76*).—Abstracted from another publication (E. S. R., 10, p. 214).

The microscopy of the more commonly occurring starches, H. Galt (*New York: W. Wood & Co., 1901, pp. 112*).

The anatomy of maize cob, with especial reference to the detection of ground cobs in wheat or rye bran, A. L. Winton (*Connecticut State Sta. Rpt. 1900, pt. 2, pp. 186–195, figs. 9*).—A botanical study of the corncob is reported.

The estimation of tartaric acid in wine, L. M. de la Source (*Ann. Chim. Analyt., 5 (1900), No. 8, pp. 281–285*).—A modification of the Berthelot-Fleurieu method of estimating tartaric acid whereby potassium bromid is substituted for the potassium hydroxid employed.

Determination of salicylic acid in wines, L. Zanardi (*Ann. Soc. Chim. Milan, 1899, p. 134; abs. in Ann. Chim. Analyt., 5 (1900), No. 10, pp. 394, 395*).

Volumetric estimation of boric acid, J. Wolff (*Ann. Chim. Analyt., 5 (1900), No. 8, pp. 293, 294*).—A volumetric method using ferrisodium salicylate as an indicator, it giving with the alkaline salts of the borates a red or yellowish red solution.

The estimation of cacao hulls in cacao preparations, F. Filsinger (*Ztschr. Oeffentl. Chem., 1899, p. 27; abs. in Hyg. Rundschau, 10 (1900), No. 23, p. 1159*).—Five grams of cacao or chocolate is extracted with ether, and the residue repeatedly treated by washing and decanting with successive portions of water. The heavier particles remaining in the beaker are transferred to a watch glass, dried and weighed. This residue may then be examined microscopically and the percentage of hulls estimated.

The chemical composition of materials, H. A. Huston and A. H. Bryan (*Indiana Sta. Rpt. 1900, pp. 80–88*).—Analyses are reported of 1 sample each of alkali incrustation, black-eye cowpeas, dwarf soy beans, ash of oat clippings and oat dust, ash of corncobs, dry distillers' grain, hominy chop, and oat feed, 2 samples of water, 5 of limestone, 3 of formaldehyde, and 2 of hothouse tomatoes, with a brief discussion of the results in each case.

On the identification of minute quantities of carbon monoxid in blood and air, S. Koster (*Archiv. Physiol. [Pflüger], 83 (1901), Nos. 10–12, pp. 572–608, figs. 3*).—Experimental methods are reported. The article contains a bibliography.

On the measurement of higher temperatures by means of the spectrum apparatus, W. Hempel (*Ztschr. Angew. Chem., 1901, No. 10, pp. 237–242, figs. 3*).

A convenient micro-polariscope for food examination, A. L. Winton (*Connecticut State Sta. Rpt. 1900, pt. 2, pp. 195–198, figs. 2*).—Noted from another publication (E. S. R., 12, p. 516).

The essential oil industry of Michigan, A. M. Todd (*Michigan Bd. Agr. Rpt. 1900, pp. 400–403*).—The history and present status of the peppermint oil industry in the State, together with methods of culture and manufacture.

BOTANY.

The resumption of root growth in the spring, E. S. Goff (*Wisconsin Sta. Rpt. 1900, pp. 291–294, figs. 3*).—In a previous report (E. S. R., 11, p. 511) the results of investigations made in the spring of 1898 upon the roots of perennial plants were shown. The winter had been, for that region, an unusually mild one and as a result the roots of all plants examined were found to have started growth at the points where growth had ceased in autumn. The succeeding winter was an extremely severe one, and examination showed that the roots of only the hardiest plants started growth from their tips. The roots of all fruit trees at the station were more or less damaged, and of many trees examined only a single root of a Whitney crab was found to have started growth from its tip. The roots of the other trees were injured in all degrees, from total destruction to the destruction of the smaller root branches. The author concludes from his observations that the question as to whether or not the roots of perennial plants resumed growth in spring at their tips depends, in many species, wholly upon the character of the winter and except in the hardiest species it is probable that there is more or less root killing in the average winter.

Investigations on the root growth of plants, Müller-Thurgau (*Jahresber. Vers. Stat. u. Schule, Wädensweil, 1897–98, pp. 79–82*).—The author conducted a number of experiments with gourd and pea seedlings to determine the effect of a mixture of salts upon the growth of the roots. The salt mixture consisted of dibasic phosphate of potash, sulphate of lime, sulphate of magnesia, phosphate of iron, sodium chlorid, and ammonium nitrate. Different proportions of this combination were added to water cultures in which the plants were grown. The development of the roots was noted from time to time, the growth of the primary and secondary roots being measured and comparisons made with roots grown in distilled water. The concentration of the solution seems to exert a detrimental effect upon root growth, in general the best results being with the weaker solutions. The overfertilization of potted plants with easily soluble nutrient salts will not only impede the transpiration of the plants, but will check the formation of new roots, rendering their growth unsatisfactory.

Investigation of flower buds, E. S. Goff (*Wisconsin Sta. Rpt. 1900, pp. 266–285, figs. 32*).—In continuation of the investigation conducted by the author in a previous season (E. S. R., 12, p. 22), the investigations on the origin and development of the flowers of the cherry, plum, apple, and pear have been continued and extended to include the peach and strawberry. The effect of temperature on the development of the flowers was a subject of investigation, and the variation between the appearance of the flowers in the two seasons was observed. The author found that the anthers of the cherry and apple did not begin to swell perceptibly until the maximum temperature had reached 70° F. The pollen of the mother cells in the plum and cherry underwent some changes before the temperature reached 50° F. The embryo flowers of the cherry and plum appeared a little earlier than in 1899, while the date of the first appearance of the embryo flowers of apple and pear was not positively determined. In some cases they appeared as early as July, and in others in September. The summer and autumn periods of flower formation may prove distinct, and the late-formed flowers of the apple and pear may alone produce a good fruit crop the following season. Side buds, developed on the fruit spurs of apple, formed embryo flowers on several varieties before the middle of October. In the Clyde strawberry, the first indication of flower formation appeared September 20, flowers appearing on the rooted runner plants at practically the same time as upon the parent plant. Experiments in which pear trees were partially defoliated early in July hastened rather than retarded the formation of embryo flowers, and the partial defoliation of the fruit spurs of plum and cherries, as embryo flowers were commencing to form, did not prevent their formation but slightly reduced their size. The embryo flowers of the peach and strawberry began to be formed with the advent of cool nights in September. Flower buds, although apparently not structurally different from leaf buds, seldom, if ever, revert to leaf buds. In the case of apple buds, they may develop into flowers the first, second, or any subsequent season. However, if heavily shaded, flowers may never be formed. In seasons favorable for flower formation many of the buds formed, and nearly all those formed the preceding two seasons that have not already flowered will become flower buds. An excessive apple crop is followed by a light one on account of the supply of reserve buds being exhausted.

Studies on the formation of nitrogenous compounds in plants, A. EMMERLING (*Landw. Vers. Stat., 54 (1900), No. 3–4, pp. 215–281; abs. in Ann. Agron., 24 (1900), No. 10, pp. 517–522*).—The author conducted a series of investigations on the formation of nitrogenous bodies in different parts of the plant during various stages of development. The plant chosen for the experiments was *Vicia faba*. Analyses were made on 9 different dates, representing stages in the development of the plant from the day it had developed 3 or 4 leaves to its maturity.

In the first and second periods, the dry matter of the plant was at the minimum. The leaves contained their minimum content of total nitrogen, and active nitrogen assimilation had not yet begun. The roots, stems, and leaves contained about the same quantities of amido acids. Combined nitrogen was most abundant in the leaves and buds. The third period was when the plants were in flower, and at this time nonproteid nitrogen was found abundantly in all parts of the flower, and amido acids exceeded all other nitrogenous compounds in the leaves. During the second to the fourth period, inclusive, the nitrogenous bodies increased about three times. The leaves maintained their relative excess over the other parts. At the end of this period assimilation was at its height. Amido acids were formed more actively than bases, and the nitrogenous content of the roots was slowly increased. At the end of the period, some fruits had been formed in which the proportion of nonproteid and total nitrogen in the seeds and hulls was about equal. During the fifth period there was a marked increase in the dry matter of the fruits, and much nitrogenous matter was required by the seeds. The daily increase in nitrogen at this period was greater than in the preceding ones, and there was an active consumption of inorganic nitrogen for the formation of albumen. The fruits at the end of this period contained nonproteid bodies as their reserve material, and basic nitrogen was more abundant in the seeds than in the hulls. The quantity of nonproteids at this time was about the same in the leaves, hulls, and seeds. In the sixth period the dry matter of the fruits increased rapidly, and the daily increase of nitrogen attained its maximum. At this time the dry matter of the leaves about equaled that of the fruits. The proteid nitrogen increased in the seeds and hulls, while the nonproteids increased but little. Amido acids diminished very appreciably in the leaves and fruits. During the sixth and subsequent periods, until maturity, there was a gradual increase in the dry matter of the seeds. An increase in the nitrogenous constituents was found only in the seeds, and it was made at the expense of the nitrogen of the leaves, stems, hulls, etc. The amido acids in the seeds are transformed during the period of ripening, and they are said to be employed for the development of the seeds. The leaves and hulls seemed to act as reserve organs for the amids. At maturity the amid compounds decreased throughout the entire plant.

An extensive review of the literature relating to the subject is given, and the methods of experimentation are described in detail.

Albuminous substances and their transformations in the plant in connection with respiration and assimilation, D. N. PRIANISHNIKOV (*Izv. Moscow Selsk. Khoz. Inst., 5 (1899), pt. 3, pp. 284–389*).—Descriptions are given of experiments with *Pisum sativum*, *Vicia faba*, and *Lupinus luteus*, lasting for 18 days and made in order to study the connection between the energy of the decomposition of the albuminous substances and the age of the plants. The author concludes:

(1) The process of the decomposition of the albuminous substances in the vegetation of seeds has its maximum period, which is characterized by a high curve.

(2) The process of the accumulation of asparagin is represented by a similar curve, its maximum coinciding with the maximum of the former curve.

(3) Both curves reach their highest points a few days earlier than the curve of the respiration of carbonic acid.

(4) At the end of the period of vegetation, the energy of the accumulation of

asparagin, or more accurately, nitrogen in the form of asparagin, exceeds the rapidity of the decomposition of the albumins.

Another series is described in which 4 experiments were made with *Pisum sativum*, in order to ascertain the influence of the temperature upon the energy of the decomposition. Comparative experiments at 20°, 28°, and 35° C. were made with the following results: The increase of temperature produces on the process of the decomposition of albumin an influence analogous to that which temperature produces on the respiration, but unlike the influence on the process of growth.

The formation of albumins, in the process of assimilation, from the products of their decomposition, is described. Numerous experiments were made in the years 1895, 1896, 1897, and 1898 with *Vicia faba*, *Pisum sativum*, *Phaseolus multiflorus*, *Lupinus luteus*, and *Cucurbita pepo*. The results can be summed up as follows:

Plants which germinate in the light destroy albuminous substances just as energetically as those germinating in the dark; at a later period, when the leaf surface has developed, there begins the regeneration of albumin. In some plants this stage occurs 10 to 15 days from the beginning of the germination, while in others, Vicia and Faba, considerably later. The regeneration of albumin takes place at the expense of asparagin, as well as of other amido compounds, or the consumption of asparagin falls behind the consumption of other amido compounds. The leaves must be considered as the place of the most energetic regeneration of the albuminous substances, and analyses corroborate this a priori conclusion.

In the fourth and last chapter are communicated the results obtained in an experiment undertaken to verify results obtained by Zaleski in his study of the germination of *Allium cepa* in the dark. The work of the author corroborates the results communicated by Zaleski, namely, that in the germination of *A. cepa* in the dark, albumin is formed the first reported case of formation of albumin in the dark. After a survey of the literature on this subject, the author concludes that the observations which Zaleski made on the germinating *A. cepa* have for the first time proved that a regeneration of albumin is possible without the aid of light; but the observations of Zaleski, as well as of others, have not yet furnished clear evidence that a synthesis of albumin in the dark from nitrates and ammonia is possible in higher plants.—P. FIREMAN.

Upon the gaseous exchange between plants and the atmosphere, T. SCHLOESING, Jr. (*Compt. Rend. Sci. Paris, 131 (1900), No. 18, pp. 716–719*).—The author has made a study of the effect of different forms of nitrogen upon the gaseous exchange of plants, using for his experiments buckwheat and *Tropæolum minus*. Plants were grown in sand cultures and given approximately the same amount of nitrogen in the form of nitric nitrogen and ammoniacal nitrogen. It was found that the plants were able to utilize the ammoniacal nitrogen almost as readily as the nitric nitrogen, the development of the buckwheat being essentially the same in both media. As a whole the volume of oxygen given off by the plants was greater than the carbon dioxid taken up, and there appeared to be a relationship between the amount of gaseous exchange and the available mineral matter contained in the soil. The author states in conclusion that there is a direct relationship between the gaseous exchange which causes the formation of vegetable tissues and the composition of the mineral salts which are in contact with the roots of the plant.

The action of dry and humid air on plants, EBERHARDT (*Compt. Rend. Acad. Sci. Paris, 131 (1900), Nos. 3, pp. 193–196; 11, pp. 513–515*).—A report is given of an extensive series of experiments conducted by the author to ascertain the effect of dry and humid air on the growth of beans, lupines, spiræa, cytisus, acacia, and castor beans. Comparisons were made with the same plants grown under normal conditions. It was found that humid air increased very materially the development of the plants, both stems and leaves, while the diameter of the stem was diminished. There was a tendency to greatly increase the leaf surface and diminish the chlorophyll contained in the leaves, as well as to greatly reduce the root system. On the other hand, the dry air checked the growth and development of stems and leaves, increased the diameter of the stems, diminished the leaf surface, and greatly increased the number and distribution of the roots. In the later paper, the effect of the same factors on the structure of plants was shown. Dry air increased the thickness of the epidermis and the number of stomata. It also increased the production of ligneous tissue, hastened the differentiation of the sclerenchymatous tissue and also the pith. There was under the influence of the dry air a much greater development of palisade tissue in the leaves. In the humid air these structures were less differentiated than under normal conditions.

A closed-circuit respiration apparatus, S. M. Babcock and H. L. Russell (*Wisconsin Sta. Rpt. 1900, pp. 142–146, figs. 3*).—A description is given of a form of apparatus devised by the authors for conducting experiments in the respiration of vegetable tissues, particularly for the study of the phenomena attending the production of heat in silage. In the processes of their investigations it was found desirable to economize in the production of gases used, which was accomplished by the use of an apparatus in which a closed circuit permitted a limited quantity of gas to be used over and over, with or without the addition of volatile substances. The circulation of the gas was secured by utilizing a Bunsen pump. Instead of the ordinary Pettenkofer absorption tube, a special form of tube for the absorption of carbon dioxid was used with good results. The tube presents numerous irregularities which break up and hold the air, so that the carbon dioxid is more readily absorbed.

A preliminary list of the Spermaphyta, seed-bearing plants of North Dakota, H. L. Bolley and L. R. Waldron (*North Dakota Sta. Bul. 46, pp. 591–681*).—A list is given of the seed-bearing plants of the State, in which 340 genera and 775 species and varieties are enumerated. Notes are given on the economic value of many of the species and their distribution throughout the State indicated. The principal points of collection are shown upon a map of the State.

Some Cercosporæ of Macon County, Alabama, G. W. Carver (*Alabama Tuskegee Sta. Bul. 4, pp. 8*).—A list is given of about 75 species of Cercospora, with their host plants.

Origin of the cultivated plants of Argentina, C. Lemée (*Bol. Ofic. Agr. Gan., 1 (1901), Feb., pp. 3–9*).

The improvement of agricultural cultivated plants, C. Fruhwirth (*Die Züchtung der landwirtschaftlichen Kulturpflanzen. Berlin: Paul Parey, 1901, pp. X + 270*).

ZOOLOGY.

Infestation by mice and means for destroying them, G. Del Guercio (*Nuove Relaz. R. Staz. Ent. Agr., 1. ser., 1900, No. 3, pp. 109–123, fig. 1*).—It is reported that *Microtus terrestris* is becoming annually more destructive in certain parts of Italy. Experiments were made for the purpose of determining the most practicable means of destroying these animals. Poisons which were used for this purpose included arsenious acid, arsenite and arsenate of potash, arsenite and arsenate of copper, sulphate of copper, and corrosive sublimate. The experiments were conducted under conditions as near the normal as possible, fresh vegetation being sprinkled with solutions of the poison. Arsenite of potash proved the most effective and arsenious acid came next in effectiveness. Good results were also obtained from the use of poisonous gasses, such as sulphurous anhydrid and bisulphid of carbon.

Experiments were conducted in infecting mice with a disease due to *Coccobacillus murium*, and under favorable conditions this method promises favorable results. Detailed directions are given for the practical application of fluid poisons, gaseous poisons, and the bacterial virus.

Combating field mice, wood mice, and house mice by means of Löffler's bacillus of mouse typhus, K. KORNAUTH (*Ztschr. Landw. Versuchsw. Oesterr., 3 (1900), No. 2, pp. 123-132*).—The laboratory methods for preparing pure cultures of this bacillus have been much improved and it is now possible to distribute cultures of a more uniform virulence and at a smaller price. During 1899, 20,471 agar cultures of this bacillus were distributed in 468 localities. Circular letters of inquiry concerning the effectiveness of these cultures were sent to 324 persons, and satisfactory replies were received from 214. Of the 115 replies which referred to field mice, it was stated in 71 cases that the action of the cultures was good, while about 15 per cent of the replies stated that the cultures had no effect. Of the 24 replies which referred to wood mice, 18 reported good effects; and of the 73 relating to house mice 57 reported good results. A detailed statement covering the statistics relating to these agar cultures is presented in tabular form. The author states that the distribution of cultures was made late in autumn, and therefore at a time of the year when the disease was less apt to spread rapidly than in the spring.

The feathered denizens of the orchard, O. WIDMANN (*Missouri State Hort. Soc. Rpt. 1900, pp. 146-156*).—Brief notes on the biological relations of woodpeckers, sapsuckers, chickadees, wrens, and other common birds.

The insectivorous birds of Western Australia, R. HALL (*Jour. Dept. Agr. West. Australia, 2 (1900), No. 6, pp. 388-397, figs. 3; 3 (1901), No. 1, pp. 18-23, fig. 1*).—Brief notes are given on the feeding habits and biology of martins, swifts, swallows, and wood swallows.

The food of the variegated crow (Corvus cornix), G. STAES (*Tijdschr. Plantenziekten, 6 (1900), Nos. 1, pp. 12-22; 3-4, pp. 98-105*).—A critical review of the literature of the subject, together with a brief summary of the results thus far obtained from the study of the feeding habits of this bird.

METEOROLOGY.

The eclipse cyclone and the diurnal cyclones, H. H. CLAYTON (*Proc. Amer. Acad. Arts and Sci., 36 (1901), No. 16, pp. 307-318, figs. 6*).—This article summarizes the results of meteorological observations on the solar eclipse of May 28, 1900. The meteorological effects of the eclipse are shown to be important, because (1) they confirm Ferrel's theory of the cold-air cyclone, and show (2) the wonderful rapidity with which cyclonic phenomena can develop and dissipate in the atmosphere, and demonstrate (3) that cyclones do not necessarily drift with the atmosphere, but move with their originating cause, which in the eclipse had a progressive velocity of about 2,000 miles an hour.

"The discovery that the brief fall of temperature attending a solar eclipse produces a well-developed cyclone which accompanies the eclipse shadow at the rate of about 2,000 miles an hour suggests that the fall of temperature due to the occurrence of night must also produce or tend to produce a cold-air cyclone. Since the heat of day produces or tends to produce a warm-air cyclone, there must tend to occur each day two minima of pressure, one near the coldest part of the day and another near the warmest part of the day, with areas of high pressure between them due to the overlapping of the pericyclones surrounding the cold-air and the warm-air cyclones, respectively. These causes must produce entirely or in part the well-known double diurnal period in air pressure. At any rate, in view of the fact that an eclipse causes a cyclone over half a hemisphere, it will be necessary before rejecting such a theory to show that the fall of temperature at night does not produce a cyclone, or that this cyclone and the corresponding warm-air cyclone of the day do not appreciably influence the barometer."

The points in favor of the theory that the double diurnal period in pressure is due to 2 diurnal cyclones, one developed by the cold of night and the other by the heat of day, are briefly stated.

West Indian hurricanes, with some observations on the hurricane of the 10th of September, 1898, at Barbados (*Bot. Sta.* [*Barbados*], *Misc. Bul. 10, pp. 1–13, figs. 4*).

On the theory of precipitation on mountains, F. Pockels (*Ann. Phys., 4. ser., 4* (*1901*), *No. 3, pp. 459–480*).—In this article an attempt is made to reduce the well-known theory of condensation of moisture from the air on mountain slopes to a quantitative mathematical basis. The conclusion is reached that there is a zone of maximum precipitation on each mountain slope and that the amount of precipitation depends more upon the inclination of the surface than upon its absolute height. It is claimed that the latter conclusion is borne out by actual observation, especially on the higher mountain ranges.

Report on radiation, presented by the international meteorological committee at St. Petersburg in 1899, J. Violle (*Ann. Chim. et Phys., 7. ser., 22* (*1901*), *Mar., pp. 329–370*).—This report briefly reviews investigations on the subject of radiation, and discusses the various instruments and apparatus which have been used for its measurement, as well as the formulas used for the calculation of results of observations.

It is stated that we have excellent apparatus for measuring and recording solar radiation in the observatory as well as transportable instruments for scientific researches, but it is questioned whether we have actinometers which combine the features of simplicity, strength, and ease of use required by meteorologists in ordinary observations. Attention is called to the unreliability of all proposed formulas for calculating the solar constant. Observations at higher elevations permit an approach to the truth, and it is therefore urged that such observations be multiplied.

Prevention of hailstorms by cannon, J. C. Covert (*U. S. Consular Rpts., 65* (*1901*), *No. 246, pp. 334–336, fig. 1*).—The almost unanimous indorsement of this method of preventing hailstorms by the "hail congress," held at Padua, Italy, in November, 1900, is reported, and a new form of cannon, which uses acetylene gas as an explosive, is briefly described.

Frost protection (*California Cult., 16* (*1901*), *No. 10, pp. 145, 149–151, fig. 1*).—Papers by E. W. Holmes, E. A. Meacham, and J. H. Reed before the Riverside Horticultural Club on the protection of citrus-fruit orchards from frost.

Meteorological and experimental observations on beets, M. Hoffmann (*Bl. Zuckerrübenbau, 8* (*1901*), *No. 1, pp. 1–7*).

Phenological observations, Canada, 1899, A. H. MacKay (*Proc. and Trans. Nova Scotia Inst. Sci., 10* (*1899–1900*), *No. 2, pp. 303–318, fig. 1*).

Annual summary of meteorological observations in the United States, 1900 (*U. S. Dept. Agr., Weather Bureau, Monthly Weather Review, 28* (*1900*), *No. 13, pp. X + 585–599, charts 7*).—This number gives a table of contents, list of corrections, additions, and changes, and an index for volume 28; and a summary of observations on temperature, pressure, precipitation, wind movement, cloudiness, and other meteorological phenomena "based essentially upon data received from about 160 regular stations, 28 regular Canadian stations, and a number of voluntary stations."

Meteorological observations, J. E. Ostrander and C. L. Rice (*Massachusetts Hatch Sta. Met. Buls. 145, 146, 147, pp. 4 each*).—Summaries of observations on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during January, February, and March. The data are briefly discussed in general notes on the weather of each month.

Meteorological observations at the Michigan Agricultural College for 1899 (*Michigan Sta. Rpt. 1900, pp. 93–117*).—Tabulated daily and monthly summaries of observations during 1899 on temperature, pressure, precipitation, humidity, cloudiness, wind movement, etc. The summary for the year is as follows: Mean temperature, 47.76° F.; humidity, 89.1 per cent; atmospheric pressure (reduced to 32° F.), 29.088; cloudiness, 47.9 per cent; amount of rain or melted snow, 24.73 in.; snowfall, 39.15 in.; number of thunderstorms, 5.

Meteorological charts of the Great Lakes (*U. S. Dept. Agr., Weather Bureau Doc. 237, pp. 23, charts 14*).—This is a summary for the season of 1900, and includes data on opening and closing of navigation, storms and storm warnings, atmospheric precipitation and lake levels, fogs, ice, and wrecks and casualties.

Meteorological observations taken in Hertfordshire in the year 1899, J. Hopkinson (*Trans. Hertfordshire Nat. Hist. Soc., 10 (1900), No. 6, pp. 223–232*).—The results of observations on temperature, humidity, rainfall, and in some cases, sunshine, at 4 stations are tabulated and discussed.

Report on the rainfall in Hertfordshire in the year 1899, J. Hopkinson (*Trans. Hertfordshire Nat. Hist. Soc., 10 (1900), No. 6, pp. 213–222*).—Monthly records of rainfall at 45 stations are tabulated and discussed.

Meteorological observations during the year 1898-99 at the meteorological observatory of the University of Naples, G. Di Paola (*Bol. Soc. Nat. Napoli, 14 (1900), No. 1, pp. 5–18*).—Observations on temperature, pressure, elasticity and tension of vapor, relative humidity, direction of the wind, rainfall, and cloudiness are reported.

Meteorological observations (*Mem. An. Estac. Enol. Haro, 1900, July, p. 31*).—A monthly summary of observations at Haro, Spain, during the year ended June 30, 1900, on pressure, temperature, radiation, humidity, wind movement, rainfall, evaporation, cloudiness, storms, etc.

Meteorological reports for 1898 and 1899 (*Bot. Sta. [Barbados], Misc. Bul. 10, pp. 14–31*).—This includes tabular monthly summaries of observations at Dodd's Botanical Station, Barbados, on temperature, pressure, tension of vapor, humidity, rainfall, rainy days, and velocity of the wind, and monthly summaries of observations on rainfall at a large number of places in different parts of the island. A table is also given which shows the average annual rainfall, the value of the chemical manures applied, the crop of the island the following year, and the number of hogsheads of sugar obtained for each inch of rain which fell the previous year for 19 years, 1881–1899. From this table it appears that the average rainfall on the Island during this period was 67.08 in., the average value of the commercial fertilizers used was £57,723 ($280,533.78), the number of hogsheads ($\frac{7}{8}$ ton) of sugar produced per inch of rain, 885.

Psychrometric tables for obtaining vapor pressure, relative humidity, and temperature of the dew-point, C. F. Marvin (*U. S. Dept. Agr., Weather Bureau Doc. 235, pp. 84, figs. 2*).—The methods and apparatus used in the measurement of atmospheric moisture are briefly discussed, the methods of computing the results are explained, and tables for the reduction of psychrometric observations at stations of the Weather Bureau and cooperating observers are given.

Weather forecasts in Australia (*Rev. Sci. Paris, 4. ser., 15 (1901), No. 10, p. 310*).—Refers to report of the Royal Astronomer of West Australia as claiming that the night and morning forecasts have attained an accuracy of 82 to 89 per cent.

WATER—SOILS.

Soluble salts of cultivated soils, F. H. King and A. R. Whitson (*Wisconsin Sta. Rpt. 1900, pp. 204–226, figs. 7*).—This is an account of a continuation of investigations of the previous year (E. S. R., 12, p. 28), including studies of the influence of tillage, season, and cropping on the total amounts, relative proportions, and distribution of nitric nitrogen and soluble salts in soils.

"The chief effort has been devoted to a study of the amount of nitric nitrogen in field soils under crop conditions throughout the season, at the same time following a parallel control series of studies in plant house cylinders as a check upon the field work.

"Work in the field was begun as soon as the frost was out of the ground and the nitric nitrogen content of the 9 field plats, covering 10 acres, has been determined at the middle and beginning of each month from April 18 to September 18, or 11 times.

"In 8 of these cases samples were taken in 1 ft. sections to a depth of 4 ft., at the other intervals at a depth of 2 ft. By doing this we have secured a detailed record of the changes in the amount and distribution of nitric acid through an entire growing season for 3 plats of corn, 2 plats of potatoes, 2 plats of clover, 1 plat of alfalfa, and 1 plat of oats. . . .

"Side by side with the nitric acid determinations we have made a study of the total soluble salts as indicated by the electrical resistance, the two sets of determinations being usually made on each set of samples.

"The amounts of water present in the field soil have been recorded at each interval and for each depth, and the total amount of dry matter produced on each plat has also been recorded; so that we are now in possession of a fairly accurate set of data showing the amount of nitric acid and the amount of water present in the soil, throughout the season, upon which known amounts of nine crops have been grown."

The experiments on tillage were made in the plant house with cylinders 52 in. deep and 18 in. and 3 ft. in diameter in 3 series, as follows: (1) Not cultivated, (2) cultivated 3 in. deep once a week, and (3) cultivated 3 in. deep once in 2 weeks. The soil used was a clay loam and had in different cases previously borne crops of corn, clover, oats, potatoes, and timothy and beets following beans. No water was applied and there was no drainage from the cylinders during the experiment. The gains and losses of nitric nitrogen and soluble salts during the 93 days of the experiment are recorded.

"The general conclusions suggested by this study may be stated as follows:

"(1) Nitrification has taken place at all depths down to 3 ft. below the surface, and hence that in these cases it is not a process limited to the surface few inches.

"(2) As a general rule there has been the highest increase of nitric nitrogen in the surface foot and the increase in the third foot has generally exceeded that in the second foot.

"(3) The increase of nitric nitrogen has been greater at all depths, as a rule, where the soils have not been cultivated than where they have.

"(4) In two groups of cylinders there has been a tendency for the nitric nitrogen to decrease rather than increase.

"(5) There has been 22 per cent more nitric nitrogen developed from the soil after clover than from the soil after corn, and 13 per cent more than from that after oats during the 93 days.

"(6) But the soil after growing corn the same number of years that the other had grown clover began the experiment with nearly three times as much nitric nitrogen in it as the soil after clover did and it closed the cultivation period with 17 per cent more nitric nitrogen.

"(7) The soil, after oats, began the experiment with 2.6 times as much nitric nitrogen as the clover soil did and it closed the cultivation period with 13.8 per cent more nitric nitrogen.

"(8) The fertilizing power of clover appears to depend more upon the amount of nitrogenous material left in the soil which is capable of rapid nitrification than upon nitric nitrogen accumulated by it.

"(9) With the marsh soil yielding poor crops there was in both cases a heavy gain of nitric nitrogen in the first foot, but in the soil giving better yields there was only a small gain in the not cultivated ground and a loss in the surface foot of cultivated ground. Indeed there was a total mean gain in the poorer soil of 37.47 parts per million but one of only 2.97 parts per million in the better soil for all three feet, while in the case of the clay loam the total mean gain was 8.77 parts per million of nitric nitrogen."

Similar observations on cylinders filled with sand or pine barrens soil on which clover and alfalfa had been grown and turned under as green manure confirmed the above conclusion that "the clovers leave a soil in such a condition that the rate of development of nitric nitrogen in them is more rapid than after other crops, like oats and corn." The soil stirred once a week developed more nitric nitrogen than that stirred once in 2 weeks, but there is no evidence that tillage exerted any notable influence in increasing nitrification or the formation of soluble salts in the soil below the stirred layer.

The influence of the frequency and depth of tillage on the nitric nitrogen and soluble salts was studied on uniform clay loam, using the cylinders described in a previous report (E. S. R., 12, p. 521). The experiment was begun in December, 1899, and lasted 258 days. The amounts of nitric nitrogen in the surface foot in the cylinders at the close of the 258 days were as follows: Not cultivated, 325.48 lbs. per acre-foot; cultivated once a week, 1 in. deep, 217.60 lbs.; cultivated once a week, 2 in. deep, 323.44 lbs.; cultivated once a week, 3 in. deep, 441.24 lbs.; cultivated once a week, 4 in. deep, 387.96 lbs.; cultivated once in 2 weeks, 1 in. deep, 213.29 lbs.; cultivated once in 2 weeks, 2 in. deep, 199 lbs.; cultivated once in 2 weeks, 3 in. deep, 401.68 lbs.; cultivated once in 2 weeks, 4 in. deep, 245.26 lbs.

The nitric nitrogen was determined August 22, 1899, and April 30, 1900, in the first, second, third, and fourth foot of soil of 9 fallow plats described in a previous report (E. S. R., 12, p. 31), which were surrounded by trenches and raised border at the beginning of winter to prevent washing and to secure as much leaching as possible from the natural precipitation. The results show "that there was more nitric nitrogen in the soil at the beginning of May, 1900, than was found after being cultivated every week or 2 weeks from May, 1899, until August 22 of that year with no crop on the ground."

"If an average of the amounts of nitric nitrogen found in the surface 4 ft. of the 9 field plats in the spring is compared with the amounts found in the upper 4 ft. of the 9 fallow plats, they will stand as given in the table below:

The differences in the amounts of nitric nitrogen in fallow ground and in that bearing crops after the winter and early spring rains.

[In pounds per acre. Calculated to dry soil.]

	First foot.	Second foot.	Third foot.	Fourth foot.
Fallow plats	212.00	56.22	21.91	13.11
Plats not fallow	25.24	15.08	10.00	7.24
Difference	186.76	41.14	11.91	5.87

Studies of the seasonal changes of nitrates and other soluble salts were continued during 1900 with crops covering the entire surface, so that intertillage could not be practiced, and with cultivated crops. The studies began in April, just after the frost had left the ground, and continued until September 19, when most of the crops had completed their growth. The combined results obtained are shown graphically. The nitrates increased rapidly in the surface foot of the cultivated ground until July 1, then fell rapidly until August 1, when the crops were making the most rapid growth. From this date they rose slowly until corn was cut, September 1, and then more rapidly until September 19, when the last observations were taken. With uncultivated crops, such as clovers, on the other hand, the nitrates of the first foot increased much more slowly, reaching a maximum June 1, or a month earlier, then declining slowly, reaching a minimum on August 1, after which they again rose until the end of the season. The most rapid increase in nitrates in case of the corn and potato soil occurred in the surface foot. When, however, the crops came into vigorous growth, the nitrates in the surface soil were rapidly reduced. Similar, but less marked, fluctuations occurred in case of the uncultivated crops—clover, alfalfa, and oats.

The total salts in the surface foot of the cultivated soil reached a maximum July 1, from which date they rapidly declined until they reached a minimum August 1. In case of the uncultivated crops—clover, alfalfa, and oats—the soluble salts increased rapidly at the beginning of the season, reaching a maximum about May 1. From this date they slowly decreased until the 1st of July, and then remained stationary until August, after which they rose again until September 1, when they were practically the same as at the beginning of the season.

"If comparison is made between the changes in nitrates in the second, third, and fourth feet and in the total soluble salts for corresponding depths it will be seen that the curves generally go through the same phases throughout the season under both the cultivated and not cultivated crops, each rising and falling together, but through a much greater amplitude with the total salts where the amounts are so much larger.

"The most striking difference between the seasonal changes, both of nitrates and total salts, in the first foot of soil, and in the next 3 ft., is found in the much greater fluctuations recorded for the surface.

"The relation existing between the amount of nitric nitrogen in field soils computed as calcium and magnesium nitrates and the total soluble salts as indicated by the electrical resistance appears to be widely variable under different conditions.

"The ratio of total soluble salts to the nitrates in the surface foot of the five cultivated fields is, on the average for the whole season 2.14 to 1, while in the surface foot of the clover fields it is 4.8 to 1. For the second, third, and fourth feet for the season the ratio is 7.29 to 1 for the corn and potato fields, and 9.97 to 1 for the clover, alfalfa and oats."

It was found that the largest yield of corn was not associated with the highest percentage of nitrates in the soil, but with the largest amount of soluble salts.

The results of the season's observations show that extremely small amounts of nitric nitrogen may occur in a soil on which plants make vigorous growth and produce large yields. With the right amount and distribution of water large yields may be produced when the nitrates in the surface foot of soil are as low as 24 lbs. per acre in case of corn, 45 lbs. in case of clover, 19 lbs. with alfalfa, and 105 lbs. with potatoes.

Influence of potash salts on black marsh soils, F. H. KING and A. R. WHITSON (*Wisconsin Sta. Rpt. 1900, pp. 197–203, fig. 1*).—In continuation of previous experiments (E. S. R., 12, p. 32), tests were made at the station of the relative effectiveness of (1) potassium sulphate, potassium chlorid, potassium-magnesium carbonate, and kainit; and (2) potassium sulphate and chlorid applied in different ways and at different rates. The potash salts were applied to corn at the following rates per acre, furnishing equal amounts of potash: Sulphate, 263.3 lbs.; chlorid, 171 lbs.; potash-magnesium carbonate, 649.8 lbs.; kainit, 644.6 lbs. Comparing the yields of the fertilized rows with the parallel unfertilized rows, counting the latter yield as 1, the following results were obtained:

Increased yield of corn with potash salts, counting yield without potash as 1.

	Increase of stalks.	Increase of ears.
With equal amounts of potash:		
623.3 lbs. potassium sulphate	2.04	4.43
171 lbs. potassium chlorid	1.89	3.66
649.8 lbs. potassium-magnesium carbonate	1.84	3.04
644.6 lbs. kainit	1.81	2.52
With different amounts of potash:		
640 lbs. potassium sulphate	1.70	2.29
320 lbs. potassium sulphate	1.51	1.91
171 lbs. potassium chlorid	1.41	1.48
85.5 lbs. potassium chlorid	1.33	1.48
In hills *vs.* broadcasting:		
Potassium sulphate applied in hill	1.72	2.37
Potassium sulphate applied broadcast	1.81	1.91
Potassium chlorid applied in hill	1.44	1.82
Potassium chlorid applied broadcast	1.42	1.24

Potassium sulphate at rates of 77.2 lbs. per acre, chlorid, 86.5 lbs., and nitrate 91.1 lbs., were each applied at the surface and at depths of 3, 6, and 9 in. to corn growing in 3 ft. cylinders of marsh soil. From the results reported it appears that:

"(1) The untreated soils have given yields only about one-half those from the treated soils.

"(2) While the yields on the untreated poorest soils are less in every case than those from the better soil, the same amount of potash given to the poorer soil as that given to the better has in nearly every case produced a larger mean yield than the better soil did.

"(3) The salts when applied at the surface have produced the least general increase in yield, the 9 in. depth standing next, while the 3 in. depth has given the largest general average.

"(4) The data appear to indicate that the corn can not utilize the potash as well for food when applied at the surface or 9 in. below as at intermediate depths, or else that the salts exert an influence between 2 in. and 6 in. which is helpful in other ways than as plant food."

In experiments with potash salts on a variety of crops on marsh soils on 3 farms in different parts of the State it was found that the potash salts were beneficial when worked into the soils.

On the absorption of monocalcium phosphate by arable soil and by humus, J. Dumont (*Compt. Rend. Acad. Sci. Paris, 132 (1901), No. 7, pp. 435–437*).—This article reports tests of the absorptive power of different kinds of soil for monocalcium phosphate by the following method: Fifty grams of the fine dry soil (passing a 1 mm. sieve) was shaken up with 350 cc. of a solution of monocalcium phosphate containing 0.815 gm. of phosphoric anhydrid, and at intervals of from 2 hours to 15 days phosphoric acid was determined in 20 cc. of the solution.

It was found that in humus soils containing variable amounts of lime, absorption was greater than in ordinary soils and that removal of humus by incineration greatly reduced the absorptive capacity. Apparently absorption depends upon the relative proportions of humus and lime, i. e., the greater the proportion of humus to lime, the greater the absorption.

The fixation of the phosphoric acid was not due exclusively to reversion, and an abundance of humus reduced the amount of reversion.

The chemical composition of Maryland soils, F. P. Veitch (*Maryland Sta. Bul. 70, pp. 63–114*).—This is a report on a chemical investigation of 60 samples of soil representing the typical soil formations of the State. The analyses were made in the laboratory of the Division of Soils of this Department. The bulletin discusses the importance, object, and scope of soil work; the purpose and methods of chemical examination of soils; describes the samples, and discusses their classification with reference to geological formations, typical crops, and chemical and mechanical composition. In the chemical examination of the soils 3 methods were used, (1) fusion method,[1] (2) concentrated (1.115 sp. gr.) hydrochloric acid method,[2] and (3) fifth-normal hydrochloric acid method.[2] The average results obtained with the different classes of soils are given in the following table:

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[1] Bul. U. S. Geol. Survey, 148.

[2] U. S. Dept. Agr., Division of Chemistry Bul. 46, revised.

Chemical composition of typical Maryland soils.

Soil and method of analysis.	Silica.*a*	Potash.	Soda.	Lime.	Magnesia.	Iron oxid.	Alumina.	Phosphoric acid.	Reaction.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	
Columbian truck soil:									
By fusion method	93.89	0.47	0.22	0.41	0.32	0.75	1.90	0.07	
Soluble in 1.115 sp. gr. HCl	96.92	.025	.04	.01	.21	.75	1.90	.025	
Soluble in 1/5-normal HCl	98.575	.010	.012	.022	.007	0.114		.001	
Chesapeake and Columbia truck soil:									Very faintly acid.
By fusion method	89.92	1.06	.94	.42	.40	.75	4.61	.075	
Soluble in 1.115 sp. gr. HCl	96.12	.08	.06	.11	.02	.58	1.25	.024	
Soluble in 1/5-normal HCl	97.813	.009	.009	.087	.019	0.115		.001	
Chesapeake tobacco soil									Acid, 2d in acidity.
By fusion method	84.95	.91	.61	.53	.47	2.30	6.58	.25	
Soluble in 1.115 sp. gr. HCl	89.72	.25	.10	.12	.37	2.12	3.78	.155	
Soluble in 1/5-normal HCl	95.531	.015	.009	.098	.030	0.617		.044	
Chesapeake corn and wheat soil									Most acid of all.
By fusion method	78.05	1.27	.52	.51	.73	3.26	9.98	.20	
Soluble in 1.115 sp. gr. HCl	84.08	.42	.18	.09	.52	1.85	7.15	.17	
Soluble in 1/5-normal HCl	93.69	(*b*)	(*b*)	.09	.056	0.711		.031	
Columbia corn and wheat soil									Acid, 3d in acidity.
By fusion method	80.99	1.29	.51	.60	.28	2.67	8.82	.16	
Soluble in 1.115 sp. gr. HCl	88.13	.21	.14	.20	.26	1.95	5.13	.06	
Soluble in 1/5-normal HCl	95.196	.006	.009	.109	.028	0.205		.004	
Chesapeake and Columbia corn and wheat soil:									
By fusion method	78.68	1.57	.77	.47	.58	2.56	10.77	.056	
Corn and wheat soil of Eastern Shore:									Neutral.
Soluble in 1.115 sp. gr. HCl	86.56	.13	.07	.14	.45	1.88	6.00	.034	
Soluble in 1/5-normal HCl	95.114	.024	.014	.094	.041	0.364		.002	
Hudson River shale									Alkaline.
By fusion method	64.80	2.40	.44	.81	1.09	5.70	15.50	.11	
Soluble in 1.115 sp. gr. HCl	73.46	.40	.22	.51	.78	4.15	10.85	.11	
Soluble in 1/5-normal HCl	90.04	.016	.000	.477	.067	0.438		.001	
Gneiss soil									Neutral.
By fusion method	64.67	1.31	.46	.38	.56	6.83	17.32	.083	
Soluble in 1.115 sp. gr. HCl	73.36	.19	.03	.13	.54	6.60	10.78	.058	
Soluble in 1/5-normal HCl	91.247	.011	.118	.117	.058	0.378		.001	
Gabbro soil									Neutral.
By fusion method	53.54	.90	.80	.53	.86	8.41	23.90	.08	
Soluble in 1.115 sp. gr. HCl	61.79	.19	.12	.18	.34	8.40	17.36	.08	
Soluble in 1/5-normal HCl	88.507	.013	.009	.074	.05	0.455		.001	
Helderberg limestone									Neutral.
By fusion method	70.86	2.37	.51	.55	.89	5.02	12.57	.17	
Soluble in 1.115 sp. gr. HCl	80.00	.72	.24	.30	.58	4.30	6.97	.105	
Soluble in 1/5-normal HCl	92.486	.022	.006	.255	.057	0.384		.003	
Catskill sandstone									Neutral.
By fusion method	65.85	3.02	.52	.34	.98	6.69	15.35	.125	
Soluble in 1.115 sp. gr. HCl	81.56	.57	.17	.13	.43	4.30	6.87	.055	
Soluble in 1/5-normal HCl	92.158	.017	.010	.046	.030	0.466		.002	
Triassic sandstone									Acid.
By fusion method	62.00	3.10	.62	.53	2.08	3.95	19.29	.11	
Soluble in 1.115 sp. gr. HCl	74.81	.67	.37	.41	1.78	5.95	9.62	.082	
Soluble in 1/5-normal HCl	93.264	.015	.01	.103	.053	0.36		.002	
Trenton limestone									Neutral.
By fusion method	65.25	3.05	.42	.57	.85	6.47	15.10	.15	
Soluble in 1.115 sp. gr. HCl	74.49	.45	.08	.29	.85	4.58	10.92	.102	
Soluble in 1/5-normal HCl	92.711	.012	.011	.267	.058	0.385		.002	
Cambrian sandstone									Neutral.
By fusion method	64.41	3.40	.48	.62	1.21	5.58	17.46	.14	
Soluble in 1.115 sp. gr. HCl	82.42	.33	.11	.17	.53	3.88	6.15	.09	
Soluble in 1/5-normal HCl	93.084	.016	.008	.072	.027	0.280		.002	
Lafayette sands:									
By fusion method	94.32	.12	.11	.04	.07	1.25	2.66	.02	
Serpentine soils									Acid.
By fusion method	67.55	1.64	1.87	.57	3.21	4.82	13.46	.19	
Soluble in 1.115 sp. gr. HCl	83.71	.18	.10	.10	.88	3.82	5.22	.065	
Soluble in 1/5-normal HCl	93.409	.015	.017	.043	.050	0.480		.001	
Potomac clay soils									Very faintly acid.
By fusion method	62.94	1.54	.63	.61	.38	4.22	21.63	.135	
Soluble in 1.115 sp. gr. HCl	84.05	.14	.10	.07	.04	3.07	5.26	.046	

a Total silica in case of fusion method, insoluble silicates in case of the concentrated hydrochloric acid method, and the sum of the soluble and insoluble silica in case of the 1/5 normal hydrochloric acid method.
b Not determined.

The author concludes from the results obtained that the ultimate chemical analysis (by fusion) of a soil "affords absolutely no reliable basis for a classification."

"The solubility of the essential plant foods in strong acids is shown to afford a grouping and an arrangement within the groups that is about as valuable as the results based upon the physical properties alone. The solubility in weak hydrochloric acid affords about as satisfactory a grouping as either of the above methods. The systematic classification of these soils upon the combined influences of their physical and chemical properties is as yet impossible. There are evidently undetermined factors whose influence is great enough to vitiate this classification."

The results indicate that these soils are most in need of lime or lime and organic matter. "Phosphoric acid is probably the substance which, after lime, is indicated as being most needed."

"In the order of economic importance the next need of our soils is nitrogen. While we have no data upon the actual nitrogen content of these soils, some information upon this point may be gained by the amount of volatile (organic) matter which they contain and which approximately determines their nitrogen supply. . . .

"From the results of the chemical analysis it is evident that the addition of potash is the least needed of the several plant foods. In all the soils it is present in great quantities. Its solubility in the two solvents, concentrated and fifth-normal hydrochloric acid, is indicative of its presence largely in an available form in all but the light sandy soils of the State."

A chemical study of the phosphoric acid and potash contents of the wheat soils of Broadbalk field, Rothamsted, B. Dyer (*Proc. Roy. Soc. [London], 68 (1901), No. 442, pp. 11–14*).—Determinations of phosphoric acid and potash soluble in strong hydrochloric acid and in 1 per cent citric acid in samples of soils from the first, second, and third 9 in. of the soil of 12 plats, manured in different ways and unmanured, that had been cultivated in wheat for 50 years consecutively, are reported. (See also E. S. R., 10, p. 933.) Examinations of samples of the same soils collected in 1865 and 1881 are also reported.

"The difference between the total percentages of phosphoric acid in different soils, unmanured and variously manured, corresponds fairly well with their history, but in the absence of a knowledge of such history these differences would not suffice to give any indication of the profound differences known to exist in the phosphatic condition and fertility of the soils. The relative proportions of citric acid soluble phosphoric acid, however, appear to afford a striking index to the relative phosphatic fertility of the soils."

The superiority of the citric acid method for determining the phosphoric acid requirements of a soil was more strikingly shown in case of the subsoils than of the surface soils. In the surface soils the average ratio of the total phosphoric acid in plats which had received phosphatic fertilizers to that in plats receiving no phosphates for 50 years was 1.65 : 1; of citric acid soluble phosphoric acid, 5.46 : 1. The results obtained indicate that a soil containing as low as 0.01 per cent of citric acid soluble phosphoric acid in the surface soil needs phosphatic fertilizer, while that containing as much as 0.03 per cent is in no immediate necessity of such fertilizing. The results generally indicate also that the greater proportion of the unconsumed phosphoric acid accumulates in the first 9 in. of soil. In case of barnyard manure and of superphosphates accompanied by potash, soda, and magnesia salts, the fertilizing constituents were diffused to a considerable extent throughout the second and even the third 9 in.

"Strong hydrochloric acid as a solvent for potash in soil analysis is shown to be practically useless as a gauge of potash fertility where there is an abundance of total potash in mineral combination, as silicates, etc. . . . The results obtained by citric acid, however, are strikingly instructive and consistent. . . . The ratio of the average quantity of hydrochloric acid soluble potash in the surface soil of 3 potash-dressed plats to the average quantity found in 7 plats not dressed with potash was 1.20 : 1. The citric acid soluble potash ratio, however, was 6.75 :1. The plat dressed with dung for 50 years and 9 years, respectively, gave, as compared with the same 7 nonpotash plats, hydrochloric acid soluble potash ratios of 1.27 : 1 and 1.23 : 1, while the citric acid soluble potash ratios were 10.67 : 1 and 9.17 : 1."

The results indicate that when the first 9 in. of the soil contains as much as 0.01 per cent of citric acid soluble potash, applications of potash fertilizers are not needed. The larger part of the unused potash was accumulated in the surface soil, although a considerable proportion was found by the citric acid method to be diffused throughout the second and third 9 in.

The valuation of arable soils on a scientific statistical basis, G. Thoms (*Zur Werthschätzung der Ackererden auf naturwissenschaftlich-statistischer Grundlage. Mitt. III. Riga: N. Kymmel, 1900, pp. 115, map 1, charts 6*).—This is a continuation of previous investigations (E. S. R., 8, p. 573) and reports the results of analyses of 234 samples of soils collected during 1893, 1894, and 1895, on 39 estates in Courland. The results are charted as well as tabulated. The following table gives a summary of the average results obtained:

Average composition of Courland soils of different productive capacities.

	Best soil.		Medium soil.		Poorest soil.		Average of surface and subsoil.		
	Surface soil.	Subsoil.	Surface soil.	Subsoil.	Surface soil.	Subsoil.	Best.	Medium.	Poorest.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Phosphoric acid	0.1332	0.0937	0.1099	0.0743	0.1011	0.0652	0.1134	0.0921	0.0831
Lime	.9973	.7290	.4393	.5585	.3401	.4918	.8631	.4989	.4159
Potash	.2849	.3638	.2437	.3308	.1785	.2500	.3243	.2872	.2142
Nitrogen	.1916	.0666	.1582	.0551	.2012	.0477	.1291	.1066	.1244
Magnesia	.5318	.6294	.3962	.6164	.2814	.4030	.5806	.5063	.3422
Water in the soil in the field	13.44	9.80	12.69	8.01	12.80	8.73	11.62	10.35	10.76
Loss on ignition	6.10	2.99	4.73	2.68	6.04	2.32	4.54	3.70	4.18
Absorptive capacity for ammonia	42.91	57.23	37.85	50.05	36.61	38.96	50.07	43.95	37.78
Clay	27.46	31.77	25.51	27.98	18.06	18.96	29.61	26.74	18.51
Depth of surface soil	29.80	....	22.76	....	17.33	....	....	....	....
Productive capacity observed	14.83	....	11.64	....	7.49	....	....	....	....
Productive capacity on basis of examination	12.87	....	12.02	....	10.90	....	....	....	....

The results show a direct relation between the productive capacity of the soil and its content of plant food as shown by analysis. This is especially true as regards the phosphoric acid, but is also shown in the case of potash, lime, magnesia, and nitrogen (in subsoil).

Waters for table use sold in bottles or jugs, H. E. Smith (*Connecticut State Sta. Rpt. 1900, pt. 2, pp. 201–215*).—Analyses of a number of samples.

FERTILIZERS.

Swamp muck, H. A. Huston and A. H. Bryan (*Indiana Sta. Rpt. 1900, pp. 73–75*).—The muck beds which are found in different parts of Indiana, in areas varying from a fraction of an acre to over 5,000 acres, are briefly described and their value as manure is discussed, the nitrogen in 6 samples of water-free muck being reported. The nitrogen varied from 2.75 per cent to 4.14 per cent. For purposes of comparison, 2 samples of muck and 1 of pure peat moss in an advanced state of decay, secured in Maine, were also analyzed. The nitrogen in water-free material in these samples was 1.75 and 1.83 per cent in case of the muck, and 0.67 per cent in the peat moss. Suggestions regarding the composting of the muck are made.

Marls, H. A. Huston, W. J. Jones, and A. H. Bryan (*Indiana Sta. Rpt. 1900, pp. 76, 77*).—The character of the calcareous marls found in Indiana are briefly described and the range in composition of 10 samples of such marls is reported as follows:

Composition of Indiana marls.

	Per cent.
Moisture	0.34 to 0.80
Organic matter	3.25 to 6.63
Insoluble matter	.44 to 3.30
Carbonate of lime	85.68 to 92.74
Magnesia	.98 to 1.76
Sulphur trioxid	.70 to 1.02
Iron and alumina	.46 to 1.64

As the analyses show, the value of these marls depends mainly upon their lime content. The utilization of the marls as fertilizer and for the manufacture of cement is discussed.

Observations on the action of sulphate of ammonia on succeeding crops, E. Kloepfer (*Fühling's Landw. Ztg., 50 (1901), No. 4, pp. 154–158*).—The results of a series of plat experiments are reported which indicate that an excess of sulphate of ammonia applied to a crop is absorbed and retained by the soil and is utilized by the succeeding crop.

Field experiments with fertilizers, Baessler (*Ber. Thät. Agrchem. Vers. Samencontrolstat. Köslin, 1899, pp. 16–135*).—This includes detailed accounts of cooperative experiments on typical soils with different crops. In these experiments the fertilizer requirements of different soils were studied by means of field experiments and by chemical and mechanical analysis. Comparative tests were made of 40 per cent potash salts and kainit. Tests were made of the effect of applying lime and marl and of the Schultz-Lupitz method of fertilizing sandy soils.

On fertilizer experiments, Behrens (*Mitt. Deut. Landw. Gesell., 16 (1901), Nos. 4, pp. 14, 15; 5, pp. 17–19; 6, pp. 21, 22*).

Fertilizers for Tennessee, C. A. Mooers (*Univ. Tennessee Record, 4 (1901), No. 1, pp. 76–80*).—A brief popular discussion.

Analyses of commercial fertilizers, W. C. Stubbs (*Louisiana Stas. Bul. 63, pp. 483–576, 592–595*).—This bulletin discusses the sources of nitrogen, phosphoric acid, and potash and the valuation of fertilizers, and reports analyses of 1,817 samples of fertilizing materials, including mixed fertilizers, acid phosphates, bone meal, bat guano, tankage, cotton-seed meal, cotton seed, dried blood, fish scrap, nitrate of soda, kainit, sulphate of potash, wood ashes, and ground oyster shells. Statistics of the consumption of fertilizers in the different parishes of the State are given. These show that 30,302 tons of fertilizers were sold in the State during the season of 1899–1900. Of this 12,338 tons was tankage. Blanks used in the inspection are given.

Analyses of licensed commercial fertilizers, F. W. Woll and A. Vivian (*Wisconsin Sta. Rpt. 1900, pp. 257–260, 336, 337*).—A report of analyses of 7 samples of fertilizers examined during the year, with notes on the fertilizer inspection in Wisconsin and the text of the State fertilizer law.

Perchlorate in nitrate of soda, T. Wetzke (*Oesterr. Chem. Ztg., 4 (1901), No. 4, p. 83*).—The author takes exception to Dafert's conclusion (E. S. R., 12, p. 325) that perchlorate was not a common impurity of nitrate of soda until within recent years. He reports finding perchlorate in 8 samples of museum specimens of caliche which he examined by the following method: The chlorin was removed with silver nitrate and the excess of the latter with sodium carbonate. The filtered solution was evaporated to dryness and the residue fused and dissolved in water. The solution was acidified with nitric acid and tested with silver nitrate for chlorin. The appearance of a precipitate or cloudiness was taken to indicate the presence of perchlorate or chlorate. Dafert in a note on the above article calls attention to the fact that in the method employed no account was taken of the iodates which might be present and would give the observed reaction with silver nitrate.

The world's production and consumption of potash fertilizers, L. GRANDEAU (*Jour. Agr. Prat., 1901, I, No. 10, pp. 305–308*).—This article notes briefly the sources of potash, the discovery of the Stassfurt deposits, the extraction, preparation, and production of the Stassfurt salts; and gives tables showing the composition, production, and consumption of the different products. It is stated that the total production of crude Stassfurt salts in 1899 was 2,737,965.38 tons (of 2,000 lbs.). This includes 64,679.877 tons of carnalite and kieserite used for agricultural purposes in Germany, and 5,082.37 tons exported to other countries for the same purpose, besides 1,385,293.041 tons converted into concentrated potash salts; and 791,051.485 tons of kainit and sylvinite used for agricultural purposes in Germany, and 347,080.319 tons exported to foreign countries for the same purpose, besides 144,778.286 tons converted into concentrated salts.

FIELD CROPS.

Farm notes, W. W. COOKE (*Colorado Sta. Bul. 57, pp. 39*).—This bulletin is a résumé of the results of different experiments with alfalfa, corn, potatoes, and sugar beets, carried on at the station during the years 1894 to 1899. This work has all been considered in former bulletins with the exception of the cooperative work on sugar beets in 1899. The results of these tests show that beets planted on May 5 gave a larger yield with a higher percentage of sugar and purity than beets planted earlier or later. Planting in rows alternately 27 and 11 in. apart gave 4.4 tons of beets more per acre than placing the rows uniformly 24 in. apart. The furrows for irrigating the beets were made in the 27 in. spaces. Seed irrigated when planted gave better results than seed not irrigated, but the author believes that in this respect no definite rule is applicable for all parts of the State since the results showed considerable variation, and he advises to irrigate the seed if within 5 days after planting there are no indications of sprouting. The varieties Zehringen, Vilmorin No. 1, Vilmorin No. 2, and Kleinwanzlebener were tested at the station. On heavy clay soil Vilmorin No. 1 showed the highest percentage of sugar in the juice and of purity, while on a clay loam soil Vilmorin No. 2 stood at the head. The average of 10 tests gave an increase of 18 per cent in the weight of the crop as a result of subsoiling.

Field experiments at Ghent, Belgium, P. DE CALUWE (*Exposé Cult. Exper. Jard. Gand., 1898–99, pp. 82, pls. 3, dgm. 1*).—The annual report on the work at the experimental garden for the province of East Flanders. Fertilizer tests were made with rye, oats, maize, peas, rape, chicory, fodder beets, and potatoes. In some cases variety and culture tests were made in connection with the fertilizer experiments. The experimental culture of comfrey and sacchaline was conducted as in previous years, but these crops received no fertilizer applications. A series of fertilizer tests were made on meadows, and the injurious effects of nitrate, perchlorate of soda, and perchlorate of potash were studied. Daily meteorological observations for the year beginning October 1, 1898, are tabulated, and the weather conditions for each month are discussed. The results of a variety test with potatoes are given in a table. The use of potassium chlorid in the fertilizer application produced a considerable and favorable effect on the yield of rye in every respect, but especially on the weight of the grain. The rye from the plats having been furnished potash weighed 4.43 kg. per hectoliter more than the grain from plats having received no potash. Thomas slag increased the yield of oat straw as compared with mineral phosphates, but the yield of grain was about the same. Alinit had no appreciable effect on the yield of oats.

Potassium chlorid as a fertilizer for peas increased the yield by 8.56 kg. of peas and 16.8 kg. of straw per acre. Among several varieties of chicory, Smouter gave the largest yield and Palingkop the highest percentage of dry matter.

In the experiments with rye nitrate of soda proved injurious in proportion to the amount of perchlorate of potash added. The perchlorate applied alone was injurious only in a small degree. In general, the injurious effects of perchlorate of potash were more pronounced than those of potassium chlorid, and less so than sodium perchlorate. Oats was much less sensitive to these substances than rye.

Influence of the right amount and the right distribution of water in crop production, F. H. King (*Wisconsin Sta. Rpt. 1900, pp. 185–188*).—This is a report on the yields of hay, corn, and potatoes grown under different degrees of soil humidity. The rainfall for the years 1898, 1899, and 1900 is compared, and the amount of water applied in irrigating this season is given. The year was not favorable for hay and small grain on account of only a small rainfall early in the season, but these conditions are considered as having favored the development of nitrates in the soil, which was beneficial to the corn crop. Corn has been grown on the same plats since 1894, and for the entire period the average yield of water-free substance per acre was 1,993 lbs. greater on irrigated ground than on ground not irrigated. The first four years of the experiment the average gain due to irrigation was 3,543 lbs. of water-free substance per acre, but for the last three years it was only 62.2 lbs. On the sandy portion of one of two potato plats there was an increase of 81.4 bu. per acre due to irrigation, but on the heavier soil of the plat there was a decrease of 56 bu. per acre. The plats were irrigated twice and the last irrigation was followed by rains, which is considered the cause of the decrease in yield on the heavy soil. On the other plat, which also had a heavy soil, the results were in favor of no irrigation. Flat culture gave a larger increase in yield than irrigation, but irrigation increased the yield of potatoes 11.6 bu. per acre over ridge culture. The different quantities of water applied by irrigation to supplement the rainfall, and the yields obtained from the various plats, are given in tables.

A five-year rotation of crops, H. J. Wheeler and J. A. Tillinghast (*Rhode Island Sta. Bul. 76, pp. 105–128*).—This bulletin describes an experiment with a 5-year rotation carried through its first course on 5 different plats, and gives the yields obtained in tabular form. The history of the different plats is given, showing that at the beginning of these experiments in 1893 corn grown without fertilizers was unable to attain a height of more than about 5 in. during the entire season. The order of the rotation tested was corn the first year, potatoes the second, winter rye the third, and grass the fourth and fifth years. The various fertilizer applications, consisting of chemicals and commercial fertilizers only, are given for the different plats for each season. During the first course of the rotation only two of the five plats gave profitable returns. In the summary, the authors report a yield of 13.78 bu. of corn and 1.3 tons of stover per acre in 1893; 72.57 bu. of grain and 2.4 tons of stover in 1896, and 65.71 bu. of grain and 3.9 tons of stover in 1900. The potato crops showed the largest gains. The smallest crop of marketable potatoes, 60 bu. per acre, was produced in 1893, and the largest crop, 283.33 bu. in 1900, when the total yield amounted to 321.66 bu. The results with rye were irregular but are considered as indicating the increase of assimilable nitrogen in the soil. From the fact that the grass crops have remained small it is believed that they received an insufficient amount of fertilizer. This rotation was not as profitable as the three and four year rotations previously reported (E. S. R., 12, p. 1030). The changes suggested by the author are beginning the rotation with rye, increasing the fertilizer application for the grass crops, and applying the fertilizers for the potato crops entirely in the drill.

Results obtained in 1900 from trial plats of grain, fodder corn, field roots, and potatoes, W. Saunders (*Canada Cent. Expt. Farm Bul. 36, pp. 5–51, figs. 4*).—This report is a record of cooperative variety tests in continuation of those previously reported (E. S. R., 12, p. 134). The plan of the experiments has remained unchanged, but owing to unfavorable weather conditions at the Brandon and Indian Head farms no results are reported from these places for this season.

The yields of each crop at the other experimental farms are tabulated. The varieties giving the largest yields at the different stations were as follows:

Oats.—Holstein Prolific, Black Beauty, Early Blossom, Golden Giant, Cromwell, Buckbee Illinois, Oderbruch, California Prolific, Hazlett Seizure, Thousand Dollar, Joanette, and Bavarian. Average yield per acre, 69 bu. 29 lbs. *Two-rowed barley.*—Beaver, Danish Chevalier, Canadian Thorpe, French Chevalier, Bolton, and Nepean. Average yield per acre, 48 bu. 2 lbs. *Six-rowed barley.*—Mansbury, Common, Royal, Odessa, Albert, and Petschora. Average yield per acre, 50 bu. 15 lbs. *Spring wheat.*—Huron, White Russian, Preston, Laurel, Countess, Red Fife, Red Fern, White Connell, Monarch, Pringle Champlain, Wellman Fife, and Colorado. Average yield per acre, 32 bu. 44 lbs. *Peas.*—White Wonder, Duke, Prince, Archer, Crown, Chancellor, Carleton, Harrison Glory, Daniel O'Rourke, German White, Agnes, and Early Britain. Average yield per acre, 27 bu. 57 lbs. *Indian corn.*—Thoroughbred White Flint, Early Mastodon, Superior Fodder, Champion White Pearl, Mammoth Cuban, and Cloud Early Yellow. Average yield per acre, 21 tons, 1,341 lbs. *Turnips.*—Carter Elephant, Perfection Swede, Champion Purple Top, Drummond Purple Top, Skirvings, and Hartley Bronze. Average yield per acre, 25 tons, 1,339 lbs. *Mangels.*—Giant Yellow Intermediate, Giant Yellow Half Long, Sutton Yellow Globe, Canadian Giant, Champion Yellow Globe, and Mammoth Yellow Intermediate. Average yield per acre, 29 tons 480 lbs. *Carrots.*—Giant White Vosges, Half Long White, Improved Short White, New White Intermediate, Green Top White Orthe, and Ontario Champion. Average yield per acre, 30 tons, 1,053 lbs. *Sugar beets.*—Improved Imperial, Red Top Sugar, Wanzleben, and Danish Red Top. Average yield per acre, 23 tons, 132 lbs. *Potatoes.*—Seattle, American Wonder, Northern Spy, Irish Daisy, Irish Cobbler, Vanier, Uncle Sam, Rural Blush, Rose No. 9, Carmen No. 1, Seedling No. 230, and Holborn Abundance. Average yield per acre, 398 bu. 13 lbs.

The average results obtained for the different crops for 5 and 6 years are also given. The varieties which have given the highest averages during this period are as follows:

Oats.—Banner, American Beauty, Bavarian, Golden Giant, Holstein Prolific, Buckbee Illinois, Columbus, Golden Beauty, Early Golden Prolific, White Schonen, Oderbruch, and Wallis. Average yield per acre, 70 bu. 31 lbs. *Two-rowed barley.*—French Chevalier, Danish Chevalier, Beaver, Canadian Thorpe, Newton, and Sidney. Average yield per acre, 43 bu. 30 lbs. *Six-rowed barley.*—Mansbury, Trooper, Odessa, Common, Royal, and Oderbruch. Average yield per acre, 47 bu. 39 lbs. *Spring wheat.*—Preston, Monarch, Wellman Fife, White Fife, Goose, Red Fife, White Connell, Huron, White Russian, Rio Grande, Hungarian, and Pringle Champlain. Average yield per acre, 31 bu. 47 lbs. *Peas.*—Crown, Carleton, Pride, New Potter, Early Britain, Duke, Mummy, Centennial, Trilby, Archer, King, and Paragon. Average yield per acre, 32 bu. 52 lbs. *Indian corn.*—Red Cob Ensilage, Thoroughbred White Flint, Selected Leaming, Giant Prolific Ensilage, Angel of Midnight, and Champion White Pearl. Average yield per acre, 21 tons, 1,604 lbs. *Turnips.*—Selected Purple Top, Perfection Swede, Bangholm Selected, East Lothian, Hartley Bronze, and Skirvings. Average yield per acre, 29 tons, 585 lbs. *Mangels.*—Yellow Intermediate, Yellow Giant Intermediate, Gate Post, Selected Mammoth Long Red, Giant Yellow Half Long, and Giant Yellow Globe. Average yield per acre, 31 tons, 21 lbs. *Carrots.*—Half Long White, Giant White Vosges, Improved Short White, Mammoth White Intermediate, Iverson Champion, and Green Top White Orthe. Average yield per acre, 20 tons, 335 lbs. *Sugar beets.*—Danish Red Top, Danish Improved, Red Top Sugar, and Wanzleben. Average yield per acre, 23 tons, 14 lbs. *Potatoes.*—Seedling No. 230, Irish Daisy, American Giant, American Wonder, Empire State, Carmen No. 1, Late Puritan, State of Maine, New Variety No. 1, Seattle, Vanier, and General Gordon. Average yield per acre, 352 bu.

Experiments with grain and forage crops, R. A. MOORE (*Wisconsin Sta. Rpt. 1900, pp. 227-238, figs. 2*).—Experiments with grain consisted of tests for hardness and productiveness of 35 varieties of oats, 15 of barley, 10 of spring wheat, 6 of peas, 2 of speltz, and 1 of spring rye. The yields of straw and grain and other data connected with the experiments are given in a table and discussed.

The best varieties of oats were Swedish, Poland White, and Tobolsk, and of barley, the Oderbrucker and Mandshury varieties. The observations on varieties of barley listed as Mandshury, Manshury, and Mandschuri indicate that they are all the same variety. Speltz stooled abundantly and grew rapidly. Sowing oats at the rate of $2\frac{1}{2}$ to $3\frac{1}{2}$ bu. per acre had no effect on the tendency to lodge, but sowing at the rate of 1 bu. was very effective in preventing lodging. Treating seed oats with a solution of 1 lb. of formalin to 50 gal. of water was found to be absolutely effective in this experiment. A comparative test of Victoria and Dwarf Essex rape indicated that Victoria rape is probably Dwarf Essex under a different name. A test was made of sowing rape at the time of seeding and two weeks later. Where rape was sown with oats on the same day the yield of oats was 50.3 bu. per acre, and where the rape was sown 2 weeks later the yield was 60.3 bu. The same variety of oats without rape yielded 64.5 bu. per acre. A good yield of rape for fall fodder was obtained in both instances. Clover was sown with oats as a nurse crop, with oats that were cut for hay while green, and without a nurse crop. Clover sown with a nurse crop gave the best result, and where the oats were cut for hay a much better stand of clover was obtained than where the oats were left to ripen. Black, yellow, and green soy beans were grown experimentally. The black and green varieties matured seed, while the seed of the yellow did not ripen. The green soy bean yielded 9.9 tons of green forage per acre.

Experiments with corn, forage crops, and spring cereals, A. M. SOULE, P. O. VANATTER, and J. R. FAIN (*Tennessee Sta. Bul., Vol. XIV, No. 1, pp. 31, figs. 13*).—This bulletin reports the results of tests with varieties of corn, sorghum, Kafir corn, Durra, broom corn, cowpeas, millet, Canadian field peas, and spring varieties of wheat, oats, and barley. In connection with these trials tests were made of sowing rape, oats, and barley at different dates, and of seed corn taken from different parts of the ear. The draft these crops make on the soil and the root systems of corn, sorghum, cowpeas, and soy beans were also studied.

Of 31 varieties of corn, Florida gave the largest yield, 18 tons per acre. No. 3889, Ellis, and Huffman all yielded over 14 tons. The best grain-producing varieties were No. 3889, yielding 72.09 bu. per acre; Improved Golden Beauty, 68.07 bu.; and the Improved Leaming, 56.69 bu. The varieties giving the highest percentage of grain in the whole crop were Three-eared with 20.48 per cent and New Klondike with 17.72 per cent. New Klondike gave the smallest total yield and the Florida and Huffman, two of the varieties giving the largest total yields, produced only 7.90 per cent and 5.64 per cent, respectively, of grain in the whole crop. Seed corn from the North gave smaller total yields, but a higher percentage of grain than Southern varieties. Several of the Northern varieties ripened in 97 days, while 119 days were required to mature the best yielding Southern varieties.

Among the different forage crops, teosinte gave the best yield of green crop, 26.25 tons per acre, followed by rape with 18.50 tons, corn and cowpeas together 17.70 tons, corn alone 17.60 tons, and cowpeas alone with 14.10 tons per acre. There was no advantage in growing cowpeas together with rape, corn, or millet, the yields being practically the same when the crops were grown alone. There was also the difficulty of obtaining crops maturing at the same time. The results showed that a succession of forage crops may be had in that region from the middle of June until November. The best yield of sorghum was 11.85 tons per acre, and of Kafir corn 8.01 tons. The varieties of cowpeas giving the largest yields of peavine hay were Taylor, Wonderful, Clay, Blackeye, and Whippoorwill, in the order given, the yields varying from 2.3

to 3.1 tons of hay per acre. There was a loss of from 5,000 to 6,000 lbs. in the production of hay per acre as compared with the weight of the green crop. Soy beans did not prove as profitable a crop as cowpeas. Japanese millet yielded 2.62 tons, but the imported Japanese varieties did not give satisfactory yields. Rape on fall-plowed land yielded 8½ tons of green crop per acre.

Of 10 varieties of spring oats, Texas Rust Proof gave the largest yield of grain, 42.26 bu. per acre, followed by Big Four with 36.38 bu., which variety also yielded the most straw, 1.93 tons per acre. Early sowing of both oats and barley gave better results than late sowing. Wellman Fife spring wheat stood at the head of varieties tested with a yield of 17.91 bu. per acre. The highest yields of digestible protein per acre were as follows: Cowpeas, 504 lbs.; soy beans, 380 lbs., and corn, 352 lbs. Corn was richer in carbohydrates and fat than soy beans or cowpeas. Sorghum was inferior in digestible nutrients to most of the crops tested. The greatest draft on the soil was made by the corn crop, which removed 144.3 lbs. of nitrogen, 52.8 lbs. of phosphatic acid, and 116.2 lbs. potash. Cowpeas came second, with 75.60 lbs. of nitrogen, 28 lbs. phosphatic acid, and 86.6 lbs. potash. It is concluded that while sorghum and millet do not draw so heavily on the soil as corn they are shallow feeders and tend to exhaust the surface foot of soil.

Experiments with forage crops, J. H. SKINNER (*Indiana Sta. Rpt. 1900, pp. 89–94*).—Red clover, alsike, alfalfa, and crimson clover were sown in 1898 on the 15th of each month, from April to September, inclusive. In 1899 the work was continued, but owing to the season was a failure. The results indicate that red and alsike clover may be sown as late as June 15. It was found more difficult to obtain a stand of alfalfa and crimson clover than of red and alsike clover. All except alfalfa winterkilled. Alfalfa stood the winter much better the second year than the first, when many of the roots were broken by the lifting of the soil, due to freezing. Culture and variety tests were made with cowpeas, soy beans, sorghum, and corn, and the results are briefly noted. Sorghum yielded the most forage, with common corn second, and Stowell Evergreen third.

Crops for summer forage, G. HEUZÉ (*Jour. Agr. Prat., 1901, I, No. 8, pp. 248, 249*).—A brief note on growing summer forage crops in Northern France.

Influence of the size of the seed on the yield, EDLER (*Landw. Ztschr. Rheinprovinz, 2 (1901), No. 1, pp. 1–3*).—This is a report on experiments with seeds weighing 50.9 and 33.9 gm. per thousand. In one test the same number of grains of the heavy and the light seed were sown, and in another test equal weights of the two kinds of seed. The heavy seed produced the heavier plants, having a larger number of productive stems and producing heavier and a larger number of grains than plants from the light seed. The conclusion is drawn that when equal weights of heavy and light seeds are sown the heavier seed will generally give the best results.

The improvement of cereal crops, T. H. MIDDLETON (*Jour. Newcastle Farmers' Club, 1901, pp. 1–29*).—A paper on the improvement of field crops.

Fertilizer experiments with different forms of potash (*Jahrb. Deut. Landw. Gesell., 15 (1900), pp. 27–42*).—A review and discussion of experiments comparing different potash salts as fertilizers for cereals, sugar and forage beets, potatoes, and meadows. The results of tests on marsh soils were also considered. The work here reviewed was done at different German experiment stations.

Causes operative in the production of silage, S. M. BABCOCK and H. L. RUSSELL (*Wisconsin Sta. Rpt. 1900, pp. 123–141*).—This is a report and a discussion of experiments in making silage under laboratory conditions for the purpose of studying the changes which occur in the formation of good silage. Work bearing on this subject done by other investigators is reviewed and the method of conducting these experiments is described. The results show that good silage can be made under conditions which exclude bacterial activity, and that the initial heating of silage is due mainly to the respiratory processes of the cut plant tissues themselves.

"The gases of a silo are carbon dioxid and nitrogen, the carbon dioxid being evolved by the intramolecular respiration of the ensiled tissues, while the nitrogen is simply due to the entangled atmospheric air that is originally present when the silo is filled. In good silage, where putrefactive changes do not occur, the gases associated with bacterial fermentation are not found."

First-class corn silage was made in numerous instances in small receivers, the temperature of which never exceeded 75 to 80° F. The changes that characterize the formation of good silage are considered due to the changes inaugurated and under the more or less direct control of the protoplasm of the plant tissues that are ensiled. It is concluded that the acids of silage are a product mainly of the intramolecular respiration, and that the degree of acidity is dependent upon the duration of the respiration of the cells. These facts are considered as explaining the presence of large amounts of acids in silage from immature and succulent crops. The putrefactive changes occurring in silage are due to bacteria capable of developing under anaerobic conditions in the succulent tissues. That the peculiar aroma of good silage can be produced under conditions in which all vital processes are suspended is taken as an indication that enzyms are operative in this connection.

"The unavoidable losses in silage are due to the formation of water, carbon dioxid, and volatile organic acids, which are produced as a result of the intramolecular respiratory processes of the ensiled tissues."

The avoidable losses are due mainly to the decomposition of organic matter by bacteria and molds. The admission of air by imperfectly constructed silos facilitates the growth of these organisms and prolongs the direct respiration of the plant tissues. Bacterial activity, instead of being essential, was found deleterious, being most marked where putrefactive changes occurred.

Unavoidable losses in silage, F. H. King (*Wisconsin Sta. Rpt. 1900, pp. 189-196, figs. 2*).—The work here reported consisted of a series of experiments in the production of silage with small quantities of different materials under the complete exclusion of air, but permitting so much as would be entangled in the material when filling the silo. The materials were ensiled in Mason jars. In the first experiment with peas, cowpeas, oats, rye, and corn, all in a comparatively early stage of growth, the results show the greatest loss in weight during the first 15 days on oats, rye standing second, and corn last. The loss on cowpeas was also small. The author concludes that in 100 tons of corn silage under similar conditions the loss of dry matter would have been between 1.27 and 1.62 tons. In this first test the material was not compressed sufficiently to crush the tissues and express the juices. In the second experiment peas, cowpeas, oats, and corn were treated as in the first, except that the plants were 27 days older. Alfalfa from 6 to 8 in. high was added to the test. The materials were packed to have a mean weight of 33.6 lbs. per cubic foot. The loss calculated on the green weight ranged from 0.91 per cent in 108 days of hot summer weather for the cowpeas to 4.93 per cent for the corn, the average loss being 2.71 per cent. The object of the third trial was to determine the effect of the closeness of packing on the losses, and the test was made with mature corn packed closely and loosely, but the results obtained were not conclusive. In the fourth and ninth experiments the gaseous products given off from the corn silage were measured. In experiment 4 the corn was in the milk stage and in experiment 9 fully matured when ensiled. In 105 days number 4 lost 3.31 per cent of its green weight and number 9 3.24 per cent in 59 days. The total amount of gas collected in experiment number 4 was 20.10 cu. ft., and in experiment number 9 17.05 cu. ft., or from 3 to 4 times the volume of the silage. On the average 74.02 per cent and 72.24 per cent of the gas given off by the silage in experiments Nos. 4 and 9, respectively, was carbonic-acid gas. Experiment number 8 consisted in the measurement of gaseous products given off from clover silage. On June 18 medium clover was packed so as to give 22.5 lbs. per cubic foot in an air-tight iron cylinder. After 28 days it had lost 0.8 per cent of its original weight and after 58 days 1.19 per cent. During the first 58 days it gave off 15.7 per cent cubic feet of gas, or about double the volume occupied by the silage. The first 5 hours 2,400 cc. of gas were given off per hour, but during the 22 days preceding September 6 the average rate per hour was only 91 cc. The first 5 days the ratio of carbon dioxid to other gases was 47.10 to 52.90, but for the rest of the time it averaged 78.41 to 21.59.

Management of ensilage crops, A. M. Soule (*Univ. Tennessee Record, 4 (1901), No. 1, pp. 68–75, figs. 5*).—This article discusses in a popular manner the growing of silage crops and points out the value of silage for feeding purposes. Corn, oats, cowpeas, sorghum, Kafir corn, and teosinte are considered in this connection.

The textile agaves of Algeria (*Bul. Soc. Nat. Agr. France, 61 (1901), No. 1, pp. 52–54*).—A series of brief descriptive notes of various textile plants belonging to the genus Agave, which are grown in Algeria.

Corn culture, R. J. Redding (*Georgia Sta. Bul. 51, pp. 273–293*).—Cultural, variety, seed, and fertilizer tests with corn are reported. The work is in continuation of that previously noted (E. S. R., 11, p. 1030). Weather indications are reported as exceedingly favorable. Among 16 varieties of corn tested in 1900, Cocke Prolific, Sanders, Tennessee Yellow, Georgia Cracker, and Virginia Horsetooth, given in the order of their productiveness, yielded from 45.20 to 51.31 bu. of shelled corn per acre; Hoffman White ranking last, yielded 34.75 bu. The yields obtained from 11 varieties for several years, including this season, are given in a table. A comparison of several methods of harvesting showed that cutting and shocking corn about the middle of August gave a greater yield of shelled corn and stover than harvesting the leaves separately at that time, or harvesting the stalks with the leaves after the plant has become dry.

A fertilizer application containing 45 per cent acid phosphate, 2 per cent muriate of potash, and 53 per cent of cotton-seed meal applied at the rate of 600 lbs. per acre on uplands increased the yield 1.45 bu. as compared with 400 lbs. and 2.61 bu. as compared with the yield from 200 lbs. A test of applying fertilizer broadcast or in drills led to the conclusion that fertilizers properly applied in the drill will give as large a yield as double the amount broadcasted. As in previous years, nitrate of soda, cotton-seed meal, and dried blood were compared as sources of nitrogen. Dried blood was a little more effective than the other two fertilizers but it was less profitable. Cotton-seed meal at from $17 to $20 per ton is considered the cheapest source of nitrogen for a corn crop. Fertilizer formulas for corn on different Georgia soils are given.

From the results of experiments on the relative value of planting corn at different distances, the author concludes that a distance 2 by 4 ft. is preferable to other distances on upland soils capable of producing from 35 to 40 bu. of shelled corn per acre, but that on the unimproved and badly worn soils the distance between hills should range from 5 by 4 ft. to 5 by 5 ft.

No advantage was observed in selecting kernels for seed from either the butt end or the middle of the ear, but kernels from the third of the ear, including the tip, were more prolific than kernels from the other parts.

The effects of continued use of immature seed corn, E. S. Goff (*Wisconsin Sta. Rpt. 1900, pp. 297–299*).—A study of this subject was begun in 1896. The results obtained during 5 years are tabulated, and the effects upon the yield of corn and stalks and upon the time of maturity are discussed. The variety grown was King Philip, a variety of flint corn. The very immature seed gave smaller yields of corn and stalks and slightly earlier maturity than the fully matured seed. Larger yields were obtained from seed corn gathered slightly immature.

Corn growing (*Sci. Amer. Sup., 51 (1901), No. 1310, pp. 21000, 21001*).—A résumé of the result of 12 years' work at different experiment stations in the United States, with conclusions based upon the results.

Cotton culture, R. J. Redding (*Georgia Sta. Bul. 52, p. 32*).—A continuation of previously reported work (E. S. R., 12, p. 137). Frequent and heavy rains interfered to some extent with the results. In 1900 21 varieties of cotton were tested. Prize, Sehley, Moss, Improved, Russell Big Boll, and Lee Improved, mentioned in the order of the value of total products, outranked the rest of the varieties in profitable returns. As in the preceding year the largest percentage of lint—39 per cent—was produced by Moss Improved. Corput Find and Griffin Improved were the earliest varieties and the least profitable. As a rule the late varieties gave better results than the early ones. Each variety is briefly described, and directions for selecting a variety and selecting seeds in the field are given.

The results obtained in a composite seed test were equally significant with those obtained in 1898 and 1899, and confirm the conclusion previously drawn that if the seeds of 2 equally productive varieties, one an early and the other a late cotton, be mixed, the yield will be greater than that of either variety planted alone.

The results of distance experiments show that cotton planted 4 ft. by 1½ ft., one plant in a place, gave a better yield than when planted 4 ft. by 3 ft., two plants in a place, and that for the years 1899 and 1900, on the soils covered by the experiments, planting 12 in. apart in rows 4 ft. apart gave better results than 16, 20, or 24 in. between plants in the row.

Dividing the fertilizer application gave results confirming the conclusion drawn from previous experiments, namely, that commercial fertilizers should be applied not less than 1 week before planting, but that nitrate of soda may sometimes be profitably applied a month or more after planting. Applying commercial fertilizer in the bedding furrow was found preferable to broadcasting the application. A general fertilizer test did not give definite results, but the author thinks they tend to the conclusion that a formula consisting of 3.33 parts of phosphoric acid, 1 part of potash, and 0.93 part of nitrogen, all in available form, is best suited to middle Georgia uplands in high condition.

Culture tests with several varieties of lupines, vetches and peas for green manuring, O. Pitsch (*Orgaan. Ver. Oudleer. Rijks. Landbouwschool, 13 (18901), No. 151, pp. 29–33*).—The results for 1897 and 1898 are reported in tabular form and discussed. In 1897 blue lupines produced the largest amount of dry matter of nitrogen. In 1898 the amount of dry matter and nitrogen produced by blue lupines was greater than the amount yielded by yellow and white lupines, but smaller than in the case of vetch and peas. The roots of lupines were richer in nitrogen than the roots of vetches and peas.

The culture of colza and lupines, Schribaux (*Bul. Soc. Nat. Agr. France, 61 (1901), No. 1, pp. 41–44*).—An article presenting a paper by Wagner, professor at the Agricultural School at Ettelbrück, Luxembourg, on the utility of the culture of colza and lupines on the value of green manure and the advantage of plowing shallow when turning under organic manures.

Experiments with varieties of oats to determine the value of seed exchange, F. F. Bruijning, Jr. (*Verzamel. Verslag. Rijk Gesubsidiëerde Proefvelden, etc., 1899–1900. Department Binnenlandsche Zaken, Netherlands, pp. 549–586; also published as a Separate, Wageningen, 1900, pp. 37*).—The question of the use of seeds raised under different conditions from those under which the crop is to be grown has usually been approached from the quantitative standpoint. In the present work variations in quality were studied. A portion of the seed first imported was reserved as a type and the quality of each year's product compared with the standard thus established.

The experiments were carried on in 1899 with five standard varieties of oats in use in the Netherlands. The seeds of these varieties were distributed to 16 farmers who planted them in the regular course of their farm rotation, without special preparation. Details as to the nature of the soil, fertilizers, weather, cultural conditions, growth, etc., are tabulated as are also data as to the purity, weight of the grain, percentage of straw to grain, etc.

It is shown that in most cases the seed sent in by farmers who had conducted the work was inferior to the original seed and in some cases the samples fell much below the standard. They contained more impurities, had a smaller hectoliter weight and a smaller weight per 1,000 seeds and a greater percentage of hull than the original seed.

The year 1899 was, however, a poor year for oats, many of the flowers were not fertilized and many seeds were shrunken.

The author further compares the standard seed and the seed produced in 1899 in regard to the character of the seed. He recognizes 5 classes, 3 of which are based upon the position of the seed in the spikelet and called, respectively, lower middle, and upper seeds, besides single and double seeds. A single seed is one developed in the lowest flower of the spikelet when the other flowers are abortive; the double seed is formed by the middle seed becoming enclosed in the glume of the lower seed of the same spikelet. The lower seeds are the heaviest and best developed, being even larger than the single seeds.

A careful analysis of the original seed and that of the 1899 crops of all varieties showed that the former contained a larger proportion of lower and single seeds than did the new crop as sent in by the farmers. This crop could, however, be made equal to the standard by selecting the heaviest seeds with a fanning mill. This is the secret of maintaining a variety constantly up to its original quality and is the means of improving it.

This is the first year of the experiment.—H. M. PIETERS.

Commercial fertilizers for potatoes, W. H. JORDAN (*New York State Sta. Bul. 187, pp. 215-232*).—This bulletin is a report on experiments made in 1899 and 1900 in continuation of work previously reported (E. S. R., 11, p. 235). The plan and purpose of the experiments have been heretofore described. The results of the yields for the 2 years are given in detail in tabular form. The author summarizes the results as follows: "Experiments in potato growing conducted for 4 years on 4 Long Island farms with fertilizers varying in quantity from 500 lbs. to 2,000 lbs. per acre show that on the average the largest profit was realized from the use of 1,000 lbs."

The so-called Long Island formula, containing 4 per cent of nitrogen, 8 of available phosphoric acid, and 10 of potash, proved to be superior to a potato formula containing 7, 4, and 10 per cent, respectively, of these different elements.

"Experiments with varying quantities of potash gave results which do not justify the use of such large quantities of this ingredient as are now being applied in potato growing by many Long Island farmers whose conditions are similar to those under which these tests were made.

"It is clearly evident that a large supply of available plant food does not necessarily insure a satisfactory crop. Other conditions which largely pertain to culture, such as texture, humus, and water supply, exercise a controlling influence, and when these conditions are unfavorable their effect is not overcome by heavy applications of fertilizer."

Profitable potato fertilizing, III, F. H. HALL and W. H. JORDAN (*New York State Sta. Bul. 187, popular ed., pp. 5*).—This is a popular summary of the above bulletin.

The influence of selecting seed potatoes from plants with well-developed stems and large tubers, C. VON SEELHORST (*Jour. Landw., 48 (1900), No. 2, pp. 97-103*).—A report is here given of experiments made in 1898 and 1899 with seed potatoes from large and from small plants. In some of the tests the seed had been selected from large or small plants since 1892. The results in nearly every case indicated that the productivity of the parent plant is transmitted, the seed tubers selected from the larger plants giving the best yields.

A chemical investigation of the rice plant and of the product and by-products of the rice industry, C. C. McDonnell (*South Carolina Sta. Bul. 59, pp. 16*).—This bulletin contains notes on the history and production of rice and a brief description of the processes employed in milling or cleaning the grains. Analyses of 21 samples, comprising parts of the plant and various by-products, were made at the station and the results are given in tables. The work included analyses of the ash. A table showing the average composition of some of the most important feeding stuffs, taken from other sources, is presented for the purpose of comparison. The value of the different parts of the rice plant and of the by-products is briefly discussed. From an investigation on the percentage relation of the various parts to the entire plant, the author finds that nearly one-half of the harvested crop is grain and that three-fifths of the straw are leaves. The ash analyses showed a very large percentage in silica, especially in the hulls. The polished grain had very little silica, but an unusually large percentage of phosphoric acid. All the samples showed but a small amount of lime. From the results of the chemical analyses reported the quantities of fertilizing constituents removed per acre by a crop of 35 bu. of rice and 1,800 lbs. of straw are calculated and presented.

Rice culture in the South, S. A. Knapp (*Rice Industry, 2* (*1901*), *No. 13, pp. 9–11*).—An article discussing rice culture in the South.

Pedigreed sorghum as a source of cane sugar, A. T. Neale (*Delaware Sta. Bul. 51, pp. 3–24*).—This bulletin gives a comparison of sugar cane, sugar beets, and sorghum as sources of sugar, describes a method of raising sorghum, points out how its value for sugar production is determined, and discusses the machinery needed to extract sorghum sugar, with estimates of its cost and suggestions as to its management. The author reviews the work that has been done along this line and summarizes the results obtained in Delaware, which have been partly reported in previous bulletins (E. S. R., 10, p. 345; 11, p. 141). In 1898 two selections of seed were made, one from stalks whose juices averaged 19.85 per cent of sugar with a purity of 83.5, the stalks weighing 23 oz. each, and the other from stalks containing 19.54 per cent of sugar in the juice with a purity of 83.1, the stalks averaging 18.6 oz. in weight. In 1899 seeds from the first selection were used on the Packard, Killen, and Neale farms, and seeds from the second selection were used on the Corbit farm. This same year seeds were selected on the Packard farm from 38 canes having an average sugar content of 16.50 per cent in the juice, a purity of 82.8, and an average weight of 24 oz. per cane. These seeds were used in 1900. The results are given in the following table:

Results from pedigreed sorghum seed in 1898, 1899, and 1900.

Grower.	Yield per acre.	Sugar per ton.	Available sugar per ton.	Available sugar per acre.	Purity of mill juice.	Number of stalks per acre.	Number of stalks in 100 ft. of row.	Distances between rows.	Full stand of cane.	Full yield of sugar.
1898.	*Tons.*	*Lbs.*	*Lbs.*	*Lbs.*	*Per ct.*			*Inches.*	*Per ct.*	*Per ct.*
E. G. Packard	10.8	310.0	267	2,880	81.6	19,097	168	46	29.3	53.1
B. F. B. Woodall	14.1	274.0	233	3,288	81.5	25,068	203	42	38.4	60.7
J. W. Killen	12.4	313.0	272	3,371	81.8	19,754	174	46	30.3	62.2
A. T. Neale	9.8	331.0	277	2,717	79.6	35,052	290	42	53.8	50.1
S. H. Derby	9.6	325.6	283	2,714	82.1	15,109	133	46	23.2	50.0
1899.										
E. G. Packard	14.1	289.0	246	3,482	80.9	28,222	180	36	43.3	64.2
D. W. Corbit	14.0	296.5	250	3,500	80.6	18,934	130	36	29.1	64.5
J. W. Killen	20.3	270.8	226	4,595	79.9	44,518	234	30	68.3	84.7
A. T. Neale	20.0	277.4	235	4,714	80.6	44,770	294	36	68.7	87.0
1900.										
E. G. Packard:										
Average	22.6	282.3	240	5,420	81.2	65,209	420	34½	100	100
Maximum	25.3	301.5	261	6,600	82.6	75,144	516	34½	......	......

The author summarizes the directions for growing sorghum for sugar as follows:

"Use seed from cane testing as high as possible in sugar, from 15 to 18 per cent, with juice purities in excess of 80 degrees. Select land which will produce 50 bu. or more of corn after repeated manuring with crimson clover, which crop may have been pastured down or plowed under, or cured as hay. Fertilize with muriate of potash broadcast at rate of 160 lbs. per acre. To this add 150 lbs. of nitrate of soda, provided some crop other than crimson clover has immediately preceded sorghum. Seed during the last fortnight in May, in rows 36 in. apart. Let each row consist of two lines of plants 4 in. apart, and in these lines let the plants stand at regular intervals of 6 in. To each plant would then be given 108 sq. in. of soil surface. Cultivate as if for Indian corn. Prepare to begin milling during the last fortnight in September; provide cane for 60 days' work, to close November 15. Such a field so planted and tilled should yield raw sugar in excess of 5,000 lbs. per acre.

Germination experiments with sugar-cane cuttings, Z. Kamerling (*Meded. Proefstat. Suikerriet West Java, 1900, No. 41, pp. 6–17*).—Two series of experiments were carried on, the first to ascertain the influence of fertilizers on the growth of sugar-cane cuttings (bibits), and the second to determine the effect of applying tar or Bordeaux mixture to the cut surface of the cutting.

For the first series of experiments 40 pots were used, in each of which 2 cuttings of 3 eyes each were planted. The manures used were potassium phosphate, magnesium sulphate, and sulphate of ammonia. These were applied to the pots in different combinations, 10 gm. of salt in solution being used in each case. The salts had no effect upon the growth of the cuttings.

In the second series of experiments 85 pots planted with 2-eyed cuttings were used. The cut surface of some of the cuttings were coated with tar, others were first washed for ½ hour and then coated with tar. A third set was treated with Bordeaux mixture, while a fourth was treated with Bordeaux mixture after having been washed for ½ hour. Of the cuttings treated with Bordeaux mixture, 81 per cent of the eyes started as compared with 62 per cent when the cuttings had been treated with tar. The former also started more promptly. When the cuttings were soaked and then treated with Bordeaux mixture a greater number of buds started than in the unsoaked lot and they also began growth more quickly. The soaking before applying tar hastened the commencement of growth, but did not materially increase the total germination. The author attributes the harmful effect of the tar to a clogging of the water vessels at the cut surface.—H. M. PIETERS.

Cane farming in Trinidad, P. Carmody (*West Indian Bul., 2 (1901), No. 1, pp. 33–41*).—A paper discussing the financial and economical phases of the industry.

A soil study of sugar beets, W. P. Headden (*Colorado Sta. Bul. 58, pp. 46*).—This bulletin is in continuation of work reported in Bulletin 46 of the station (E. S. R., 10, p. 743). An outline of the previous work and some of the conclusions drawn therefrom are given in the preface. The experiments here reported were made in 1898 and 1899 on the same plat that had been used in 1897. They embrace a study of irrigation, manuring, and alkali content of the soil in connection with sugar-beet culture, and an investigation on the influence of drying and soaking the beets and the size of the beets on the composition. During these seasons the crop received but one irrigation and was cultivated less frequently than in 1897. In 1898 the plat was divided into sections, the alternate ones receiving an application of 64 tons of barnyard manure to the acre. One section received a dressing of cut straw at the rate of 14 tons per acre. No further application of manure was given in 1899. Irrigation was unnecessary in 1899, but water was applied from August 31 to September 2 and the ground then left to bake and harden. The year before the plat received about 8 in. of rain and irrigation water. The plat also received subirrigation.

The results show that the application of manure mitigated the effects of the alkali and improved the stand of beets in general, but produced beets of inferior shape and quality. It did not, however, prevent an absence of a stand in some spots. The mechanical effect of the cut straw on the soil was nearly as great as that of the manure, but in other respects was less effective. The second season the influence of the manure was less evident, but, owing to soil conditions retarding its decay, the percentage of sugar and the purity of the beet were affected about the same as during the first season. The results corroborate the conclusions of 1897, that the quantity of alkali in the soil of the plat had no injurious effect on the percentage of sugar in the beet, and that it had no influence on the maturity. The average sugar content of 1898 was 13.62 per cent and of the crop grown on alkali soil 13.65 per cent. There was an increase of 4.9 per cent of dry matter in the beet in 1898 and of 3.8 per cent in 1899 over the percentage of dry matter in 1897. It is stated that beets weighing 2 lbs. or more are as rich as those weighing less than 1 lb. grown under the same conditions. The fact that an increase in sugar at the time of ripening, observed in 1897, was not noticeable in these crops is attributed to differences in the seasons. Beets grown in a single row with several feet of space on either side were lower in sugar content than beets of the same varieties grown in rows 20 in. apart.

The chemical work done in this connection showed that continued cropping and cultivation of the plat had slightly decreased the percentage of ash in the beet and changed its composition, particularly lowering the percentage of chlorin. The percentage of pentoses in beet pulp after the extraction of the sugars was found to be higher in beets rich in sugar than in beets of a low sugar content. It was found that beets soaked for 7 days in water cooled by ice showed an actual increase in sugar content. The leaves of the sugar beet were found to contain some glucose and maltose, but very little sucrose.

Influence of mineral fertilizers on the yield of sugar beets, P. PETROV (*Selsk. Khoz. i Lyesov., 197 (1900), May, pp. 327–377*).—The experiments here described were conducted on the estates of P. I. Kharitonenko in the Kharkov government, Russia. In studying the influence on the yield of sugar beets of calcium superphosphate, waste products from beet-sugar factories, and a mixture of these two substances when applied as fertilizers, it was found that the mixture gave the best results as to quantity and quality. The results further showed that a large application of calcium superphosphate improved the quality of the beets, while a small application lowered it. The author explains this result by stating that phosphoric acid has a deteriorating influence on the quality of sugar beets, while lime has the opposite effect, and that in heavy applications the beneficial influence of the lime overcomes the injurious effect of the phosphoric acid, while in light applications this is not the case.

Notes on sugar beets for 1899, R. H. McDOWELL (*Nevada Sta. Bul. 50, p. 13*).—This bulletin contains a report on several cooperative culture tests with sugar beets in Nevada. The possibilitities of growing sugar beets in the State and of establishing sugar factories is considered.

Sugar-beet culture in Wisconsin during 1899, F. W. WOLL (*Wisconsin Sta. Rpt. 1900, pp. 239–256, figs. 3, map 1*).—The work with sugar beets for 1899 consisted of analyses of samples grown by farmers in different parts of the State, and of variety and fertilizer tests with sugar beets made at the university farm. The results of all analyses and the meteorological data for the season are given in tables. The results of analyses for the years 1890 to 1899 are arranged by counties and further indicated on a map.

The analyses of 178 samples of beets from 56 counties show an average of 14.68 per cent of sugar in the juice, with a purity of 80.5 per cent. The average weight of topped beets in the samples was 1.34 lbs., and the average yield per acre 16.1 tons.

The experiments at the university farm show a depressing influence of an application of 20 tons of barnyard manure per acre on the quality of the beets, and an improvement in the quality due to a special fertilizer containing phosphoric acid and potash and to an application of phosphoric acid alone, each used at the rate of 200 lbs. per acre. Vilmorin, Kleinwanzleben and Rölker Dippe Elite produced beets of early maturity and exceptional richness. The Rölker Dippe Elite grown without fertilizer contained 19 per cent of sugar in the juice with a purity coefficient of 92.9 per cent.

The culture of beets on the experimental field at Grignon in 1900, P. P. Dehérain (*Ann. Agron., 26 (1900), No. 12, pp. 593–603*).—The work here reported consisted of a test of 3 varieties of beets grown at different distances. Each variety occupied 6 different plats fertilized with barnyard manure at the rate of 40,000 lbs. per hectare. A report on similar work has been previously given (E. S. R., 10, p. 839). Meteorological data for the year, which was characterized by a dry summer, are given. The results show that the variety Giant Rose gave a much better yield than the Small Leaved Globe or the Giant White. The Giant Rose and the Giant White varieties are known as *demi-sucrières*, indicating that their sugar content is high but not high enough for the manufacture of sugar. For Giant Rose the distance of 35 cm. in rows 40 cm. apart gave the best results. The author states, however, that no definite conclusions as to distance can be drawn from this season's results.

The conservation (drying) of beet tops (*Deut. Landw. Presse, 27 (1900), No. 86, pp. 1059, 1060*).—In a paper read by L. Wüstenhagen before the Agricultural Society of Bernberg, the following phases of the subject were considered: Cleaning the tops from dirt, small stones, etc.; decreasing the oxalic acid content of the leaves; preserving the sugar content of the root crowns; cutting up the crowns and tops to facilitate drying, and drying the same for storage.

The method of handling the beets is as follows: The tops are gathered in small heaps and left lying in the field for a week or so. Here the leaves wilt, thus losing a part of their moisture content and at the same time part of the oxalic acid contained in them. Whether the decrease in the oxalic acid content of the leaves is due direct to oxidation or to the action of micro-organisms was not determined. The tops are taken from the field to the factory, where they are put into a revolving sieve cylinder and brought in contact with a blast of hot air. The dirt, sand, and stones are largely removed by this process and the further decomposition of the oxalic acid in the leaves hastened by contact with the hot air. The tops are then cut up and the drying continued at a lower temperature, in order not to decompose the sugar in the root crowns, until only about 15 per cent of water remains.

That the oxalic acid content of the leaves is greatly reduced by this drying is shown by the analyses of the leaves before drying and of the finished product. In one instance the leaves before drying contained 2.93 per cent of oxalic acid; afterward, 0.6 per cent, and the average for a whole week for the dried product was only 0.3 per cent of oxalic acid.

Examination of protuberances on sugar beets, H. A. Huston and A. H. Bryan (*Indiana Sta. Rpt. 1900, pp. 78, 79*).—Comparative analyses are reported of normally grown sugar beets and of beets which had one or more protuberances on the upper portion of the roots, the protuberances and the beet proper having been analyzed separately. All the samples were of the same variety. The results show that the quality of the beet is very seriously impaired by the presence of protuberances.

List of publications on sugar-beet culture published in 1900, H. Briem (*Bl. Zuckerrübenbau, 8 (1901), No. 3, pp. 33–38*).—A bibliography of 149 publications bearing directly upon the culture of the sugar beet.

The beet-sugar industry in Michigan, 1900, C. D. Smith (*Michigan Bd. Agr. Rpt. 1900, pp. 380–391*).—A paper discussing the relation of the manufacturer of beet sugar to the farmer and laboring classes.

The sunflower plant: its cultivation, composition, and uses, H. W. Wiley (*U. S. Dept. Agr., Division of Chemistry Bul. 60, pp. 31, pl. 1, figs. 2*).—This bulletin treats of the botanical, agricultural, and commercial relations of the sunflower.

The uses of the plant are considered, and full directions for its culture are given. A series of letters on the culture of the crop, its expenses and returns, are presented, and investigations of sunflowers by experiment stations in the United States and Canada and the Division of Chemistry of this Department are reviewed and the results noted. The investigations by the Division of Chemistry comprise measurements of the plant and its different parts, the determination of the weight of the seeds, kernels, and shells, and chemical analyses of the various parts of the plant, including the ash.

Variation in the nitrogen content of cultivated wheats, P. DE VILMORIN ET AL. (*Bul. Soc. Nat. Agr. France, 61 (1901), No. 1, pp. 73–101*).—A comprehensive discussion of this subject at a meeting of the National Agricultural Society of France. The results of physical and chemical analyses of a list of varieties of wheat are given in a table.

The production of wheat in Michigan, O. C. HOWE (*Michigan Bd. Agr. Rpt. 1900, pp. 375–379*).—A general discussion of the subject.

Domestic supply of sugar for Michigan, R. C. KEDZIE (*Michigan Bd. Agr. Rpt. 1900, pp. 391–400, map 1*).—This article is an abstract of a paper presented before the United States Industrial Commission in 1900. The history, progress, and present condition of the beet-sugar industry in Michigan are reviewed.

Management of the estate of Ellenbach, A. CARON (*Jahrb. Deut. Landw. Gesell., 15 (1900), pp. 43, 44*).—A paper read at a meeting of the German Agricultural Society in 1900.

HORTICULTURE.

Report of the horticulturist, A. L. QUAINTANCE (*Georgia Sta. Rpt. 1900, pp. 305–351, pls. 4*).—This is a report on work at the station with peaches, plums, grapes, cantaloupes, onions, and celery. Analyses with reference to sugar, water, and starch content are also given for 43 varieties of sweet potatoes, and some illustrations given showing the development of the fruit buds of the peach at different stages of growth between May 23 and the following December. Of the 65 varieties of native and European plums tested at the station, Munson, Wild Goose, Hughes, and Nebraska are considered the most desirable.

The work with grapes is in continuation of that previously reported (E. S. R., 12, p. 50) and consists (1) of a study of the degree of self-fertility of the different varieties, and an examination of the stamens as to whether they were upright or reflexed; (2) a test of the keeping qualities of the different varieties; (3) a study of the effects on the fruit of ringing grapevines; and (4) analyses of the different varieties with reference to the sugar content of the juice. In the self-fertility test, out of 271 varieties grown, 144 are recorded as having bunches above 80 per cent perfect. These were all varieties with upright stamens. The author states that those varieties which have a percentage of self-fertility less than 80 should be planted with other varieties of the same blooming period. When inclosed in sacks varieties with reflexed stamens failed entirely to produce fruit. In some other instances the bunches from the inclosed flowers were often larger and more perfect than where the flowers were exposed to pollen of other varieties, and there was almost every gradation from this condition to complete self-sterility. In the test of the keeping qualities of grapes, there was no great degree of uniformity with the results secured the preceding year. This question is being further studied.

The fruit from ringed and unringed canes is compared in point of size, quality, and date of ripening in a number of tables. The ringing was begun when each variety was about one-third grown. "Great variation was noticed in the effects produced on the different varieties. In some the ripening of the fruit was much earlier, while in other varieties it was actually retarded."

Twelve methods of training grapes were compared, and notes are given on the results secured with each. Caywood or arbor system, umbrella Kniffin, and the true or three-wire Munson system were most satisfactory.

Work with cantaloupes consisted of a test of 43 varieties planted at different dates. The first seed was planted in Neponset pots on March 24. On April 7 a second planting was made, and these were transplanted in the field April 30, at which date seed was also planted in the ground. The average yield per vine for the different plantings was as follows: March 24, 3.89 lbs.; April 7, 4.97 lbs.; April 30, 4.06 lbs.

Thirteen varieties of onions were tested; one-half of each plat was fertilized in 1899 with lime at the rate of 50 bu. per acre, and in 1900 at the rate of 25 bu. per acre. The best yields were made by Prize Taker, 391 bu. per acre on the limed soil, and by Gigantic Gibraltar with a yield of 252 bu. per acre, also on limed soil. The greater part of the latter crop rotted in the field. The effect of lime on the whole was contradictory.

Of a number of varieties of celery grown, Golden Self-Blanching, Giant Pascal, and Boston Market are considered the best.

Report of the chief of the division of horticulture, botany, and entomology, W. F. Massey (*North Carolina Sta. Rpt. 1900, pp. XXI–XXIX*).—The author reviews the work of the year, mentioning briefly the results in some instances. A large number of orchard fruits have been planted, and experiments in bulb culture, tomato growing, and seed growing carried out. Good narcissus bulbs have been produced, and very favorable results secured in the bulb culture of the Bermuda Easter lily. In experiments with tomatoes, limed plats were entirely free from the bacterial blight known as "Southern blight," while on unlimed plats nearly all of the plants died of the disease. The following season when tomatoes were planted on both limed and unlimed plats, without further addition of lime, the plants on both plats died, showing that the lime to be of benefit must be renewed each year. Some experiments in seed production seemed to show that some of the late-blooming flowers may be profitably grown for seed in that State.

The effects of continued use of immature tomato seed, E. S. Goff (*Wisconsin Sta. Rpt. 1900, pp. 295–297*).—Experiments with Cook Favorite tomatoes in 1891 (E. S. R., 4, p. 155) with seed from mature and immature fruits, through six generations, indicated that the use of immature seed reduced the growth of the plant, increased its prolificacy, and promoted early maturity. In the fall of 1891, samples of seed from mature fruit, and from fruit that had not commenced to redden, were saved from Cook Favorite, Little Gem, and Potomac varieties. With the Potomac variety, the seed from fruit that had just commenced to redden was also saved. These were planted the following season and seed again saved for the next year's crop, the mature seed being taken from plants grown from the mature seed, and the immature seed from the plants grown from the immature seed. This method of selection has been continued up to the present time. The yield of fruit per 100 lbs. of vine, percentage of crop that reddened before frost, and the percentage of fruit gathered in the first four pickings, from both the mature and immature seeds, are arranged in tabular form. A study of these data shows results entirely at variance with those reported in 1891. The use of the immature seed in this second experiment had no uniform effect "on the prolificacy or the maturing season of the plants, and no effect could be seen at any time upon the vigor of the plants."

The horizontal training of tomatoes, G. Quinn (*Jour. Agr. and Ind., South Australia, 4 (1901), No. 7, pp. 583–585, figs. 3*).—Wire netting with large meshes is stretched horizontally about a foot above the tomato rows. The vines grow through the meshes and are thus kept off the ground. Good results have been obtained by the author by this method of training.

Fertilizer and cultural tests with different varieties of tomatoes, J. Troop (*Indiana Sta. Rpt. 1900, pp. 56–72*).—Results are here reported of fertilizer and cultural tests with 12 varieties of tomatoes in plat experiments. The plants were grown from seed in the greenhouse, except 2 varieties which were started from cuttings. A portion of the plants were transplanted once from the seed bed into pots before planting them out in the open ground. The results secured in the fertilizer test with each variety are recorded in 9 tables, but no conclusions are drawn. The results of the experiment in transplanting versus nontransplanting with 7 varieties of tomatoes are in favor of the nontransplanted plants as regards the average yields per plant of all the varieties. The Stone variety yielded 15 lbs. per plant from cuttings, as compared with 11.32 lbs. per plant from seed—a difference in favor of cuttings of 3.68 lbs. per plant.

Tomatoes were grown in the greenhouse and a portion subwatered. The results show a decided gain in the weight of fruit from the subwatered plants as compared with the surface-irrigated plants, although the latter produced the greater number of fruits. In connection with these experiments, the author investigated the variations which occur in individual plants. "Fourteen plants were selected from a lot that was as nearly uniform in size and vigor of growth as possible, and these were planted in the greenhouse and treated exactly alike so far as it was possible to do so. The results of these tests gave a maximum variation in number of fruits produced by each plant of 75 per cent. Some individual plants produced nothing but small fruits throughout the season. The maximum variation in the weight of fruit produced by each plant was only 1¼ lbs." Some data are also included on results of fertilizer experiments with tomatoes in the greenhouse, no conclusions from which are drawn.

Notes on celery, E. Walker (*Arkansas Sta. Bul. 64, pp. 77–94, figs. 5*).—A number of cultural, fertilizer, and irrigation experiments were made at the station with celery, and notes are given on the results of the different experiments, together with brief suggestions on growing celery. The rainfall record for the months of July, August, and September is appended. The author's experiments seem to indicate that pithiness of the stalk may be caused by a deficiency of water during a late stage of growth. Early sown celery rotted when it was bleached by earthing up in warm weather or by the use of boards. This difficulty was obviated by planting self-blanching varieties close together, as in the "new celery culture."

The cabbage plusia, parsley worm, and the celery-leaf blight (*Cercospora apii*) were held in check by applications of Bordeaux mixture containing Paris green. A rot occurred among young transplanted celery, following severe topping. It occurred at the base of leafstalks next to the ground, in cases where the whole blade had been cut away, leaving a leafless petiole. "It was checked by pulling out plants most affected and many of the affected leafstalks, cleaning up between the rows, and spraying with Bordeaux mixture." The author states, in this connection, that the tops should not be sheared off too close in transplanting. It is recommended to prepare the seed bed as for tobacco. Giant Pascal is considered one of the best of the green varieties of celery.

Duration of the growth period in fruit trees, F. Cranefield (*Wisconsin Sta. Rpt. 1900, pp. 300–308, figs. 2, dgms. 2*).—The length of the growing period of apple, pear, cherry, and plum trees has been studied by the station for the past 2 years. The growth of the branches was determined by careful measurements of selected branches at intervals of 2 to 4 days, until no further growth in length could be observed. On the trees under observation, no increase in the growth of the pear occurred after June 1, nor the cherry after May 27. With the apple, the branch growth ceased about June 4, and with the plum June 23. Examination of several hundred other orchard trees during the following July and August showed no indications of further growth. The author points out in this connection that these observations were taken after one of the most severe winters ever known in Wisconsin.

During the season of 1900 no growth on any of the trees under observation occurred after July 10, while with the pear tree growth ceased June 18, and with the apple and plum June 29. Other trees in the same orchard, however, continued to grow until October 1, "at which time most of the terminal buds examined appeared to be plump and fully formed." This second growth on the other trees in the orchard began about July 15, and out of 325 trees examined 66 per cent of the trees on cultivated soil and 21.1 per cent of those in sod made a second growth. "Several of these second-growth shoots were measured as in the previous case and were found to be growing rapidly, in some cases at the rate of ½ in. per day."

"No second growth was found in the cherry orchard, consisting mainly of Russian varieties, nor on any native plum trees, but all of the Japan plums developed a strong second growth. . . . Many apple grafts, top-worked on orchard trees in the spring of 1900, continued to grow several weeks later than the stocks. No flowers opened at any time, showing that only the leaf buds developed, and of these only the terminal buds."

In connection with these experiments, observations were made to determine, "if possible, the earliest and latest date on which the bark would peel or separate from the wood readily enough to permit of budding, and if this condition prevailed continuously throughout the season; also to learn if the bark 'set' or tightened earlier on the smaller or larger branches. The method employed in the season of 1899 was to make T cuts similar to those employed in budding in branches of various sizes on trees of the various species previously mentioned. Several thousand of such cuts were made during the season, and as a result it was found that the bark could be peeled readily at any time on both large and small branches up to August 15; that after this date the bark was set on many of the smaller branches, although it could be easily peeled on the larger ones; that no difference appeared to exist between trees of different ages; that cultural conditions appeared to exert no influence; that a wide difference existed between trees of the same variety, age, and external appearance, and that the difference was often greater between different branches of one tree than between different trees."

During the season of 1900 the bark slipped readily on all branches up to September 15. After this date it was found impossible to slip the bark from branches ½ in. or less in diameter. On the larger branches it separated easily up to about September 25, and after October 3 it appeared firmly set on all branches, both large and small alike. "From this it would appear that the time when the bark sets varies with the season, as it could be peeled one month later in 1900 than in 1899. It would also appear that it sets first on the smaller branches."

The duration of the period of root growth was determined by digging a narrow trench on May 25 about 2 ft. from the trunks of the different trees. In doing this, many roots were cut. The trenches were then filled with well-enriched earth. This earth when examined, July 10, showed that many active new roots had pushed out into the soil from the cut ends, the most extensive root growth being found with the cherry, followed in order by the plum, pear, and the apple, which had made the least growth. The new growth of roots was then cut off and the trenches refilled. An examination of the roots August 22, and again October 6, showed that in all cases good root growth had been made, although no growth of twigs had occurred on any of the trees later than July 1, as determined by a careful system of measurements.

Trial orchards, W. G. VINCENHELLER (*Arkansas Sta. Rpt. 1900, pp. 111–113*).—These are orchards which are being established by the station throughout the cotton-growing sections of the State for the purpose of encouraging fruit growing. Thus far 27 orchards have been established in as many counties. Typical soils of the locality are selected, and the orchard so planned as to be a model as regards methods of cultivation, etc., for the neighborhood in which it is located. The station furnishes the trees, while the land is furnished by the owner, who is selected for his intelligence and promise to care for the trees in accordance with directions furnished by the station.

Under planting in orchards, C. A. Keffer (*Univ. Tennessee Record, 4 (1901), No. 1, pp. 59–61, figs. 2*).—The author discusses the value of various crops for planting in the young orchard. Cowpeas planted in the orchard the last of June, plowed under the latter part of September, and followed by a seeding of rye, has been practiced at the university farm with good results. The soil cover of rye is designed to prevent the washing of the land during winter.

The effect of alfalfa and grass on the growth of orchard trees (*Ber. K. Lehranst. Obst, Wein u. Gartenbau, Geisenheim, 1899–1900, pp. 16–18*).—Trees in alfalfa and grass were compared with those in cultivation. The results as regards tree development and fruit production were decidedly in favor of cultivation.

Apples that originated in Ohio, W. R. Lazenby (*Jour. Columbus Hort. Soc., 15 (1900), No. 4, pp. 137–140*).—Descriptions of 8 varieties which originated in Ohio, with a list of summer, autumn, and winter varieties for the State.

The cherry in Kansas, with a chapter on the apricot and nectarine (*Topeka: State, 1900, pp. 128, figs. 3, map 1*).—This is a popular compilation of a number of articles on the culture, insects, and diseases of cherries, apricots, and nectarines, with statistics of Kansas production. The work is compiled and revised by W. H. Barnes for the Kansas State Horticultural Society.

Pickling green olives, F. T. Bioletti (*Pacific Rural Press, 61 (1901), No. 10, p. 148*).—The author describes a successful process for pickling olives so that they will maintain their green color.

Training the young lemon tree, Leffingwell (*Pacific Coast Fruit World, 11 (1901), No. 2, p. 3, figs. 4*).—The open-topped system of pruning lemon trees is briefly described and its advantages pointed out.

The artificial coloring of oranges, Pum and K. Micko (*Ztschr. Untersuch. Nahr. u. Genussmtl., 3 (1900), No. 11, pp. 729–735, figs. 11*).—Attempts to color oranges in imitation of blood oranges by injection with solutions of fuchsia, or with the coloring material in grapes or bilberries, resulted in failure. Even where the solutions were injected under considerable pressure, the colored portions were always local and of such an appearance as to deceive no one. The reaction secured with the juice from blood oranges and a number of chemical reagents is given in some detail.

Navelencia, a new citrus creation (*Pacific Coast Fruit World, 10 (1901), No. 25, p. 3*).—A new orange originated by A. C. Thompson by the union of buds of the navel with the Valencia orange. The new variety is said to have all the points of superiority of the navel with the shape and late-ripening habits of the Valencia.

Training the peach, C. A. Keffer (*Univ. Tennessee Record, 4 (1901), No. 1, pp. 57–59*).—Methods of pruning the peach tree at different stages of growth are illustrated and described.

Peaches in Massachusetts, J. W. Clark (*Amer. Gard., 22 (1901), No. 327, pp. 229, 230*).—A paper discussing the history of peaches and the results secured by the author in growing peaches in Massachusetts. Peaches can be successfully grown in Massachusetts in certain locations on high ground, but the crop is frequently destroyed by winter temperature of —20° F.

Grafting (*Amer. Gard., 22 (1901), No. 324, p. 171*).—The writer states that he has successfully grafted two Wagner apple trees with Flemish Beauty pears. The pears grew much larger than on the original Flemish Beauty trees, and had no brown specks on them when ripe like those on the mother pear tree. The fruit was also much superior in flavor. The grafts bore every year for 6 years without intermission, while the mother pear tree bore no fruit some years, and the Wagner apple trees on which they were grafted bore apples only every second year. Grafts of Black Tartarian cherries on the American black wild cherry always died the third year.

An ideal method of pruning fruit trees, E. S. Goff (*Amer. Gard., 22 (1901), No. 325, p. 188*).

Where to cut in pruning, C. A. KEFFER (*Univ. Tennessee Record, 4 (1901), No. 1, pp. 53–55*).—The author believes that the best method of cutting off limbs is through the base of the shoulder parallel to the trunk or limb on which the branch to be removed is growing.

On a hybrid of the Liberian and Arabian coffee tree obtained at Réunion, E. BORDAGE (*Rev. Cult. Coloniales, 8 (1901), No. 68, pp. 1–7, figs. 5*).—Illustrations and descriptions are given of the leaves, flowers, and fruit of a natural hybrid between the Liberian and Arabian coffee trees. The hybrid resembles the Arabian tree most in the form of its leaves, flowers, fruits, and the quality of the berries. On the other hand, it is much more resistant to insect attacks and fungus diseases than the Arabian coffee, and in these respects resembles the Liberian tree.

Liberian coffee; its culture and manipulation, V. BOUTILLY (*Le caféier de Libéria, sa culture et sa manipulation. Paris: A. Challamel, 1900, pp. 137, pl. 1*).—Includes also a bibliography on the subject.

The cultivated guavas and their botanical differences, J. B. DAVY (*Pacific Rural Press, 61 (1901), No. 11, p. 164*).—A brief account of the genus with a key to the species already introduced.

A tendency to bisexuality in strawberries, U. P. HEDRICK (*Amer. Gard., 22 (1901), No. 327, p. 226*).—The author has examined the history and sex of strawberries originated in America and has found that of the 185 varieties introduced between 1834 and 1870, 96 varieties, or 52 per cent, were pistillate. Of the 513 varieties originated between 1870 and 1900, only 136 varieties, or 30 per cent, were pistillate. Considering the whole period there was a somewhat uniform progressive tendency from beginning to end for varieties to become bisexual. No reasons could be assigned for this tendency, but climate, soil, cultivation, and the natural tendency of strawberries to bear perfect flowers, as do most other plants of the same order, are suggested.

Second report on experiment in pinching raspberry shoots, E. S. GOFF (*Wisconsin Sta. Rpt. 1900, pp. 286–290*).—The experiments along this line reported in 1899 have been continued (E. S. R., 12, p. 51), being modified only by allowing 5 shoots to grow to each plant instead of 4. The data for the two years are tabulated and summarized. "Judging from the first two full crops, high pinching, i. e., at 18 to 24 in., has apparently increased the yield of the Gregg raspberry, but has slightly decreased the yield of the Cuthbert. Low pinching, i. e., at 12 in., has decreased the yield of both varieties. Pinching appears to have slightly reduced the size of the berries in both varieties. Pinching has evidently increased the growth of superfluous shoots in the Gregg variety."

Making a cranberry bog, F. A. MAKEPEACE (*Agr. Epitomist, 20 (1901), No. 4, p. 23*).—The work of preparing the bog, grading, planting the vines, and harvesting the crop is discussed.

Grapes, F. S. EARLE and C. F. AUSTIN (*Alabama College Sta. Bul. 110, pp. 55–91, figs. 2*).—This bulletin discusses in a general way soils and planting, training and pruning, cultivation, marketing, and insects and diseases and their treatment. One of the most serious diseases at the station has been root rot. Out of 651 vines planted in 1894, 483 vines, or a little over 75 per cent, are now dead, and the death of the majority of them was caused by the root rot. Of the 16 varieties included in this planting, only 2, Herbemont and Rulander, were entirely resistant to the disease. It is thought that possibly these varieties may be used as stocks for less resistant kinds. Various fertilizers have been used to note their effect in the control of the disease. Among others heavy applications of kainit, lime, coal ashes, and stable manure have been made, but with no marked results so far as the disease was concerned. The southern part of the State seems to suffer more than the northern part from the disease, and it is worse on sandy lands than on clays.

Short descriptive notes are given on 94 varieties of grapes fruited in the station vineyard during 1900. Of these varieties Rockwood is considered deserving of special mention as the best of the very early black grapes. For market purposes, Concord, Ives, Delaware, Brighton, Moore Diamond, and Niagara are recommended.

Grapes, C. C. Newman (*South Carolina Sta. Bul. 58, pp. 27, pls. 18*).—A popular bulletin on grape culture, including the laying out of the vineyard, planting, cultivation, pruning, training, trellises, spraying, selection of varieties, etc.

Ringing (*Amer. Gard., 22 (1901), No. 328, pp. 245, 246*).—A general discussion of the effects of ringing plants to produce earliness of fruit, with a review of L. Daniel's experiments in ringing herbaceous plants. In Daniel's works, when cabbage and Brussels sprouts were ringed, the results of the operation were seen in the more open heart or head, combined with a decrease in size; with the kohl-rabi a bulb was formed above the wound, showing that the bulb is a product of the elaborated or descending sap. The bulb was modified in form somewhat, being drawn out something like a gourd. In the case of ruta-bagas the operation was performed below the tuft of leaves. As a result the leaves became elongated and the root developed in the form of an abundant mass of fibers. With these plants the conclusion is reached that ringing is of no practical value whatever. With eggplants the size of the fruit was nearly doubled by ringing, and with tomatoes the size was increased considerably, as was also the quantity, but the quality was somewhat deficient. The results with these plants point out the value of the operation in developing these fruits for exhibition purposes.

The Kniffin method of grape pruning, C. A. Keffer (*Univ. Tennessee Record, 4 (1901), No. 1, pp. 56, 57, figs. 2*).—A popular description of this method.

Waxed paper bands for grafting grapes (*Ber. K. Lehranst. Obst. Wein u. Gartenbau, Geisenheim, 1899–1900, p. 42*).—Parchment paper bands were waxed with the following mixture: One-third resin, one-third beeswax, and one-third crude turpentine. The paper was 3 cm. wide and 20 cm. long. These strips were tightly bound around the grafts and gave very satisfactory results.

First steps in ampelography: A guide to facilitate the recognition of vines, M. Mazade (*Melbourne: Govt., 1900, pp. 95, figs. 43*).—Translated by R. Dubois and W. P. Wilkinson from the French. A simple guide for the recognition of the more prominent species and varieties of European and American grapes.

Introduction to Roumanian ampelography, G. N. Nicoleano (*Introduction a l'Ampélographie Roumaine. Bucharest: Govt., 1900, pp. 152, pls. 12, figs. 54*).—Treats of the varieties of grapes grown in Roumania, climate, soils of different provinces, history of grape culture in the State, production and value of the crop, and gives careful descriptions and plate illustrations of all the more important varieties, with analyses of many wines, etc.

Chestnut cultivation in France, J. C. Covert (*U. S. Consular Rpts., 65 (1901), No. 246, pp. 304–308*).—French varieties of chestnuts are briefly described, their uses—especially in confectionery—noted, and the belief expressed that French chestnuts might be profitably grown in many places in the United States, especially along the coast of Lake Erie near Cleveland. In the preparation of glacéd chestnuts the meats are peeled and boiled and placed for 3 days in vanilla sirup, after which they are drained, coated thinly with vanilla, and put up in fancy packages for shipment. It is believed this industry could be profitably undertaken in the United States, where sugar is 50 per cent cheaper than in France.

A practical guide to garden plants, J. Weathers (*London: Longmans, Green & Co. (1901), pp. XII + 1192, figs. 163*).—This work contains descriptions of the hardiest and most beautiful annuals and biennials; hardy herbaceous and bulbous perennials; hardy water and bog plants; flowering and ornamental trees and shrubs; hardy ferns, bamboos, and other ornamental grasses; also an account of the best kinds of fruits and vegetables that may be grown in the open air in the British Islands, with practical instructions as to culture and propagation. The work is well indexed. It is particularly intended for the use of amateur gardeners, and also for those engaged professionally in horticulture, as a book of reference.

The experiment stations and the florist trade (*Florists' Exchange, 13 (1901), No. 12, pp. 303–307*).—Reports from 40 experiment stations throughout the country, summarizing the work done at each station along the lines of floriculture. An account of the work done by the Division of Pomology and the Division of Vegetable Physiology and Pathology of this Department along the same lines is also included.

The question of color relative to flowers, F. S. MATHEWS (*Florists' Exchange, 13 (1901), No. 13, p. 361*).—Points out the differences occurring in supposedly authentic color charts as regards names of different colors.

Ether treatment of plants (*Gartenflora, 50 (1901), No. 4, p. 99*).—A brief account is here given of the successful use of ether vapor in forcing a number of greenhouse plants. It was especially valuable with *Viburnum tomentosum plicatum, Azalea mollis*, and *A. pontica*, but was without benefit with *Deutzia gracilis*.

Hybridization in Amarylleæ (*Gard. Chron., 3. ser., 29 (1901), Nos. 734, pp. 37, 38; 735, p. 53; 736, pp. 71, 72; 737, pp. 89, 90; 738, pp. 111, 112*).—The author deals with hybrids that have been raised in gardens between individuals of this suborder from warm, temperate, and tropical regions. Forty-seven genera are dealt with specifically.

Notes on cannas, F. K. LUKE (*Jour. Columbus Hort. Soc., 15 (1900), No. 4, pp. 150–159, pls. 3*).—Cannas are divided into 4 subgenera and a number of the more prominent varieties described.

Carnations, preparation for field planting, A. M. HERR (*Amer. Florist, 16 (1901), No. 668, pp. 1159, 1160*).—Directions for fertilizing and cultivation.

New chrysanthemums of 1900, H. DAUTHENAY (*Rev. Hort., 73 (1901), No. 5, pp. 121–123*).—This paper purposes to give a complete list of the different varieties of chrysanthemums introduced in 1900. Each variety is descriptively characterized.

Shasta daisies (*Pacific Rural Press, 61 (1901), No. 8, p. 113, figs. 2*).—This new creation by Luther Burbank is illustrated and described. It is said to be the result of crossing and selection between the weedy, free-flowering American species, the rather large but coarse European species, and the Japanese species. The flowers are very large, averaging from 3 to 4 in. in diameter, and are produced on stiff stems nearly 2 ft. in length. The petals are glistening white and arranged in three rows. The plant flowers freely and is hardy wherever oak is hardy. Some Shasta daisies with well-marked colors are now appearing.

Hydrangea hortensia, Jeanne d'Arc (*Amer. Gard., 22 (1901), No. 327, p. 225*).—A new pure white creation said to be a sport from the variety Thomas Hogg and especially suitable for pot culture.

DISEASES OF PLANTS.

Plant diseases in 1900, A. L. QUAINTANCE (*Georgia Sta. Rpt. 1900, pp. 351–361, pls. 3*).—Notes are given on a number of the more injurious plant diseases noted by the author during the season covered by the report. One of the most destructive diseases is the brown rot of peaches and plums (*Monilia fructigena*). Experiments have been reported (E. S. R., 12, p. 962) for the control of this disease on the peach, and in the present report the results of spraying plums of the Americana type are given. From the data at hand it appears that the spraying with Bordeaux mixture was practically without value upon plums of this race. As an explanation of the inefficiency of the fungicide the author suggests that possibly the fruit is infected by the fungus which may have been perennial in the fruiting spurs. A bacterial rot of onions, similar to that which has been described as occurring in New York (E. S. R., 12, p. 56), is reported, and in some cases has proved very destructive.

Notes are given on a number of diseases of peach, cherry, pear, grape, and apple. A cantaloupe blight, similar to that described in Colorado (E. S. R., 12, p. 261), is mentioned as occurring at the station. This blight is said to be due to *Macrosporium cucumerium*. The older leaves first showed small brown spots, which developed so as to kill the leaf in a week or ten days. The injury proceeded mostly from the older to the younger leaves, leaving the central part of the hill destitute of foliage. The quality of the fruit produced during the season was very inferior, and this depreciation is believed to be due to the presence of the disease.

A very destructive disease of tomatoes is reported as occurring at the station during the summer of 1900. It made its appearance in the tomatoes when about one-third grown and was first noticeable by the presence of small brown, slightly depressed spots with an irregular tessellated margin. The spots enlarge rapidly, the skin shrinks, becoming more or less cracked and wrinkled, making it possible for the entrance of numerous fungi. As yet no organism has been positively observed in the early stages of the disease. Experiments were conducted for the prevention of this disease, with the idea that it was possibly of bacterial origin and might be spread by insects. Tomatoes were sprayed with Bordeaux mixture and a number of insecticides, with the result that those plants receiving the Bordeaux mixture every 2 weeks had 48.6 per cent of their fruit rotted, while the untreated plants had 88 per cent rotten fruits. The plants which were sprayed with insecticides showed no improvement, and in one case a greater amount of disease was noticed on plants which received applications of the insecticide at intervals of from 5 to 7 days during the growing season.

A disease of apple trees, which is due to an unidentified fungus, is reported. It attacks the foliage, causing the leaves to fall, or causing them to dry up and remain upon the tree, giving an appearance resembling that of the pear blight. The fungus causing the trouble appears to be wholly superficial and is readily controlled by applications of Bordeaux mixture.

Notes on injurious fungi (*Agr. Bul. Malay Peninsula* [*Gard. and Forest Dept., Straits Settlements*], *1900, No. 9, pp. 284–286*).—Brief descriptions are given of a disease of clove trees, the destructive action of *Rosellinia radiciperda*, and a disease of nutmegs.

The disease of clove trees is characterized by the appearance of dark red spots on the under surface of the leaves. These spots attain a diameter of ⅛ to ¼ in. and later become white, resembling mildew. The leaves fall, and if large numbers are affected the tree soon presents a nearly leafless appearance. The shoots are attacked, die back, and the tree eventually becomes leafless and dies. The fungus causing this disease is not definitely known, but a crude treatment with Bordeaux mixture seemed to indicate that it would be efficient in preventing the disease.

The destructive action of Rosellinia is described, and it is stated that all plants growing beneath a large tree of *Ficus dubia* were observed to be seriously affected. Examination showed that on an area of about 10 yards all plants had been killed, and that the base of the stem and the roots of the fig tree had become black. To extirpate the pest, the ground was cleared of all dead and dying plants, trash, etc., the affected roots of the tree were cut off and all affected material burned, after which the ground was dug over and lime liberally applied. Bordeaux mixture was liberally poured over the base of the tree and over the ground, and the disease seems to have been checked, no further spread being noticed.

The disease of nutmegs is attributed to the attacks of a fungus forming brown spots on the husk. It is caused by a species of Melanconieæ. The fungus causes the premature dehiscence of the fruit, the valves not growing as rapidly as usual. The tension between the seed and husk increases more rapidly in diseased fruits than in sound ones, resulting in the splitting of the husk prematurely. This disease being rather troublesome, planters are warned to pay attention to the spotting of the husk and to destroy all infected fruits as speedily as possible.

Report of the vegetable pathologist, H. TRYON (*Queensland Dept. Agr. Rpt. 1899–1900, pp. 30, 31*).—Brief notes are given on the occurrence of a number of diseases upon various economic plants.

The sterile fungus Rhizoctonia as a cause of plant diseases in America, B. M. DUGGAR and F. C. STEWART (*New York Cornell Sta. Bul. 186, pp. 51–76, figs. 9; New York State Sta. Bul. 186, pp. 30, figs. 9*).—This investigation was conducted by cooperation between the two New York stations. A brief account is given of the morphology of the fungus, and some of the more destructive of the American forms are described. Sterile Rhizoctonia produces diseases of the bean, beet, carrot, celery, cotton, lettuce, potato, radish, rhubarb, ornamental asparagus, china aster, carnation, sweet william, and violet, as well as being apparently the cause of diseases upon a number of other plants. In many cases Rhizoctonia is truly parasitic, and the diseases of beet, carnation, lettuce, and others have been repeatedly caused by the authors by placing pure cultures of the fungus in contact with the plants. In other cases the fungus is found associated with the disease, but as yet there is no proof that it is the chief cause of the trouble. The fungus is believed to be capable of prolonged existence upon decaying organic matter in the soil, and in this way it may be spread from plant to plant, even when culture or other means fail to spread it. Plants growing under favorable conditions of moisture, temperature, and nutrition will probably show marked resistance to the attack of the fungus, so that in seeking to prevent this disease good sanitary conditions are of the greatest importance. In the propagating and forcing benches, where the fungus is commonly present, a frequent change of soil is advisable. Should the fungus prove a serious pest in greenhouses, the sterilization of the soil with steam or hot water is recommended. The fungus grows readily upon acid media, and as a consequence liming of soil, while not thoroughly effective, will frequently prove beneficial.

Plant diseases due to Rhizoctonia, F. H. HALL, B. M. DUGGAR, and F. C. STEWART (*New York State Sta. Bul. 186, popular ed., pp. 11, pls. 2, figs. 2*).—This is a popular summary of the bulletin noted above.

A second preliminary report on plant diseases in the United States due to Rhizoctonia, B. M. DUGGAR and F. C. STEWART (*Abs. in Science, n. ser., 13 (1901), No. 320, p. 249*).—Since the publication of the previous notes on diseases caused by Rhizoctonia (E. S. R., 11, p. 57), the authors have observed the fungus on a number of entirely new host plants. The principal host plants of this fungus are beans, sugar beet, cabbage, cauliflower, carrot, celery, cotton, lettuce, potato, radish, rhubarb, asparagus, china aster, carnation, coreopsis, sweet william, and violet, with about a dozen other plants of less importance. In many cases the Rhizoctonia proves to be truly parasitic and undoubtedly the cause of the disease, as is shown by abundant experiments, while in other cases innoculation experiments have not been performed. Studies are in progress to determine more carefully the physiology of the forms and the limitations of the species.

The wilt disease of cotton and its control, W. A. ORTON (*U. S. Dept. Agr., Division of Vegetable Physiology and Pathology Bul. 27, pp. 16, pls. 4*).—The wilt disease of cotton is widely distributed through the South, having been reported from a number of places in South Carolina, Georgia, Florida, and Arkansas. The extent of loss from this source is very considerable, in some places cotton culture having been abandoned on infected soil. A description of the disease, together with its cause, is given. The nature of the fungus (*Neocosmospora vasinfecta*) has been previously described by the Division (E. S. R., 11, p. 944). In addition to cotton, this same disease is believed to occur on okra, and in both the okra and cotton it is sometimes complicated by the presence of root nematodes (*Heterodera radicicola*). The progress of the disease is relatively slow when compared with others, on account of its being a soil fungus. Natural and artificial infections from cultures of it are described, and experiments with fungicides for its prevention are outlined. Some of the common fungicides were applied to the soil in such quantities as to be practically prohibitive in ordinary practice without destroying the fungus or reducing the disease. The preventive measures suggested are rotation of crops, removal of diseased plants, avoidance of the spread of the disease by means of cattle, tools, etc., and care of the compost heap. Probably the most hopeful means for combating this disease is to be found in the resistant races of cotton. Experiments with a number of varieties have shown that some are much less subject to the disease than others. Experiments in this line are to be continued.

Formalin and hot water as preventives of loose smut of wheat, J. C. ARTHUR (*Indiana Sta. Rpt. 1900, pp. 17-24*).—The loose smut of wheat is said to sometimes cause losses amounting to 50 per cent of the crop, and quite commonly 10 per cent of the crop is destroyed year after year. Earlier experiments have seemed to indicate that the loose smut is more difficult to eradicate than the stinking smut, and experiments were conducted to test this subject. Smutted seed wheat was treated with hot water and various strengths of formalin, after which the seed was sown and the amount of smut in the subsequent crop ascertained. These experiments were repeated several years, and from the data at hand the conclusion is reached that the loose smut of wheat can not be removed from a crop by the treatment of the seed with formalin or hot water even when the treatment is so severe as to kill one-third or more of the seed. As indirect methods of preventing loose smut, it is recommended that seed should be sown only from fields known to be free from the smut and upon land that had not borne wheat for 2 or 3 years. In addition, it is recommended that wheat used for seed should be thoroughly screened, using a strong blast which would dislodge or blow out a large portion of the smut germs.

Formalin as a preventive of millet smut, W. STUART (*Indiana Sta. Rpt. 1900, p. 25*).—In the spring of 1899 the author treated millet seed from a badly smutted field with different strengths of formalin to test its value as a preventive of the smut. As a result of his experiments, the efficiency of formalin as a preventive of millet smut was established. Where the seed was treated for 1 to 2 hours in a solution of 1 lb. of formalin to 45 gal. of water there was no smut in the resulting crop. Where a weaker solution was used a small percentage of smut was noticed, but in no case was the disease as prevalent as in the check plats.

Inoculation experiments with grass-infesting ergots, R. STÄGER (*Bot. Centbl., 83 (1900), No. 5, p. 145*).—According to the author there are 5 species of grass-infesting ergots, namely, *Claviceps purpurea, C. microcephala, C. wilsoni, C. pusilla*, and *C. setulosa*. Inoculation experiments were conducted by means of ascospores and conidia with the first three, and a preliminary report is given of the results. It was found possible with ergot on rye to inoculate the following: Rye, *Anthoxanthum odoratum, Arrhenatherum elatius, Phalaris arundinacea, Poa pratensis, P. alpina, P. sudetica, P. hybrida, P. cæsia, Hierochloa borealis, Bromus sterilis, Dactylis glomerata, Hordeum murinum*, barley, *Briza media*, and *Calamagrostis arundinacea*.

It was found impossible to inoculate *Lolium* sp. or *Bromus erectus* with *C. purpurea* from rye, although reciprocal inoculations were made between Lolium and Bromus. On this account it is claimed that the *C. purpurea* reputed to occur on Lolium and Bromus is physiologically different from that of rye and other grasses and must be considered as a distinct biological species.

Ascospores of *C. microcephala* from *Phragmites communis* regularly infected *Nardus stricta*, and from *Molinia cærulea* they were successfully transferred to *Nardus stricta*, but all attempts to inoculate the grass hosts of *C. purpurea* with *C. microcephala* failed. *C. wilsoni* from *Glyceria fluitans* is said to be a distinct species readily infecting its host plants, but withstanding all attempts to transfer it to other species of grasses.

Damping off of beets in the field, J. C. ARTHUR (*Indiana Sta. Rpt. 1900, pp. 15, 16*).—The author's attention was called in May, 1900, to a serious trouble which affected the beets in some parts of the State. At the time of the attack the beets were in the first to third leaf following the seed leaves, and had been planted about 3 weeks. The roots and stems below ground became black and lifeless and the top dropped to the ground and withered. An examination of the roots showed the presence of the fungus mycelium, but in the absence of fruiting bodies it was impossible to identify it. The author believes it probable that the disease was conveyed through the seed, and suggests a treatment of the beet seed before planting. A second disease similar to the one just described is reported as affecting young sugar beets in Michigan. It passed under the name "black rot," and differed from the other outbreak chiefly in its failure to kill the plants outright. The surface tissues of the roots were blackened, but the central axis remained alive, and the plants in fields which had not been plowed up largely recovered. It is believed that this disease likewise is conveyed to the crop through the seed, and the use of either formalin or hot water on the seed would prove beneficial.

The diseases of sugar beets, A. STIFT (*Les maladies de la betterave. Paris: Cerf, 1900, pp. X + 111*).—This is a translation of a German publication relating to the diseases of the sugar beet.

The scab of sugar beets (*Bl. Zuckerrübenbau, 7 (1900), No. 4, pp. 61, 62*).

The asparagus rust, J. C. ARTHUR (*Indiana Sta. Rpt. 1900, pp. 10–14*).—The author notes the occurrence of the asparagus rust in the State and briefly outlines its life history. The rust was first noticed in Indiana in 1896. The æcidiospores, which are formed in the spring, are rarely met with, but the other forms are quite common and the disease promises considerable injury to the asparagus crop. Various methods are suggested for combating the disease, among them spraying the plants, destroying the spring spores, burning over the ground in autumn for the destruction of winter spores, and planting on soil which will supply an abundance of moisture during the summer. Other means are mentioned, such as the removal of all plants growing in hedge rows or fields, and the natural check to the rust by its parasites.

Diseases of tomatoes, H. TRYON (*Queensland Agr. Jour., 8 (1901), No. 2, pp. 136, 137*).—A description is given of a tomato black rot in which a number of fungi are associated. The principal one, however, proved to be *Macrosporium tomato*.

A bacterial disease of tomatoes, W. STUART (*Indiana Sta. Rpt. 1900, pp. 33–36, pl. 1, fig. 1*).—While studying the effect of chemical fertilizers upon tomatoes grown in the greenhouse, the author experienced considerable annoyance by a disease which attacked and destroyed many of the fruits. Usually the fruit showed no sign of injury until two-thirds grown, sometimes not until fully developed. The first indication of the disease was noticed in the appearance of slightly watery discolorations of tissue beneath the epidermis. As the disease progressed the affected portion assumed a darker color, followed by a gradual depression of the affected tissue, resembling in many respects the disease caused by the black rot. The entire fruit was rarely destroyed, but as a rule its maturity was hastened, the ripe fruit, however, being unmarketable. Generally the disease attacked the apical portion of the fruit, although in a few instances its appearance was noticed in the central or basal portions. An examination of the diseased tissues showed the presence of motile bacteria, which seemed to be fairly constant in all the tissues examined. The organism was isolated and cultures made of it, after which inoculation experiments were conducted with the pure cultures. The inoculation experiments were made by puncturing the epidermis of the fruit and introducing the germs, and a characteristic infection was established within a week or 10 days. In this time the greater portion of the tomatoes had become involved, and in 2 weeks thoroughly decomposed. In some respects the disease produced by the artificial inoculations differed from that occurring naturally; there was a decidedly offensive odor accompanying the rot of the inoculated plants and they were completely destroyed, while in the ordinary process of the disease no odor was perceptible and only rarely was the entire fruit involved. Inoculation was made upon one-half or two-thirds grown tomatoes still remaining on the vines, and produced the disease in all cases where the epidermis was punctured. All attempts to infect the fruit through the flower proved futile. Some doubt is expressed as to whether the two diseases are due to the same organism. This is to be a subject of further investigation. From the limited knowledge of the disease, no preventive measures are suggested.

A new method of combating club root of cruciferous plants, J. BURVENICH (*Bul. Arbor. et Flor., 1900, pp. 337–340*).

A disease of turnips caused by bacteria, W. CARRUTHERS and A. L. SMITH (*Jour. Bot.* [*London*], *39* (*1901*), *No. 457, pp. 33–36, figs. 2; and Jour. Roy. Soc.* [*England*], *3. ser., 11* (*1900*), *pt. 4, pp. 738–741, figs. 2*).—A disease of turnips has been the subject of investigation by the authors for a number of years. The injured plants had the crown of young leaves destroyed, and a cavity scooped out of the turnip occupied the top immediately below where the leaves had grown. This cavity was empty, its wall a dark-brown color, and the remaining tissues were protected by the development of a corky layer. There was no indication of injury in the turnip beyond the wall of the empty cavity. The first specimen of this disease submitted to the authors was in 1893. In 1900, in Yorkshire, the disease was very prevalent. In the worst cases the young leaves disappeared from the crown or rotted away. The outer older leaves showed signs of wilting, their stalks decaying at the base. As a rule, the outer skin of the turnip was sound. In some instances, where the top was scooped out, the depression was lined by a white slimy substance; in other cases the injury had penetrated farther through the turnip and the whole center was a mass of rotten pulp. A careful examination of the leaf and root showed the injury was due to bacteria, which had probably gained access to the plants between the bases of the young leaves or through the broken surface of the root. Sections taken from the diseased parts were swarming with bacteria. They were motile, cylindrical rods, measuring 0.65μ in width and 1 to 4μ in length.

Later a careful field examination was made, upon which it was found that in a field of 25 acres not one turnip in five had escaped. Yellow turnips had suffered very little. Cabbages growing near were somewhat diseased, but a strip of kohl-rabi through the center of the severely diseased area was without injury. At a later period the progress of the disease was to a large extent checked. This was probably due to the destruction of so many of the leaves, leaving the rows somewhat bare. The sunlight and air gained free access to the roots and the bacteria were dried up or destroyed. The well-known action of sunlight on bacteria is cited, and it is thought probable that the same influence had been exerted in the turnip field, for in many cases the only trace of injury observed was a clean walled cavity at the top of the turnip.

Experiments on the sulphur-lime treatment for onion smut, F. A. SIRRINE and F. C. STEWART (*New York State Sta. Bul. 182, pp. 145–172, figs. 2*).—The smut caused by *Urocystis cepulæ* is said to be exceedingly troublesome in the onion fields of some portions of New York. When onions have been grown continuously on the same land, the smut gradually continues to increase from year to year until crops can no longer be profitably grown. The organism is a soil-inhabiting fungus, and is rarely transferred except as carried on the bulbs. Numerous methods of combating this disease have been suggested and some of them practiced. It is a rather common practice to use larger quantities of seed than required, the idea being that a portion of them will escape the disease. Rotation of crops and deep plowing have been suggested. As the fungus attacks the onion in a very young stage as a seedling, it has been recommended that the young plants be started in beds where the soil is uninfested and thence transplanted to the field. This method is known to give freedom from the smut, but large growers do not practice it on account of the expense in transplanting. In order to ascertain some cheaper method of treatment, the authors began in 1896, and continued for 5 years, field experiments in which the value of sulphur, and sulphur and lime, as soil treatments were tested. Various amounts of sulphur and sulphur and lime were applied in the drills where the seed was planted, with beneficial results. The best results were obtained where 100 lbs. of sulphur and 50 lbs. of lime per acre were applied directly to the drills. With this treatment there was an average annual increase of fully 50 per cent in the product on soil that had previously given smutty crops. The application of sulphur and lime, when sown broadcast, was without particular value. It is recommended in the application of lime and sulphur for the prevention of smut that it be drilled in the drills at the same time the seed is sown, and an implement is described which was used with success for this purpose.

Experiments were conducted to ascertain the time when the plants were infected by the fungus, which showed that they were immune to attacks of the smut by the time the seedlings reached the surface of the soil. Soaking the seed or coating it with fungicides did not prove of any benefit in preventing the disease.

Sulphur and lime for onion smut, F. H. HALL, F. A. SIRRINE, and F. C. STEWART (*New York State Sta. Bul. 182, popular ed., pp. 8*).—This is a popular summary of the above bulletin.

Crown gall of apple, W. G. VINCENHELLER (*Arkansas Sta. Rpt. 1900, pp. 112, 113*).—The occurrence of crown gall on apple trees in orchard and nursery is mentioned. Investigations conducted by the author seemed to indicate that grafts made from whole or long roots and short scions are much more liable to injury than those made with short roots and longer scions. The short root and long scion placed the union 7 or 8 in. below the surface, and at that depth trees are apparently less subject to attack. The results of experiments with grafting 30 varieties of apples, 200 grafts each, showed that most of the varieties were free from the diseased growth. The author believes that propagating trees by the method suggested, as a means for the prevention of crown gall, is worthy of trial.

The New York apple-tree canker, W. PADDOCK (*New York State Sta. Bul. 185, pp. 205–213, pls. 4*).—This bulletin is the second report on the canker which affects apple trees, being a continuation of the investigations reported in Bulletin 163 of the station (E. S. R., 12, p. 59). It has been found that any part of the apple tree above ground, with the possible exception of the leaves, is subject to attack by the canker fungus, which has proved to be *Sphæropsis malorum*. When occurring on the limbs or trunks the injuries are known as cankers, and they are often quite conspicuous since the bark becomes thick and rough, and saprophytic fungi soon gain a foothold, causing the parts to turn black. The injuries are often several feet in length, and because of these striking characters the cankered limbs may be recognized at a considerable distance. The fungus can live in the outer bark of the tree where it does but little harm. An affected branch may be girdled by the fungus and saprophytic fungi complete the work of destruction. When it occurs on new growth the twigs are killed in a manner very much resembling the attack of pear blight. When the fungus occurs on the fruit of the apple it produces what is known as black rot, and numerous experiments have shown that it occurs not only upon the apple, but also upon the pear and quince fruit. The author's experiments have shown that the fungus causing the black rot and the canker fungus are identical. It is said that the leaves of apple trees are occasionally attacked by a species of Sphæropsis the identity of which is not thoroughly established, but the indications are that it is the same as that occurring upon the other parts of the tree. Inoculation experiments were conducted to determine if possible the relationship between the different forms of Sphæropsis occurring on various plants. Cultures were taken from cankered apple-tree limbs and from decaying apples, and inoculation experiments made upon apple, pear, hawthorn, apricot, peach, sumac, persimmon, and hop hornbeam. The inoculations were successful only where applied to the apple, pear, and hawthorn, but experiments with cultures of Sphaeropsis taken from all the other trees, with the exception of the peach, were found to readily produce the black rot of the apple fruit. Two explanations are offered for this behavior, one that the apple fruit is a very favorable medium for the growth of the different species, the other that Sphaeropsis is not parasitic on all of the trees. As a result of his experiments, conducted through 3 seasons, the author states that he has positive evidence that the Sphaeropsis occurring on apple, pear, and hawthorn trees and on apple, pear, and quince fruits is one and the same species. The relation between sun scald, sunburn, and canker is shown, in which it is believed that the canker fungus finds access to the living tissues through such injuries as sun scald and sunburn. To prevent these injuries it is recommended that trees be sprayed with a winter wash composed of lime 30 lbs., tallow 4 lbs., salt 5 lbs., diluted with enough water to make it spray readily. Experiments for the control of the canker were continued, but as yet no definite results have been obtained. The recommendations of the previous year, in which good orchard sanitation and spraying with Bordeaux mixture is advised, are repeated.

Accompanying the apple-tree canker, as mentioned in the previous report, is a second fungus, *Macrophoma malorum*. It resembles the canker fungus very closely, except in the character of its spores. Inoculation experiments on both apple and pear trees with cultures of Macrophoma gave negative results. These, however, should be repeated before deciding that the fungus is not parasitic.

The author reports the occurrence of the European canker, *Nectria ditissima*, upon apple trees in a number of portions of New York and in Nova Scotia, the preliminary report of which is given in E. S. R., 12, p. 262.

Apple-tree cankers, F. H. HALL and W. PADDOCK (*New York State Sta. Bul. 185, popular ed., pp. 4, pls. 2*).—This is a popular summary of the bulletin noted above.

The canker (Rostrella disease) of Coffea arabica, A. ZIMMERMANN (*Meded. 'S Lands Plantentuin, 37 (1900), pp. 24–62, figs. 19*).—The author describes a canker disease of coffee trees, shows that it is caused by a hitherto undescribed fungus, and suggests methods of treatment.

The disease is confined to the Java variety of coffee and usually attacks isolated trees. So far it has been known to attack only trees at least 10 years old. A yellowing and sudden drooping of the leaves indicates the presence of the disease, which is further characterized by the development of brown patches in the cortex of the stem and larger limbs. Death follows soon after the leaves droop. The brown patches may extend nearly around the tree and involve the entire cortex, including the cambium layer. The mycelium has not been found in the wood.

The fungus belongs to a hitherto undescribed genus of Ascomycetes, and the author names it *Rostrella coffea*. Four forms of reproductive bodies are developed, ascospores, macroconidia, microconidia, and a fourth form which the author calls rudimentary microconidia, produced by the breaking up of hypæ developed from the macroconidia and microconidia, each form being fully described.

Infection experiments were made by placing small portions of diseased tissue under the cortex of healthy trees or pieces of stem and later by inoculation with microconidia. All the infections were successful and the checks uniformly remained free from the disease. The characteristic symptoms appeared in from 4 to 8 days and frequently all the spore forms were developed. Infection experiments made on the leaves and young twigs, as well as on the older limbs and trunk, showed that in very moist air *Rostrella coffea* can develop on the leaves and young twigs of *Coffea arabica* when fresh wounds are present, but that the disease is checked on the young parts by the development of a cork layer. Hence the injury to the trees is always caused by the disease attacking the stem or larger limbs.

Experiments on *Coffea liberica* showed that while the fungus made a weak growth in fresh wounds on both stem and leaves, the mycelium did not penetrate beyond the wound. Open air experiments gave negative results. Experiments on shrubs or weeds growing in or near coffee plantations proved that the fungus would grow in wounds on *Erythrina lithosperma*, *Albizzia molukkana*, and *Cedrela serrata*, but only when the experiments were conducted in moist air. Open air cultures were unsuccessful. The fungus will not grow on sugar cane (*Saccharum officinarum*).

For treatment of the disease the author recommends burning all diseased trees; or, if this is not desirable, cutting out the infected parts and coating the wounds with tar. Tree trunks should be coated with Bordeaux mixture or lime to prevent insect injuries. All wounds due to pruning should be coated with tar. If diseased trees are allowed to remain in the plantation, the trunks should be coated with tar to prevent the dissemination of spores.—H. M. PIETERS.

Mulberry-dwarf troubles, U. SUZUKI (*Bul. Col. Agr. Imp. Univ. Tokyo, 4 (1900), No. 3, pp. 167–226, pls. 22*).—For 10 years or more there has been known in Japan a widespread disease of the mulberry which attacks the leaves and branches, checking the growth and finally causing the death of the plant. This disease has spread, causing great losses to silkworm raisers by almost entirely destroying the crop of mulberry leaves.

In 1897 the Japanese Government appointed a commission to investigate the subject, and the present bulletin is in the nature of a report. The first recognition of the disease is supposed to have been 20 or 30 years ago. Different varieties of mulberries are unequally affected. Generally speaking, those varieties which are most highly esteemed for leaf production are most subject to the disease, while those which are characterized by hard leaves and slow growth are comparatively free from it.

The different methods of cutting mulberries are described, and the belief expressed that the primary cause of the disease is attributable to the practice of subjecting the mulberry to repeated cuttings. This treatment results in a deficiency of reserve material in the twigs and tends to abnormal development.

Chemical analyses of healthy and diseased plants at various stages of growth are reported upon in considerable detail. Investigations were made on the reserve materials of the mulberry tree and their relation to the disease. It was found that the diseased leaves were remarkably poor in nitrogen and in the development of woody fiber. The deficiency in nitrogen in the diseased plants was not due to an insufficient supply of nitrogen in the soil, but is attributed to a diminution of the absorptive power of the roots and the chemical activity of the plant cells. The repeated cutting of twigs or plucking of leaves results in the exhaustion of the new shoots before they have attained a height and development sufficient to enable them to perform the function of assimilation. This statement, it is claimed, is supported by the fact that the disease always appears in new shoots after cutting in the growing season and is never observed in plants which have not been cut. Diseased plants may recover when kept from cutting for a number of years.

Differences in the susceptibility of varieties and the effect of different soils are mentioned. It appears that a plant becomes more liable to disease by accelerating its growth with abundant soluble manures. Young plants are rarely diseased. This is thought to be due to the rapid development of the roots and the large capacity for the absorption of nutrients by the young plants. Old plants have less power of developing new roots, and consequently there is a deficiency of reserve material which can not be supplied by the absorption of material from the soil and air.

Careful investigations were made, but no fungi or other micro-organisms were found constantly associated with the disease, the decay of the roots being considered secondary. Aside from the correction of methods of pruning which suggest themselves, no other means of prevention are described.

The black rot and mildew of grapes and their treatment, SCHLOESING (*Rev. Vit., 1900, No. 360, Sup.*).

Guignardia reniformis in the Caucasus, A. LEBEDEFF (*Centbl. Bakt. u. Par., 2. Abt., 6 (1900), No. 20, p. 652, fig. 1*).—A report is given of studies of grapes received from the Caucasus. Examinations were made of the perithecia, in which the author claims to have found the fungus *Guignardia reniformis*. The characteristics of the fungus are described, and it is affirmed that this fungus is undoubtedly that which causes the black rot of grapes in the Caucasus region.

Some diseases of New England conifers, H. von Schrenk (*U. S. Dept. Agr., Division of Vegetable Physiology and Pathology Bul. 25, pp. 56, pls. 15, figs. 3*).—A preliminary account is given of studies made by the author in the forest region of the Northeastern United States, particular attention being paid to the coniferous trees. The extent of injury, evidences of decay, and relation of insect attacks to diseases are discussed. The vegetative conditions of the New England forests are described and notes given on the occurrence and habits of the prevailing coniferous trees, which are red and white spruce, balsam fir, hemlock, arbor vitæ, white pine, and tamarack. The fungi described as attacking these trees mostly belong to the group Polyporei. The species described are *Polyporus schweinitzii*, *P. pinicola*, *P. sulphureus*, *P. subacidus*, and *Trametes pini abietis*. The occurrence of these different fungi, the structure of diseased wood, characters of the fruiting organs, the effect of the fungus on the tree, and methods of combating are described in greater or less detail. In addition to the foregoing species, *Polyporus vaporarius*, *P. annosus*, and *Agaricus melleus* are briefly noted as causing disease upon the same species.

The author finds the forest conditions in New England very favorable to the growth and development of timber-destroying fungi. Trees are frequently cut high up on the stump and low in the top, leaving a great portion of the tree to the attacks of the fungi. From these dead trunks and limbs the spores are spread to standing trees which might otherwise remain sound. Attention should be given to the cutting of trees when they have become matured, as they are more liable to attacks of fungi after this period has been reached. In this way the depreciation due to attacks of fungi and insects may be greatly lessened.

A disease of Taxodium distichum, etc., known as peckiness, also a similar disease of Libocedrus decurrens known as pin rot, H. von Schrenk (*Missouri Bot. Gard. Rpt. 1900, pp. 23–77, pls. 6, fig. 1*).—The disease of cypress known as "pecky" or "peggy" is a species of decay to which it is very liable. When a diseased cypress tree is cut down the heart wood frequently appears as though a large number of holes had been bored through it. These holes vary in size from $\frac{1}{4}$ to $\frac{3}{4}$ in., and are found in the heart wood only. Young trees of Taxodium varying in age from 50 to 125 years are almost always free from defect, only the older ones being attacked. The holes in the wood extend longitudinally up and down the trunk, parallel to the wood fibers, never transversely. They are separated from one another by cells of apparently sound wood. The holes vary in length from $\frac{1}{4}$ to 6 in. or longer, most frequently from 4 to 5 in. long. The cavities are filled with a yellow-brown powder, which readily crumbles in the fingers. A fluffy white mycelium, covered with drops of liquid resembling dew, is sometimes present.

The structure of the diseased wood is described at considerable length. In the cells immediately surrounding the rotten areas certain parts of the holes are colored dark brown. This is thought to be due to the formation of humus compounds. The wood between the rotted areas is described and data given relative to the comparative strength of sound and pecky heart wood.

The progress of the disease is described. The constant presence of the colorless mycelium in the diseased trees makes it seem probable that it is the vegetable part of a fungus which causes the decay. The author states that certain ferments are associated with this disease, and he arrives at the conclusion that humus compounds found in the wood surrounding the holes are probably one of the effective means in preventing the unlimited spread and destructive action of the disease.

A somewhat similar disease of *Libocedrus decurrens* is described. The author summarizes his investigations as follows:

"In the foregoing, two forms of decay have been described, one destroying wood of *Taxodium distichum*, the other of *Libocedrus decurrens*. In both cases the wood is destroyed in localized areas, which are surrounded by apparently sound wood. The cell walls are changed into compounds which diffuse through the walls and fill the cells surrounding the decayed center; and these have been called humus compounds. In both, a fungus mycelium occurs with strongly marked characteristics, which flourishes within the diseased centers and grows between these centers without affecting the intervening wood. This wood can be utilized for many purposes even when much rotted, and in neither case does the mycelium grow after the tree has once been cut down. . . . The two forms of decay differ but slightly, and not more than might be expected in two woods of different character. Taking these facts into consideration, it appears probable that the two diseases are caused by one and the same fungus, the fruiting form of which has not yet been found."

A new species of Trimmatostroma, M. W. DOHERTY (*Bot. Gaz., 30* (*1900*), *No. 6, pp. 400–403, figs. 3*).—In the summer of 1898, the author's attention was called to a diseased condition of the balsam firs in the province of Ontario, Canada. The disease at this time had done but little damage and all efforts to collect fruiting material of the fungus was futile. In 1899, the author visited the same locality and found that trees which the previous season showed only an occasional dead branch had entirely succumbed and the disease was spreading rapidly, many new points of infection being noticed. At this time the diseased leaves showed the presence of numerous black warty tubercles, which proved to be fruiting masses of the fungus. A quantity of material was collected and subjected to further examination and study. From observations made on cultures, the author has decided the fungus is new and has given it the name *Trimmatostroma abietina*. The technical characters of the fungus are described, from which it appears that it belongs to the section Phragmosporæ of the Hyphomycetes. Thus far the only hosts on which the fungus has been observed are *Abies alba* and *A. balsamea*, but it is thought probable the spruces are not immune.

The rust of white pine, C. VON TUBEUF (*Agronome, 1900, pp. 377, 378*).

Concerning a fungus disease of the Norway spruce, R. BECK (*Tharand. Forst. Jahrb., 50* (*1900*), *pp. 178–194, pl. 1*).

On the use of a copper-soda mixture for the prevention of pine-leaf cast, F. GRUNDNER (*Allg. Forst u. Jagd Ztg., 1900, Nov., pp. 369–372*).

Studies on the hexenbesens of barberry, J. ERIKSSON (*Landt. Akad. Handl. Tidskr., 39* (*1900*), *No. 5–6, pp. 346–360, pls. 3*).—The results are given of inoculation experiments with *Æcidium graveolens* and *Puccinia arrhenatheri*.

Wakker's hyacinth germ (Pseudomonas hyacinthi), E. F. SMITH (*U. S. Dept. Agr., Division of Vegetable Physiology and Pathology Bul. 26, pp. 45, pl. 1, figs. 6*).—In this bulletin the author gives an account of the morphology of the organism which causes the rotting of hyacinths known as "Wakker's disease." The organism was isolated, and several series of inoculation experiments begun in 1897 and carried through 1899 are described in detail. In these inoculation experiments hyacinths, onions, cabbages, and other plants were experimented with. The pathogenic nature of the organism is clearly established through the inoculation experiments, as the symptoms always began in that part of the plant which had been inoculated and proceeded downward, the bulb being the last part to show the disease, and because the organism was found present in the yellow bundles of the bulbs. The morphology of the organism is described at considerable length and a synopsis of its characters given. The organism is said to be closely related to the ones causing the bacterial brown rot of cruciferous plants and the bacterial disease of beans, and somewhat less so to that causing the bacteriosis of sweet corn. It is readily distinguished from the first two by its brighter color, lower thermal death point, and manner of growth. It is distinguished from the organism causing the bacteriosis of sweet corn by a brighter color, lower thermal death point, and different characters of growth.

On the coloring and spotting of rose leaves, C. WEHMER (*Gartenflora, 49 (1900), Nos. 9, pp. 225–229; 10, pp. 262–267, pls. 2*).—The author describes the various causes which produce discoloration of rose leaves. The different categories described are those due to parasitic organisms, to physical influence of the atmosphere, and to chemical influence of atmosphere, the normal autumnal change of color, and changes which are brought about by soil influences, drought, etc. The different injuries are described at some length and suggestions given for their prevention. The parasitic diseases mentioned are those caused by *Asteroma radiosum* and *Phragmidium subcorticium*.

A nematode disease of clematis, J. CHIFFLOT (*Semaine Hort., 1900, pp. 535–537*).—Describes attacks of *Heterodera radicicola*.

Concerning a bacteria-like fungus which destroys nematodes, G. LAGERHEIM (*Bihang Svenska Vetensk Akad. Handl., 26 (1900), No. 4; abs. in Bot. Centbl., 85 (1901), No. 9, pp. 282, 283*).—A description is given of a fungus which resembles Actinomyces, that has been found parasitic upon *Tylenchus agrostidis* in the flowering clusters of *Poa alpina*. The fungus seems very destructive to this nematode, and it is probable that it will prove destructive to others. Experiments are to be conducted to ascertain this fact.

Fungicides (*South Carolina Sta. Bul. 57, pp. 16*).—Notes are given on the use of fungicides for the prevention of various diseases of plants, together with formulas and directions for the application of a number of the more common fungicides.

Copper and sulphur in plant protection, J. E. WEISS (*Prakt. Bl. Pflanzenschutz, 1900, No. 8, pp. 60–62*).

Bordeaux mixture with linseed oil, CONDEMINAL (*Rev. Vit., 10, p. 765; abs. in Ann. Agron., 26 (1900), No. 4, p. 216*).—The formula is given for Bordeaux mixture, in which 15 to 20 gm. of linseed oil to each kilogram of lime is added. The adhesive property of the Bordeaux mixture is said to be considerably increased.

Suggestions for an international phytopathological commission, J. ERIKSSON (*Landt. Akad. Handl. Tidskr., 39 (1900), No. 5–6, pp. 361–368*).

ENTOMOLOGY.

Thirty-first annual report of the Entomological Society of Ontario, 1900 (*Rpt. Ontario Ent. Soc. 1900, pp. 112, figs. 46*).—This report contains the proceedings of the thirty-seventh annual meeting of the Entomological Society of Ontario, held in London, November 13, 14, and 15, 1900, and the proceedings of the second annual meeting of the Northwest Entomological Society, held at Lacombe, Alberta, Northwest Territory, January 16, 1901.

A discussion of the San José scale problem was given by G. E. Fisher (pp. 26–29). Whale-oil soap and kerosene were found to be somewhat unsatisfactory remedies for this insect. Crude petroleum gave most beneficial results. Trees were freed from the scale and case bearers and many other insects were destroyed by the use of a 25 or 30 per cent mixture of crude petroleum and water. The annual address of the president, T. W. Fyles (pp. 29–34) was devoted to a discussion of the beneficial action of insects toward plants. W. Lochhead (pp. 34–37) called attention to the necessity of making a systematic study of the forest insects of Ontario. F. M. Webster made a report on experiments in protecting apples from the attacks of the second brood of codling moths (pp. 37, 38). Two trees were selected in the center of an orchard, sprayed on the 22d of June, and one was covered with a netting on the next day. From the covered trees 627 apples were obtained, of which 466 were sound, while from the uncovered tree 1,544 apples were obtained, of which only 452 were sound.

Brief notes were given on the habits and life history of forest tent caterpillar, pea weevil, tussock moth, clover-root borer, and cabbage-root maggot. J. A. Moffat (pp. 42–52) presented notes on the habits and means of combating carpet beetles, and gave a detailed account of the life history of Archippus butterfly. The eggs of Chrysopa were found parasitized to a certain extent by an Ichneumon fly. T. W. Fyles presented an account of the dragon flies of Quebec (pp. 52–57). The possibility of silkworm industry in Ontario was discussed by W. Lochhead (pp. 57–59). It was concluded that the cost of labor and price of silk precluded the practicability of the establishment of the silkworm industry in Ontario. F. M. Webster (pp. 59–61) reported the results of experiments with petroleum by N. A. Hadden on Catawba Island. Peach trees were killed by spraying with undiluted crude petroleum on March 10, 1900, while 1 peach tree and some plum trees escaped injury after being sprayed on the same day. J. Fletcher (pp. 62–72) gave notes on the habits and life history of Hessian fly, cutworms in grain, white grubs, pea weevil, pea moth (*Semasia nigricana*), destructive pea aphis, clover-root borer, clover weevil (*Phytonomus punctatus*), imported cabbage butterfly, cabbage-root maggots, asparagus beetle, cabbage aphis, codling moth, plum curculio, palmer worm, etc. W. Lochhead (pp. 72–78) presented notes on fruit-bark beetle, San José scale, bean fly, (*Anthomyia radicum*), asparagus beetle, Hessian fly, pea weevil, bollworm, and imported cabbage butterfly and squash bug. F. M. Webster (pp. 81–84) reported observations on *Saperda vestita*, which was found injuring linden trees in nursery rows, and *Oberea bimaculata* as a pest of small fruits.

The habits of *Dermestes talpinus* and other species of this family were discussed. A brief account of the present status of the San José scale in Ontario was given, together with notes on *Tyroglyphus malus* as a parasite of San José scale.

Miscellaneous notes on injurious insects, V. H. Lowe (*New York State Sta. Bul. 180, pp. 113–136, pls. 8, figs. 2*).—The forest tent caterpillar (pp. 115–122) is reported as having been unusually destructive to orchard trees. Circular letters were sent to correspondents throughout the State for the purpose of obtaining information concerning the abundance and injuriousness of this species. The localities of its occurrence are given and the life history of the insect is briefly described. As remedies for this insect the author recommends the destruction of egg masses, which is most conveniently done at the time when the trees are pruned, banding the trees to prevent the caterpillars from crawling back after being jarred off, and spraying with arsenical poisons, such as Paris green, arsenite of lime, or arsenate of lead. Kerosene oil applied directly to the caterpillars on the trunks and branches of trees gave satisfactory results. Caterpillars may also be dislodged by streams of water from hydrants. The cocoons are conspicuous and may be readily gathered by children.

The fruit-bark beetle (pp. 122–128) is reported as attacking the branches of cherry, peach, and other fruit trees. During late summer and fall the beetles make short galleries in the thick bark of the trunk and large limbs and longer galleries in the sapwood of twigs and small limbs, in which the eggs are laid. In a peach orchard it was noticed that the most extensive injury was done to Crawford and Reeves Favorite varieties. Injury to twigs is shown by the death of the leaves and by drops of sap which exude from the burrows. The number of eggs in each burrow vary from 1 to 12. The number of broods per year for western New York was not determined. For studying the habits of the beetle under experimental conditions, half-inch curtain rings were fastened together and to the bark by means of melted paraffin, the beetles being placed in these cells and covered by a cover glass. Their habits of boring could then be observed. As remedies against this beetle the author recommends a liberal application of a caustic solution, such as whale-oil soap, 2 lbs. to the gallon of water, about the middle of July. Crude carbolic acid may be added to the solution in the proportion of 2 oz. to the gallon. The object of these applications is to prevent the beetles from burrowing into the bark. Severe winter pruning and burning of the twigs will destroy the eggs and hibernating insects.

A mealy bug attacking quince trees (pp. 128–130), a species of Dactylopius, was found injurious and its habits were studied. A quince orchard examined on April 27 showed that nearly all the trees were infested. The adult mealy bugs were noticed making cocoons and laying eggs on June 28. When the orchard was examined, on September 26, the numbers of the species had materially diminished. Brief descriptions of the insect in all its stages are given. As remedies the author suggests 1 or 2 applications of whale-oil soap, 1 lb. to 5 gal. of water, in the spring and scraping the trunk and large limbs during the winter, and painting with a strong solution of whale-oil soap.

Apple leaf miners (*Ornix prunivorella*) (pp. 131–135) were first reported from Brockport in 1900. The young larvæ of this species feed upon the parenchyma, usually on the upper side of the leaf. The epidermis of the leaf is uninjured, and a mine is produced which causes the distortion of the leaf. Before pupating the caterpillars line their retreats with a heavy coating of silk thread. A brief description is given of the caterpillars. Arsenical or other sprays would have little effect in the case of this species. Since it passes the winter in the leaves, the insect may be held in check by destroying the fallen leaves or plowing them under. *Tischeria malifoliella* is reported as very common in the leaves of apple orchards at Albion and Geneva. The mines are somewhat trumpet shaped in the upper side of the leaf.

The tarnished plant bug (p. 135) is said to have caused considerable damage to peaches. The bugs were watched by means of a hand lens and could be seen to puncture the fruits. The bugs usually confine their attacks to the under side of the fruit, making large numbers of punctures with their beaks. Shortly afterwards drops of sap exude from the punctures and the skin begins to wither. The peaches ultimately become deformed.

A few fruit-tree foes, F. H. HALL and V. H. LOWE (*New York State Sta. Bul. 180, popular ed., pp. 8, pls. 2*).—This is a popular summary of the above bulletin.

Insect notes, A. L. QUAINTANCE (*Georgia Sta. Rpt. 1900, pp. 361–371, pl. 1*).—The author gives brief notes on harlequin cabbage bug, leaf-footed plant bug, tarnished plant bug, squash bug, *Cicadula exitiosa*, bollworm, grape-leaf folder, imported cabbage worm, cabbage plusia, and codling moth.

The pickle worm is reported as having been injurious to squash, cucumber, cantaloupe, and watermelon, the vines of which were more or less injured, especially those of the cantaloupe and squash. The fruit of the pumpkin was not injured. In order to test the value of squash as a trap crop for the larvæ, 4 rows of summer squash were planted at equal intervals across a 1-acre field of cantaloupes. From June 19 until July 17 squash flowers were picked off, and the larvæ infesting them were counted. In all, 1,640 larvæ were thus captured, and the cantaloupes were practically free from pickle worms until July 14. Experiments with arsenites were again unsuccessful. Cantaloupes were thoroughly sprayed with Paris green, 1 lb. to 50 gal. of water, and with Disparene, 6 lbs. to 25 gal. of water. The pickle worm was not affected by the latter and only slightly by the Paris green.

Short notes are also given on the melon worm, squash vine borer, *Diatræa saccharalis*, striped cucumber beetle, *Ceratoma trifurcata*, Colorado potato beetle, false potato beetle (*Doryphora juncta*), plum curculio, and *Allorhina nitida*. An article on *Diabrotica 12-punctata* is reprinted from Bulletin 26, Division of Entomology of this Department (E. S. R., 12, p. 860).

Bugs injurious to our cultivated plants, O. LUGGER (*Minnesota Sta. Bul. 69, pp. 259, pls. 16, figs. 200*).—This bulletin contains a general account of the anatomy, life history, habits, and classifications of the order Hemiptera, including lice, Heteroptera, and Homoptera. Brief biological and economic notes are given on the more important species of the various families of these suborders. The bulletin constitutes a compendium of practical information upon these insects.

Beetles injuring trees in the Turkestan region and means of destroying them, N. N. Sokolov (*Zhuki porrezhdayushchie derevo v skladakh Turkestanskago kraya i sposobui ikh unichtozheniya. St. Petersburg: Minister of Agriculture and Imperial Domains, 1900, pp. 27; abs. in Selsk. Khoz. i Lyesov., 199 (1900), Oct., pp. 249, 250*).—The author gives an account of the life history and means of combating *Clytus faldermanni, C. herbsti, Dicerca aenea,* and *Ptilinus costatus.*

Report of the division of biology, T. W. Kirk (*New Zealand Dept. Agr. Rpt. 1900, pp. 276–346, pls. 26, figs. 8*).—The author gives brief notes on *Rhizobius ventralis* and *Cryptolæmus montrouzieri.* A brief statement is made of the purpose and effectiveness of the Orchard and Garden Pests Bill, which was passed in 1896. Imported fruit and nursery stock is inspected and, if necessary, subjected to fumigation. Inspection was also made for the presence of fruit flies. Brief notes are given on the plum curculio, Hessian fly, ox louse, bird flea, (*Pulex avium*), *Sarcoptes mutans,* and Phylloxera.

Since it had been asserted that fumigation injures the keeping qualities of the orange, a practical test was made with the result that fumigated oranges were found to remain sound for as great a length of time as untreated oranges. During the course of this work it was found that mites were able to withstand the full strength of the gas. The mites not only survived, but were found soon after fumigation feeding on scale insects.

In the treatment of Phylloxera with bisulphid of carbon, the cooperation of grape growers was found to be a matter of great importance.

Report of the entomologist, H. Tryon (*Queensland Dept. Agr. Rpt. 1899–1900, pp. 28–32*).—This report contains brief notes on a large number of injurious insects which attack fruit trees, garden crops, cereals, and other field crops.

The structure and biology of Anopheles maculipennis. The egg and larva, G. F. H. Nuttall and A. E. Shipley (*Jour. Hyg.* [*Cambridge*], *1* (*1901*), *No. 1, pp. 45–77, pls. 2*).—The authors give a brief critical review of the literature of this subject in connection with a bibliography. A detailed account is given of the anatomy and biology of the egg and larvæ of the species. The eggs are laid upon water which is suitable for the development of the larvæ and which is rich in vegetable matter, such as various algæ. On the second or third day after oviposition, the larva leaves the egg and begins to swim about in the water. The larva of Anopheles has only a single pair of maxillæ. This is the first pair, there being nothing which can be identified with the second pair. The chief occupation of the larva is feeding near the surface of the water. In this act the head is reversed so that the ventral surface lies uppermost, the body retaining its normal position. The food of the larva consists in the main of spores of algæ, diatoms, the decaying leaves of Lemna, and other minute organisms. The larvæ feed with the long axis of the body parallel to the surface of the water. When disturbed they wriggle rapidly to the bottom, tail first, where they lie motionless. They are, however, less readily frightened than the larvæ of Culex.

Extermination of malaria-breeding mosquitoes by petroleum and drainage, H. C. Weeks (*Sci. Amer. Sup., 51 (1901), No. 1305, pp. 20921, 20922*).—A popular account of work thus far done by way of experiments in the extermination of mosquitoes.

Remarks on Psorophora ciliata, with notes on its early stages, L. O Howard (*Canad. Ent., 32 (1900), No. 12, pp. 353–357, figs. 3*).—This mosquito is said to occur most abundantly in the austral life zone. Attempts to secure eggs and watch the process of egg laying were unsuccessful. Specimens of the larvæ were obtained from W. P. Seal, of New Jersey. These larvæ are larger than most mosquito larvæ and resemble those of Culex more nearly than those of Anopheles. The duration of the pūpal stage was from 4 to 5 days. The adult of the species is readily distinguished by the presence of vertical scales on the legs. The breeding places in which the larvæ were found were depressions in the bed of a small stream and in small ponds.

Phylloxera and its destruction by means of lysol, G. Cantin (*Le Phylloxéra. Sa destruction par le lysol. Paris: Librairie Agricole Maison Rustique, 1900, pp. 22, 23*).—The author gives a brief history of the ravages caused by phylloxera, and the life history of the insect. Notes are also given on the various methods of combating phylloxera which have been previously adopted. Experiments with lysol were conducted on a vineyard in Chavignol which had been badly invested with phylloxera since 1893. The first treatment consisted in painting all the stems by means of a brush with 5 per cent solution of lysol. The work of painting 6,500 grape stems required 25 kg. of lysol and cost about $13.50. The second treatment was given one week later, and consisted in spraying the stems and the moss and old bark which had been scraped off and was lying about the base of the stems. A 5 per cent solution of lysol was used for this purpose, and the moss and old bark was thoroughly saturated. This treatment required also 25 kg. of lysol, but as the labor was somewhat greater the expense was about $15.

On the theory that phylloxera depends for its propagation on the individuals that issue from winter eggs, this treatment of the stems with lysol promises success. The author estimates that the subterranean colonies of phylloxera will disappear by exhaustion after about 3 years, if not reinforced by young hatched out of the winter eggs.

The palmer worm, M. V. Slingerland (*New York Cornell Sta. Bul. 187, pp. 77–101, figs. 9*).—The name "palmer worm" has been applied in the United States to *Ypsolophus pometellus*. The author describes the larva, pupa, and adult moth of this species. The distribution of the insect seems to be confined to the United States. It is most common in New York and New England, where the greatest amount of damage is done; and it has also been reported from Ohio, Kentucky, and a few of the Southern States. During the past century it has occurred in injurious numbers only 3 times. Its food plants include apple, oak, plum, and cherry trees.

The larvæ feed upon the leaves in much the same manner as cankerworms. Occasionally a few of these are fastened together with silken threads, so as to form a nest within which the caterpillars feed. Considerable damage is also done to young apples, upon which the larvæ feed with great avidity. When the branches are jarred the caterpillars drop, but remain attached by means of a silken thread.

During the second half of June the insect passed into the pupal condition. The pupæ were formed on the leaves, being attached by means of a few threads. The insect remained in the pupal condition for about 10 days, and the moths emerged during the last week in June and the first 10 days of July. The moths were not active during the day unless disturbed. The author conducted breeding experiments for the purpose of determining the further life history of the insect. The moths remained alive in breeding cages from July 5 until November, which indicated that the species hibernates in the adult condition. It is believed, therefore, that there is but one brood of caterpillars annually. The egg-laying habit was not observed and no eggs were found.

The climatic conditions which are most favorable for the development of this species are dry and hot weather during April and May. A number of hymenopterous parasites were bred from pupæ of the palmer worm, which proved to be *Apanteles perplexus*. As an artificial remedy for this insect the author recommends spraying with Paris green at the same times at which such applications are made for the codling moth. A bibliography of the literature relating to this species is given.

The carpenter worm, S. B. Doten (*Nevada Sta. Bul. 49, pp. 12, figs. 7*).—This species, which commonly attacks cottonwood trees, is reported as doing considerable damage to young elms. The insect is described in its various stages, and brief notes are given on its life history. Since the carpenter worm attacks willows, infested willows in the vicinity of elms should be cut down and destroyed. Poplars and cottonwoods which have become badly infested should be cut down in the early autumn and burned for firewood, so as to prevent the escape of the insects. While the caterpillars are small and not deeply buried in the wood, they may be destroyed by a knife or a wire. The entrances to the burrows may be cleaned out and a wad of cotton saturated with bisulphid of carbon inserted. Woodpeckers are mentioned as feeding upon the caterpillars to some extent.

The codling moth or apple maggot (*Gard. Chron., 3. ser., 29 (1901), No. 733, p. 32, figs. 3*).—Brief notes on the habits and life history of this insect. For preventing the caterpillars from crawling up the trees, the author recommends the banding of trees with sacking. The bark of infested trees may be scraped and treated with caustic solutions.

The gypsy moth, S. Lampa (*Malmöhus Läns Kgl. Hush. Sällsk. Qvart., 1900, No. 1, pp. 116–123, pl. 1*).—The author presents in a popular manner various details concerning the appearance of this insect in its various stages, the injuries from serious outbreaks, its life history and habits, its natural enemies, and the more effective artificial remedies to be used for combating it.

Orchard insects, H. Osborn (*Jour. Columbus Hort. Soc., 15 (1900), No. 4, pp. 142–146*).—Economical and biological notes on the woolly aphis, round-headed apple-tree borer, oyster-shell bark-louse, scurfy scale, San José scale, apple maggot, and codling moth.

Spring treatment for orchards infested with the San José scale, W. M. Scott (*Georgia State Bd. Ent. Circ. 5, pp. 4, fig. 1*).—The treatment recommended by the author includes two winter applications, one soon after the foliage falls, and the other in late winter. Brief notes are given on digging up infested trees, kerosene and water treatment, and the use of crude petroleum.

Crude petroleum for the San José scale, M. V. Slingerland (*Rural New Yorker, 59 (1900), No. 2649, p. 732*).—The author gives brief notes on the use of this insecticide in spraying orchards. In one instance 1,000 large apple trees were sprayed with about 500 gal. of crude petroleum in April. The oil was used in a 25 per cent solution, and the total expense for the orchard was about $100. The application was very effective in the destruction of the San José scale.

Location of San José scale in Indiana, J. Troop (*Indiana Sta. Rpt. 1900, p. 72*).—San José scale has been found in 17 counties within the State. A few counties are apparently free from the insect, on account of the persistent efforts of fruit men to destroy the scale and prevent its further introduction.

Crude petroleum; the elm louse; the pear-leaf blister mite, J. M. Aldrich (*Idaho Sta. Bul. 26, pp. 15–24, figs. 1*).—The author experimented with commercial crude petroleum, purchased in San Francisco, with a specific gravity of 0.954 and a density of 16.8 Baumé. It was found impossible to spray this oil undiluted, since it was so gummy that 75 lbs. pressure to the inch was not sufficient to break the oil into a spray. The machines commonly used for making automatic mixtures of kerosene and water were useless for making mixtures of the crude oil and water. This oil was found, however, to pass into emulsion with soapsuds more readily than with kerosene. Spraying with emulsions for San José scale was made March 1 to 10, and the trees were inspected on September 21 following. At that time it was found that one large pear tree, which had been covered with a solid stream of pure petroleum, bore more and larger fruit than adjacent trees of the same variety which were not infested with the scale, and that the foliage was in good condition. One side of an apple tree sprayed with undiluted petroleum died after leafing out, while the other side, which was sprayed with a 50 per cent emulsion, was in good condition and free from scale. Experiments were made with emulsions of crude petroleum varying in strength from 3½ to 50 per cent. Branches of trees which had been sprayed with 3½ per cent emulsion, examined soon after, revealed no living scales.

The author believes, therefore, that the weakest solution used is sufficient to kill all scales with which it comes in contact. In some cases a marked stimulation of pear trees as a result of spraying with crude petroleum was observed. Spraying with a 33 per cent emulsion of petroleum was very effective in destroying apple aphis and elm aphis.

The elm aphis (*Schizoneura americana*) lays its eggs in crevices of the bark and passes the winter in the egg stage. During summer the attacks of this insect cause the leaves to roll up and some leaves contain a hundred or more plant lice of all sizes. About midsummer the plant lice develop wings and migrate. In September the return migration occurs. These return migrations produce a new brood, which deposits the egg. The only remedy recommended by the author for this species is crude petroleum, as already mentioned.

The pear-leaf blister mite is reported as having caused the death of some trees at the station. Experiments with kerosene emulsion were carried on and emulsions of $12\frac{1}{2}$, $16\frac{2}{3}$, and 20 per cent kerosene were used. The weaker solutions did not destroy all the eggs, while the 20 per cent solution was very effective.

Nectarophora pisi, E. D. SANDERSON (*Canad. Ent., 33* (*1901*), *No. 2, pp. 31–39, pl. 1*).—The author compared series of specimens from American and European sources with the result that the species previously described as *N. destructor* is considered the same as that called *N. pisi* by European authors. The specimens of *N. destructor*, upon which measurements were based in the original description, were larger than the average form. Details of measurements of specimens from different sources are given. The author discusses briefly the previous outbreaks of this species in the United States. The insect is described in its various forms, together with notes on the varieties found on various plants.

The pea aphis, J. C. CHAPAIS (*Nat. Canad., 28* (*1901*), *No. 2, pp. 17–20*).—Brief notes on the habits, life history, and remedies for *Nectarophora destructor*.

Some plant lice affecting peas, clover, and lettuce, E. D. SANDERSON (*Canad. Ent., 33* (*1901*), *No. 3, pp. 69–74, pl. 1, fig. 1*).—Descriptive and biological notes on *Nectarophora lactucæ*, *Rhopalosiphum lactucæ*, and *Myzus pergandii*. The last-named species is described as new.

Heliothis dipsaceus and certain other enemies of flax in northern Caucasus, I. M. KRASILSHCHIK (*Lyutzernovaya i li lnyanaya sobka i nyekotoruie drugie vrediteli lna na syevernon Karkazye. St. Petersburg: Minister of Agriculture and Imperial Domains, 1900, pp. 61; abs. in Selsk. Khoz. i Lyesov., 199* (*1900*), *Oct., pp. 251, 252*).—The author gives an account of the life history of this insect and refers to the remedies which have been found effective in combating it. Brief notes are given on Gordius and a fungus disease of the species. Brief mention is also made of *Cochylis epilinana* and *Plusia gamma* as enemies of flax.

Insect pests of sugar cane, H. MAXWELL-LEFROY (*West Indian Bul., 2* (*1901*), *No. 1, pp. 41–44*).—This paper contains notes on the habits, life histories, and remedies to be adopted against *Sphenophorus sacchari*, *Delphax saccharivora*, and the cane moth borer.

Anatomy and physiology of insects, H. SKINNER (*Sci. Amer. Sup., 51* (*1901*), *No. 1308, pp. 20965, 20966*).—A brief general account of insect parasitism and details of the anatomy and functions of various organs which constitute the insect's body.

The simple eyes of insects, R. HESSE (*Zool. Anz., 24* (*1901*), *No. 634, pp. 30, 31*).—The author reports the results of his studies on the structure of the simple eyes as found in the larvæ of a considerable variety of insects.

Biological notes on the predaceous Hymenoptera, G. ADLERZ (*Ent. Tidskr., 21* (*1900*), *No. 3–4, pp. 161–200*).—The author gives notes on the habits and life history of a number of species, including *Ammophila sabulosa*, *Miscus campestris*, *Cerceris labiata*, and species of Psammophila, Crabro, Pompilus, etc.

Biology of coprophagous insects, E. A. BOGDANOW (*Allg. Ztschr. Ent., 6* (*1901*), *No. 3, pp. 35–41*).—The author gives brief notes on the habits and life history of several species of flies and beetles. Experiments were conducted on some of these species for the purpose of determining their reaction to light, gravity, and other influences.

The spinning apparatus of larvæ of Lyda, N. Cholodkovsky (*Allg. Ztschr. Ent., 6 (1901), No. 2, pp. 17–19, figs. 4*).—The author gives a detailed description of the anatomy of the spinning glands and related structures in the larvæ of the genus Lyda, especially *L. erythrocephala*.

The stridulating organs of the Rhynchota, A. Handlirsch (*Verhandl. K. K. Zool. Bot. Gesell. Wien, 50 (1900), No. 10, pp. 555–560, figs. 7*).—The author studied the stridulating organs of a number of species and gives details of the anatomy of these structures. The study involved a large number of species.

Occurrence of Drosophila ampelophila in great numbers, L. Melichar (*Weiner Ent. Ztg., 20 (1901), No. 1–2, pp. 7, 8*).—This species of vinegar fly is reported as being abundant in southern parts of Germany. The author observed the species in great numbers during October, 1900, in and about a barrel in which wormy fruit had been left. A brief discussion is given of the literature relating to this species.

Cockchafers and means of combating them in forests, A. Sobolev (*Selsk. Khoz. i Lyesor., 199 (1900), Nov., pp. 389–408*).—The author reviews the literature relating to the life history and means of combating *Melolontha vulgaris* and *M. hippocastani*, and gives a list of years during which these insects were especially injurious. Especial attention is given to the habits of and remedies for the latter species, especially since there is so little literature on the subject. The methods of digging out and cutting out are described in detail, and notes are given on the agency of the fungus parasite *Botrytis tenella* in controlling the cockchafers.

Means of protection of plants against attacks by caterpillars, G. Lagerheim (*Ent. Tidskr., 21 (1900), No. 3–4, pp. 209–232, figs. 5*).—The author presents detailed notes on Coleoptera, Lepidoptera, Diptera, and Aphididæ, with reference to the frequency of their attacks upon various plants. Notes are also given on the bitter juices, hairs, tough tissues, and other devices by which different families of plants are to some extent protected against the insects' attacks.

Directions for treatment of insect pests and plant diseases, E. D. Sanderson and F. D. Chester (*Delaware Sta. Bul. 50, folio, figs. 8*).—Brief notes are given on the common insect and fungus diseases of the more important economic plants, together with formulas for making the standard insecticides and fungicides.

Paris green, W. C. Stubbs (*Louisiana Stas. Bul. 63, 2. ser., pp. 577–589, 595, 596*).—The author gives a copy of the Louisiana law regulating the sale and purity of Paris green as an insecticide, and reports the percentage of arsenious acid found in a large number of samples. The amount of Paris green sold in different parishes is mentioned, and it is stated that no evidence has thus far been obtained of violation of the law in adulterating Paris green.

A fumigator for small orchard trees, V. H. Lowe (*New York State Sta. Bul. 181, pp. 138–142, pls. 5*).—The author devised a fumigator with dimensions 10 by 6 by 6 ft. The frame was made of pine strips, one side of the bottom being left out, so that the box could be easily placed around the tree. A movable side was constructed so as to be easily fastened in place by means of wooden buttons. The frame is covered with any suitable gas-tight material, such as 8 oz. duck, which may be treated with raw oil and white lead, or shellac with oil and white lead. The canvas over the top may be protected by fastening wire gauze in the top of the box, to prevent the branches from tearing the canvas. A strip of canvas 18 in. wide is fastened to each side of the base of the fumigator, and when the box is in place these strips are covered by dirt or sand bags. The box is thus gas tight.

The cost of this fumigator varies from $13 to $18, according to the kind of material used for the cover. The box may be easily manipulated by 2 men. A bag of cyanid is placed over the dish of acid, and by means of a string passing through a small hole in one of the upright sticks may be pulled into the acid. The time required for moving the box from one tree to another is about 10 minutes. The advantages claimed for this fumigator are that its cubic contents may be accurately computed, that the same amount of chemicals will be used for each charge, thus avoiding extra weighings, that fewer men are required to handle it, and that the fumigator does not rest upon the tree and is therefore not likely to break the limbs.

Apiculture, A. GALE (*Agr. Gaz. New South Wales, 12 (1901), No. 1, pp. 213-217, pl. 1*).—The author gives a brief historical account of the development of apiculture in New South Wales, with reference to the more important bee diseases.

The natural history of the honeybee, G. KOZHEVNIKOV (*Materialui po estestrennoi istorii pchelui. Moscow: Imperial Society of Naturalists, Anthropologists, and Ethnologists, 1900, pp. 144, pls. 3, figs. 45; abs. in Selsk. Khoz. i Lyesov., 199 (1900), Oct., pp. 282, 283*).—The author discusses in detail the different forms of *Apis mellifica* occurring in the colony, and gives a brief account of *A. dorsata* and *A. florea*.

Do bees eat fruit? (*California Cult., 16 (1901), No. 5, p. 69*).—A. J. Cook discusses this subject by way of answering correspondence relating to the possible injury of fruit by bees. It is believed that the mouth parts of bees are so constructed that they might be used in injuring fruit, though the evidence at hand indicates that this is seldom the case.

Formaldehyde vapors for combating foul brood of bees, B. GALLI-VALERIO (*Centbl. Bakt. u. Par., 1. Abt., 29 (1901), No. 4, pp. 127-129, figs. 2*).—In preliminary experiments with this substance the author made use of frames containing larvæ infested with foul brood. Small portions of the comb were exposed in glass vessels to the vapor of formaldehyde for one-quarter of an hour. This treatment was found to have destroyed the bacillus of foul brood. The experiments were repeated on a larger scale by a practical bee keeper with satisfactory results, and a lamp has been devised which is especially adapted for fumigating infested colonies in the hive. Very favorable results have been obtained from its use. A detailed description is given of the lamp.

Foul brood of bees, F. C. HARRISON (*Ontario Agr. Col. and Expt. Farm Bul. 112, pp. 32, pls. 4*).—This article has already been noted from another source (E. S. R., 12, p. 966).

Some experiments in the exportation of beneficial insects, F. M. WEBSTER (*Canad. Ent., 33 (1901), No. 2, pp. 58, 59*).—The author refers briefly to experiments in shipping species of lady bug beetles from Ohio to South Africa. Numerous specimens of several species were sent with good results in the case of *Pentilia misella*.

FOODS—NUTRITION.

Experiments on the effect of muscular work upon the digestibility of food and the metabolism of nitrogen, conducted at the University of Tennessee, 1897-1899, C. E. WAIT (*U. S. Dept. Agr., Office of Experiment Stations Bul. 89, pp. 77*).—This bulletin is in continuation of previous work (E. S. R., 10, p. 171), and reports 16 experiments. With one exception they are divided into three periods, during two of which the subject (in every case a young man in health) performed little or no muscular work, while during the third period he had more or less exercise. The digestibility of the diet and the balance of income and outgo of nitrogen were determined in all the periods with a view to learning the effects of muscular work. During the majority of the work periods and some of the rest periods the outgo of nitrogen in the urine was determined in portions corresponding to 6-hour intervals.

"The muscular work performed during the work period of the experiments carried on [during the first year] was not at all severe. There was, moreover, a slight increase of nitrogen in the diet during the work period, in addition to a large increase of energy from additional fats and carbohydrates in the ration (in some cases as much as 1,000 calories per day). It was found that the digestibility of the diet was not appreciably affected under these conditions. As regards the income and outgo of nitrogen, there was almost invariably a gain of nitrogen during the period of work which amounted to as much as 5 gm. per day at times. Allowing for the slightly increased amounts of nitrogen in the daily diet during this period, as compared with the preceding rest period, there was at times a relative gain and at times a relative loss of nitrogen. In the experiments made [during the second year] the energy in the diet during the period of muscular activity was increased by about 500 calories per day, while the nitrogen remained practically the same as during the preceding rest period. The calculated energy required for the measured muscular work ranged from 127 to 147 calories and averaged 139 per day. The digestibility of the diet was again uninfluenced by muscular work. A study of the nitrogen balance shows that in the majority of cases if there was a gain during the rest period it was increased during the work period, and if there was a loss it was diminished. In other words, comparing the elimination of nitrogen in the periods of little muscular activity and normal diet with that during periods of increased activity and a diet furnishing energy largely in excess of the heat equivalent of the measured work performed, there seems to be a slight decrease under the latter condition. This is true even when we consider the possibilities of a small loss of nitrogen in the perspiration and a lag of considerable duration between the breaking down of nitrogenous material within the body and the excretion of nitrogen in the urine."

Concerning the influence of pasteurized grape juice upon general nitrogen metabolism, etc., body weight, and intestinal putrefaction in healthy man on mixed diet, M. MINAS (*Inaug. Diss., Dorpat, 1900, pp. 144; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), No. 5. pp. 204, 205*).—Detailed analyses of pasteurized grape juice (including ash constituents) are reported, as well as a number of experiments in which grape juice was consumed as part of a mixed diet. Among other conclusions it was pointed out that a rational use of such pasteurized grape juice with a satisfactory mixed diet diminishes the cleavage of protein in the body. The power to protect protein depends upon the grape sugar present and is dependent not alone upon the quantity of grape juice taken, but also on the kind and amount of protein consumed. The richer the food in easily digestible protein, the greater the power of the grape juice to protect the protein. The effect of pasteurized grape juice on the digestibility of protein and other questions of interest from a dietetic standpoint are discussed at some length.

The available nourishment in foods, C. TURLE (*British Food Jour., 2 (1900), Nos. 23, pp. 311, 312; 24, pp. 348, 349*).—A general discussion of food and diet.

Nutrition and the nation's food, J. FRENTZEL (*Ernährung und Volksnährungsmittel. Leipsic: B. G. Teubner, 1900; rev. in Oesterr. Chem. Ztg., 3 (1900), No 20, p. 493*).—A series of six lectures.

The principles of metabolism and nutrition, L. BREISACHER (*Reprint from Phys. and Surg., 1900, Nov., pp. 20*).—The author discusses experiments carried on by himself and other investigators.

The methods of practical hygiene, K. B. LEHMANN (*Die Methoden der praktischen Hygiene. Wiesbaden: J. F. Bergman, 1901, 2. ed., pp. XVIII + 698, figs. 140*).—A revised and enlarged edition of this handbook and laboratory manual, which is designed to meet the needs of physicians, chemists, and others who have occasion to make examinations of air, animal and vegetable foods, etc., from a hygienic standpoint.

Fifth report on food products, E. H. JENKINS (*Connecticut State Sta. Rpt. 1900, pt. 2, pp. 105–114*).—The Connecticut food law and the law regulating the sale of commercial feeding stuffs are quoted. The work of the station during the year in the examination of food products is briefly reviewed. In all 824 samples were examined.

Food products examined for the dairy commissioner in the twelve months ended July 31, 1900 (*Connecticut State Sta. Rpt. 1900, pt. 2, pp. 216–218*).—Samples of a number of materials including butter, molasses, and vinegar were examined.

Bread and the principles of bread making, HELEN W. ATWATER (*British Food Jour., 2 (1900), Nos. 17, pp. 120–122; 18, pp. 150, 151; 19, pp. 180, 181; 20, pp. 215–217; 21, pp. 245, 246; 22, pp. 279, 280; 23, pp. 312, 313; 24, pp. 349, 350*).—A reprint of U. S. Dept. Agr., Farmers' Bul. 112 (E. S. R., 12, p. 279).

The Schweitzer system of grinding grain and making bread, A. MÜNTZ (*Bul. Agr. Algérie et Tunisie, 6 (1900), pp. 253–258*).—A descriptive article, with a report of the analysis of the crust and crumb of ordinary bread, and white bread made by the Schweitzer system as well as white bread made by ordinary methods.

Shredded entire wheat biscuit (*Connecticut State Sta. Rpt. 1900, pt. 2, p. 156*).—An analysis of this product is reported.

Buckwheat flour, A. L. WINTON (*Connecticut State Sta. Rpt. 1900, pt. 2, pp. 114–119*).—A total of 115 samples were examined of which 63 were not found to be adulterated.

Sugar as food, F. STROHMER (*Oesterr. Ungar. Ztschr. Zuckerind. u. Landw., 28 (1899), No. 3; abs. in Centbl. Agr. Chem., 29 (1900), No. 3, pp. 172–174*).—Noted from another publication (E. S. R., 11, p. 481).

Preserves, A. L. WINTON (*Connecticut State Sta. Rpt. 1900, pt. 2, p. 156*).—Notes on the analyses of samples of preserves.

Fruit eating (*Agr. Jour. Cape Good Hope, 17 (1900), No. 13, pp. 824, 825*).—Extracted from an article by Leriche in *Le Petit Jardin*.

Lard, A. L. WINTON and A. W. OGDEN (*Connecticut State Sta. Rpt. 1900, pt. 2, pp. 136–148*).—Of the 160 samples of lard examined during the year 6.2 per cent were found to be adulterated. As 36.5 per cent of the samples were found to be adulterated in 1896, it would appear that adulteration of lard has diminished since the food law went into operation.

Lard oil, A. L. WINTON (*Connecticut State Sta. Rpt. 1900, pt. 2, p. 148*).—A sample of lard oil, a fat which is said to be used by bakers for deep frying, was found to be adulterated by about half its weight with coal oil.

Olive oil, A. L. WINTON and A. W. OGDEN (*Connecticut State Sta. Rpt. 1900, pt. 2, pp. 148–155*).—Of the 105 samples examined 39 per cent were found to be adulterated.

Milk powder, A. L. WINTON (*Connecticut State Sta. Rpt. 1900, pt. 2, pp. 198–200*).—Samples of an egg substitute, which is said to be made from skim milk, were examined and analyses reported.

Adulteration of true mace with Bombay mace, A. L. WINTON (*Connecticut State Sta. Rpt. 1900, pt. 2, pp. 156, 157*).—Notes on the adulteration of samples of mace.

Baking powders, A. L. WINTON, A. W. OGDEN, and C. LANGLEY (*Connecticut State Sta. Rpt. 1900, pt. 2, pp. 157–180, pl. 1*).—Details are reported of the examination of 76 brands of baking powders.

Cream of tartar, A. W. OGDEN (*Connecticut State Sta. Rpt. 1900, pt. 2, pp. 180–185*).—Seventy-six samples of cream of tartar were examined.

The manufacture of vinegar, E. M. HAWKINS (*British Food Jour., 2 (1900), No. 24, pp. 347, 348*).—A descriptive article.

Coffee and coffee compounds, A. L. WINTON (*Connecticut State Sta. Rpt. 1900, pt. 2, pp. 118–122*).—Of the 5 samples of unground coffee examined during the year it is stated that 3 were unadulterated; of the ground coffees, 48 were not adulterated and 7 adulterated.

Chocolate meal, A. BEYTHIEN and H. HEMPEL (*Ztschr. Untersuch. Nahr. u. Genussmtl. 4 (1901), No. 1, pp. 23–25*).—A chemical examination of samples of so-called chocolate meal is reported.

Concerning Dutch cocoa, J. FORSTER (*Hyg. Rundschau, 10 (1900), No. 7, pp. 305–307*).—The process of manufacture and healthfulness of cocoa is discussed at some length. Analyses (proximate and ash) are briefly reported, as well as digestion experiments by artificial methods and with a healthy man. The average coefficients of digestibility of cocoa were: Dry matter 90, protein 80, fat 100, and ash 100 per cent. Twenty gm. of cocoa were found to be more thoroughly digested than a larger amount (60 gm.).

The author also studied the effect of consuming different quantities of cocoa on the digestibility of milk. When milk was consumed alone, the following coefficients of digestibility were found: Dry matter 91.6, protein 93, fat 96, and ash 56.7 per cent. When 20 gm. of cocoa was consumed per 100 gm. of milk, the coefficients of digestibility were as follows: Dry matter 92, protein 93.2, fat 96.3, and ash 66.1. When 60 gm. of cocoa per 100 gm. of milk were consumed, the corresponding percentages were: Dry matter 90.8, protein 92.4, fat 95.6, and ash 63.1. In other words, the consumption of cocoa with milk increased the digestibility of the latter food.

Zanzibar carbon, A. L. Winton (*Connecticut State Sta. Rpt. 1900, pt. 2, pp. 200, 201*).—This material, which is recommended by the manufacturers for giving the same color as smoke to meats and sausage and for other purposes, was found to consist chiefly of a coal-tar color, probably Bismarck brown, and common salt. An analysis of the material is reported.

Introduction to the microscopical examination of vegetable foods and condiments, A. F. W. Schimper (*Anleitung zur mikroskopischen Untersuchung der Vegetabilischen Nahrungs und Genussmittel. Jena: J. G. Fischer, 1900, 2. rev. ed., pp. 158, figs. 134; rev. in Oesterr. Chem. Ztg., 3 (1900), No. 20, p. 493*).—A handbook.

Protection of food products from injurious temperatures, H. E. Williams (*U. S. Dept. Agr., Farmers' Bul. 125, pp. 26*).—A popular summary of information available on the use of cold storage for preserving food products.

Pure-food laws of European countries affecting American exports, W. D. Bigelow (*U. S. Dept. Agr., Division of Chemistry Bul. 61, pp. 39*).—A comprehensive summary.

The imperial meat-inspection law (*U. S. Dept. Agr., Bureau of Animal Industry Circ. 32, pp. 19*).—The German text and English translation of the new imperial German meat-inspection law.

Literature along domestic science and household economic lines, Minnie A. N. Stoner (*Industrialist, 27 (1901), No. 15, pp. 189–194*).—The article contains a bibliography.

Bibliography of domestic economy, R. K. Shaw (*New York State Library Bul. 52, Jan., 1900, pp. 170*).—An extended bibliography of the literature of domestic economy. Only works printed in England are included. One of the sections refers to food, cooking, etc.

ANIMAL PRODUCTION.

Condimental and medicinal cattle and poultry foods (*Connecticut State Sta. Bul. 132, pp. 7*).—Analyses are reported of 15 samples of condimental and medicinal cattle and poultry foods. As is pointed out, these foods consist of ordinary concentrated foods such as corn meal, linseed meal, and such drugs as ginger, fenugreek, sulphur, charcoal, salt, Epsom salts, and gentian. In proportion to the cost of the materials, the prices asked for these materials are very high, and there is no reason to suppose that the effect they produce is at all proportionate to the claims made for them.

Feeding stuffs, R. J. Davidson (*Virginia Sta. Bul. 107, pp. 211–233*).—In addition to a general discussion, the author reports the analyses of a number of samples of cotton-seed meal, cotton-seed hulls, linseed meal, bran, middlings, shorts, mill feed, corn meal, dried brewers' grain, pea meal, gluten meal, ship stuff, and a number of mixed and condimental feeds.

Computation of rations, A. M. Soule (*Univ. Tennessee Record, 4 (1901), No. 1, pp. 44–51, figs. 3*).—Practical directions are given for computing rations.

Concerning the nature and value of the nitrogenous constituents of molasses, C. Beger (*Chem. Ztg., 25 (1901), No. 1, pp. 8–10*).—The total nitrogen in beet-sugar molasses was found to be 1.47 per cent. Of this, 29.3 per cent was nitrogen of organic bases, such as betein, and 48.3 per cent nitrogen of amid compounds, such as glutamin; while, as shown by the Stutzer method, 12.2 per cent was albuminoid nitrogen. If the ammonium sulphate method was used, only 5.3 per cent albuminoid nitrogen was found. The character of the remaining nitrogen, according to the author, has not yet been determined. Rabbits were fed molasses to which a salt mixture containing phosphates was added. The molasses was absorbed in filter paper. This supplied crude fiber and made the ration when dried easy to handle. It was not possible to maintain the body weight of the rabbits on this ration. When gluten meal was added to it, gains in weight were made and a nearly constant weight maintained. The nonalbuminoid nitrogenous compounds in beet molasses, the author concludes, can not replace protein. The tests do not show whether or not they have a power to protect protein similar to that of asparagin.

The proteids of the muscles of cold-blooded animals and their relation to heat rigor, O. von Fürth (*Ztschr. Physiol. Chem., 31 (1901), No. 3–4, pp. 338–352*).—Experiments are reported and discussed.

The principles of animal production with reference to farm animals, R. Müller (*Grundzüge der landwirthschaftlichen Thierproductionlehre. Berlin: P. Parey, 1900, pp. 439, figs. 184; rev. in Ztschr. Landw. Versuchsw. Oesterr., 3 (1900), No. 2, pp. 170, 171*).—A handbook for students and practical farmers.

Feeding native steers, A. M. Soule and J. R. Fain (*Tennessee Sta. Bul., Vol. XIII, No. 4, pp. 23, figs. 7*).—The comparative value of cotton-seed meal and cowpea-vine hay as sources of protein and the feeding value of finely ground cotton-seed hulls or cotton-seed bran were tested with 2 lots of 4 steers each. The animals used were ordinary steers, as it was desired to test the possibility of profitably fattening native stock. The test began January 1, and covered 98 days. At the beginning lot 1 was fed per day per thousand pounds a ration consisting of 6 lbs. cowpea-vine hay, 3 lbs. corn meal, and shredded corn fodder ad libitum. Lot 2 was fed 6 to 16 lbs. cotton-seed bran, 4 to 7 lbs. cotton-seed meal, and corn stover ad libitum. Later the grain ration consisted of 6 lbs. of cotton-seed bran, 3 lbs. cotton-seed meal, and 4 lbs. corn meal. The average weight of the steers in lot 1 at the beginning of the test was 759.7 lbs. and the average daily gain 1.99 lbs. The corresponding figures for lot 2 were 777.7 and 1.75 lbs., respectively. Lot 1 consumed 6.3 lbs. of coarse fodder and 3.17 lbs. of concentrated feed per pound of gain, while lot 2 consumed 7.56 lbs. corn fodder and 3.63 lbs. of concentrated feed per pound of gain. The amount of water consumed per head daily by the 2 lots was about the same, being 42.90 lbs. for lot 1 and 43.51 lbs. for lot 2. At the close of the test the steers were slaughtered and the results of the slaughter test recorded. The average percentage of valuable meat per carcass in lot 1 was 55.75 lbs. and for lot 2 55.59 lbs. The average weight of the liver and the intestinal fat in lot 1 was 10.1 and 20.7 lbs., respectively. Corresponding figures for lot 2 were 11.2 and 17.7 lbs. On the assumption that caring for the animals was worth 3 cts. per day, the profits with lot 1 were $6.15 and with lot 2 $3.62 per steer. Among the general conclusions reached were the following:

"This experiment indicates that native steers can be successfully fed at home at a fair profit. It further indicates that all the corn stover now wasting in the fields should be shredded and fed.

"Cotton-seed bran is too expensive for [coarse fodder], and has an unfavorable effect on digestion, producing impaction of the rumen. . . .

"Cowpea-vine hay made an admirable substitute for cotton-seed meal. As it is not so rich in protein, however, it should be fed at the rate of 2 to 3 lbs. of the former for 1 lb. of the latter.

"It is seen from these tests that a home-grown ration of shredded stover, cowpea-vine hay, and corn meal can be fed with success to a fair type of native cattle. . . .

"Cotton-seed meal gave the better results when combined with corn meal in the proportion of 1 lb. of the former to $1\frac{1}{4}$ lbs. of the latter than when fed alone. . . .

"The results of this experiment favor the use of a ration of corn stover, cowpea-vine hay, and corn meal in preference to one of shredded stover, cotton-seed bran, and cotton-seed meal."

Salt for fattening cattle, J. G. HANEY (*Industrialist, 27 (1901), No. 20, pp. 255–256*).—A general discussion, with brief notes on the amount of salt consumed by a number of grade calves.

The comparative feeding value of corn fodder, corn silage, roots and hay, for feeding breeding ewes in winter, A. L. CARLYLE (*Wisconsin Sta. Rpt. 1900, pp. 28–36*).—Using 3 lots of 12 and 1 of 11 ewes, a number of rations were compared for winter feeding, with especial reference to the value of corn fodder and silage. Lots 1 and 2 were fed corn fodder with bran and oats (1:1), lot 2 receiving corn silage in addition; lots 3 and 4 were fed hay, with bran and oats (1:1), the former receiving corn silage and the latter roots in addition. The ewes in lots 1, 2, and 3 were given $\frac{1}{2}$ lb. of grain per head daily, and those in lot 4, $\frac{3}{4}$ lb. In 10 weeks the lots gained 197, 122, 154, and 159 lbs., respectively. Data are recorded concerning the production of lambs by the different lots, also the weight and condition at birth. "There was not very much difference in the average length of time that the ewes of the different lots carried their lambs. . . . Nothing of any importance can be gleaned from these slight differences in this respect, and the same may be said of a comparison of the number of days in pregnancy of the ewes of different breeds on this experiment. There is also very little that is noteworthy in a comparison of the number or the condition of the lambs produced by the different lots, except the uniformity of increase and general vigor of the lambs from all the flock, irrespective of the kinds of feed given the ewes. . . .

"Well-cured corn fodder, of which about 65 per cent has had the ear corn removed, was a satisfactory feeding stuff. . . .

"Corn silage fed in conjunction with either corn fodder or mixed hay and the same ration of bran and oats is a very satisfactory and very cheap ration for winter breeding ewes that are pregnant. This experiment would also seem to indicate that hay and roots make a very expensive feed ration for wintering breeding ewes and that they do not give any better results than the other and cheaper rations fed. It would appear also that corn fodder containing a large proportion of ears should not be fed largely to breeding ewes until the ear corn had been removed, as well cured and unhusked corn fodder may have fully 50 per cent of its weight in the ear corn, and the ewes might readily get too much ear corn and become too fat."

Pig feeding experiments: Fattening value of certain foods grazed by pigs; feeding experiments to harden soft pork, R. L. BENNETT (*Arkansas Sta. Bul. 65, pp. 97–110*).—Tests of the value of forage crops for pigs (E. S. R., 10, p. 1065) have shown that pork produced by grazing on such foods as soy beans, peanuts, and chufas lacked the hardness of corn-fed pigs. A test was therefore undertaken to learn what quantity of corn was required, and how long it was necessary to feed it after grazing in order to secure carcasses of the desired quality. A lot of 10 mixed grade pigs averaging 116.7 lbs. in weight was pastured for 60 days on peanuts and chufas planted three rows of the former to one of the latter. The average daily gain per pig was 1.6 lbs. A similar lot of 10 pigs averaging 116.2 lbs. each at the beginning of the test was pastured 60 days on peanuts. At the close of the period the pigs in both lots were put on full corn fodder for 8 weeks, the amount of corn eaten being recorded. At intervals of 2 weeks the 2 fattest pigs were slaughtered and the melting point of samples of fat tested.

For purposes of comparison, three lots were pastured during the whole test on peanuts and chufas alone and combined. Four pigs weighing an average of 115.5 lbs. each when pastured on chufas for 60 days made an average gain of 1.38 lbs. Two pigs weighing 111.5 lbs. each when pastured on peanuts made an average daily gain of 1.37 lbs. Two pigs weighing 116.5 lbs. were pastured for 90 days on peanuts and chufas in the proportion of three rows of the former to one of the latter and made an average daily gain of 1.47 lbs. The melting point of the back fat and kidney fat of the pigs fed no corn was 22.9° C. and 32.2° C., respectively. The average melting point of the back fat and kidney fat of the pigs fed corn after the grazing period was 26.3° C. and 34.1° C., respectively. There was thus on an average 3.4° C. in favor of the pigs given corn after grazing. "What effect longer feeding than 8 weeks would have on the hardening of the fat was not ascertained, because to feed longer than 4 weeks is more expensive than the objects of the experiments would permit, which was to produce pork on a minimum quantity of corn and of a quality equal to full corn-fattened pork."

The animals used in the above tests were the average pigs of the region, and were scrubs with the exception of two or three which showed improved blood. The latter produced a somewhat better quality of pork and probably harder fat than the former. In a subsequent test the effect of feeding corn while grazing on peanuts and chufas, and the value of thoroughbred as compared with scrub stock, was studied. As the pigs when grazing had considerable exercise, the test also bears upon the question of the effect of exercise combined with corn feeding. Four pigs, weighing on an average 99.5 lbs., when pastured on peanuts and chufas in alternate rows and fed corn in addition for 75 days made an average daily gain of 1.7 lbs. per pig. They grazed over 0.78 acre and consumed 14 bu. of corn. Four pigs, averaging 95 lbs. each, when grazed on peanuts and chufas in alternate rows for 50 days gained 89.5 lbs. each. They were then fed corn for 25 days. During the whole test the average daily gain was 1.6 lbs. per pig. Fourteen bushels of corn were consumed and 0.71 acre were grazed over. One lot of four pigs weighing 96.3 lbs. each was pastured on peanuts for 75 days and fed corn in addition. The average daily gain was 1.78 lbs. Fourteen bushels of corn were consumed in addition to the feed received on 0.78 acre of a field of peanuts. When grazed on peanuts for 50 days, 4 pigs averaging 95 lbs. each, gained 95.5 lbs. They were then fed corn for 25 days. During the whole test the average daily gain per pig was 1.7 lbs., 14 bu. of corn and the peanuts on 0.71 acre being consumed. In comparison with the above lots, which were made up of ordinary scrub stock, 6 thoroughbred Berkshires averaging 96 lbs. each were grazed on peanuts for 75 days and fed corn in addition. The average daily gain was 1.6 lbs. per pig. This lot grazed over 1.19 acres and consumed 20 bu. of corn. The average melting point of the back fat of the pigs fed corn while grazing was 33.1° C. and of the kidney fat 38.4° C. Similar values for pigs fed corn after grazing were 32.5° C. and 37.8° C. According to the author the thoroughbred pigs or good grades, on peanuts and chufas, combined or alone and fed at the same time a quantity of corn equal to the amount required in four weeks, if fed exclusively, produced pork and lard that in appearance and cooking quality could not be distinguished from that produced by pork fattened on corn exclusively. Scrub pigs similarly grazed and fed produced an inferior flesh and fat, which was soft and oily.

"[A quantity of corn equal] to full feed for a month raised the melting point of fat a few degrees and hardened the flesh, but . . . a smaller quantity was of no material benefit; . . . a larger quantity for feeding longer than one month was too expensive and did not produce good effects to a proportionate extent as the first month of corn feeding."

Data concerning the melting point of the fat of pigs used in an earlier test (E. S. R., 10, p. 1086) are also reported.

Feeding pigs for the production of lean and of fat meat, W. L. Carlyle and A. G. Hopkins (*Wisconsin Sta. Rpt. 1900, pp. 12–24, pls. 6*).—It has been claimed by some that "the feeding of corn to hogs produces a carcass containing a much larger proportion of soft blubbery fat than is the case when feeds such as peas, barley, oats, and skim milk, etc., are fed, since these contain a greater percentage of nitrogenous or flesh-forming material than corn. There are also a number of authorities who insist that the percentage of lean meat is more dependent upon the breed and type of hogs fed than upon character of the feed given them."

In view of the growing demand for lean pork, especially for export purposes, a test was begun with 2 lots of 8 pigs each, to study the causes which influence the character of the gains made. Each lot contained Berkshires, Poland Chinas, and Yorkshires. During the 18 weeks of the test, lot 1 was fed corn meal and skim milk, 1:1; lot 2, wheat middlings and ground peas, 1:1, mixed with an equal amount of skim milk. The nutritive ratio of the rations fed the two lots was 1:7.7 and 1:3.6, respectively. The average amount of grain eaten per pig per day in the 2 lots was 3.92 and 3.94 lbs., and the average daily gain per pig, 1.26 and 1.17 lbs., respectively, the amount of food consumed per pound of gain being 6.32 and 6.81 lbs. As regards breeds, the Berkshires gained on an average of 1.34 lbs.; Poland Chinas, 1.21 lbs., and Yorkshires, 1.08 lbs. The pigs were slaughtered and a block test was made. Among the conclusions drawn were the following:

"The pigs in the corn-fed lot averaged slightly longer in body than did those fed peas, but this must be attributed to the individual peculiarity of the pigs comprising the different lots. In comparing the average length of the small intestines with the average length of the bodies of the pigs in the different lots, we notice that in the lot fed corn the average length of the small intestines is 18.4 times the average length of the body, and in the pea-fed lot they are 18.6 times longer than the average length of their bodies. . . .

"In the corn-fed lot we find the average percentage of intestinal fat to dressed weight to be 2.2 per cent and in the pea-fed lot it is just 2 per cent. This difference is not so pronounced as in the average percentage of kidney fat found in the two lots. . . .

"The fat from the two pigs fed peas and middlings contained a much larger percentage of water than did those fed on corn meal. What effect this may have on the curing and edible properties of the fat meat we are not prepared to say, but it would certainly add to the value of the kidney fat of the pigs from the corn-fed lot over the other for lard-rendering purposes. . . .

"In the amount of blood, weight of intestines and stomach, weight of livers and weight of kidneys the pea-fed lot has a greater average weight in every case than the corn-fed lot."

Experiments in pig feeding (*Queensland Dept. Agr. Rpt. 1899–1900, pp. 19–24*).—In a comparison of boiled mangolds and swill vs. boiled mangolds and ground barley, made with 2 lots of 4 pigs each, the average daily gain per pig in 4 weeks was 0.6 lb. on the former ration as compared with 1.65 lbs. on the latter. Cooked, i. e. boiled barley and raw ground barley were compared with 2 lots of 4 pigs each. The average daily gain in 4 weeks was 1.93 lbs. on cooked and 1.74 lbs. on ground barley; the food consumed per pound of gain was 5.43 and 5.94 lbs., respectively. Under similar experimental conditions the value of ground barley with and without cane molasses was tested. On ground barley the average daily gain per pig was 1.93 lbs. and on ground barley and cane molasses (5.7:1) it was 1.96 lbs. The food consumed per pound of gain was 5.5 and 5.08 lbs., respectively.

Whole corn compared with corn meal for fattening swine, W. A. Henry (*Wisconsin Sta. Rpt. 1900, pp. 7–11*).—In continuation of earlier work (E. S. R., 10, p. 776), whole corn and corn meal were compared for 14 weeks with 2 lots of 14 pigs each. Wheat middlings were fed with the corn and constituted one-third of the ration. A few of the pigs were Poland China Berkshire crosses; the others were pure-bred Poland Chinas. The total whole corn and wheat middlings consumed by lot 1 was 5,852 and 2,926 lbs., respectively, the total gain being 1,571 lbs. Lot 2 consumed 6,183 lbs. corn meal and 3,092 lbs. wheat middlings, the total gain being 1,938 lbs. Lot 1 required 5.59 lbs. of corn per pound of gain, while lot 2 required 4.79 lbs. The results have varied in different years, therefore the authors believe that the tests must be continued before definite conclusions can be drawn.

Feeding value of rape for growing pigs, W. L. CARLYLE (*Wisconsin Sta. Rpt. 1900, pp. 25–27*).—The feeding value of rape alone was tested with 30 pigs averaging 6 months old at the beginning of the test. For 2 weeks they were pastured on about 4 acres of rape. It was eaten readily and with no bad effects. During the time the pigs lost a total of 60 lbs.

"The results of this experiment would indicate that a ration of rape alone fed to pigs for a period of 2 weeks was not sufficient to supply the food necessary for their support. It is quite possible, however, that it may have a much higher feeding value for pigs at this age than when fed in conjunction with grain feed."

Horse breeding, A. M. SOULE (*Univ. Tennessee Record, 4 (1901), No. 1, pp. 29–36, figs. 5*).—A general discussion.

Michigan live stock; review of its present condition, R. GIBBONS (*Michigan Bd. Agr. Rpt. 1900, pp. 365–374*).—A general and statistical article.

DAIRY FARMING—DAIRYING.

On the economy of heavy grain feeding of dairy cows, F. W. WOLL and W. L. CARLYLE (*Wisconsin Sta. Rpt. 1900, pp. 37–61*).—A feeding experiment comparing medium and large quantities of grain, conducted on the same general plan as earlier work (E. S. R., 12, p. 81), is reported. The experiment included 2 lots of 8 cows each and covered 3 periods of 4 weeks each. A medium or normal grain ration, "the amount of grain which, according to careful observations and trials, was required by each animal for maintaining a good flow of milk and a constant live weight," was fed to the cows in lot A during the first and third periods and to the cows in lot B during all 3 periods. The quantity of grain in this ration averaged about 8 lbs. A heavy grain ration, which was $1\frac{1}{2}$ times the normal ration, was fed to lot A during the second period. The grain consisted of wheat bran, ground oats ground corn, and old-process oil meal. Hay and silage were fed in addition Analyses of the feeding stuffs and the nutrients of the rations are given in tables. Some of the data are summarized in the following table:

Results of feeding different amounts of grain to milch cows.

	Food consumed.			Total production.		Cost of food per pound of fat.
	Silage.	Hay.	Grain.	Milk.	Fat.	
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Cents.*
Lot A:						
Period I (8 lbs. grain)	6,813	219.1	1,344	4,581.8	195.40	9.0
Period II (12 lbs. grain)	6,996	222.6	2,016	4,445.7	186.94	12.2
Period III (8 lbs. grain)	7,530	221.0	1,344	3,972.7	167.95	10.8
Average of Periods I and III	7,171.5	221.55	1,344	4,277.25	181.675	9.9
Lot B:						
Period I (8 lbs. grain)	7,372	222.3	1,344	4,416.3	189.16	9.6
Period II (8 lbs. grain)	7,700	223.4	1,344	4,076.1	173.81	10.6
Period III (8 lbs. grain)	7,602	224.0	1,344	3,735.1	159.38	11.6
Average of Periods I and III	7,487	223.15	1,344	4,075.7	174.27	10.6

The results are discussed at some length. The production of milk and butter per unit of dry matter consumed decreased during the heavy grain feeding. The after effects were unfavorable to heavy grain feeding. "The results of the experiments in this line conducted by us during the last two years lead to the general conclusion that it does not pay to feed dairy cows more than a medium amount of grain feed, which may be placed at about 8 lbs. per head daily, except in case of cows of marked dairy tendencies that respond to heavy grain feeding by an increased production of milk and fat rather than by a gain in live weight."

Record of the university dairy herd, W. L. CARLYLE (*Wisconsin Sta. Rpt. 1900, pp. 314–335, figs. 14*).—An account is given of the care and management of the dairy herd, used in a comparison of the milk and butter production of cows of the special-purpose dairy type and cows of the dual-purpose type, and the records of 12 pure-bred and grade cows for the year. The data given include the breed, age, and weight of cows; kind, amount, and cost of food eaten; number of days in milk; amount and value of products, and total profit. Variations in the production of 2 cows are noted. Illustrations are given of 10 of the cows, accompanied in each case by descriptive and historical notes and a summary of production and profit. "The records, when taken in connection with those reported last year [E. S. R., 12, p. 83], certainly contain some surprising results in favor of grade Shorthorns as profitable milkers. The cows of this breed here reported have been bought from 4 different herds in widely separated parts of the country, and have been bred from a variety of lines of breeding."

The record of the grade Guernsey cow, Dolly, summarized by periods of 8 weeks, shows "a remarkable falling off in her production between the amount produced in the best week in the first period of 8 weeks and the best week in the third period of 8 weeks. The feed received indicates that she ate as much feed during the second and third periods as she did during the first. This is a remarkable instance of the folly of condemning a cow on a single day, a single week, or even a single year's record.

"The case of Pauline, a beefy grade Shorthorn cow, is another example, but the difference is not so great in the production of the 2 years. Her record, completed in 1899, gave her credit for 4,335 lbs. of milk and 184.33 lbs. of butter fat, or 215.05 lbs. of butter. Her present yearly record gives her credit for 7,996.7 lbs. of milk and 322.1 lbs. of butter fat, or 364.56 lbs. of butter. Here we have a difference of 3,661.7 in pounds of milk, or 149.51 in pounds of butter. In her record of the present year the profit over cost of feed was $57.48, while last year it was but $20.86."

Official tests of dairy cows, 1899-1900, F. W. WOLL (*Wisconsin Sta. Rpt. 1900, pp. 62–75*).—Rules regarding the conduct of official tests of dairy cows, and directions for station representatives in conducting the tests, as adopted by the station January 1, 1900, are given. Under these rules the station, working in conjunction with the various breeders' associations, will make official tests of registered cows. The person for whom the test is made is expected to pay all expenses connected with the test, including traveling expenses and $2 a day for the station's representative, and provide him accommodations. The results of such official tests of 110 Holstein, 7 Guernsey, 2 Shorthorn, and 8 Red Polled cows are reported in detail. Data for "economical food tests" of 14 of the Holstein cows are included.

An improved cow stall, H. E. VAN NORMAN (*Indiana Sta. Rpt. 1900, pp. 95–97, figs. 6*).—The requisites of an ideal stall are given and a stall, believed to combine these requisites, which has proven very satisfactory at the station, is described.

The relation between the specific gravity, the fat, and the solids-not-fat of milk, C. GROHMANN (*Mitt. Landw. Inst. Univ. Leipzig, 1901, No. 2, pp. 55–89*).—An extended review is given of the work of Fleischmann, Veith, and others upon the composition of milk, and especially upon the determination of the amount of ash, protein, and sugar from the specific gravity and fat content. In 87 analyses of milk from various sources, the author found the difference between the calculated and the analytical results to range from −0.890 to 0.708 per cent dry matter. Not only were the differences in the percentages of ash, protein, and sugar variable, but attention is called to the fact that the specific weight of the fat varies, as the Reichert-Meissl, saponification and iodin numbers show. To determine whether a relation between the fat content of the milk and the amount of solids-not-fat may be established, the author divides his results into 3 groups. In the first group he places the milks containing less than 3 per cent of fat; in the second group those containing from 3 to 4 per cent; and in the third group those containing above 4 per cent. From an average of the 3 groups it was found that an increase in the percentage of fat shows a percentage increase in the solids-not-fat. This is brought out in the following table in which the fat and solids-not-fat of group 1 are taken as 100:

Relation of fat to solids-not-fat in milk.

Group.	Fat.	Fat-free substance.
1	100.0	100.0
2	125.7	102.5
3	171.3	103.4

The volatile products of milk, H. and G. WAUTHY (*Jour. Agricole* [*Paris*], *12* (*1901*), *No. 132, p. 48*).—Milk was distilled to dryness, the successive portions collected and examined.

Milk, A. L. WINTON and C. LANGLEY (*Connecticut State Sta. Rpt. 1900, pt. 2, pp. 122–133, pl. 1*).—Analyses of 246 samples of milk purchased from milkmen in the cities and larger villages of the State are reported. Methods of analysis are given. Eleven samples showed less than 3 per cent of fat, 54 less than 12 per cent of solids, and 17 less than 3 per cent of fat and 12 per cent of solids. Seven contained boric acid or borax and 14 formaldehyde.

Milk and cream sampled and sent by individuals, A. L. WINTON, A. W. OGDEN and C. LANGLEY (*Connecticut State Sta. Rpt. 1900, pt. 2, pp. 134–136*).—Details are reported of the examination of a number of samples of milk, cream, ice cream, and separator skim milk. None of the samples of ice cream contained added preservatives, although some of the samples of cream did.

The sanitary production of milk, A. M. SOULE (*Univ. Tennessee Record, 4* (*1901*), *No. 1, pp. 37–44, figs. 3*).—A general discussion of this subject.

Aeration of milk, J. D. DAVIDSON (*Jour. Agr. and Ind. South Australia, 4* (*1901*), *No. 7, pp. 558–560*).—It was found by experiment that the aeration of milk no only extended the time during which it remained sweet, but eliminated the anima odor and the dandelion flavor which remained in the control.

Preservation of samples of milk, P. LEENHOUTS (*Orgaan Ver. Oudleer. Rijks. Landbouwschool, 12* (*1900*), *No. 148, pp. 195–197*).—The difficulty in preserving composite samples of milk at creameries led to a study of milk preservatives, and especially of formaldehyde. The commercial 40 per cent formalin was used, and the experiments were to determine (1) whether the fat content is changed by the addition of formaldehyde, and (2) what influence the different amounts of formaldehyde exert on the duration of the preservation; also the minimum amount needed to preserve milk for a given time.

Seven flasks of milk were prepared, the fat content and souring point being determined for each lot. Then to each liter of milk was added an amount of formaldehyde varying from 1 to 6 cc. One flask was not treated and served as a check. The fat content was determined by means of Gerber's acid butyrometer and the souring point was expressed in degrees Soxhlet. The milk was tested every other day for 3½ weeks. The results are given in a table. The author concludes that formaldehyde is one of the best preservatives for milk. Throughout the experiment the fat content remained unchanged, and only when finally the milk became thick and sour did the results become untrustworthy. The tests were carried on at a temperature of 16 to 20° C., which is the temperature at which samples are usually kept in a laboratory. When samples are kept in a cool place at about 12° C., 1 cc. of formaldehyde will suffice to preserve 1 liter of milk for 30 days. Larger amounts than 3 cc. per liter are not advised.—H. M. PIETERS.

Formaldehyde as a milk preservative, A. G. YOUNG (*Med. Age, 18–19* (*1900*), *pp. 723–737*).

Milk testing at factories, G. S. Thomson (*Jour. Agr. and Ind. South Australia, 4* (*1901*), *No. 7, pp. 560–563*).—In an experiment of covering milk cans with cloth kept moistened, it was found that the milk arrived at the factory several degrees cooler and with a lower acid content by several points.

A source of error in some turbine testers, F. W. Woll (*Wisconsin Sta. Rpt. 1900, pp. 76–81*).—This has been abstracted from another source (E. S. R., 11, p. 1083).

Influence of temperature on tests of skim milk by the Babcock test, E. H. Farrington (*Wisconsin Sta. Rpt. 1900, pp. 81–86*).—The fat content of skim milk was determined by gravimetric analysis and by steam turbine testers at 140 and 200° F. in 10 comparative tests. The average results by the 3 methods were, respectively, 0.08, 0.06, and 0.03 per cent. "In every case the tests were higher when made in the tightly-closed tester and heated to about 200° F. than they were when tested in the machine having an opening in the cover and whirled at about 140° F. In some cases twice as much fat was shown in the hot test bottles as in the others. . . . Tests of skim milk made with 20 cc. of acid and whirled at a high speed in a machine heated to about 200° F. give results nearer those obtained by gravimetric analysis than are obtained by any other method."

The estimation of fat in sweetened condensed milk by the Babcock test, E. H. Farrington (*Wisconsin Sta. Rpt. 1900, pp. 86–89*).—This has been abstracted from another source (E. S. R., 12, p. 307).

Testing for pasteurized milk, A. Bernstein (*Ztschr. Fleisch u. Milchhyg., 11* (*1900*), *No. 3, pp. 80, 81*).—The following method is given for estimating the degree to which milk has been heated: To 50 cc. of the milk 4.5 cc. of a normal solution of acetic acid is added, slightly shaken until the milk has coagulated, filtered, and the clear filtrate heated. If the original milk has not been pasteurized, a heavy precipitate of albumin will form. The higher the milk has been heated, up to 90° C., the smaller will be the precipitate. Above that no precipitate will occur.

Thermal death point of tubercle bacilli under commercial conditions, H. L. Russell and E. G. Hastings (*Wisconsin Sta. Rpt. 1900, pp. 147–170*).—Standards recommended for the pasteurization of milk for the destruction of tubercle bacilli are given and discussed, and investigations conducted for the purpose of retesting some of the more recent work (E. S. R., 12, p. 1091) under commercial conditions are reported.

In 5 series of experiments milk was inoculated with pure cultures of the tubercle bacillus and heated at 60° C. in a commercial rotary pasteurizer. The time of heating in the different tests varied from 5 to 45 minutes. Control samples were unheated. The vitality of the bacilli was tested by intraperitoneal injections into guinea pigs. The results of the tests, including post-mortem notes, are given in detail. "The conclusions from these series indicate that a temperature of 10 minutes at 60° C. (140° F.) is sufficient to destroy the vitality of the tubercle organism so completely that large doses inoculated in the most susceptible portion of a very susceptible animal (guinea pig) fail to produce any development of the disease, while unheated samples of milk and those exposed to 60° C. (140° F.) for 5 minutes produced the disease without exception."

In 2 series of experiments a comparison was made of heating milk at 60° C. in the commercial pasteurizer and in open bottles placed in a water bath. In the latter case the milk remained in a quiescent condition and was exposed to the action of the air which permitted a film to form on the surface. "Where the milk was exposed in a quiescent condition, as in a glass tube or bottle, the tubercle bacilli were more resistant than where the milk was in a closed receiver and agitated. While all tubercular organisms were destroyed in the commercial pasteurizer in 10 minutes, neither an exposure for this period nor for 15 minutes sufficed to destroy the same lot of organisms when the milk was treated in a quiescent condition at the same temperature in vessels to which the air had more access. . . .

"It is recommended in order to thoroughly pasteurize milk so as to destroy any tubercle bacilli which it may contain, without in any way injuring its creaming properties or consistency, to heat the same in closed pasteurizers for a period of not less than 20 minutes at 140° F. (60° C.)."

Influence of heredity upon the percentage of butter fat in milk, W. Kirchner (*Mitt. Landw. Inst. Univ. Leipzig, 1901, No. 2, pp. 129–139*).—Observations were made during 10 years on the influence of heredity in crossing dairy cattle. From the comparison of the percentage of fat in the milk of the cows in the 2 families crossed, the conclusion is reached that the fat content is influenced by heredity.

The variation of volatile fatty acids in butter fat, P. Vieth (*Milch Ztg., 30 (1901), No. 12, pp. 177–179*).—In a series of determinations covering 2 years it was found that the Reichert-Meissl number ranged from 22.4 to 31.3. The volatile fatty acid content was highest during the spring months and lowest during the autumn months.

Moisture in butter, E. H. Farrington (*Chicago Dairy Produce, 7 (1901), No. 85, p. 18*).—A paper read before the National Butter Makers' Association at St. Paul, 1901. The results reported by various experiment station workers are given. The effect of salting has been found to reduce the moisture content. Working reduces the water content of butter, and the higher the temperature at which it is worked the greater the loss. The influence of the size of the granules upon the water content has been found to be variable. The Ontario Agricultural College reports the greater loss of moisture with butter churned to large granules. The Wisconsin Station found a greater loss with small granules.

New Zealand butter-making experiments (*Station, Farm and Dairy, 3 (1901), No. 39, p. 773*).—A report of a series of experiments carried out by the New Zealand dairy commissioner. It was found that ripened cream produced a better keeping butter than the sweet or unripened cream; that the pasteurized cream butter scored decisively over the nonpasteurized, and that the butter made from cream properly ripened with a starter had a superior flavor and kept better than that from self-ripened cream.

The "Columbia Air Churn," E. H. Farrington and F. Dewhirst (*Wisconsin Sta. Rpt. 1900, pp. 93–97*).—A description of this patent churn is given and some of the advantages claimed for it by the manufacturers are quoted. Twenty-one tests in which comparisons were made of the air churn and a barrel churn under uniform conditions are reported in tabular form. The yield of butter from 121.39 lbs. of fat in the cream was 130.19 lbs. by the air churn and 135.13 lbs. by the barrel churn, making the overrun in the two cases respectively 7.25 and 11.31 per cent. The average fat content of the buttermilk from the air churn was 0.77 per cent and from the barrel churn 0.26 per cent. The average time required for churning was 1.3 minutes less in case of the air churn. A comparison of the 2 churns as regards ease of running, economy in cost, lasting qualities, etc., was unfavorable to the air churn.

Calculating dividends for milk and for cream at the same factory, E. H. Farrington (*Wisconsin Sta. Rpt. 1900, pp. 90–92*).—This subject is briefly discussed and an illustration of the calculation of dividends is given. The fat returned to the milk patron in the skim milk is taken at 3 per cent of the fat in the whole milk. The amount of fat received from the cream patron is therefore increased by 3 per cent, and compared with the amount of fat in the whole milk received from the milk patron in calculating dividends.

Creameries and cheese factories of western Oregon, F. L. Kent (*Oregon Sta. Bul. 65, pp. 25–60, pls. 3*).—Information on this subject was collected by the author in a tour of inspection made during July and August, 1899. The bulletin contains a list of the creameries and cheese factories visited, with data as to form of organization, value of plant, number of patrons, etc., of each; estimates of the butter and cheese production in the State in 1899; an account of the more common methods of operating creameries and cheese factories; the constitution and by-laws of several of the dairy associations; a discussion of the location and cost of building and equipping creameries and cheese factories; notes on keeping accounts at factories; directions for operating the Babcock test; and miscellaneous notes on the feeding and production of cows in the State, the separators and churns in general use at factories, Babcock testers and the cleansing of test bottles, water supply and fuel of factories, and packing and marketing butter. The production of creamery butter and cheese in the State in 1899 is estimated at about 2,500,000 and 1,500,000 lbs., respectively.

Notes on some dairy troubles, H. A. Harding, L. A. Rogers, and G. A. Smith (*New York State Sta. Bul. 183, pp. 173–193*).—Flavor in milk and its products is briefly discussed, and investigations of a fishy flavor in milk, a bitter flavor in Neufchatel cheese, a sweet flavor in Cheddar cheese, and rusty spot in Cheddar cheese are reported and summarized as follows:

"Appearance of a highly-disagreeable, fishy flavor in the product of a dairy was traced to the milk of a single apparently healthy cow. On rejecting the product of this animal no further trouble was experienced. No cause for the outbreak could be found.

"An intensely bitter flavor in Neufchatel cheese was found to be connected with the activity of an acid-forming bacillus. The bitter flavor was not reproduced in liquid cultures but appeared upon draining and aerating the cheese curd.

"The causal relation of certain yeasts to the production of undesirable flavors common in Cheddar cheese appeared probable from their constant presence in cheese showing sweet flavor and their absence in all that having a clean flavor. The uniform reproduction of off-flavors, when using pure starters of these yeasts in cheese making tends still further to establish this relation.

"Rusty spot in Cheddar cheese is caused by a bacterial growth. The addition of cultures of this bacillus to the vat before adding the rennet failed to reproduce the discoloration; but adding cultures of the same organism after cutting the curd gave a very marked case of rusty spot."

Dairy disagreeables busy the bacteriologists, F. H. Hall, H. A. Harding, L. A. Rogers, and G. A. Smith (*New York State Sta. Bul. 183, popular ed., pp. 9*).—This is a popular summary of the above bulletin.

The cause of the ripening of cheese, E. von Freudenreich (*Ann. Agr. Suisse, 2 (1901), No. 1, pp. 1–5*).—In the present study it was sought to make cheese under normal conditions, but without containing certain bacteria. For this reason milk was drawn under the best aseptic conditions possible. Six lots of milk were obtained with from 62 to 316 bacteria per cubic centimeter. These lots were made into 6 cheeses. In Nos. 1 and 2, used as checks, the milk from which they were made did not contain any lactic-acid bacteria and was coagulated with artificial rennet to avoid the addition of bacteria. Two other portions (Nos. 3 and 4) were coagulated with a natural rennet that contained almost pure cultures of these lactic-acid ferments, which, according to the author, are necessary in the ripening of cheese. The fifth lot was coagulated with artificial rennet and in addition 3 kinds of lactic-acid bacteria, *Bacterium lactis acidi* and 2 others denominated α and ε, were incorporated. The sixth lot was made up as No. 5, except that only 1 kind of lactic-acid forming bacteria, ε, was added. After 10 weeks, bacteriological and chemical examinations of the cheeses were made, the chemical examination consisting in the determination of the nitrogen soluble in water, and the nitrogen of the products of decomposition, in percentages of the total nitrogen.

The following shows the chemical analyses:

Analyses of cheese ripened in different ways.

Cheese No.	Nitrogen soluble in water.	Nitrogen of the products of decomposition.	Nitrogen of decomposition in total soluble nitrogen.
	Per cent.	*Per cent.*	*Per cent.*
1 (artificial rennet)	9.31	0.75	8
2 (artificial rennet)	16.38	1.70	10
3 (natural rennet)	9.77	3.00	30
4 (natural rennet)	12.88	3.52	27
5 (artificial rennet, with 3 lactic-acid bacteria)	13.89	2.55	18
6 (artificial rennet, with 1 lactic-acid bacteria)	12.20	1.30	10

In the checks in which lactic-acid bacteria were absent, there was no evidence of ripening in the taste of the cheese. The differences in the amounts of soluble nitrogen in these cheeses appeared to depend upon the number of bacteria present which were able to decompose the casein but which did not have any favorable influence upon the ripening. The larger decomposition of No. 2 did not show an improvement in quality over No. 1. In Nos. 3 and 4, while the ripening had not progressed very far, yet the results were favorable for the production of a good cheese. The differences between No. 5 and No. 6 showed that the absence of 2 of the lactic-acid bacteria in the last lot had an unfavorable influence upon the ripening. The differences between the cheeses in the experiments are more strongly brought out in the column in the table giving the percentage of nitrogen of decomposition in the total soluble nitrogen.

The rôle of lactic acid bacteria in the ripening of cheese, R. Chodat and N. O. Hofman-Bang (*Ann. Inst. Pasteur, 15 (1901), No. 1, pp. 36–48*).—The authors made a number of culture experiments with different species of lactic-acid bacteria and the tyrothrix form of Duclaux. Casein was used as a culture medium and was prepared as follows: Fresh milk was creamed in a separator, pasteurized, coagulated, the whey removed, and the curd washed and dried. When used, the curd was treated with a small amount of water and sterilized. The small portions of the culture medium were inoculated with the various forms of bacteria tested, and the soluble and insoluble nitrogen formed are shown in tables. From the results obtained the authors conclude that the lactic-acid bacteria do not have the importance in ripening cheese that Freudenreich ascribes to them. The tyrothrix forms appeared to have the power of dissolving the casein of the culture medium while the lactic-acid bacteria did not.

The influence of the temperature of curing upon the commercial quality of cheese, G. A. Smith (*New York State Sta. Bul. 184, pp. 193–203*).—Introductory notes are given on the cheese industry in New York, and experiments reported in curing cheese at temperatures common under ordinary factory conditions and at lower temperatures. The method of making the cheese was uniform in all the experiments and is described in detail. In 1899 cheese was cured at 55, 60, 65, and 70° F., and in 1900 also at 75 and 80°. Scorings are tabulated.

"Of the cheeses made in 1899 those cured at 60° F. and below scored, on the average, almost 5 points higher on flavor and 2.5 points higher on texture, than those cured at 65° F. and above. In 1900, the average difference in favor of the lower temperatures was 5.1 points on flavor and 2.7 points on texture." The improvement of curing rooms, by making them tighter and providing some means of cooling them, as a cold-air duct, is strongly urged.

Cold-cured cheese, F. H. Hall and G. A. Smith (*New York State Sta. Bul. 184, popular ed., pp. 4*).—This is a brief review of the above bulletin.

The changes of the fat in the ripening of cheese, K. WINDISCH (*Arb. K. Gesundheitsamte, 17 (1901), pp. 1–160; abs. in Chem. Centbl., 72 (1901), I, No. 2, pp. 128–130*).—The changes in the fat in the ripening of cheese are apparent from the variations in the quality and the amount of the fat. The changes in the quality are chemical and are especially noted in the formation of soluble fatty acids. The breaking up of the glycerids with the formation of soluble fatty acids begins shortly after the manufacture of the cheese, the volatile acids being in part at least eliminated. With the changes of fatty acids, there is a gradual reduction of the Reichert-Meissl and the refractometer numbers, and in a lesser amount the saponification number. The source of the free fatty acid is in the breaking up of the fat, and it is not formed from the milk sugar or albumin. From a study of the causes of the breaking up of the fat, the author believes that bacteria play the principal rôle, the work being especially aided by certain enzym-producing species.

Influence of rennet on cheese ripening, S. M. BABCOCK, H. L. RUSSELL, and A. VIVIAN (*Wisconsin Sta. Rpt. 1900, pp. 102–122, figs. 5*).—The views of various authors on the action of rennet in cheese making are given and investigations to determine the effect of different quantities of rennet in cheese ripening are reported.

Two, four, eight, and sixteen ounces of rennet extract, respectively, were added to 1,000 lbs. of milk, and the percentage of soluble nitrogen in the cheese made in each case was determined at different intervals. An increase in the quantity of rennet extract used was accompanied in each case by an increase in the percentage of soluble nitrogenous products. The average water content of cheese made from 1,000 lbs. of milk to which 3 oz. of rennet extract had been added was 35.23 per cent, and from the same quantity of milk to which 9 oz. of rennet extract had been added was 34.37 per cent. The hypothesis advanced that an increase in the amount of rennet tends to increase the moisture of cheese and so hasten the ripening process is therefore considered untenable. To determine if other ferments than rennin in the rennet extract was the cause of increased digestion where large quantities of the extract were used, an attempt was made to inhibit the action of rennin by heat. Rennet extract heated to 152° F. for 5 minutes was compared with the unheated extract. As heating decreased the proteolytic action as well as the curdling power of the rennet extract, the results of this experiment did not permit of a definite conclusion.

Studies were made of the soluble decomposition products in cheese made with varying quantities of rennet. Four series of experiments are reported in detail. Determinations of the albumoses, peptones precipitated by tannin and by phosphotungstic acid, amids, and ammonia in cheese made with varying quantities of rennet at different stages of ripening are given. The effect of adding varying quantities of pepsin to the rennet extract was also studied, as well as the influence of acidity of curd on rate of peptic digestion. Several different brands of commercial pepsin were compared. The results of the investigations are summarized as follows:

"The increase in soluble nitrogenous products in cheese and also in milk due to an increase in amount of rennet extract used are also confined to those by-products that are peculiar to pepsin, thus indicating that the digestive action of rennet extract is attributable to the action of the pepsin incorporated with the rennet extract. The crucial test of this conclusion was made by adding purified pepsin to milk and making the same into cheese, where rennet extract was or was not added to curdle the milk. In such cheese digestion has been increased in those cases to which pepsin has been added, and this increase has been confined to those by-products that are characteristic of pepsin, and which also appear in cheese made with high quantities of rennet.

"The digestion in cheese incident to pepsin is determined mainly by the degree of acidity developed in the milk and curd. In Cheddar cheese, peptic digestion probably does not begin until the acidity of the milk is approximately 0.3 per cent lactic acid. Acid salts as phosphates, etc., favor peptic digestion in milk in a manner comparable to free acids. Free acid does not normally exist in Cheddar cheese, the apparent acidity being due to acid salts.

"Summarizing these conclusions, rennet exerts a digestive effect on the casein of cheese, due to the presence of peptic enzyms contained in rennet extracts, the action of which is intensified by development of acid in the curd. The soluble nitrogenous products formed in Cheddar cheese by rennet are the albumoses and the higher peptones that are precipitated by tannin."

A study of the action of rennet, J. J. O. de Vries and F. W. J. Boekhout (*Landw. Vers. Stat., 55 (1901), No. 3, pp. 221–239*).—The work of several authors on the influence of the organic and mineral substances of milk upon the action of rennet is reviewed. The work of Söldner upon the favorable influence of soluble lime salts on the coagulation of milk is treated at length. The effect on the action of rennet of heating, diluting, and the addition of soda solution, carbonic acid, and of calcium chlorid to the milk, are shown. From the results of the several tests the conclusion is drawn that Söldner's theory of the great influence of the soluble lime salts upon the action of rennet is not well founded, and that they do not have the importance that he ascribes to them. The solubility of lime is variable, depending upon its combination and the acidity of the milk, and does not indicate the most favorable condition for rapid coagulation. Removing carbonic acid previously added to milk will not affect the soluble lime content, but will greatly reduce the coagulating power of the rennet. It would appear, therefore, that the acidity, as well as the soluble lime content of the milk, affects the action of the rennet.

A description of the new cheese-curing rooms and the foreign cheese-making rooms, E. H. Farrington (*Wisconsin Sta. Rpt. 1900, pp. 309–313, figs. 2*).—An addition to the dairy building provides rooms for instruction in the manufacture of Swiss, brick, and Limburger cheese, and rooms for pressing and curing Cheddar cheese. The main floor of the new building, which is below the surface of the ground, is 47 by 57 ft. The ground plan and the side elevation of the building are given, and the subearth duct, method of heating, and method of roofing the cellar are described.

Officials, associations, and educational institutions connected with the dairy interests of the United States for the year 1901 (*U. S. Dept. Agr., Bureau of Animal Industry Circ. 33, pp. 8*).—A list of each.

VETERINARY SCIENCE AND PRACTICE.

Proceedings of the American Veterinary Medical Association for 1900 (*St. Paul: Veterinary Press Co., pp. 296, pl. 1*).—The thirty-seventh meeting of the Association was held in Detroit, Mich., September 4 to 7, 1900. Some of the papers presented are briefly noted below.

Labor, rest, and confinement, *W. L. Williams* (pp. 82–92).—The author attempts to define these terms as applied to domesticated animals.

The relation of veterinary medicine to the public health, *W. H. Lowe* (pp. 92–96).—In this article the author gives a brief statement of the services which the veterinarian may render in preventing the transmission of animal diseases to man.

Sarcoptic scabies of the horse and psoroptic scabies of cattle in Montana, *M. E. Knowles* (pp. 97–104, pl. 1).—In the northern part of Montana sarcoptic scabies of the horse has prevailed to some extent since 1885. It is believed that the disease was introduced by Indian horses, perhaps during the raid of the Nez Percé Indians in 1877. During the past 3 years, about 12,000 horses have been treated for this disease, and it is now practically stamped out. Each affected horse was roped and hand treated. A brief account is given of the symptoms of the disease and of the behavior of affected horses.

The psoroptic scabies of cattle is reported as prevailing to considerable extent in Teton County, Montana. The cattle men of the State describe a similar disease which affected the buffalo, and believe that the disease was transmitted from buffaloes to domestic cattle. The disease makes its first appearance in cattle at the root of the tail or on the neck and withers, and slowly extends along the shoulders and sides of the chest. In long standing cases it comes finally to cover the entire body and head, except the part of the legs below the knees. The author estimates that of the cattle on the ranges north of the Missouri River, between the Rocky Mountains and the Dakota line, 20 per cent are affected with this disease. At first paraffine oil, to which about 3 per cent of sulphur was added, was used for hand treatment of the disease. Later extensive dipping vats were constructed, and a lime-and-sulphur dip has been employed cheaply and successfully.

The rapid diagnosis of rabies, N. P. Ravenel and D. J. McCarthy (pp. 109–111).—In all positive cases of rabies in dogs and rabbits the authors found certain constant changes in the intervertebral ganglia. The most pronounced changes were noted in the ganglia of rabbits in which the disease had been produced from subdural inoculations with material from dogs.

The relation of the lymphatics to meat inspection, T. Butler (pp. 112–123).—The author calls attention to the frequency with which the various lymphatic glands are affected in cases of infectious diseases. Detailed notes are given of changes produced in these glands by the pathogenic organisms of various diseases.

Rabies and hydrophobia, D. E. Salmon (pp. 124–144).—A controversial article concerning the nature and prevention of this disease.

Antiseptic therapeutics, J. F. Winchester (pp. 153–159).—In this article the author discusses the possibility of checking or preventing the growth of pathogenic bacteria within the animal organism by an excess of alkalies or acids and by the use of such antiseptics as potassium permanganate, benzol, and petroleum.

Obstacles to enforcing regulations requiring the tuberculin test in interstate cattle traffic, A. Peters (pp. 202–214).—The author states that the greatest obstacle to the enforcement of laws or regulations requiring a tuberculin test is dishonesty among certain cattle dealers who object to the test because it interferes with their profit, and among certain veterinarians who advance certificates without reliable tests.

Experimental tuberculosis, human and bovine, in the domestic animals, R. R. Dinwiddie (pp. 215–228).—Three pigs were inoculated with sputum cultures and another pig of the same size with bovine culture. All of these pigs soon exhibited signs of disease. The pig which received the bovine culture showed the more extensive tubercular disease. Another comparative test of sputum and bovine cultures on pigs clearly indicated the greater virulence of the bacilli of bovine origin for pigs. Comparative experiments on sheep gave similar results.

The following articles were also read during the meetings of this society: A possible cause of azoturia, A. W. Balch; The pathology of azoturia, W. A. Brinckerhoff; Practical antiseptics in surgery, G. A. Johnson; Veterinary progress in Michigan, W. Jopling; Spavin, its etiology and treatment, W. J. Martin; Snakes, snake venoms, and antivenines, E. M. Ranck; Urinary analysis in veterinary practice, P. A. Fish; Live-stock vaccines and serum therapy, W. Rushworth; Gruber's reaction in hog cholera, R. R. Dinwiddie (E. S. R., 12, p. 788); The work of the veterinary section of the experiment stations, J. J. Repp (E. S. R., 12, p. 601).

Report of cattle commissioners, I. A. WATSON and N. G. BACHELDER (*New Hampshire State Bd. Agr. Rpt. 1899–1900, pp. 353–382*).—A copy is given of the regulations of the State Board of Cattle Commissioners regarding the care and disposition of diseased animals, and regarding quarantine and inspection service. Brief notes are given on the use of tuberculin and mallein in the control of tuberculosis and glanders. It is concluded that enforcement of proper sanitary measures for preventing the development of bovine tuberculosis is as important as the destruction of diseased animals. Thorough disinfection has been insisted upon in all stables where outbreaks of the disease were found.

Phagocytosis during fatal infections, T. TCHISTOVITCH (*Ann. Inst. Pasteur, 14 (1900), No. 12, pp. 802–812*).—Rabbits were inoculated with fatal doses of streptococcus and killed for examination after $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, 2, 4, and 6 hours. These experiments showed that immediately after intravenous injection of streptococcus these organisms are found in considerable numbers in the lungs, free at first and later surrounded by polynuclear leucocytes. The leucocytes are numerous and invade the capillaries. Phagocytosis in the lungs is by no means complete, and free streptococci were found in all of the rabbits. The process of phagocytosis was more complete in the lungs than in the liver.

The bot fly (Gastrophilus equi), W. W. FROGGATT (*Agr. Gaz. New South Wales, 11 (1900), No. 11, pp. 947–951, pl. 1*).—The author gives a brief account of the life history and habits of the more common species of this family which infest the horse, ox, sheep, and camel. An experiment was conducted by T. Steel in treating mules for bot flies. After a preliminary feeding with bran mash, $1\frac{1}{2}$ drams of carbon bisulphid were given in a pint of water, and the dose was repeated 3 hours later. In the evening of the same day $\frac{1}{2}$ pt. of linseed oil was administered. The treatment had no apparent effect on the bot flies, although a large number of parasitic worms were expelled, but it was not certain that the bot flies had not left the mule when the treatment was administered. The species of bot fly which is common in Victoria is said to be *G. salutaris*.

A new process in the culture of tetanus bacillus, L. DEBRAND (*Ann. Inst. Pasteur, 14 (1900), No. 11, pp. 757–768*).—The tetanus bacillus when cultivated alone is anaerobic, and the experimenter has always the extra trouble of producing a vacuum in order to secure abundant supplies of pure cultures. In experiments conducted by the author it was found that when the tetanus bacillus was grown together with *Bacillus subtilis*, it vegetated rapidly in the presence of oxygen, and a toxin was obtained from such cultures which possessed the same properties as the toxin from the tetanus bacillus grown alone under anaerobic conditions. This gives an easy and convenient method for obtaining pure cultures of the tetanus bacillus. It was also found that other bacteria beside *B. subtilis* had the same effect on the tetanus bacillus. Among these, mention may be made of *B. mesentericus* and *B. anthracis*. When grown with the anthrax bacillus, however, the tetanus bacillus produces a very weak toxin.

On the ringworm infection in man and animals, J. L. BUNCH (*British Med. Jour., 1901, No. 2093, Epit., pp. 323–326, pls. 2, figs. 4*).—The author discusses a number of cases of ringworm which were communicated from horses and cats to man. The nature of the fungus parasite which was isolated is described in detail, together with remarks on its behavior in different culture media.

Agglutination of bacillus of Koch by tuberculous discharges, P. COURMONT (*Arch. Med. Exper. et Anat. Path., Paris, 1. ser., 12 (1900), No. 6, pp. 697–732*).—The author's experiments included series of tests with serous fluids and blood serum from man and experimental animals. When animals were inoculated with the virulent form of tuberculosis the serum reaction was almost always negative, although death followed later in every case. On the other hand, when the animals were inoculated with a less virulent form of tuberculosis the serum reaction was always positive, in the proportion of 1 to 20 in the case of the guinea pig and 1 to 600 in the case of the dog. Experiments with various serous discharges which were not tuberculous gave reactions which were always negative.

The general results obtained may be stated as follows: Nontuberculous, serous fluids do not agglutinate the tubercle bacillus under ordinary conditions in the proportion of 1 to 5. The majority of tuberculous, serous fluids show an agglutinating power in proportions of from 1 to 5 and 1 to 20. A certain proportion, however, of tuberculous, serous fluids do not give a positve reaction, even in the proportion of 1 to 5. As a rule, however, this failure of the reaction occurs in cases of advanced or generalized tuberculosis. The agglutinating power of blood is not always equal to that of the serous fluids upon the same animal. It may be more or less, or may be entirely absent, while that of the other serous fluids is quite pronounced. Under favorable conditions the agglutinating power of the blood serum and of other serums can be progressively increased. The results obtained from the study of serums of human origin and from other animals gave the same results. It is believed, therefore, that a positive reaction in the proportion of 1 to 5 constitutes a reasonably certain diagnosis of tuberculosis.

Bacillus tuberculosis piscium and the tuberculosis of frogs caused by this bacillus, Ledoux-Lebard (*Ann. Inst. Pasteur, 14* (*1900*), *No. 8, pp. 535–554, pl. 1*).—This bacillus develops in the frog under forms more varied than those of the bacillus of Koch in mammals. The cellular reactions vary in different species and to a certain extent in different organs of the same species. Each organ seems to defend itself against the invasion of the bacillus in its own way. In the liver of the frog certain special cells are recognized which differ from ordinary migratory cells and which are pigmented. These cells do not necessarily participate in the formation of tubercles, but under certain conditions they appear to be more numerous and become associated with the tubercles already formed.

Bovine tuberculosis, E. Nocard (*Jour. Agricole* [*Paris*], *12* (*1901*), *No. 130, pp. 5–10*).—The author discusses the liability to contagion from this disease and the various methods which have been proposed for preventing the spread of the disease and for controlling the sale of tuberculous meat and milk.

Outbreaks of anthrax fever traceable to tannery refuse, H. L. Russell (*Wisconsin Sta. Rpt. 1900, pp. 171–184*).—During the season of 1899 an outbreak of anthrax occurred on the Black River below Medford, Wis. Bacteriological examination of blood obtained from a horse which had died of the disease showed that the organism had all the characteristics of the anthrax bacillus. The disease prevailed for a distance of about 10 miles along the river below a tannery, and the distribution of the cases of anthrax in the affected area indicated the river water as being the carrier of the virus. The wastes of the tannery are discharged into a canal, which in turn empties into the river. The hides received by the tannery came partly from South America and partly from China. The evidence obtained pointed conclusively to these hides as the original source of infection.

Experiments were made by E. G. Hastings in testing the value of formaldehyde in destroying the anthrax bacillus. Pieces of dried hide were infected with anthrax spores and then placed in solutions of formaldehyde varying in strength from 1: 500 to 1: 10,000. The series of experiments was continued for 11 days, and at the end of this period anthrax spores capable of development were still found on the hides which had been immersed in solutions containing from 1: 10,000 to 1: 2,500 parts of formaldehyde. The formaldehyde gradually combined with the materials composing the hide, and after from 8 to 12 days its presence could not be detected in solutions of the strengths just mentioned. The formaldehyde exerted a somewhat injurious effect upon the hides, and subsequent tests showed that the hair did not "sweat off" as readily after being treated with formaldehyde as did the hide which had not been so treated. As a practical disinfection of the hides seems to be impossible, it is recommended that the waste from tanneries be disinfected, and that stock raisers should vaccinate stock on areas which are likely to become infected.

The behavior of anthrax bacillus in the body cavity of guinea pigs, J. B. Van Leent (*Centbl. Bakt. u. Par., 1. Abt., 28* (*1900*), *No. 21, pp. 737–742*).—The author's experiments were conducted on guinea pigs which weighed about 500 gm. and with anthrax bacilli from 24 to 48 hours old, which had been grown on bouillon at a temperature of 28° C. The following conclusions are drawn from the experiments: Anthrax bacilli, even when present in large quantities in the body cavity of guinea pigs, are frequently destroyed. The animal does not acquire immunity, however, during this process. In some cases, when the experimental animal succumbed to hypodermic inoculations of the anthrax bacillus, the peritoneum killed all the bacilli which were in the body cavity. If the anthrax bacillus is absorbed from the body cavity, it is fatal to the experimental animal, but the resorption of the serous fluid of the body cavity may be beneficial to the animal. The germicide action of the peritoneum is influenced to considerable extent by the presence of foreign bodies or a large quantity of fluid in the body cavity. Wandering cells seemed not to exercise any great influence on the anthrax bacillus, and no pronounced phagocytosis was observed.

Anthrax among city horses, J. McFadyean (*Jour. Comp. Path. and Ther., 13 (1900), No. 4, pp. 344–345*).—The author gives brief notes on 2 cases of anthrax in horses. The source of infection was not definitely ascertained, but it was found that the 2 animals had eaten oats from the same source, and the disease might possibly have been carried in this way.

Report on the work of the bacteriological station of the Kharkov Veterinary Institute in 1899, A. Rayevski (*Selsk. Khoz. i Lyesov., 197 (1900), June, pp. 543–552*).—During the year 1899, 238 liters of the first and 122 of the second anthrax vaccine were prepared and used in the inoculation of sheep, horses, and cattle in various parts of European Russia. The mortality from vaccination was 0.38 per cent in sheep, 0.04 per cent in cattle, and 0.29 per cent in horses.

The decomposition of peroxid of hydrogen by animal tissues and by bacterial organisms, B. Danilewsky (*Physiologiste Russe, 2 (1900), No. 21–25, pp. 12–15*).—In testing the effect of bacteria upon peroxid of hydrogen, the author made use of pure cultures of the anthrax bacillus on agar-agar. These cultures contained spores. It was found that the anthrax bacillus at ordinary temperatures decomposes peroxid of hydrogen, but loses this power to considerable degree after having been heated for from ½ to 1 hour at a temperature of 55 to 60° C. The anthrax bacillus was found to be very sensitive to alcohol, which weakened its power of decomposing peroxid of hydrogen. A number of experiments were made in determining the effect of ether, chloroform, corrosive sublimate, formaldehyde, and carbolic acid upon the anthrax bacillus.

Spore formation of the anthrax bacillus under anaerobic conditions, A. Klett (*Ztschr. Hyg. u. Infectionskrank., 35 (1900), No. 3, pp. 420–438*).—The results of the author's experiments may be summarized as follows: Spore formation in the anthrax bacillus is not dependent upon the presence of oxygen. Anthrax bacilli were found to form spores abundantly in an atmosphere of nitrogen. Spores were not formed in an atmosphere of hydrogen on account of the injurious effect of hydrogen upon the bacillus. The author believes that the term "anaerobiosis" should be more definitely characterized by reference to all the conditions which are concerned in any particular case.

A new staining method for demonstrating the so-called capsule of the anthrax bacillus, W. Raebiger (*Ztschr. Fleisch u. Milchhyg., 11 (1900), No. 3, pp. 68–70*).—The author obtained unfavorable results by fixing the bacillus upon the slide by means of the flame, and was most successful in using a 40 per cent aqueous solution of formaldehyde for fixing the bacillus. The bacillus was then stained in formalin stains—formalingentianviolet, formalinfuchsin. It was found that by this method the anthrax bacillus could be readily differentiated from other organisms, since the anthrax bacillus showed a conspicuous capsule. Even in decomposing material where numerous bacteria of other species were present, a single anthrax bacillus was readily detected.

Immunization of the anthrax bacillus against the action of rat serum, J. Danysz (*Ann. Inst. Pasteur, 14 (1900), No. 10, pp. 641–655*).—The author conducted a number of experiments for the purpose of determining the action of rat serum upon the anthrax bacillus. Small quantities of the first and second vaccine and of virulent cultures were inoculated in 20 mixtures of bouillon and rat serum, which were arranged in a series, beginning with 19 drops of bouillon to one drop of rat serum, and ending with the pure serum. The results of these experiments indicated that the action of the diastase contained in the rat serum is more noticeable in distilled than in physiological water, and more so in the latter medium than in bouillon. The first vaccine was more sensitive to the action of diastase than the second vaccine, and the latter more sensitive than the virus. Very small quantities of serum favored the active growth of the bacillus. From these experiments the author concludes that rat serum does not contain a true bacteriolytic diastase, but only a substance analogous to antiseptics, which paralyzes the functions of assimilation and growth of the bacillus, while it favors the secretion and digestive action of a diastase which is secreted by the anthrax bacillus. The bacillus protects itself against the action of rat serum by the formation of a mucilaginous sheath. The immunization of the bacillus against this substance does not render it more resistant to autodigestion, but simply permits it to produce new cultures. Rat serum deprived of its antiseptic constituent is a good culture medium for the anthrax bacillus.

By comparing the results obtained in these experiments with those indicated by experiments with solutions of arsenic, the author concludes that the digestion of the bacillus in rat serum is a phenomenon of similar nature to that of its digestion in suitable solutions of arsenic. The antipathetic substance formed by the bacillus has no direct action upon the diastase, and does not arrest the development of pathogenic symptoms.

Experimental studies on blackleg; immunization by serum, E. LECLAINCHE and H. VALLÉE (*Rev. Vét. Toulouse, 25 (1900), No. 12, pp. 745–756*).—The authors' experiments were arranged in 2 series. In the first series a goat which had been immunized by a virulent intravenous injection, received during a period of 6 months subcutaneous inoculations of muscle tissue from infected guinea pigs. The first inoculations produced rather serious local lesions. Later inoculations, however, caused no reaction. The serum of the goat acquired immunizing properties rather slowly. After 3 inoculations, at intervals of 10 days, with 5, 10, and 15 cc. of filtered material from infected guinea pigs, a serum was obtained which, in doses of from 1 to 5 cc., protected guinea pigs against inoculations of ½ cc. of virulent material. In the second series of experiments pure cultures of *Bacterium chauvæi* were used. Two horses were used in these experiments, having been immunized by intravenous injections of pure cultures. They were subsequently treated by intravenous injections of virulent serous fluid in one case and of pure culture in bouillon in the other.

The authors found that a subcutaneous injection of serum produces an immunization in organisms thus treated which permits them to endure repeated inoculations with the virulent material. Both the horses and the goat were rapidly brought to a condition where they furnished immunizing serum. A fatal dose of virus mixed with a small quantity of immunizing serum becomes neutralized. The simultaneous injection at different parts of the body of virus and serum does not produce any increased resisting power in the guinea pig. It was found that an indifferent serum obtained from horses or cattle would not bring about agglutination, even in the proportion of 1 to 12, while the serum of an immunized horse produced immediate agglutination in the proportions of from 1 to 30 to 1 to 3,000. The authors conclude that serum is endowed with preventive properties and that it confers merely a temporary immunity. Serum and virus when mixed neutralize each other without conferring a permanent immunity. From a practical standpoint the authors believe that serum therapy must be restricted in use, and that vaccination by means of pure virus is the method to be chosen, as being more simple and certain.

Preventive vaccination as a means of combating cattle plague, A. Dudukalov (*Arch. Vet. Nauk, 30 (1900), No. 11, II, pp. 447–452*).—The author discusses briefly the extent of this disease and the losses caused by it, and presents a detailed account of the method for making preventive inoculations.

The study of the organism of cattle plague, G. Garlichkov (*Arch. Vet. Nauk, 30 (1900), No. 11, II, pp. 452–461, figs. 8*).—The author discusses the methods by which these organisms may be obtained, and describes their behavior on different culture media.

Fat formation by different bacteria together with a new stain for actinomyces on sections, A. Sata (*Centbl. Allg. Path. u. Path. Anat., 11 (1900), Nos. 3–4, pp. 97–102*).—The author discusses the literature of this subject in connection with a bibliography of a number of pathogenic organisms. A method for staining actinomyces on sections is described, which depends upon the affinity of a stain known as Sudan III for fatty substances. The method includes fixation in formalin, washing in water, sectioning with the freezing microtome, staining with dilute hæmatoxylin, washing with alcohol, staining in an alcoholic solution of Sudan III for 12 to 24 hours, and embedding in glycerin.

The lesion in actinomycosis with a few new stains for the actinomyces, R. C. Rosenberger (*Jour. Appl. Micros., 3 (1900), No. 11, pp. 1051–1053*).—The author obtained good results from staining this organism with hæmatoxylin and methylene blue. The ray forms of the organism are readily distinguished, their situation being usually within an area of small round cells. A clear zone surrounds the whole mass, and beside the small round cells a number of leucocytes are usually found in the tumor.

Bacteria in milk after recovery from mammitis, J. F. Lameris and H. G. Van Harrevelt (*Ztschr. Fleisch u. Milchhyg., 11 (1900), No. 4, pp. 114, 115*).—An investigation was instituted to determine the cause of serious diarrhœa among the consumers of milk from a certain dairy. It was found that a streptococcus was present in great numbers in one quarter of the udder of the cow which had suffered from mammitis but had recovered. The streptococcus was not pathogenic for rabbits or guinea pigs. It was doubtful whether the organism was the original cause of mammitis. It persisted for several days in the apparently normal milk from the quarter of the udder which had previously been diseased.

Spotted kidney in calves, K. Kavitz (*Monatsh. Prakt. Thierh., 12 (1901), No. 4, pp. 157–192, figs. 8*).—The author made detailed studies of this disease in calves, with the following conclusions: The primary infection may be through the navel from chemical toxic substances or from infections which arise in the alimentary tract.

Diseases of sheep (*Kansas State Bd. Agr. Rpt., 12 (1899–1900), pp. 131–159, figs. 9*).—Brief accounts are given of the desirability of the practice of fall dipping. Bulletin 21 of the Bureau of Animal Industry on sheep scab is reprinted in part, and short notes are presented on ticks, lice, foot rot, stomach worms, lungworms, tapeworms, and the sheep bot fly.

Diseases of sheep, W. A. Rushworth (*The sheep. Buffalo, N. Y.: Buffalo Review Co., (1899), pp. 143–404, figs. 12*).—The greater part of this volume is devoted to a discussion of the diseases of sheep, including those of the brain and nervous system, respiratory and digestive tracts, skin diseases, and specific contagious affections. Recommendations are made with regard to the treatment of the various sheep diseases, and formulas for the approved remedies are given. A general discussion is given as to the subject of Federal and State inspection of sheep.

The micro-organism of sheep pox, F. J. Bosc (*Compt. Rend. Soc. Biol. Paris, 53 (1901), No. 1, pp. 9, 10*).—The author made an investigation of cases of sheep pox for the purpose of studying the micro-organism which causes this disease. Pustules in the skin and other tissue were fixed in corrosive sublimate and acetic acid, and sectioned. In the skin pustules the micro-organism was found in epithelial cells of the epidermis and also in the sebaceous glands. In the lung the micro-organisms were found in hypertrophied epithelial cells, such as are found in catarrhal pneumonia.

The prevalence of sheep scab, A. W. Bitting (*Indiana Sta. Rpt. 1900, pp. 49–52*).—The author reports in a tabular form the results of inquiries concerning the prevalence of this disease during the years 1899 to 1900. These inquiries indicated that there are about 5,700 cases of sheep scab in the State.

Epidemics of hog cholera and swine plague, A. W. Bitting (*Indiana Sta. Rpt. 1900, pp. 37–48*).—The observations upon which this report is based cover a period of 8 years, from 1893 to 1900, inclusive. A table is given showing the number of hogs and loss from disease in Indiana for a period of years. The author studied the relation of hog diseases to the water supply, with the result that the losses were found to be much greater in the counties which border upon the Wabash and White Rivers than in the counties which were farther removed. During the same time a correspondence with breeders of pure-bred swine indicated that about 90 per cent of them lost no hogs, while their neighbors suffered severely. In most cases they had used well water, while their neighbors had used surface water. During epidemics of swine diseases the decaying carcasses are frequently thrown into rivers and other water supply, and the conditions seem to be favorable for the spread of the disease. Similar investigations, however, from 1898 to 1900, inclusive, showed no appreciable difference in the prevalence of the disease in townships bordering on the river and those which were more remote, the percentage of disease being somewhat higher in the remote townships. These results are apparently contradictory and indicate that the water supply is only one means of disseminating the contagious hog diseases. A study of the relationship between differences in elevation and the prevalence of the diseases showed that such differences had no appreciable effect. Negative results were also obtained from a study of the relation of the amount and distribution of the rainfall to the prevalence of hog cholera. In some seasons the disease was more prevalent in dry areas and in others in those having the greatest rainfall. Only slight difference in the percentage of disease was noted in townships of varying density in the swine population.

Hog cholera is present at all seasons, but is more epidemic during late summer and fall, and gradually subsides during winter and spring. Feeding with corn has not been shown to have an unfavorable effect. The author made a study of the relation of transportation to the spread of the disease. During 8 years not more than a dozen outbreaks of the disease were found which appeared independently of the shipment of stock, and the disease was not found more prevalent along railroad lines than at points more remote. Experiments were made to determine the length of time during which the hog-cholera bacillus may persist in a virulent condition in infected premises. Repeated observations showed that outbreaks of the disease occurred in from 1 to 4 years as a result of rooting out and eating the remains of former victims. Many farmers, however, allow the hogs to run on premises from which diseased hogs have just been removed, and without bad results. The carcasses of dead hogs are often fed to other hogs. In harmony with these practices is the observation that after a severe outbreak of hog cholera the premises usually remain free from the disease for a few years.

A study of the relation of the age of swine to the virulence of the infection indicated that hogs under 5 months suffered more than those which were older. Exhibitions at fairs and public sales are considered more important factors in the dissemination of disease than they are usually thought to be. Government efforts in stamping out the disease in Iowa, Minnesota, and in England have yielded favorable results, but such police measures are expensive.

Diseases of the pig, A. W. Bitting (*Special report of the Indiana State Board of Agriculture on the hog. Indianapolis: W. B. Burford, 1900, pp. 9–65*).—In this part of the report the author discusses swine diseases, including those of the alimentary tract, nervous system, and respiratory passages, those caused by parasitic worms and arthropods, and the more important infectious diseases, among which may be mentioned hog cholera, swine plague, and anthrax.

Combating swine plague and hog cholera, SCHREIBER (*Berlin. Thierärztl. Wchnschr., 1900, No. 51, pp. 61–64*).—The author conducted experiments in immunizing sheep, cattle, and horses against swine plague and hog cholera, in order to obtain from them an active serum for treatment of these diseases in hogs. A serum was obtained which in very small doses protected mice from fatal doses of the swine plague bacillus. Later this method was applied to hogs with encouraging results. The immunity thus produced, however, was only temporary. Inoculations for curative purposes in cases of swine plague were made with Septicidin. A hog which was suffering from swine plague and showed a temperature of 40.8° C. was much improved in its condition on the second day after inoculation, and on the fourth day appeared to be entirely recovered. The author conducted other experiments along this line with similar results.

A study of the constituents of corn smut, W. STUART (*Indiana Sta. Rpt. 1900, pp. 26–32*).—The author made a number of tests for alkaloid salts and total alkaloid content by technical methods which are described in detail, with the 4 reagents potassium-mercuric iodid, phosphotungstic acid, iodin in potassium iodid solution, and picric acid. Positive results were obtained from the first 2 reagents in all cases, and negative from the last 2. Tests were also made of commercial extracts of ergot and corn smut for the purpose of comparing them with extracts made in the laboratory. The results were quite uniform.

Experiments for the purpose of testing the physiological effect of alcoholic extracts of corn smut upon horses were made by Dr. R. A. Craig. In these experiments it was found that a subcutaneous injection of 25 to 30 cc. caused an increased peristaltic movement of the intestines and a slight acceleration of the pulse and breathing. An injection of 45 cc. produced in addition to these symptoms dullness and an unsteady gait. Subcutaneous injections of 15 cc. and doses of 130 cc. by way of the mouth produced little effect. Determinations were also made of the ash and moisture content of the smut spores.

Nerve diseases of horses in the sacral plexus, THOMASSEN (*Monatsh. Prakt. Thierh., 12 (1901), No. 4, pp. 145–156*).—The author gives a brief account of the symptoms and post-mortem findings in cases of diseases of the sacral plexus.

Upon the occurrence of rabies, A. W. BITTING (*Indiana Sta. Rpt. 1900, pp. 53–55*).—A report is given of 3 outbreaks of this disease which occurred within the State. During these outbreaks dogs, sheep, hogs, horses, and cows became infected with the disease.

Antirabies serum therapy, A. RODET and GALAVIELLE (*Compt. Rend. Soc. Biol. Paris, 52 (1900), No. 40, pp. 1091–1093*).—The serum employed in the author's experiments was obtained from a sheep which had been treated with rabies virus. This serum inoculated hypodermically, intravenously, or into the body cavity, during the period of incubation, proved to be without effect, except after the use of rabies virus. When injected into the brain alone, either during the period of incubation or after the appearance of rabies symptoms, it had the effect of prolonging the duration of the disease; but its influence in all cases was very slight. It did not bring about a recovery from the disease or prevent the appearance of violent symptoms. If this serum be introduced into the brain, mixed with virulent material, it exercises a marked influence on the progress of the disease and retards to a great extent the final fatal attack.

Animal parasites, I, E. P. NILES (*Virginia Sta. Bul. 108, pp. 11*).—A brief classification of the parasites of domestic animals according to the natural orders to which they belong.

Animal parasites, II, E. P. NILES (*Virginia Sta. Bul. 109, pp. 13–22, figs. 2*).—Brief popular notes on the Culicidæ with suggestions of remedies against these insects.

Destruction of offal in slaughterhouses, LAURENT (*Rec. Med. Vet., Paris, 8. ser., 7 (1900), No. 23, pp. 890–892*).—A number of disinfectant methods which have been proposed for treating offal from slaughterhouses are discussed by the author. It is contended, however, that no method is so thorough and certain as the complete incineration of all waste materials.

STATISTICS—MISCELLANEOUS.

Thirteenth Annual Report of Alabama College Station, 1900 (*Alabama College Sta. Rpt. 1900, pp. 20*).—This includes a financial statement for the fiscal year ended June 30, 1900, and reports of the director and heads of departments reviewing the different lines of station work.

Thirteenth Annual Report of Arkansas Station, 1900 (*Arkansas Sta. Rpt. 1900, pp. 7+114*).—This includes a financial statement for the fiscal year ended June 30, 1900, a brief report of the director, and reprints of Bulletins 61–65 of the station dealing with the following subjects: Some hay, forage, and pasture plants for Arkansas (E. S. R., 12, p. 634); wheat experiments (E. S. R., 12, p. 1034); the relative susceptibility of the domestic animals to the contagia of human and bovine tuberculosis (E. S. R., 12, p. 1084); notes on celery (E. S. R., 13, p. 48); and pig feeding experiments (E. S. R., 13, p. 77). A popular edition of Bulletin 63, entitled the source of tuberculosis in farm animals (E. S. R., 12, p. 1092), and a station circular on pomology and institutes are also reprinted.

Thirteenth Annual Report of Georgia Station, 1900 (*Georgia Sta. Rpt. 1900, pp. 294–371*).—This includes a report of the director on the publications and work of the station during the year, a financial statement for the fiscal year ended June 30, 1900, and a report of the biologist and horticulturist abstracted elsewhere.

Twenty-third Annual Report of North Carolina Station, 1900 (*North Carolina Sta. Rpt. 1900, pp. XXX+104*).—This includes a report of the director on the work and publications of the station during the year; reports of the agriculturist, chemist, and the horticulturist, botanist, and entomologist, giving detailed outlines of the work of their respective departments; a financial statement for the fiscal year ended June 30, 1900; and reprints of Bulletins 170–174 of the station on the following subjects: Gardening under glass (E. S. R., 12, p. 444), corn culture in North Carolina (E. S. R., 12, p. 538), the digestibility of some non-nitrogenous constituents of certain feeding stuffs (E. S. R., 12, p. 667), purification of phloroglucinol (E. S. R. 12, p. 611), another warning in regard to compost peddlers (E. S. R., 12, p. 841), and methods of determining proteid nitrogen in vegetable materials (E. S. R., 12, p. 819).

Thirteenth Annual Report of Indiana Station, 1900 (*Indiana Sta. Rpt. 1900, pp. 104*).—This includes a report of the director enumerating the different lines of station work and giving a subject list of station publications issued during the year; miscellaneous articles abstracted elsewhere; a list of periodicals received at the station; and a financial statement for the fiscal year ended June 30, 1900.

Thirteenth Annual Report of Michigan Station, 1900 (*Michigan Sta. Rpt. 1900, pp. 69–361*).—Included in these pages are reports of the director and heads of departments reviewing in some detail the work of the station during the year, a financial statement for the fiscal year ended June 30, 1900, meteorological observations noted elsewhere, and reprints of Bulletins 175–185 of the station on the following subjects: Some insects of the year 1898 (E. S. R., 11, p. 954), strawberry notes for 1899 (E. S. R., 11, p. 931), the South Haven report for 1899 (E. S. R., 12, p. 236), the production and marketing of wool (E. S. R., 12, p. 275), sugar-beet investigations (E. S. R., 12, p. 540), some insects of the year 1899 (E. S. R., 12, p. 575), cooperative soil test experiments (E. S. R., 12, p. 623), a popular discussion of pure milk supply

(E. S. R., 12, p. 986), gassy curd and cheese (E. S. R., 12, p. 984), tuberculosis and its management (E. S. R., 12, p. 987), and fertilizer analysis (E. S. R., 12, p. 933).

Thirteenth Annual Report of Tennessee Station, 1900 (*Tennessee Sta. Rpt. 1900, pp. 40*).—This includes a general outline of station work during the year; a history of the station from 1882 to 1900, with a list of publications issued during that time; reports by the agriculturist, botanist, horticulturist, chemist, and librarian reviewing the work of the different departments; a brief discussion of the object, construction, and use of daily weather charts by the meteorologist, and a financial statement for the fiscal year ended June 30, 1900.

Seventeenth Annual Report of Wisconsin Station, 1900 (*Wisconsin Sta. Rpt. 1900, pp. 352*).—A report of the director on the work and publications of the station during the year, miscellaneous articles abstracted elsewhere, lists of exchanges and acknowledgments, and a financial statement for the fiscal year ended June 30, 1900.

Organization lists of the agricultural colleges and experiment stations in the United States, with a list of agricultural experiment stations in foreign countries (*U. S. Dept. Agr., Office of Experiment Stations Bul. 88, pp. 134*).—The bulletin contains in addition to the organization lists a subject list of the publications of the experiment stations received by this Office during 1900, Federal legislation affecting agricultural colleges and experiment stations, and the rulings of the Post-Office, Treasury, and Agricultural Departments as to the construction of the act of Congress of March 2, 1887, establishing the stations.

Experiment Station Work—XVII (*U. S. Dept. Agr., Farmers' Bul. 124, pp. 32, figs. 6*).—This number contains articles on the following subjects: Distilled drinking water, soil inoculation, treatment of sandy soils, lime as a fertilizer, fertilizers for market-garden crops, pecan culture, weed destruction, maple sirup and sugar, value of cotton seed, alfalfa silage, forage crops for pigs, grazing steers, and type of the dairy cow.

Estimates of Russian crops, E. T. PETERS (*U. S. Dept. Agr., Division of Statistics Circ. 14, pp. 11, map 1*).—A report on the principal cereal crops of European Russia for 1900.

Foreign markets for American agricultural products, F. H. HITCHCOCK (*U. S. Dept. Agr. Rpt. 67, pp. 53*).—Testimony given before the Industrial Commission.

Agriculture at the Paris Exposition of 1900, F. BRETTREICH (*Vrtljschr. Bayer. Landw. Rath., 5 (1900), No. 4, pp. 511–527*).—A series of short descriptions of the agricultural exhibits of the different countries represented at the Paris Exposition.

Fourth progress report of the Victoria Royal Commission on technical education (*Melbourne: Government, 1900, pp. 210*).—A review of the progress and condition of agricultural education in Great Britain, Ireland, the continental countries of Europe, America, and the Australian colonies. Part 1 discusses the teaching of elementary agriculture in these different countries. Part 2 gives the general systems of agricultural education.

Among the patriarchs of agriculture, I. KLINGEN (*St. Petersburg: Department of Appanages, 1899, pt. 1, pp, 460, figs. 132, map 1; pt. 2, pp. VII+335, figs. 178, dgms. 4, chart 1; pt. 3, pp. 180, figs. 145; rev. in Selsk. Khoz. i Lyesor., 196 (1900), Mar., pp. 667–671*).—This large work is a report to the Department of Appanages by the chief of an expedition sent by the department for the study of subtropical agriculture in the Orient. Part 1 deals with Egypt, part 2 with India and Ceylon, and part 3 with China. These three volumes will be followed by another on Japan.—P. FIREMAN.

German agriculture at the end of the nineteenth century, L. GESCHWIND (*Ann. Agron., 26 (1900), No. 12, pp. 603–627*).—This article is a general discussion of German agriculture, treating of the nature and importance of agricultural crops, animal industry, agricultural machinery, the agricultural population, the fertilizer industry, and the causes of agricultural development in the German Empire during the nineteenth century. Much statistical matter is given in tables.

NOTES.

Iowa Station.—W. T. Shaw has recently been appointed assistant entomologist of the station.

New Mexico College and Station.—Dr. Frederic W. Sanders, who for the past two years has been president and director, has declined reelection except upon condition that the system of annual elections be abandoned or modified. The board of control having declined to change its system, Dr. Sanders will leave the institution and spend next year abroad. His successor has not yet been chosen. J. D. Tinsley has been elected vice-director for the year beginning July 1 next, with the understanding that he shall in most things act as the responsible director. For the year 1901–1902 the president of the college will retain the title of director. The department of entomology in the station has been abolished.

Oklahoma Station.—W. H. Coyle, of Guthrie, Okla., has been appointed a member of the board of regents, vice J. C. Tousley, whose term has expired. William M. Jenkins has succeeded C. M. Barnes as governor of Oklahoma and ex-officio member of the board.

Utah College and Station.—Peter A. Yoder, Ph. D., has been appointed assistant chemist in the college and station.

Experiment Farm of the Virginia State Board of Agriculture.—S. B. Heiges, formerly pomologist of this Department, has been appointed superintendent of the farm at Saxe, Charlotte County, Va., secured by the State board of agriculture for the purpose of conducting experiments with fertilizers on various crops, as required by the provisions of the State fertilizer law. It is proposed to give special attention to experiments with tobacco, but other crops will also be included. Professor Heiges will have the assistance of a tobacco expert in his work with this crop.

New Publications.—*Climat* is the name of a 16-page (32 pages octavo) semimonthly meteorological journal whose publication at St. Petersburg under the editorship of N. A. Dembchinsky is announced. The main object of this journal is stated to be the exact prediction of the weather. It will also include reports of theoretical investigations on questions of weather and climate, especial attention being given, however, to the influence of the moon on the weather, as the editor maintains that "the chief factor in the weather is the moon's attraction." All of the more important papers will be printed in Russian, French, English, and German. The predictions will cover Europe and North America, and the journal will be issued "sufficiently early to reach the most distant points (e. g., San Francisco) for which predictions are made before the fortnight to which they refer, e. g., the forecasts for the 1–15 May will come out in the beginning of April." Each number will contain 78 curves giving the weather elements at many stations in Europe and North America, and 2 maps of Europe and 2 of North America giving isobars and isotherms for each week.

A new recruit to the agricultural press, which from its title and objects is worthy of special mention, is *Agricultural Experiments*, described as "a practical review of experiment-station work, recent agricultural investigations and developments in all branches of rural industry." Its object is to present timely and readable reviews of the experiment-station and similar literature in order to aid the farmer in keeping posted in the progress along these lines and to assist him in the practical application of the results. In addition to these reviews and notes the paper contains special articles by experiment-station workers which are in a sense résumés of the work along particular lines. While the agricultural papers generally give considerable attention to the work and publications of the experiment stations, there is an opportunity for furnishing better abstracts and résumés than is usually done. The progressive farmer must depend quite largely upon the teachings of the experiment stations, and any publication which presents these observations and discoveries to him in a concise and intelligent manner serves a useful purpose.

Agricola Aridus is the title of an attractive bimonthly recently inaugurated by the agricultural department of the Colorado Agricultural College and Experiment Station. The publication is intended as a form of university-extension work, its object being educational. It differs from the popular bulletins of some stations by appearing periodically, and by being composed of short timely articles on the work of the college and the station, the object being to arouse an interest in this work and to extend its range of usefulness. The attractive and readable character of the first number bespeaks for it a useful place among publications of its class.

MISCELLANEOUS.—Notice has been sent out of the following resolution adopted by the American Veterinary Medical Association at its last annual meeting at Detroit, Mich.:

"Whereas we believe that the time has arrived in the history of our profession and in the history of our stock-breeding industry when the experiment stations of our various States and Territories should undertake the work of research in regard to the physiology and diseases of domestic animals in a more comprehensive manner than has yet been done: Therefore, be it

"*Resolved*, That this association recommend to the governing boards of the various stations that they give this branch of station work more liberal support."

NECROLOGY.—Dr. Otto Lugger, State entomologist to Minnesota and entomologist to the Minnesota College and Station, died May 21 of pneumonia. Born in Germany in 1844, he came to this country in 1865, and was engaged in the engineer service of the Great Lakes for a period of three years. At the end of this time he became assistant to C. V. Riley in Missouri, which position he held for seven years, after which he was chosen as curator of the Maryland Academy of Science in Baltimore. Professor Lugger spent two years in the Division of Entomology of this Department, and in 1888 was appointed entomologist and botanist at the Minnesota Station and professor of zoology and entomology in the college. These positions, together with that of State entomologist, he held at the time of his death. While he maintained a general interest in a variety of biological work, his main efforts were put forth in the field of entomology. In economic entomology his published contributions are recognized as being of high rank. Some of the more prominent features of his work have been his investigations on Rocky Mountain locusts and other locusts, and insects injurious to cereals, including numerous experiments in devising remedies for combating the chinch bug. During the past few years he published a number of reports on certain groups of insects, among which may be mentioned butterflies and moths injurious to fruit-producing trees, beetles injurious to fruit-producing trees, and bugs injurious to our cultivated plants. These reports contain, along with the summaries, many notes prepared from original observations on a great variety of insects during the active years of his life. In his death the Minnesota College and Station and the cause of economic entomology in general have sustained a severe loss.

The death of David Dickson, director of the practical school of agriculture at Berthonval (Pais-de-Calais), France, is reported in the *Journal d'Agriculture Pratique*. In collaboration with L. Malpeaux he had conducted a number of experiments on various agricultural topics while director of the station, notably on the use of pure and artificial milk for fattening calves, and upon the use of molasses in feeding animals.

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EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Assistant Director.*

EDITORIAL DEPARTMENTS.

Chemistry, Dairy Farming, and Dairying—The Editor and H. W. Lawson.
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Entomology and Veterinary Science—E. V. Wilcox, Ph. D.
Horticulture—C. B. Smith.
With the cooperation of the scientific divisions of the Department and the Abstract Committee of the Association of Official Agricultural Chemists.

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EXPERIMENT STATION RECORD.

VOL. XIII. No. 2.

From statistics recently collated by this Office, it appears that educational institutions receiving the benefits of the acts of Congress of July 1, 1862, and August 30, 1890, are now in operation in all of the States and Territories, but not in Alaska, Hawaii, Porto Rico, and the Philippines. The total number of these institutions is 65, of which 62 maintain courses of instruction in agriculture.

The aggregate value of the permanent funds and equipment of the land-grant colleges and universities in 1900 is estimated to be as follows: Land-grant fund of 1862, $10,725,180.31; other land-grant funds, $1,528,441.37; other permanent funds, $15,017,963.80; land grant of 1862 still unsold, $3,570,907.80; farms and grounds owned by the institutions, $5,659,731.26; buildings, $16,781,968.63; apparatus, $1,456,619.19; machinery, $1,738,369.88; libraries, $1,326,889.13; miscellaneous equipment, $1,519,048.33; total, $59,325,119.70. The income of these institutions in 1900, exclusive of the funds received from the United States for agricultural experiment stations ($719,999.07), was as follows: Interest on land grant of 1862, $677,870.33; interest on other funds, $726,229.70; United States appropriation under act of 1890, $1,198,100.21; State appropriation (annual or regular), $1,889,288.34; State appropriation (occasional), $744,184.07; tuition fees, $390,334.08; incidental fees, $254,337.26; miscellaneous, $550,694.68; total, $6,431,038.67. The value of the additions to the permanent endowment and equipment of these institutions in 1900 is estimated as follows: Permanent endowment, $1,917,941.16; buildings, $948,377.94; library, $119,312.81; apparatus, $151,405.35; machinery, $141,667.15; miscellaneous, $129,288.49; total, $3,407,992.90. The number of persons in the faculties of the colleges of agriculture and mechanic arts were as follows: For preparatory classes, 333; for collegiate and special classes, 1,642; total, 2,013. In the other departments the faculties aggregated 842, making a grand total of 2,855 persons in the faculties of the land-grant institutions. The students in 1900 were as follows: (1) By classes—preparatory, 6,541; freshmen, 7,512; sophomores, 5,036; juniors, 3,648; seniors, 3,072; special, 12,964; postgraduate, 732; total, 39,505. (2) By courses—agriculture, 5,066; mechanical engineering, 3,932; civil engineering, 1,964; electrical engineering, 1,617; mining engineering, 950; architecture, 292; household economy, 1,908; veterinary science, 1,167; military tactics, 11,506. The graduates in 1900 were 3,114, and since the organization of these institutions, 41,690. The average age of graduates in 1900 was 21 years 10 months. The total number of volumes in the libraries was 1,469,318. The total number of acres of land granted to the States under the act of 1862 was 9,660,379, of which 886,889 are still unsold.

Agricultural experiment stations are now in operation under the act of Congress of March 2, 1887, in all the States and Territories. Agricultural experiments have been begun in Alaska with the aid of national funds, and two experiment stations are in operation in Hawaii; one under private auspices, the other under federal control. Steps have been taken to establish a station in Porto Rico under national auspices. In each of the States of Connecticut, New Jersey, and New York a separate station is maintained wholly or in part by State funds. In Louisiana three stations are thus maintained; and in Alabama two—the Canebrake and Tuskegee stations—are maintained wholly by State funds. Excluding the branch stations established in the several States, the total number of stations in the United States is 57. Of these, 52 received the appropriation provided for in the act of Congress above mentioned. The total income of the stations during 1900 was $1,170,857.78, of which $719,999.07 was received from the National Government, the remainder, $450,858.71, coming from the following sources: State governments, $247,281.46; individuals and communities, $2,420.51; fees for analyses of fertilizers, $70,927.31; sales of farm products, $90,088.84; miscellaneous, $40,140.59. In addition to this, the Office of Experiment Stations had an appropriation of $45,000 for the past fiscal year, including $12,000 for the Alaskan investigations. The value of additions to the equipment of the stations in 1900 is estimated as follows: Buildings, $89,416.23; libraries, $10,784.70; apparatus, $19,397.85; farm implements, $17,015.86; live stock, $22,009.10; miscellaneous, $8,850.94; total, $167,474.68.

The stations employ 693 persons in the work of administration and inquiry. The number of officers engaged in the different lines of work is as follows: Directors, 71; chemists, 143; agriculturists, 74; experts in animal husbandry, 14; horticulturists, 75; farm foremen, 24; dairymen, 30; botanists, 55; entomologists, 50; veterinarians, 29; meteorologists, 16; biologists, 6; physicists, 7; geologists, 6; mycologists and bacteriologists, 17; irrigation engineers, 7; in charge of substations, 10; secretaries and treasurers, 27; librarians, 10, and clerks, 51. There are also 30 persons classified under the head of "miscellaneous," including superintendents of gardens, grounds and buildings, apiarists, herdsmen, etc. Three hundred and twenty-seven station officers do more or less teaching in the colleges with which the stations are connected.

During 1900 the stations published 386 annual reports and bulletins. Besides regular reports and bulletins, a number of the stations issued press bulletins, which were widely reproduced in the agricultural and county papers. The mailing lists of the stations now aggregate half a million names.

In his report on the work and expenditures of the stations for the year ended June 30, 1900, the Director of this Office makes the following general statements: By far the largest part of the work of our stations has direct relation to the important agricultural interests of the communities in which they are located. The stations are, in fact, very responsive to the immediate demands of their farmer constituencies. Their greatest danger is not that they will undertake too much work of remote practical bearing, but that in the effort to meet the calls made upon them for immediate assistance they will attempt individually to cover more fields of investigation than the funds at their disposal will permit them to treat thoroughly. This temptation the stations generally are, however, resisting more successfully as their work is becoming better organized and their investigations are more carefully planned and supervised. The nature of their operations is also becoming better understood by the farmers, and the desirability of more thorough and far-reaching investigations is much more appreciated than formerly. A broader and deeper foundation of scientific inquiry is being laid each year, and there is a constant accumulation of data regarding the general agricultural conditions of the different regions of the United States. The climate, soil, water supply, native and cultivated plants, injurious insects, fungi, and bacteria are being studied in more detail and with greater thoroughness than ever before. The principles of nutrition of animals and the causes of their diseases are being subjected to more elaborate and fundamental scrutiny. Methods of investigation and the improvement of apparatus for research are being given increased attention.

Much of this work is done without public observation and in the intervals of other operations. Without doubt it should receive more definite recognition and encouragement. But it is cause for congratulation that so much patient labor of this character is being performed by station officers, who, as a rule, are seeking to advance the boundaries of knowledge for useful ends and are not deterred by a multiplicity of duties from giving attention to the more fundamental concerns of agricultural science. And this work is having its effect on the more practical operations of our stations. These are assuming a more substantial and systematic character and are being conducted with more definite relation to actual conditions. They have, therefore, a greater assurance of successful practical outcome. Questions relating to the introduction of plants or to the improvement of the live-stock industry in any region, for example, are now being investigated with a strict relation to the real requirements of the agriculture of that region which would have been impossible a few years ago. The present activity in plant breeding, as distinguished from the indiscriminate testing of varieties, is a good example of the raising of the level of experiment-station work as applied to directly practical ends. The plant breeder now sets definitely before him the kind of variety needed by the farmer in a given region or for a given purpose and applies all his scientific knowledge and practical skill to the production of such a variety. The notable success of some of the efforts in this direction already made are but a foretaste of much wider practical results as knowledge and experience in this line of endeavor increase. To do such work effectively there must be an almost ideal combination of science and practice. And the more we can learn definitely regarding the underlying principles the more surely will we be able to make successful practical applications. In such investigations science becomes more practical and art more scientific.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

The heat of combustion as a factor in the analytical examination of oils and the heats of combustion of some commercial oils, H. C. SHERMAN and J. F. SNELL (*Jour. Amer. Chem. Soc., 23 (1901), No. 3, pp. 164–172*).—The accuracy and the rapidity of the determination of the heat of combustion or calorific power by the use of the bomb calorimeter, has led the authors to attempt to apply this method in the identification of oils. In the work reported the heats of combustion were determined with a bomb calorimeter of the Atwater-Blakeslee type. The results are shown in a table and are the mean of two or more determinations, the figures being reduced to combustion at constant volume. In making the determinations, the oil was absorbed by a small amount of fibrous asbestos and was ignited directly by electrically fused iron wire. The sources of the oil are given and the probable age of the sample. In each case the specific gravity, the iodin absorption, the free acid as oleic, and the heat of combustion per gram under constant volume and constant pressure are shown. Of the 40 samples reported, it was found that the sperm, rosin, and mineral oils were considerably higher in calorific value than the fatty oils. Among the fatty oils the nondrying were of slightly higher value than the drying oils. Castor oil and boiled linseed oil showed a low heat combustion. The old samples whose specific gravities were high and iodin figures low gave in all cases rather low heats of combustion. Oxidation caused by light and air seemed to lower the heat of combustion to almost the same extent that it raised the specific gravity. By dividing the heat of combustion by the specific gravity a value was obtained ranging from 10 to 10.3 in the fresh fatty oils examined. The value obtained from sperm oil was 11.2 and for mineral oils from 11.8 to 12.3. The authors conclude that from the determination of the heat of combustion, accomplished in less than one hour, it would appear that the result would be of value, considered in relation to the specific gravity, in detecting mineral or rosin oils in fatty oils or fatty oils in sperm oil.

An apparatus for the determination of the melting point of fats, F. T. SHUTT and H. W. CHARLTON (*Trans. Roy. Soc. Canada, 2. ser., 6 (1900–1901), Sec. III, pp. 21–25, fig. 1*).—An electrical method, using mercury as the medium for conveying the heat to the fat and having a bell in the circuit to note the moment of fusion. It is to some extent a modification of the method of Christomanos, but is much more rapid. The apparatus employed is figured and described. The advantages claimed for the method are that (1) there is no necessity to remelt the fat, as when drawn-out glass tubes are used, thus avoiding one source of error, (2) the factor of pressure is practically eliminated, (3) the method is rapid.

A rapid method of determining the amount of salt in butter, C. L. PITCH (*Nat. Cream. Buttermakers' Assoc. Rpt. 1901, pp. 176–181, fig. 1*).—This method, which the writer has used in 6 creameries during 1 year, is carried out as follows: The butter is sampled with a trier, and from the sample small portions are taken here and there and carefully packed in a little brass measure. The measure is suspended in a large cylinder partially filled with a known amount of hot water, and the cylinder stoppered and shaken until the butter melts; 17.6 cc. of the aqueous solution is removed with a Babcock pipette and placed in a beaker. A tablet specially prepared and containing a definite amount of nitrate of silver is dissolved in 50 cc. of cold water. The solution containing an aliquot portion of the salt of the butter is then carefully titrated with the nitrate of silver solution, using potassium bichromate as an indicator. The number of cubic centimeters of the tablet solution used to produce a permanent brick-red color indicates the number of tenths per cent of salt contained in the butter. Thus, 10 cc. of the silver nitrate solution indicates 1 per cent of salt. The author states that he is able to bring variations within $\frac{1}{4}$ of 1 per cent of the standard desired. By employing this method the amount of salt in butter can be more easily controlled and a more uniform product produced.

Determination of cocoanut oil in butter and in oleomargarine, J. Wauters (*Bul. Assoc. Belge Chim., 15 (1901), No. 1, pp. 25–28*).—A distinction is found by determining both the soluble and insoluble fatty acids by the Reichert-Meissl number.

The chemical estimation of starch, E. Gianturco (*Bol. Chim. Pharm., 39 (1900), pp. 329–335; Schweiz. Wchnschr. Pharm., 38 (1900), p. 348; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), No. 1, pp. 40–41*).—This method is based on the tendency of carbohydrate bodies to unite with earthy bases, and is carried out in a manner somewhat similar to the method of Asboth, except an aluminum salt is used instead of barium hydroxid.

A solution of potash alum is made up, in which 1 cc. contains 0.060769 gm. alum, equal to 0.01 gm. aluminum hydroxid. Of this solution 10 cc. is used for each 0.5 to 1.5 gm. starch. With commercial starch 2.5 gm. of finely powdered, well mixed substance is put into a beaker, and 150 to 200 cc. water and 15 cc. of the alum solution added and thoroughly mixed. A small excess of ammonia is then added and the precipitate brought upon a filter, washed until no sulphate reaction is given, dried at 100°, and weighed. With meal, 3 gm. of the substance is made into a dough with a little water, and then the starch washed out into a beaker with a fine stream, and the process continued as indicated above.

Estimation of dextrose and dextrin in commercial glucose, L. Lindet (*Ann. Chim. Analyt., 6 (1901), No. 2, pp. 43–45*).—In the method proposed the total carbon is estimated by combustion with cupric oxid in the usual manner, and the rotary power of the glucose determined. From the carbon obtained by combustion the combined weight of the sugars present is calculated as $C_6H_{12}O_6$. From this figure and the rotary power of the glucose, the relative proportion of dextrose and dextrin is calculated. In making the estimation the specific rotary power of dextrose is placed at 52.5°, of dextrin at 195°.

Influence of the nature and intensity of light on the inversion of sucrose by mineral acids, H. Gillot (*Bul. Acad. Roy. Sci. Belg., 1900, pp. 863–874; abs. in Jour. Chem. Soc. [London], 80 (1901), No. 460, I, p. 127*).—Light of all wave lengths promotes inversion of sucrose in the presence of sulphuric and hydrochloric acid. The rays in the blue, violet, and ultra violet are much more active than those in the yellow or red.

The determination of tragacanthin and dextrin in cacao and chocolate and the estimation of the dextrins by polarization, P. Welmans (*Ztschr. Oeffent. Chem., 5 (1900), pp. 478–483; abs. in Chem. Centbl., 1901, I, No. 1, pp. 65, 66*).

Method of dissolving cellulose, Thiele (*Rev. Prod. Chim., 3, p. 325; abs. in Jour. Soc. Chem. Ind., 20 (1901), No. 2, p. 119*).—Cotton wool mercerized in caustic soda, dried, and immersed in an ammoniacal solution of cupric oxid will dissolve almost immediately at ordinary temperature.

Elementary organic analysis, F. G. Benedict (*Easton, Pa.: Chemical Publishing Co., 1900, pp. VI+86, figs. 15*).—Description of apparatus and methods employed in making determinations of carbon and hydrogen in various combinations.

The determination of sugar in wine and beer in the absence of salicylic acid, F. Wirthle (*Chem. Ztg., 24 (1900), No. 95, p. 1035*).—A method for making a very delicate color test.

The cause of error in the search for salicylic acid in wines, A. Y. Ferreira da Silva (*Bul. Soc. Chim. Paris, 3. ser., 23 (1900), p. 795; Chem. News, 83 (1901), No. 2145, p. 4*).—In making this test the point is emphasized that no more than 50 cc. of the wine should be taken. In larger amounts there is danger of getting the reaction in a pure wine, as such may contain naturally enough of a substance resembling salicylic acid to respond to the test.

A new coloring matter in wine and the determination of orseille, cochineal, pokeberry, and beet coloring matter, J. Bellier (*Ann. Chim. Analyt., 5 (1900), pp. 407–413; abs. in Chem. Centbl., 1900, II, No. 26, pp. 1296, 1297; Chem. Ztg., 25 (1901), No. 2, p. 5*).

Testing for orseille in wine, R. Truchon (*Ann. Chim. Analyt., 5 (1900), No. 12, pp. 444, 445*).—Threads of wool boiled 5 minutes in a portion of the wine slightly acidulated with sulphuric acid, and then placed in ammonia water, are dyed in the presence of orseille a violet color.

Estimation of tartaric acid in presence of oxalic acid, M. Palladini (*Gaz. Chim. Ital., 30 (1900), pp. 446–453; abs. in Jour. Chem. Soc. [London], 80 (1901), No. 460, II, p. 135*).—A solution containing tartaric, oxalic, and citric acids is neutralized with sodium hydroxid and calcium chlorid added. The oxalic acid and a part of the tartaric acid are precipitated as calcium salts. The oxalic acid is then precipitated with argentic nitrate.

International association method of tannin determination, H. R. Procter (*Jour. Soc. Chem. Ind., 20 (1901), No. 2, p. 104*).—Because of the difficulty of obtaining a clear filtrate in the analysis of certain hide powders, as quebracho extract, F. A. Blockey proposes to dilute such solutions, so that they contain approximately 0.4 gr. "tannin," instead of 0.7 gr. per 100 cc. This suggestion has been adopted by the International Association of Leather Trades Chemists, and they now direct that solutions for analysis contain not more than 0.45 and not less than 0.35 gr. of "tanning matter" per 100 cc.

The estimation of free acid in tanning decoction, B. Weiss (*Gerber, 26 (1900), pp. 269–283; abs. in Chem. Ztg., 24 (1900), No. 96, p. 355*).—A method of separation and of titration with standard alkali solution.

Estimation of tanning materials, L. Specht and F. Lorenz (*Chem. Ztg., 25 (1901), No. 1, pp. 5, 6*).—Formulas for estimating results and comparisons of results.

The estimation of organic and mineral acids in tanning solutions, F. Jean (*Ann. Chim. Analyt., 5 (1900), No. 11, pp. 413–416; abs. in Chem. Ztg., 25 (1901), No. 2, p. 4*).—A discussion of practical methods.

The quantitative estimation of malic acid, A. Hilger (*Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), No. 2, pp. 49, 50*).—The application of the method with palladium chlorid in estimating the malic acid in wine.

Detection of dulcin (phenetol-carbamid) in foods and beverages, J. Bellier (*Ann. Chim. Analyt., 5 (1900), p. 333; abs. in Jour. Soc. Chem. Ind., 20 (1901), No. 1, pp. 72, 73*).

A simple gas volumetric method of estimating formaldehyde, E. Riegler (*Ztschr. Analyt. Chem., 40 (1901), No. 2, pp. 92–94*).—This method depends upon the fact that hydrazin sulphate ($N_2H_4H_2SO_4$) with a solution of iodic acid gives off free nitrogen. Hydrazin sulphate in the presence of formaldehyde forms hydrazon, and upon the addition of iodic acid the compound is broken up and free nitrogen given off. This is collected in a Knop-Wagner azotometer and the amount calculated to a zero temperature and 760 mm. pressure. One cubic centimeter of nitrogen equals 2.7 mg. formaldehyde.

The elementary analysis and calorimetric value of the muscle substance of various animals, A. Köhler (*Ztschr. Physiol. Chem., 31, pp. 479–519; abs. in Chem. Centbl., 1901, I, No. 13, p. 752*).—The carbon, hydrogen, nitrogen, sulphur, and oxygen content and the calorimetric value of the flesh of cattle, swine, sheep, dog, chicken, and horse are given.

Determination of starch in liver sausage, R. Hefelmann (*Ztschr. Oeffentl. Chem., 7, pp. 43–47; abs. in Chem. Centbl., 1901, I, No. 12, pp. 707, 708*).

Fluorescein as an indicator, H. Zellner (*Pharm. Ztg., 46 (1901), p. 100; abs. in Chem. Ztg., 25 (1901), No. 14, p. 40*).—Fluorescein is used as an indicator in estimating ammonia. It is prepared by dissolving 0.4 gm. in 50 cc. alcohol and adding 30 cc. water.

The determination of ammonia in the air of stables, A. Pagnoul (*Bul. Sta. Agron. Pas de Calais, 1900, pp. 5–8, 29–32, fig. 1*).—A description is given of an aspirator arranged to draw a definite volume (2 liters) of air through 10 cc. of acidulated ammonia-free distilled water in a Nessler tube. The ammonia is determined by means of Nessler's reagent.

Report of analyses of Paris green and other insecticides in 1900, L. L. Van Slyke and W. H. Andrews (*New York State Sta. Bul. 190, pp. 283–290*).—Analyses were made of 22 samples of Paris green and 1 sample each of Arsenoid, Paragrene, Black Death, Bug Death, and Hammond's Slugshot. In the 22 samples of Paris green the arsenic content varied from 55.83 to 60.8 per cent, and averaged 57.05 per cent. The amount of arsenious oxid soluble in water in the different samples ranged from 0.51 to 15.69 per cent and averaged 1.68 per cent. The amount of copper in the 22 samples averaged 28.97 per cent. Microscopic examination for testing the purity of Paris green was not found satisfactory. The results obtained from the study of the different samples of Paris green indicated that this substance was sold in a satisfactory condition. The chemical analysis of the other insecticides is tabulated.

Analyses of Paris green and other insecticides, C. A. Goessmann (*Massachusetts Hatch Sta. Bul. 74, pp. 7–9*).—Analyses of 14 samples of Paris green and one each of pink arsenoid (lead arsenite), green arsenoid (copper arsenite), white arsenoid (barium arsenite), Laurel green, and Bug Death are reported.

Soluble arsenious oxid in Paris green, S. Avery and H. T. Beans (*Jour. Amer. Chem. Soc., 23 (1901), No. 2, pp. 111–117*).—In this preliminary report it appears from the results of the experiments that the method of estimating the arsenious oxid in Paris green by suspending in 1,000 parts of water for 1 week is quite arbitrary. The use of a strong solution of sodium acetate seems to be a better solvent than water. The authors believe, however, that too much importance is attached to the content of "soluble arsenious oxid" in Paris green.

The iodometric estimation of arsenic acid, F. A. Gooch and Julia C. Morris (*Chem. News, 83 (1901), No. 2146, pp. 15–17*).—The authors show that an arbitrary correction of about 0.003 gm. must be deducted from the indications in Williamson's process of direct titration with thiosulphate; and a correction varying from one-half that amount to nothing, according to the amount of arsenious acid present, when determination is made by iodin after neutralization with acid potassium carbonate. In the vaporization process the application of an arbitrary correction is unnecessary.

Detection of arsenic in the presence of sulphites, J. F. Smith (*Chem. News, 83 (1901), No. 2145, pp. 2, 3*).—A modification of Marsh's test. By this method 15 parts of arsenic in 1,000,000 were detected in the presence of a large quantity of bisulphite in 5 cc. of beer without previous treatment.

The detection of arsenic in beer and brewing materials, A. C. Chapman (*Analyst, 26 (1901), No. 298, pp. 8–10*).—By this method the presence of arsenic is determined by boiling a solution in which a piece of bright copper gauze is suspended.

Potassium—microchemical detection, E. M. Chamot (*Jour. Appl. Micros., 3 (1900), No. 12, pp. 1077–1083, figs. 5*).—Methods of formation and detection of crystals of potassium salts in various materials.

Chemistry in its relation to agriculture, F. B. Guthrie (*Agr. Gaz. New South Wales, 12 (1901), No. 1, pp. 114–130, figs. 2*).—A general review of the subject with special reference to the progress of agricultural chemistry in Australia.

BOTANY.

Critical points in the relation of light to plants, D. T. MacDougal (*Abs. in Science, n. ser., 13 (1901), No. 320, p. 252*).—The influence of light upon plants is summarized by the author as follows: "Light exercises a direct chemical effect upon the substances of which protoplasm is composed. It stimulates protoplasm to the formation of chlorophyll, although its action is not necessary to the process, and its direct chemical effect disintegrates this substance. It constitutes a source of energy which is absorbed by the chloroplasts. Absence of light constitutes a specific stimulus, calling out the various reactions of etiolation. Light acts as a directive or orienting stimulus to which the plant responds by locomotory or bending movements. Different portions of the spectrum are operative in producing these separate effects." The author states that illumination is not necessary to the motility of protoplasm, and conversely that the deprivation of light does not induce a condition of rigor, but sets up various pathological phenomena, among which is the breaking down of chlorophyll. Light does not exert a paratonic or retarding effect upon growth. Its chemical action may hinder the accumulation of somatic material. The changed development of plants in darkness is an adaptive response which has for its purpose the elevation of the chlorophyll screen and reproductive bodies.

On the development of etiolated plants when placed in sunlight, H. Ricôme (*Compt. Rend. Acad. Sci. Paris, 131 (1900), No. 26, pp. 1251–1253*).—The results of a number of experiments in which etiolated plants were placed in the sunlight and morphological changes noted are given. The effect of the change on the structure of the stem and leaves and on the weight of the plants is shown. The stems of etiolated plants were considerably longer than normal ones and the leaves were smaller when the plant had but little reserve material at its disposal. When plants having a large amount of reserve material were deprived of light for a considerable time and afterwards brought into the light, the effect of the etiolation was not as marked as in the case of those plants having a limited amount of reserve material. Transpiration was shown to play an important part in determining the effect of etiolation. It was shown that etiolated plants brought out to the light suffered a great loss of water, but this loss diminished as the dry weight of the plant increased.

Contribution to the question of the synthesis of albumin by the higher plants in the dark, R. Schröder (*Izv. Moscow Selsk. Khoz. Inst., 6 (1900), No. 3, pp. 405–428*).—The author experimented with squash, peas, potatoes, and dahlias. In the case of the etiolated squash seedlings it was found that in the first two days after the soaking of the seeds no decomposition of albumin took place, but after that the albuminous substances began to decompose as usual. No synthesis of albumin was observed. In the experiments with month-old etiolated pea seedlings, placed in a 6 per cent cane-sugar solution with other nutritive substances, no increase of albuminous nitrogen was observed, but there was a retarding of the decomposition of the proteids. In the experiments with potatoes germinated in sand cultures in the dark an increase of the albuminous nitrogen was observed. In the absence of potassium nitrate there was either no increase or it was very slow. Dahlia tubers germinated in pure quartz sand and without nutritive substances showed no increase of albuminous nitrogen. The above experiments, therefore, corroborate the statements of various authors concerning the possibility of albumin synthesis in the dark by the higher plants.—P. FIREMAN.

Rheotropism of roots, F. C. NEWCOMBE (*Abs. in Science, n. ser., 13 (1901), No. 320, p. 250*).—Rheotropism is defined as the curvature of the root when growing in running water. In all cases so far observed the root tip curves against the stream. In the experiments upon which the report is based the author examined 32 species of plants, 15 of which have shown themselves to be rheotropic and 17 insensitive. Species of the same genius differ widely in the degree of response to this stimulus. Members of the Cruciferæ are among the most sensitive plants found, their roots often attaining an angle of 90° from the vertical. The velocity of the current was found to exercise a considerable influence upon the amount of curvature, the best response being given in a current carrying from 100 to 500 cm. per minute. A velocity of 2,000 cm. per minute in most plants produced a negative curve. The area of the root which perceives the stimulus includes the apex of the root and the elongating zone, and the roots of mature plants are as responsive as those of seedlings.

Thigmotropism of roots, F. C. NEWCOMBE (*Abs. in Science, n. ser., 13 (1901), No. 320, pp. 250, 251*).—The sensitiveness of roots to contact or pressure has been investigated and the author shows that roots are responsive to pressure on the elongating zone. Some species respond to pressure while others do not, and the response is considered of the same class of phenomena as shown by tendrils when in contact with a solid object. In the experiments outlined by the author all the roots that showed the effect of this stimulus became concave on the side receiving the stimulus.

The relation of water plants to the solid substratum, R. H. POND (*Abs. in Science, n. ser., 13 (1901), No. 320, pp. 256, 257*).—The common statement that the roots of water plants serve only as means of attachment requires, according to the author, some modification. He has found that aquatic plants rooted in soil exceeded in vegetation and dry weight plants rooted in sand or merely suspended. Plants rooted in sand or merely suspended contained an excess of starch, lime, and magnesium, while they were lacking in nitrogen, potash, and phosphoric acid. A volumetric measurement of root absorption was made showing that the rooted plants absorbed more than floating ones.

The influence of the presence of pure metals upon plants, E. B. COPELAND and L. KAHLENBERG (*Trans. Wisconsin Acad. Sci., Arts, and Letters, 12 (1900), pt. 2, pp. 454–474*).—The authors state that injury to plants grown in cultures containing pure metals will depend upon the tendency of the metal to go into solution and the specific toxicity of the metal when in solution. A series of experiments were conducted in which chemically pure metals were placed in distilled water, and the effect noted upon the growth of a number of plants. As many of the metals as were available were rolled into foil or were in the shape of wire. Some of the other metals were in the form of sticks, others in flakes, etc. The vessels containing the water cultures were glass beakers, coated internally with paraffin, so that no solution of glass would be possible. Seedlings of maize, lupines, oats, and soy beans were placed in these solutions and the effect of their growth determined by the increase in length of the radicles. In all, 30 metals were tested, the more common of which were copper, nickel, tin, silver, platinum, gold, mercury, antimony, bismuth, cobalt, iron, zinc, lead, manganese, sulphur, and carbon. The effect of these different elements is shown in tabular form. It appears that thallium, cadmium, copper, cobalt, zinc, lead, iron, antimony, magnesium, arsenic, iodin, tungsten, and tellurium were almost invariably fatal to the growth of plants. It was not always possible to demonstrate by chemical tests the presence of these substances in the roots which they had killed, but in a number of instances the appearance of the roots showed the presence of the salts of the metal that had killed it. It was found that those metals whose salts are already known to be toxic poisoned plants when present in water. It is stated as a well-recognized fact in animal physiology that the phenomena of stimulation and poisoning are very intimately related, and in the authors' experiments it was found that copper and cobalt stimulated growth very appreciably, and boron, lead, and tungsten exerted a stimulating influence in individual cases. The subject of chemical stimulants is said to be one for further study. A list of about 30 important works relating to this subject is given.

The effect of mechanical shock on longitudinal growth of plant organs, J. B. Pollock (*Abs. in Science, n. ser., 13 (1901), No. 320, p. 251*).—Studies were made of the hyphæ of Phycomyces, hypocotyls of Brassica, radish, sunflower, lupine, and gourd, the epicotyl of beans, and the leaf sheath and first leaves of oats and wheat. Single shocks given by pressure upon the mycelium of the fungus showed that there was a retardation, followed by a recovery in from 5 to 30 minutes, after which the growth was frequently faster than at first. In the larger plants bending was followed by rapid elongation, after which growth was retarded for a short time, and upon the resumption of the functions of the plant the rate of growth was sometimes greater and sometimes less than at first. The effect of continuous shock upon plants was investigated by means of a form of apparatus which kept the plants swaying from side to side. The results obtained were decisive only in the case of experiments with gourds, which showed a decided acceleration due to the swaying. With the other plants the results were variable, but as a whole gave evidence of acceleration where the swaying was not too vigorous.

The effect of annular decortication of herbaceous plants, L. Daniel (*Compt. Rend. Acad. Sci. Paris, 131 (1900), No. 26, pp. 1253–1255*).—The effect of removing a portion of the bark from annual plants was investigated by the author, the subjects of the experiments being different species of crucifers, eggplant, and tomatoes. In the case of the crucifers experimented with, the ringing of the stems was generally followed by a wilting and final death of the lower leaves. When in a moist medium the plant was severely injured. If in a drier medium the wound was healed over to some extent. The heads produced by the different varieties of cabbage, Brussels sprouts, etc., were considerably smaller than in the check plants. In the experiments with eggplants and tomatoes there was a marked increase in the size of the fruit following the annular ringing of the plant. While there was increase in size of the solanaceous fruits, there was a corresponding decrease in their flavor. It is thought probable that the marked effect shown in these plants would probably be shown in other annual plants which furnish edible fruits.

Notes upon albinism in sweet corn, B. D. Halsted (*Abs. in Science, n. ser., 13 (1901), No. 320, p. 247*).—The author reports a complete albinism in a cross between black Mexican and Egyptian sweet corns. The albinos were produced in about equal numbers from the white, pink, and purple grains resulting from the crosses, and in some instances about 15 per cent of the plants were white. The albino plants possessed normal vigor and in every way resembled the types, except in the lack of a capacity to produce chlorophyll. After about 2 weeks' growth the plants began to weaken, and perished within a short time. In the dark they grew like normal plants, except no etiolin was produced. The grain produced by overburdened plants seemed more liable to produce albinos than that from stalks which bore a single ear. The albinism is believed to have been due to incomplete fecundation, and the fact that the plants were close bred may have had an effect upon the progeny.

Loss of vigor in corn from inbreeding, H. J. Webber (*Abs. in Science, n. ser., 13 (1901), No. 320, pp. 257, 258*).—The effect of inbreeding corn with pollen from the same stalk is shown by a number of examples. One hundred stalks of Hickory King corn grown from seed inbred with pollen from the same stalk yielded 46 ears, weighing 9.3 lbs., while seeds of the same race produced by crossing different seedlings yielded, from the same number of stalks, 82 ears, weighing 27½ lbs. In attempting to fix hybrids of Hickory King and Cuzco, a number of ears were inbred with pollen from the stalks bearing them, while others were fertilized with pollen from other hybrid seedlings of the same parentage. The hybrids of the second generation, where the seed was inbred, showed a great loss of vigor, being small in structure and almost totally sterile. From these observations it is believed that in fixing corn hybrids it will be found desirable to cross different hybrid seedlings of the same parentage which are found to present the same characters, rather than inbreed the hybrid with its own pollen, as is frequently advocated by plant breeders.

The morphology of the fruit of Opuntia, J. W. Toumey (*Abs. in Science, n. ser., 13 (1901), No. 320, pp. 253, 254*).—While the primary function of fruits is seed production and dissemination, according to the author the Opuntia has developed special adaptations for this purpose. Under the influence of desert environment many species of plants have to a great degree lost the power of production of seed, and in *Opuntia fulgida* the fruit is mostly sterile. The reproduction of the plant largely takes place by the dissemination of the swollen, spine-covered, terminal joints. In this case the function of the fruit is not to produce seeds but to attract animals to the plant that the fragile branches may adhere to them and thus become disseminated. In many instances the author has observed clusters of spineless, short, proliferous joints which resemble fruits externally, but are entirely without evidence of even an abortive ovary. These in the economy of plants serve the same purpose as fruit clusters without the necessity of floral development.

Concerning manna produced by olive trees, Trabut (*Compt. Rend. Acad. Sci. Paris, 132 (1901), No. 4, pp. 225, 226; Bul. Agr. Algérie et Tunisie, 7 (1901), No. 3, pp. 54–56, fig. 1*).—The author reports the occurrence in Algiers of a great number of olive trees which exude during the summer a form of manna which is apparently identical with that produced by the ash tree. Analysis shows it to contain 52 per cent mannite and 7.8 per cent reducing sugars. The trees producing the manna are evidently diseased. The manna exudes from the trunk and larger branches and at these points the cambium is in a state of complete liquefaction. This decomposition is caused by a bacterium. It forms large canker-like growths, exposing the naked wood. The author is led to believe that the bacteria are distributed by insects which puncture the bark, making it possible for the organism to reach the cambial layer.

The limits of variation in plants, J. W. Harshberger (*Abs. in Science, n. ser., 13 (1901), No. 320, pp. 251, 252*).—The author has made a study of the limits of variation in plants as bearing on the survival of seedlings. It was found that size and shape of leaves, weight and size of fruits varied in a mathematical ratio. The size, configuration, and persistence of early forms in the case of a number of leaves were noted, and these changes were attributed to hereditary impulse and to the direct influence of the environment, fitting the leaf to utilize the space at its disposal, thus enabling the plant to present the largest amount of leaf surface to the light.

Phenological observations in Canada in 1899, A. H. Mackay (*Proc. and Trans. Nova Scotian Inst. Sci., 10 (1899–1900), No. 2, pp. 303–318*).—An account is given of the phenomena accompanying the flowering of 10 species of plants which are distributed over a considerable portion of the country, 18 stations being reported. In addition, the first flowering and fruiting of a large number of plants, and the dates of the first appearance of migratory birds are given. The species of plants considered in the first portion of the report were mayflower (*Epigæa repens*), blue violet, red maple, dandelion, strawberry, wild red cherry, tall buttercup, service berry or shad bush, apple, and lilac.

On the nitrogenous products of the seed and the embryo of Lupinus albus, N. J. Wassilieff (*Ann. Agron., 27 (1901), No. 2, pp. 81–90*).—This is an article translated from the German[1] by E. Sellier.

The insular flora of Mississippi and Louisiana, F. E. Lloyd and S. M. Tracy (*Abs. in Science, n. ser., 13 (1901), No. 320, p. 253*).—This paper deals with the

[1] Landw. Vers. Stat., 55 (1901), No. 1–2, p. 45.

climate, physiography, and vegetation of the islands in the vicinity of the Delta of the Mississippi, and is especially concerned with a comparison of the ecological conditions in this region and that recently reported for Ocracoke Island, North Carolina (E. S. R., 12, p. 720). The islands of the Delta region are composed of sand, muck-marsh, and what are called mud-lumps. These have distinctive strand formations which are described in some detail.

The grasses in Elliott's "Sketch of the botany of South Carolina and Georgia," F. LAMSON-SCRIBNER (*U. S. Dept. Agr., Division of Agrostology Circ. 29, pp. 12, figs. 4*).—Notes are given, based upon a careful examination of the collection upon which the descriptions of the grasses of Elliott's Sketch of the Botany of South Carolina and Georgia, which appeared in 1817, was based. These specimens are well preserved in the herbarium of the College of Charleston, South Carolina, and furnish the basis for a critical study of some of the less known grasses of that region.

New or little known grasses, F. LAMSON-SCRIBNER (*U. S. Dept. Agr., Division of Agrostology Circ. 30, pp. 8*).—Descriptions are given of a number of new or little known species of grasses which have been received by the Division from various sources, principally California, Mexico, and the region from the Rocky Mountains westward. A number of new species are described and new names given others.

Bermuda grass, A. S. HITCHCOCK (*U. S. Dept. Agr., Division of Agrostology Circ. 31, pp. 6, figs. 2*).—The economic distribution of Bermuda grass is given, and different forms of the grass are described. Its value as a pasture and hay grass is shown, as well as for soil binding and lawns. Means are suggested for its eradication, which may be done by proper cultivation and growing of shading crops, especially cowpeas, on the land.

Monograph of the North American Umbelliferæ, J. M. COULTER and J. N. ROSE (*U. S. Dept. Agr., Division of Botany, Contributions from the U. S. National Herbarium, vol. 7, No. 1, pp. 256, pls. 9, figs. 65*).—A revision is given of the genera and species of the North American Umbelliferæ.

Studies of American fungi: Mushrooms, edible, poisonous, etc., G. F. ATKINSON (*Ithaca, N. Y.: Andrus & Church, 1900, pp. 275, figs. 223*).—The author describes and illustrates with natural-size figures all the more important agarics found in the United States, and also genera and species of other orders of higher fungi, including many of the edible forms. An analytical key, glossary of technical terms, indexes of genera, species, and illustrations are given; and also chapters as follows: Recipes for cooking mushrooms, Sarah T. Rorer; Chemistry and toxicology of mushrooms, J. F. Clark; Structural characters of mushrooms, H. Hasselbring.

Mushrooms or toadstools, L. P. HENDERSON (*Idaho Sta. Bul. 27, pp. 27–64, pls. 12*).—Descriptions are given of a number of the more common mushrooms, and directions for their identification. Notes are given upon the value of mushrooms as food, and a number of recipes for preparing them for the table, taken from various sources, conclude the bulletin.

Edible and poisonous mushrooms and toadstools, W. TRELEASE (*Reprint from Missouri State Hort. Soc. Rpt. 1901, pp. 18, figs. 1*).

Studies on the influence of medium on the polymorphism of fungi, J. BEAUVERIE (*Études sur le polymorphisme des champignons; influence du milieu. Thesis, Lyon, 1900, pp. 269*).

FERMENTATION—BACTERIOLOGY.

Investigations on acetic-acid bacteria, E. C. HANSEN (*Compt. Rend. Travaux Lab. Carlsberg, 5 (1900), No. 1, pp. 39–46*).—Investigations are given on the limits of vitality and variations of 3 species of acetifying bacteria. The author found that *Bacterium aceti* in beer fermented at low temperature (*bière basse de garde*) remained living for 9 years, in double beer 5 or 6 years. In a saccharose solution the limit of vitality was about 2 years, and in water about 16 months. The limit of vitality of *B. pasteurianum* in the low fermented beer is about 10 years, in double beer about 6 years, in saccharose solution about 1 year, and in water from 6 to 12 months. The third species investigated, *B. kützingianum*, remains viable in the low fermented beer from 5 to 7 years, in double beer about 6 years, in the saccharose solution about 1 year, and in water 9 months. The variation of these different bacteria in different media and at different temperatures and under other conditions was determined.

Growth of bacteria in the presence of chloroform and thymol, E. F. Smith (*Abs. in Science, n. ser., 13 (1901), No. 322, p. 327*).—On account of the frequent dependence of bacteriologists upon the antiseptic property of chloroform and thymol, the author calls attention to the fact that 12 micro-organisms are known which grow readily in test-tube cultures of milk or beef bouillon to which an equal volume of chloroform has been added. Two organisms, it is stated, are known to grow readily in beef bouillon to which thymol has been added.

Duration of life of typhoid bacilli, from different sources, in ice; and the effect of intense cold on bacteria, W. H. Park (*Abs. in Science, n. ser., 13 (1901), No. 322, p. 323*).—An account is given in which 20 cultures of bacteria of typhoid fever, after having been grown for 28 hours in nutrient agar, were placed in a room the temperature of which was rather constant at about 23° F. From time to time tubes were removed and the effect of the cold, as shown in the development of bacteria, was noted. At the end of one week, only 14 per cent of the bacteria were then living, and at the end of 22 weeks all the cultures were dead. Watery suspensions of different bacteria were placed in small tubes and dropped into liquid air, exposures being from 3 minutes to 2 hours and 10 minutes. As a result of this exposure the virulence of the organisms was only slightly diminished.

The use of carbolic acid in isolating Bacillus coli communis from river water, W. B. Copeland (*Abs. in Science, n. ser., 13 (1901), No. 322, pp. 330, 331*).—A description is given of a method by which the author has been able to separate the colon bacillus by the use of solid media. The cultures were made on Würtz agar and the acid colonies were readily distinguishable by the reddening of the litmus. As numerous other bacteria are present in river water, the author has found that by adding 0.2 cc. of a 2 per cent solution of carbolic acid the number of bacteria in the water is greatly reduced, while there is apparently no effect upon the colon bacilli.

A compendium of bacteriological water investigations, W. Migula (*Compendium der bakteriologischen Wasseruntersuchung nebst vollständiger Uebersicht der Trinkwasserbakterien. Wiesbaden: Otto Nemnich, 1901, pp. VII + 440, tables 2*).

Formation of sulphureted hydrogen in town drains, and the genus Aerobacter, M. W. Beijerinck (*Centbl. Bakt. u. Par., 2. Abt., 6 (1900), No. 7, pp. 193–206*).—The formation of sulphureted hydrogen in town drains by *Spirillum desulphuricans* is mentioned. As a result of further research in this direction, the author suggests that this is due not only to the reduction of sulphate but also to free sulphur and to albuminous bodies. The decomposition of albuminous bodies is brought about either by aerobic organisms or by temporary anaerobes. These organisms were found by a special method of investigation to form sulphites. As a result of the author's investigations, the suggestion is made that these gas-forming species endowed with this temporary anaerobism should be classed together in a genus to which he gives the name Aerobacter, the species mentioned being (1) *Aerobacter aerogenes=Bacillus lactis aerogenes;* (2) *A. viscosum;* (3) *A. coli=B. coli communis*; (4) *A. coli infusionum;* and (5) *A. liquefaciens.* The different sources from which the organisms obtain their sulphur are said to be albumin, sulphur, sulphites, and sulphates.

Bacteria in the Ames, Iowa, sewage disposal plant, L. H. Pammel (*Abs. in Science, n. ser., 13 (1901), No. 322, pp. 323, 324*).—A brief description is given of a sewage plant designed for the disposal of the sewage of about 600 people. The plant consisted of the ordinary type of filter beds, the filtration amounting to about 100 gal. per day per acre. A bacteriological analysis of the filtrate showed the presence of an average of 5,127 bacteria per cc., and at no time did it rise above 11,075. An examination of the water in the tank showed, in September, 9,000,000 per cc., falling in cold weather to about 100,000. This showed the efficiency of the filter bed for removing bacteria.

The action of light upon bacteria, A. Bournaret (*Thesis, Toulouse, 1900*).

The use of paraffin to exclude oxygen in growing anaërobic bacteria, W. H. Park (*Abs. in Science, n. ser., 13* (*1901*), *No. 322, p. 323*).—The author shows that covering the nutrient solution in tubes or flasks with paraffin, whose melting point was 42° C., proved very useful in the development of cultures of anaerobic bacteria. The inoculations can be made through the paraffin before it is fully cooled, or through the paraffin film by heating in a gas flame. The accumulation of gas forces the paraffin to rise in the tube or the flask, but does not permit the entrance of oxygen.

The utility of a supply of live steam in the laboratory, H. A. Harding (*Abs. in Science, n. ser., 13* (*1901*), *No. 322, p. 331*).—On account of some of the disadvantages attending the use of gas in the bacteriological laboratory, the author has devised means by which a steam pipe is introduced into an Arnold sterilizer. By this means the sterilizer can be brought to a temperature of 99° C. within 5 minutes, and by the use of a reducing valve the temperature can be controlled at any desired degree.

Catalase, a new enzym of general occurrence, O. Loew (*U. S. Dept. Agr. Rpt. 68, pp. 47*).—In the examination of many samples of tobacco the author found that one sample from the crop of 1898 contained a very energetic enzym capable of developing oxygen by the addition of hydrogen peroxid. Tests showed that neither diastase, proteolytic enzym, emulsin, oxidase, or peroxidase were present in the sample. From further study the conclusion was reached that another enzym was present, which the author calls catalase. A résumé of previous work on the decomposing power of certain enzyms upon hydrogen peroxid, and the investigations of the author upon the enzym catalase, are given at some length. The new enzym was found to exist in both an insoluble and a soluble form, distinguished as α- and β-catalase. Quite a number of tests are reported, showing the presence of catalase in a number of plant and animal organs, and tables are given showing the amount of oxygen given off by treating the various substances with hydrogen peroxid. The method of preparing the enzym and the effect upon it of various salts, acids, bases, and other compounds, are shown. The persistence of the enzym is found to be greater than that of any other contained in vegetable organs, so far as tested. Some herbarium specimens showed its presence after a lapse of over 50 years.

From a number of tests the author concludes that catalase belongs to the oxidizing group of enzyms. Owing to its very general occurrence, its presence is not believed to be accidental, but that it plays some rôle in the physiological processes; and the energy with which it attacks hydrogen peroxid, suggests the view tentatively that its rôle in the animal and vegetable organism may be the breaking down of this product, which has been claimed by some authors to be a product of organic growth. The various views upon the formation of hydrogen peroxid in living cells are reviewed, and the author's suggestions of the probable relation of catalase to the life processes of the cells submitted.

Oxidizing ferments in phanerogams, N. Passerini (*Nuov. Gior. Bot. Ital., 6* (*1899*), *pp. 296–321; abs. in Jour. Roy. Micros. Soc.* [*London*], *1900, No. 3, p. 342*).—In examining with the guiacum test about 100 species of flowering plants belonging to 49 different families the author found evidence in all but about 20 of at least a trace of oxidase in some organ of the plant. The part in which it was most constantly present was the root. In the stem it is often stronger in the bark than in the pith. In the leaves oxidases are most commonly entirely wanting or present only in very small quantities and are then generally localized along the veins. When present in the flower these ferments are more abundant in the pistils than in the stamens. In the stamens they occur chiefly in the filaments. In fruits they are most abundant in the pericarp, disappearing in the seed before maturity. In general the reaction is strongest in those organs which change color rapidly on exposure to the air. In a number of aquatic plants examined oxidases appeared to be absent.

Upon the occurrence and function of proteolytic enzyms in germinating seeds, W. BUTKEWITSCH (*Zhur. Opuit. Agron., 1 (1900), No. 3, pp. 233–255; Ber. Deut. Bot. Gesell., 18 (1900), No. 8, pp. 358–364*).—The author reports studies on the germinated and unsprouted seeds of *Vicia faba*, *Ricinus major*, *Lupinus luteus*, and *L. angustifolius*. To ascertain the presence of proteolytic enzyms the seeds were dried and pulverized in a mortar, after which they were treated with ether for 2 or 3 days, and the extract kept in an Erlenmeyer flask in a thermostat for some time, and then examined. The treatment was considered fatal to all organisms and destructive of living protoplasm; yet in every case examined a change in the albuminoid matter had taken place, with a formation of amid compounds. The enzym present agreed closely with the trypsin of animal organisms, as has already been reported by Green. The shoots of *Lupinus luteus* and unsprouted seed of *L. angustifolius* were found to contain a body very similar to zymogen. The proteolytic enzym in the seeds, according to the author's experiments, showed sufficient activity to transform all the protein reserve material contained in the seeds. A detailed report of the author's investigations is published in *Ztschr. Physiol. Chem.*, 32 (1901), No. 1–2, pp. 1–53.

Ferment of seeds with horny endosperm, E. BOURQUELOT and H. HÉRISSEY (*Compt. Rend. Acad. Sci. Paris, 130 (1900), No. 11, pp. 731–733*).—The authors regard the seed of carob as the type of seed with a horny endosperm composed for the greater part of mannan and galactan. During germination the embryo secretes a soluble ferment which hydrolyzes the carbohydrates of the endosperm, producing mannose and galactose. Similar results are obtained with fenugreek and alfalfa. The action of these soluble ferments is comparable to that of dilute sulphuric acid. The ferment obtained from these 2 plants, which appears to be distinct from that found in the carob, is called seminase.

The presence of seminase in seeds having a horny endosperm, E. BOURQUELOT and H. HÉRISSEY (*Compt. Rend. Acad. Sci. Paris, 131 (1900), No. 22, pp. 903–905*).—Examination was made by the authors of the seed of alfalfa and indigo, with the result that they found present a small quantity of a soluble ferment, seminase, capable of liquefying the horny endosperm and transforming it to a form of sugar capable of being assimilated.

Cacao fermentation, A. PREYER (*Tropenpflanzer, 5 (1901), No. 4, pp. 157–173, figs. 4*).—The process of fermentation of cacao is described, and the author claims to have isolated an organism which is concerned in the fermentation, to which the name *Saccharomyces theobromæ* is given. It is described and the results of experiments with pure cultures stated. A modified method of cacao fermentation is described at some length.

Diastases and their uses, C. POZZI-ESCOT (*Les diastases et leurs applications. Encyclopédie-scientifique des aidemémoire. Paris: Gauthier-Villars, 1901, pp. 219*).

A proteolytic and a protein-coagulating enzym in germinating barley, F. WEIS (*Ztschr. Physiol. Chem., 31 (1900), No. 1–2, pp. 79–97*).

The formation of solanin in potatoes as a result of bacterial action, R. WEIL (*Pharm. Ztg., 1900, No. 93, p. 901*).

A diastatic enzym in the potato plant, A. MEYER (*Jour. Landw., 48 (1900), No. 1, pp. 67–70*).

On the oxydase in kaki fruit, K. Aso (*Bot. Mag. [Tokyo], 14 (1900), No. 166, pp. 285–289*).

A physiological function of oxydase in kaki fruit, K. Aso (*Bot. Mag. [Tokyo], 14 (1900), No. 166, pp. 179, 180*).

METEOROLOGY.

Report of the Chief of the Weather Bureau, 1898–99, W. L. Moore (*U. S. Dept. Agr., Weather Bureau Rpt. 1898–99, I, pp. 247*).—The first part of this report contains an account of the operations of the Weather Bureau during the year ended June 30, 1899 (E. S. R., 11, p. 621); part 2, a list of observing stations and changes therein during 1898, and hourly averages of atmospheric pressure, temperature, and wind at 28 stations; part 3, monthly and annual meteorological summaries for 159 stations; part 4, monthly and annual means and extremes of temperature and dates of first and last killing frosts; and part 5, monthly and annual precipitation.

Report of the Chief of the Weather Bureau, 1899–1900, W. L. Moore (*U. S. Dept. Agr., Weather Bureau Rpt. 1899–1900, pp. 436*).—This includes an administrative report giving a general account of the operations of the Bureau during the year,[1] and reports containing a list of observing stations and changes therein during 1899 and hourly averages of atmospheric pressure, temperature, and winds from the records of automatic instruments at 28 stations; monthly and annual meteorological summaries for 170 Weather Bureau stations; monthly and annual means and extremes of temperature and dates of first and last killing frost, 1899; monthly and annual precipitation; miscellaneous meteorological tables and reports, including data relating to sunshine and excessive precipitation in 1898 and 1899, and pressure, temperature, etc., for the West India stations; and meteorological observations of the second Wellman expedition.

Monthly Weather Review (*U. S. Dept. Agr., Weather Bureau, Monthly Weather Review, 29 (1901), Nos. 1, pp. 1–48, pls. 2, figs. 3, charts 10; 2, pp. 49–98, pls. 5, figs. 10, charts 8; 3, pp. 99–144, pl. 1, charts 9*).—In addition to the usual reports on forecasts, warnings, weather and crop conditions, meteorological tables and charts for the months of January, February, and March, 1901, recent papers bearing on meteorology, etc., these numbers contain the following articles and notes:

No. 1, special contributions on The relation of rainfall to mountains, by W. H. Alexander; Climate and corn, by H. B. Wren; Methods employed in the distribution of weather forecasts, by J. Berry; Long range seasonal forecasts for the Pacific Coast States, by A. McC. Ashley; Some features of the climate of Idaho (illus.), by S. M. Blandford; Studies on the atmosphere at Trappes, France, by L. Teisserenc de Bort; Relation of the water level of Great Salt Lake to the precipitation (illus.), by L. H. Murdoch; The water level of Great Salt Lake, by G. K. Gilbert; and Fog studies on Mount Tamalpais: Number 3—photographs of fog billows, (illus.), by A. G. McAdie; and notes by the editor on the Milwaukee convention of Weather Bureau officials, station libraries, lectures and instruction by Weather Bureau men, and cumulus clouds above columns of smoke.

No. 2, Special contributions on Ice caves at Flagstaff, Ariz., by Mrs. E. Renoe; Relative length of warm and cold seasons, by H. Pennywitt; The rainfall of the Leeward and Windward islands, by M. S. W. Jefferson; The relation between the level of Great Salt Lake and the rainfall (illus.), by S. F. Mackie; Fog studies on Mount Tamalpais: Number 5—wreck of the Pacific Mail steamship Rio de Janeiro (illus.), by A. G. McAdie; Lake Ladoga from a thermic point of view (illus.), by J. de Schokalsky; and Frost fighting, by A. G. McAdie; and notes by the editor on Mr.

[1] Published also as Weather Bureau Doc. 231, and in Report of the Secretary of Agriculture, 1900.

Howard Shriver, Dr. Earl Flint, Herbertson's distribution of rainfall over the land, the storms of the Hawaiian Islands, the rainfall and evaporation of Great Salt Lake, Harvard's meteorological stations, reflection by clouds of light from a distant fire, history of meteorology in Belgium, official standard time, the work of the Meteorological Institute of Prussia, temperature of deep lakes, ice caves, Weather Bureau men as instructors, English v. metric system of measurements, the structure and formation of hail, Hann's new meteorology, the relative duration of the normal warm and cold seasons, the weather in distant regions, and new determination of vapor tension.

No. 3, special contributions on Fog studies on Mount Tamalpais: Number 4 (illus.), by A. G. McAdie; Pressure of saturated aqueous vapor at temperatures below freezing, by M. Thiesen; Auroral observations on the second Wellman expedition made in the neighborhood of Franz Josef land, by E. B. Baldwin; and Damage by hail in spite of cannonading, by J. M. Pernter; and notes by the editor on snow crystals, charts of atmosphere humidity, J. Brown Hicklin, normals for Manila, the new Philippine weather service, Weather Bureau men as instructors, dust storms and red rain, the permanence of climate, and the moon and the weather.

Report of the meteorological council for the year ending March 31, 1900, to the president and council of the Royal Society (*London: Government, 1900, pp. 158, fig. 1, charts 2*).—Gives an account, with numerous appendixes, of the operations of the weather service during the year.

The application of meteorology to agriculture, J. Vandervaeren (*Des applications de la météorologie en agriculture. Brecht: L. Braeckmans, 1900, pp. 33, pl. 1*).—The pamphlet discusses weather forecasting, briefly describing the systems followed in Belgium, France, England, Switzerland, and the United States, and explains weather signals and other means of disseminating weather predictions and storm warnings. A brief note on the importance of climatological observations is added.

Meteorological observations, 1900, L. G. Carpenter, R. E. Trimble, et al. (*Colorado Sta. Rpt. 1900, pp. 165–211, 217, 218*).—This is a tabulated daily and monthly summary of observations, during 1900, on temperature, pressure, precipitation, dew point, relative humidity, terrestrial and solar radiation, wind movement, and days of frost at Fort Collins, Colorado; monthly summaries of similar observations at Rockyford and Cheyenne Wells; and monthly summaries of observations on temperature and precipitation at the base of Long's Peak, near Estes Park, elevation about 9,000 ft.; Gleneyre, elevation 8,000 ft.; Pinkhampton, North Park, elevation 8,400 ft. Tables are also given which summarize the monthly and annual precipitation at 8 different points in the State, and show the monthly and annual rainfall at Fort Collins for the period from 1872 to 1900 with the normals for that period. The following is a summary of the principal meteorological data reported for Fort Collins: Mean temperature (½ maximum and ½ minimum), 48° F.; maximum, 94.4°, June; minimum, —23.4°, February; precipitation, 19.21 in.; snow fall, 52.1 in.; mean relative humidity, 66.3 per cent. The normals for this place are, temperature, 46.5° F., precipitation, 14.14 in.; mean relative humidity, 65.1 per cent.

Meteorological report, J. Dryden (*Utah Sta. Rpt. 1900, pp. XLV–XLVIII*).—Tables are given which show the average monthly temperature and precipitation for 12 representative points in the State, compiled from the monthly reports of the U. S. Weather Bureau. This is a continuation of the records published in a previous bulletin (E. S. R., 8, p. 963), bringing these records up to the end of 1898, except in case of Salt Lake City, for which they are brought up to the end of 1899. In case of Corinne and Ogden the figures represent averages of 29 years, for Salt Lake City 30 years, and for all other places 8 years. The mean temperature for the State, calculated from these records, is 46.8° F., the total rainfall, 12.17 in.

Barometers and the measurement of atmospheric pressure, C. F. Marvin (*U. S. Dept. Agr., Weather Bureau Doc. 241, pp. 94, figs. 23*).—This is a second edition of "a pamphlet of information respecting the theory and construction of barometers in general, with summary of instructions for the care and use of the standard Weather Bureau instruments."

The mean diurnal variation of temperature at Tacubaya, M. Moreno y Anda (*Mem. y Rev. Soc. Cient. "Antonio Alzate," 15 (1900–1901), No. 5–6, pp. 189–200*).—This is a contribution to the study of the climatology of the valley of Mexico.

Protection against hail, J. Roberts (*Grêle, 2 (1901), Nos. 4, pp. 3–5, fig. 1; 5, pp. 3–9, figs. 3*).

Agronomic charts and the agricultural situation of the Canton of Redon, G. V. Lechartier (*Cartes agronomiques et situation agricole du Canton de Redon. Rennes: Oberthur, 1900, pp. 74*).—This pamphlet explains the agricultural chart showing the composition and fertilizer requirements of the soils of Redon, based on analyses of 229 samples.

AIR—WATER—SOILS.

On the elimination of methane in the atmosphere, M. Urbain (*Compt. Rend. Acad. Sci. Paris, 132 (1901), No. 6, pp. 334–336*).—Previous studies on this subject are briefly referred to and experiments are reported which indicate that the disappearance of the methane from the air is not entirely, or even largely, due to the oxidizing action of ozone, but to its absorption by plants. The latter fact was brought out by growing plants in an atmosphere containing varying amounts of methane and observing the amount of methane which had disappeared at the end of different periods.

Evaporation from water surfaces, L. G. Carpenter (*Colorado Sta. Rpt. 1900, p. 216*).—A table is given which shows the monthly and annual evaporation from a tank 3 by 3 by 3 ft. flush with the ground at Fort Collins during 14 years, 1887–1900.

Mineral-water industry (*Spec. [U. S.] Consular Rpts., 22 (1901), pt. 2, pp. 85–212*).—This is a report of consuls of the United States on the extent of trade in mineral waters in various countries of Europe, India, Japan, Siberia, Syria, Palestine, Asia Minor, New South Wales, New Zealand, Victoria, and Mexico.

The chemical composition of the soils of the southwestern districts of the Cape Colony, C. F. Juritz (*Trans. Phil. Soc. South Africa, 11 (1900), pt. 2, pp. 125–160, charts 5; Agr. Jour. Cape Good Hope, 18 (1901), Nos. 6, pp. 328–338; 7, pp. 391–401; 8, pp. 452–462*).—An account is here given of the work done to date, January 31, 1900, on the systematic soil survey of the Colony which was begun in 1892 and which has been noted from time to time (E. S. R., 12, p. 122). The results are reported in tabular form and in charts, and there is a brief discussion of the general subject of soil analysis and of the practical application of the analytical data reported, with a description of the methods used in this investigation. These methods are in brief as follows: The samples are taken to a depth not exceeding 12 in. and sufficiently below the surface to avoid top growth and accumulations. The sample is washed through a $\frac{1}{2}$ mm. mesh sieve. The part passing the sieve, together with the residue from the evaporation of the water used in washing it through, is designated fine earth and is used for the determination of lime, potash, and phosphorid acid. The portion which does not pass through the $\frac{1}{2}$ mm. mesh sieve is dried and sifted through a 1 mm. mesh sieve. The part passing through is designated coarse sand and is included with the fine earth in determining moisture, organic matter, chlorin, and nitrogen.

To prepare the solution for analysis, allow 200 gm. of the fine earth to remain in contact with 400 cc. of hydrochloric acid (sp. gr. 1.115) in a large flask for 5 days at ordinary temperature, shaking thoroughly from time to time. Filter through dry plaited filters into a dry flask, evaporate 250 cc. of the filtrate to dryness, using first a small open flame, then the water bath, and finally a sand bath or air oven at 120° C., adding during the evaporation a few cubic centimeters of strong nitric acid.

Moisten the residue with strong nitric acid and again evaporate to dryness. To expel nitric acid, moisten the residue with hydrochloric acid and evaporate nearly to dryness on the water bath, taking care to prevent the formation of crusts. Dry the residue in an air bath for an hour, treat with warm water and 20 per cent solution of hydrochloric acid, wash into a 250 cc. flask, boil for 15 minutes, and after cooling fill the flask to the mark with distilled water, and filter the solution.

For the determination of lime add to 50 cc. of this filtered solution in a 250 cc. flask 2 or 3 drops of rosolic-acid solution and ammonia from a dropping tube until a pinkish color appears. Boil until the pink color almost disappears, thus precipitating alumina and oxid of iron. After cooling, fill the flask to the mark, shake thoroughly, and filter into a 300 cc. flask, the solution being made to the mark. To 100 cc. of this filtrate add 3 to 5 drops of acetic acid and 20 cc. of a 4 per cent ammonium oxalate solution. Keep on a water bath for 6 hours and filter through double filter papers. Ignite the precipitate first over a Bunsen flame, then heat strongly in a furnace for 10 minutes. This gives the weight of lime.

To determine potash, boil 50 cc. of the original soil extract in a 250 cc. flask, add 5 cc. of a 10 per cent solution of barium chlorid and boil again for some time, add a few drops of rosolic acid and boil with ammonia, as in case of the lime determination. When partly cool add 2 or 3 gm. of crystalline ammonium carbonate and raise the temperature at once to the boiling point to separate lime and barium. After complete precipitation of the latter cool the liquid, fill the flask to the mark, and filter the solution. Evaporate 100 cc. of this filtrate to dryness in a platinum dish on a water bath, heat carefully to expel all ammonium salts, and wash the residue through a filter with boiling water into a glass dish. Add 2 cc. of a 10 per cent solution of platinum chlorid and evaporate to dryness on a water bath. After cooling add 80 to 82 per cent alcohol to the residue, allow to stand for at least half an hour, filter through a Gooch crucible, using the filter pump, and wash first with 96 per cent and then with absolute alcohol, drying the precipitate for 2 hours in a water oven. After weighing the crucible, wash the double salt through with boiling water, follow with alcohol, dry, and weigh, taking the difference between the two weighings as the amount of potassium platinum chlorid. This multiplied by 0.193 gives the quantity of potash in 10 gm. of soil.

To determine phosphoric acid, add 25 cc. of concentrated nitric acid to 25 gm. of fine earth in a 500 cc. flask and shake thoroughly. Then add 50 cc. of concentrated sulphuric acid and again shake the mixture carefully. Heat gently, shaking at frequent intervals, and if this does not secure complete oxidation add more nitric acid and continue the heating. Cool the mixture, dilute to the mark with distilled water, shake well, and filter. Nearly neutralize 200 cc. of the filtrate with strong ammonia solution, a few drops of nitric acid being used to acidulate the mixture in case the limit is exceeded. Add 200 cc. of molybdic solution prepared as follows: Dissolve 150 gm. of ammonium molybdate in a liter of water, adding 1 liter of nitric acid (sp. gr. 1.2), and heat to a temperature of 50° C. for 3 hours in a water oven. Allow to cool completely and decant the liquid through a small filter, washing the precipitate in the flask with dilute molybdic solution. Dissolve the precipitate in warm 4 per cent ammonia, acidulate slightly with hydrochloric acid, and add 20 cc. of magnesia mixture, drop by drop, at the rate of 1 cc. every 5 seconds, and then 25 cc. of 5 per cent ammonia. Shake the mixture for a short time and allow to stand for 2 hours. Filter through a Gooch crucible, wash with 5 per cent ammonia solution, dry first on an iron plate, then ignite in a furnace for 15 minutes, cool, and weigh.

Of the 212 samples of soil of which analyses are reported, only 45 contained normal amounts of lime, 167 were fairly supplied with lime, and 86 were decidedly poor in this constituent. Only 15 contained a normal amount of phosphoric acid and 124 would be classed as poor in this constituent. As regards potash, 57 samples contained normal amounts and 53 were poor. The results therefore indicate that the greatest need of the soils is phosphoric acid, the second most important requirement being lime. A comparison of hillock soils with those of the level ground showed that the former are much more fertile than the latter, although still in need of improvement.

Humus and carbon in cultivated soils, A. Pagnoul (*Bul. Sta. Agron. Pas de Calais, 1900, pp. 9–15*).—In an examination of 11 samples of soil no fixed relation was found to exist between carbon and nitrogen, but apparently the carbon, nitrogen, and humus degree varied in the same direction, although irregularly.

Investigations on the cohesiveness of soils and on mechanical and physico-chemical analysis, S. von Piedzicki (*Mitt. Landw. Inst. Univ. Leipsic, 1901, No. 2, pp. 1–54*).

Soil temperatures, L. G. Carpenter (*Colorado Sta. Rpt. 1900, pp. 212–215*).—This is a tabulated record of weekly observations on soil temperatures at different depths in irrigated and unirrigated soils.

Value of the incidental increment of plant food in soils (*Trinidad Bot. Dept. Bul. Misc. Inform., 1901, No. 27, pp. 325–327*).—It is claimed that plants derive much more plant food from soils than chemical analysis accounts for. "A large amount of incidental plant food is evidently conveyed by rain water. . . . It appears probable also that the fertility given by the deposited excreta of small animals, birds, insects, and worms and reptiles, and the decay of their bodies upon the ground, and also the decay of vegetable matter, dust deposited by wind, leaves, flowers, seeds, and branches, etc., is largely in excess of what has been previously estimated, and in fact is of as much importance as food obtained from the reserves held by the soil itself. This must be known as the 'incidental increment,' and must be taken into full account in all agricultural operations."

FERTILIZERS.

The substitution of soda for potash in plant growth, W. H. Jordan and C. G. Jenter (*New York State Sta. Bul. 192, pp. 333–350, pls. 6*).—The results of previous investigations on this subject are briefly reviewed, and an account is given of experiments at the station during the winters of 1898–99 and 1899–1900. These experiments were carried on in a forcing house, with galvanized iron pots containing 25 lbs. of ground quartz rock passing a 0.025 in. mesh sieve. Drainage was secured in the pots by a layer of 4 to 6 lbs. of quartz chips, and aeration was provided for by connecting the drainage material with glass tubes extending up the sides of the pots above the sand. One series of pots received no fertilizers. The kinds and quantities of fertilizing material used in 5 other series are shown in the following table:

Kinds and amounts of fertilizing materials added to each pot.

Order in series.	Acid phosphate.	Potassium nitrate.	Sodium nitrate.	Magnesium sulphate.	Ammonium nitrate.	Calcium carbonate.	Ferric chlorid.
	Grams.	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Grams.*
1	7.5	5.0	5.0	2.5	....	5.0	1.0
2	7.5	5.0	....	2.5	2.35	5.0	1.0
3	7.5	....	5.0	2.5	2.00	5.0	1.0
4	7.5	....	....	2.5	4.35	5.0	1.0
5	....	....	....	....	4.35	....	....

Calcium carbonate was added in each case in sufficient quantity to neutralize any acidity which might arise. The crops grown were barley, tomatoes, and peas. The data secured and reported in the bulletin include yield and moisture, potash, and soda content of the air-dry crop. The results are summarized as follows:

"(1) A deficiency of available potash greatly depressed the growth of the plant even in the presence of an abundant supply of soda salts. A lack of soda in the presence of potash sufficient for the plant's needs seemed to have no deleterious effect whatever upon growth.

"(2) Plants to which the necessary supply of potash was not accessible took up more soda than when potash was present in abundance. Soda may be substituted for potash in quantity when the latter is lacking.

"(3) While the substitution may take place in quantity, it evidently can not do so in function, as is shown by the limited growth when the plants were deprived of potash, even though soda was appropriated in increased proportions.

"(4) The experiments incidentally suggest the view that the real need of plants for certain essential mineral constituents is not even approximately measured by the proportions of these constituents which the plant takes up."

Can plants use soda in place of potash? F. H. Hall, W. H. Jordan, and C. G. Jenter (*New York State Sta. Bul. 192, popular ed., pp. 10, figs. 4*).—This is a popular summary of the above bulletin.

The relative values of some nitrogenous fertilizers, W. A. Withers and G. S. Fraps (*North Carolina Sta. Bul. 176, pp. 15–22*).—The bulletin calls attention to the results obtained by Müntz and Girard, and Bonâme (E. S. R., 9, p. 732) in studies of the rate of nitrification of fertilizers, and also to the work of Jenkins and Britton on the availability of nitrogenous fertilizers (E. S. R., 10, p. 232), and reports experiments on the relative rate of nitrification carried out as follows:

"A sandy clay soil from a pasture was sifted through a coarse sieve (6 meshes to the inch), and a quantity of material equivalent to 0.6 gm. nitrogen was intimately mixed with 1,000 gm. of the soil. The soil was then placed in precipitating jars and kept in a dark closet, enough water being added to raise the percentage from 6.3 to 11.6. At suitable periods 3 of the jars were weighed, and the estimated loss of water was replaced in all the jars. The temperature was 28 to 30° C., and the time was 3 weeks. When calcium carbonate was added, the amount was exactly sufficient to combine with the nitrogen of the fertilizer if the entire amount were converted to nitric acid. At the end of the experiment the nitrates were leached out and the amount determined by the Tiemann-Schulze method. The amount of nitrates found in a blank experiment was deducted from the total."

The results of these experiments, as well as of tests of the solubility in pepsin-hydrochloric acid and neutral permanganate, and of vegetation tests with oats and Hungarian grass made by Jenkins and Britton, are given in the following table.

Rate of nitrification and availability of various nitrogenous fertilizers.

Fertilizer.	Rate of nitrification.				Availability.		
	Without calcium carbonate.		With calcium carbonate.		By potassium permanganate method.	By pepsin-hydrochloric acid method.	By vegetation test.
Series I:	*Per cent.*	*Rank.*	*Per cent.*	*Rank.*	*Per cent.*	*Per cent.*	*Per cent.*
Dried blood	34.8	100	54.9	100	94.4	94.7	73.3
Cotton-seed meal	33.9	97	54.8	100	91.1	91.1	64.8
Dried fish	30.3	87	46.5	85	88.7	67.3	63.9
Tankage	26.2	75	34.8	63	88.3	56.4	49.4
Bat guano	22.4	64	35.8	65	75.1	56.4	....
Bone	18.9	54	16.6	30	64.2	92.3	16.7
Bone (6 weeks)	21.7	....	17.4	....	....	....	....
Ammonium sulphate	1.3	4	31.1	55	100.0	100.0	....
Nitrate of soda	....	....	....	....	100.0	100.0	100.0
Series II:							
Cotton-seed meal	26.7	....	....	....	....	....	....
Ammonium sulphate	3.4	....	32.6	....	....	....	....

The conclusions drawn from this work are as follows:

"(1) The nitrification of blood takes place more rapidly when it is mixed with a large quantity of soil than with a small quantity.

"(2) The order of nitrification in the soil used was dried blood (most nitrified), dried fish, tankage, bat guano, bone, ammonium sulphate. Excluding the ammonium sulphate, this is the order of availability, as measured by vegetation tests, and solubility in permanganate of potash.

"(3) When calcium carbonate was added to the soil, the nitrification was greatly accelerated, and the order became dried blood, cotton-seed meal, dried fish, bat guano, tankage, ammonium sulphate, bone.

"(4) When ammonium sulphate is used as a fertilizer, in most cases it would be advisable to add calcium carbonate in some form also.

"(5) The low rate of nitrification of ammonium sulphate is probably due to the presence of organisms which nitrify organic compounds in preference to ammonium salts. The presence of the ammonium sulphate may also hinder the activity of the nitrifying organisms. The acids formed may also be a hindrance when no base is present to neutralize them. All three of these causes may be in operation at the same time."

The assimilation of free nitrogen by soil bacteria without symbiosis with leguminous plants, J. Kühn (*Fühling's Landw. Ztg., 50 (1901), No. 1, pp. 2–9*).—This article is a discussion of the results of fertilizer experiments in progress on the experiment fields of the University at Halle since 1878. The fertilizers applied annually on the different plats were barnyard manure, superphosphate and kainit, superphosphate and kainit in conjunction with ammonium sulphate and nitrate of soda, and ammonium sulphate and nitrate of soda alone. A check plat received no manure. In 1892 the results showed that where the nitrogenous and nonnitrogenous fertilizers were used together the quantity of nitrogen in the yield was greater than in the crop which had received only nonnitrogenous fertilizers, the proportion being about as 3 to 2. The author discusses the question as to where the nitrogen came from which was contained in the crop receiving no nitrogenous fertilizers. The results bearing on this subject obtained by different investigators, and indicating the increase of the available supply of nitrogen in the soil through the activity of soil bacteria without a symbiotic relation with leguminous plants, are reviewed.

Pot experiments in 1899, J. Hanamann (*Ztschr. Landw. Versuchsw. Oesterr., 3 (1900), No. 5, pp. 575–582*).—Experiments were conducted for three years in succession to determine the residual effects of different fertilizer combinations applied the first year the experiments were in progress. Four different kinds of soil—sand, sandy loam, loam, and clay—were used. The results for the season are recorded in detail and the observations on the action of different fertilizer substances discussed. An experiment with different reagents to test the solubility of phosphoric acids in soils is reported.

Comparative tests of fertilizing value of two new phosphates, Grimm (*Chem. Ind., 24 (1901), p. 213; abs. in Chem. Ztg., 25 (1901), No. 28, Repert., p. 106*).—Comparative tests of Wiborgh phosphate and Wolters ground phosphate on mustard, alfalfa, and barley grown in pots containing 7,000 gm. of soil are reported. The Wiborgh phosphate used contained 26.09 per cent of total phosphoric acid, 25.47 per cent of citrate-soluble phosphoric acid, 37.9 per cent of lime, 1.39 per cent of potash, and 8.76 per cent of silica. The Wolters phosphate contained 16.25 per cent of total phosphoric acid, 15.08 per cent of citrate-soluble phosphoric acid, 25.77 per cent of lime, and 28.36 per cent of silica. The latter material is prepared by fusing crude phosphates with siliceous material, sand or glass, and calcium carbonate. Its phosphoric acid was apparently more available to plants in these experiments than that of the Wiborgh phosphate.

Green manure and phosphorite as a fertilizer, A. N. ENGLEHART (*Abs. Ztschr. Landw. Versuchsw. Oesterr., 3 (1900), No. 6, pp. 631–648*).—This article, an abstract of a book review, treats of the use of phosphorites as fertilizers and reports the results from the use of finely ground phosphorites and barnyard manure in growing rye, the application of finely ground phosphorites alone as a fertilizer for barley, oats, potatoes, and rye, and the use of lime as compared with phosphorites. The effect of applications of phosphorites is also shown. The experiments here reported cover the period of 1885 to 1889.

Fertilizing value of steamed bone meal, F. W. DAFERT (*Ztschr. Landw. Versuchsw. Oesterr., 4 (1901), No. 2, pp. 96–98*).—In reply to the claim of Kellner and Böttcher (E. S. R., 12, p. 323) that the phosphoric acid of bone meal is very incompletely utilized on soils abundantly supplied with lime, but is very effective on those poor in this constituent, the author reports the results of experiments on both kinds of soils which seem to show that there is no definite relation between the lime content of the soil and the action of the bone meal. He therefore concludes that the action of bone meal does not depend upon the lime content of the soil, but upon other conditions.

Fish scrap fertilizers, W. H. HEILEMAN (*Washington Sta. Bul. 44, pp. 13*).—This bulletin is supplementary to a previous one (E. S. R., 12, p. 225), dealing with the sources, uses, and value of commercial fertilizers. It calls attention to the value and importance of dried fish and fish scrap fertilizers, which are very abundant in the State, but are now allowed to go to waste.

Commercial fertilizers, M. A. SCOVELL, A. M. PETER, and H. E. CURTIS (*Kentucky Sta. Bul. 90, pp. 201–230*).—This bulletin reports the results of the inspection, including analyses and valuations, of 175 samples of fertilizers examined during the last half of 1900.

Analyses of commercial fertilizers, H. B. MCDONNELL ET AL. (*Maryland Agr. College Quart., 1901, No. 11, pp. 55*).—This bulletin reports the results of analyses and valuations of 479 samples of fertilizing materials examined during the last half of 1900.

Analyses of fertilizers, C. A. GOESSMANN (*Massachusetts Hatch Sta. Bul. 74, pp. 16*).—This bulletin contains instructions regarding the sampling of fertilzers; notes on valuation of fertilizers; the Massachusetts laws relating to commercial fertilizers, with instructions to manufacturers, agents, etc.; and analyses of 64 samples of fertilizing materials, including wood ashes, ashes from jute waste, hair waste, wool waste, cotton waste, tobacco and tobacco dust, cotton-seed meal, linseed meal, hen manure, sheep manure, sewage, sizing paste, fleshings, bone, and soils (5 samples).

Registration and analyses of fertilizers, B. W. KILGORE (*Bul. North Carolina State Bd. Agr., 22 (1901), No. 3, pp. 3–25*).—A list with guaranteed analyses of fertilizers registered during 1901, and analyses and valuations of 128 samples of fertilizers examined during the spring of 1901 are given, with explanations of terms used in analyses of fertilizers, notes on valuation, and a statement of freight rates from the seaboard to interior points of the State.

Analyses of commercial fertilizers, J. HAMILTON and W. FREAR (*Pennsylvania Dept. Agr. Bul. 72, pp. 171*).—This bulletin contains the text of the fertilizer law of Pennsylvania, notes on valuation, a discussion of the composition of raw materials and the cost of fertilizer constituents, and tabulated analyses and valuations of 716 samples of fertilizing materials examined during 1900. The average composition of the fertilizers examined during 1900 is given and their selling price and valuation are compared with similar data for fertilizers examined during previous years.

Analyses of commercial fertilizers, J. L. HILLS, C. H. JONES, and B. O. WHITE (*Vermont Sta. Bul. 86, pp. 123–144*).—This bulletin contains analyses and valuations of samples of 40 brands of fertilizers, with notes on valuation, etc., and tables showing the composition of the leading brands of fertilizers examined by the station during the past 5 years, 1896–1900.

FIELD CROPS.

Fourth report on the agricultural investigations in Alaska, 1900, C. C. GEORGESON (*U. S. Dept. Agr., Office of Experiment Stations Bul. 94, pp. 83, pls. 24*).—This report deals with experiments in growing cereals and vegetables at the Sitka and Kenai experiment stations and at numerous other points, and the steps taken to establish experiment stations at Rampart and Fort Yukon in the valley of the Yukon River.

Spring wheat, barley, rye, oats, emmer, millet, buckwheat, and corn were grown experimentally and the results obtained, together with the character and habits of growth of the different varieties, are reported. The qualities sought in cereals for the region are earliness and ability to stand up well during stormy weather. Romanow has proven the best and earliest variety of spring wheat thus far grown. Ladoga equals it in earliness, but is inferior in vigor and in yield. Among the different varieties of barley, Mansbury has given the best results and Sisolsk, an imported Russian variety, promises to stand next in value. Swedish rye, sown in May, 1899, and left undisturbed the following winter, gave a good yield. It averaged 5 ft. high in July of this year, produced heads about 6 inches long and ripened early in September. The most promising variety of oats with regard to earliness and strength of straw was Burt Extra Early, but it produced rather light yields of both grain and straw. The other varieties grown, although doing well, were either not quite early enough or did not have sufficient strength of straw. Ufa spring emmer matured early enough but was found inferior in quality to the grains already grown in that region. The best buckwheat thus far tested is Orenburg, a variety imported from Russia. A variety of early corn was grown, but it proved a failure, and the author doubts the successful culture of corn in Alaska, even for feed.

Fertilizer experiments were conducted with barley, oats, and potatoes on soil consisting largely of decayed moss and rotten and disintegrated wood. In its virgin state, this soil is almost entirely sterile. The fertilizers applied in this connection were fish guano, stable manure, and seaweed, used alone or in conjunction with lime. On unfertilized new land all the crops were failures. The best barley was grown on land fertilized at the rate of ½ ton of fish guano and a ton of lime per acre. Applications of 20 tons of seaweed with 2,000 lbs. of lime and a ton of fish guano alone per acre also gave good yields of barley. Lime when used alone was not very beneficial. Oats made very satisfactory growth on plats fertilized with fish guano alone and in conjunction with lime. Potatoes grown without manure gave very poor results, but with fish guano and lime a fair crop was produced and a still better yield was obtained from the use of seaweed as a fertilizer. These results "would indicate that the sterility of new soil is due chiefly to a lack of available plant food, and that the improvement which takes place in the land under cultivation is due to the gradual liberation of the elements of plant food, probably caused chiefly by the action of the atmosphere." The construction of brush drains was found an effective method for improving the land.

The bulletin further reviews the agricultural possibilities of different sections of Alaska, and reproduces reports on gardening operations by settlers in various parts of the coast region. The author made a tour of investigation into the interior of the territory and surveyed two proposed sites for agricultural experiment stations, one at Fort Yukon and the other at Rampart. The itinerary with full notes on the trip are given and the observations are recorded. Soil temperature and meteorological observations made at different points are shown in tables.

The influence of the water content of the soil on the development of plants, C. VON SEELHORST (*Jour. Landw., 48 (1900), No. 2, pp. 165–177, pls. 2*).—Experiments were conducted with oats and spring wheat to ascertain the influence of different quantities of water in the soil on the form and composition of the plants. Five grains were sown in each of 32 pots and the soil in all the pots received the same quantity of water to insure equal germination. When the plants had well started, the pots were divided into two series of 16 pots each. In the first series the water content was held at 47.4 per cent of the water-holding capacity of the soil, and in the second at 84.1 per cent. When the plants began to head, 4 pots of the first series were changed to the second and 4 pots of the second series to the first. The results obtained are tabulated in detail.

The tests with oats indicated that a high percentage of soil moisture during the early period of growth increases the number of internodes, and during the period of heading it increases the strength and the length of the culm. A high water content of the soil when the plants were heading considerably lengthened the two upper internodes and the rachis. The number of zigzags in the rachis, as well as the number of spikelets, was increased by a high percentage of soil moisture during early growth, while the number of blossoms developed in the spikelets was relatively much greater when the water content of the soil was high at the time of heading than when it was low. The weight of the grains responded to the same influences to which the growth of the head responded. The specific gravity of the grain was smallest in the cases of highest soil moisture at heading time. The proportion of glumes in the grain was largest in the series of high water content for the entire time of the experiments and in the 4 pots in which the water content had been decreased when the plants began to head. The nitrogen content of the grain decreased with the increase of the proportion of glumes. The author draws the general conclusions that a high percentage of soil moisture at the time of heading is highly important in increasing the yields of straw and grain.

The results with wheat were in many respects the same as with oats, but the effect of the water content during the early period of growth on the number of internodes was not so marked. It was also found that with wheat the length of the head depended upon a high water content during the early vegetative period. Increasing the amount of water in the soil at the time the wheat plants began to head did not increase the number of spikelets, but it was very effective in increasing the number of developed blossoms. The nitrogen content of the grains was influenced in the same manner as in the experiments with oats, and the specific weight of the grains agreed with their nitrogen content.

The influence of the water content of the soil and the application of fertilizers on the yield and composition of Italian rye grass and red clover, C. von Seelhorst, N. Georgs, and F. Fahrenholtz (*Jour. Landw., 48 (1900), No. 3, pp. 265, 286*).—The report on this investigation is prefaced by references to similar work by other investigators. The results obtained by Pagnoul, being to some extent opposed to those obtained by the authors, are quite fully described. The method of conducting the investigation is outlined and the results are tabulated and discussed.

The experiments were made in pots containing each 11 kg. of soil. One-half the entire number of pots received no fertilizer, while the rest of the clover pots received 1 gm. each of potash and phosphoric acid and 5 gm. of rich marl and the grass pots 1 gm. of nitrogen in the form of nitrate of soda in addition to this application. Four-tenths of a gram of clover seed and 0.6 gm. of grass seed were sown per pot. In each test 4 pots were treated alike. The different quantities of water used grouped the pots into 3 series, as shown in the table below:

Table showing the weight at which pots were held during different periods by controlling the water content of the soil.

Period.	First series.	Second series.	Third series.
	Grams.	*Grams.*	*Grams.*
May 8 to June 6	13,400	14,400	15,400
June 6 to June 22	14,400	15,400	16,400
June 22 to November 10	14,800	15,600	16,400

The results indicate that an increase in the water content of the soil within the limits of the experiment increased the yield of clover and the quantity of its most important food elements. The yield of rye grass was also increased, but owing to the dearth of nitrogen in the soil no appreciable increase in its protein content was obtained. The quality of the crops, however, suffered from an increase in the water content. The first cutting of clover showed a decrease in the percentage of protein and fat. In the rye grass the decrease in protein was greater than in the clover, which the authors again attribute to the insufficient supply of nitrogen in the soil. The percentage of dry matter in the green clover decreased with the increase of water in the soil. In general the percentage of ash in the plants increased as the water content of the soil increased. The influence of the fertilizers on the percentage of protein in the clover was very small but quite marked in the rye grass grown on the soil lowest in water content.

Agricultural, botanical, and chemical results of experiments on the mixed herbage of permanent grass lands, conducted for many years in succession on the same land; the chemical results, J. B. Lawes and J. H. Gilbert (*Phil. Trans. Roy. Soc. London, ser. B, 192 (1900), pp. 139–210*).—The topics treated in this paper are the botanical composition of the mixed herbage, chemical composition of the separated graminous, leguminous, and other herbage of the mixed produce of grass land; the state of existing knowledge as to the function of the mineral or ash constituents of vegetation; the conditions under which carbon dioxid is determined in plant ashes and the results obtained; and the dependence of the chemical composition of various crops on the character and the stage of their growth and on the fertilizers applied.

"The results show that the chemical composition of the mixed herbage is very directly dependent, not only on the supplies within the soil, and on the seasons, but also very prominently on the description of plants encouraged, and on the character of their development. . . .

"There were very characteristic differences in the composition of the ashes of different crops, according to the amounts of nitrogen they assimilated. Red clover, for example, yields large amounts of nitrogen over a given area, part of which is due to fixation, but much is certainly taken up as nitrates from the soil; and the results show that the greater the amount of nitrogen assimilated the more is the ash characterized by containing fixed base in combination with carbonic acid, presumably representing organic acid in the vegetable substance before incineration.

"The conclusion was that, independently of any specially physiological function of the bases, such as that of potash in connection with the formation of carbohydrates, for example, their office was prominently also that of carriers of nitric acid, and that when the nitrogen had been assimilated the base was left as a residue in combination with organic acid, which, according to the character of the plant, was represented more or less completely by carbonic acid in the ash.

"Further, existing knowledge—as to the condition in which nitrogen is found in soil waters, as to the action of nitrates used as manures, as to the presence of nitrates in still-growing plants, and as to the connection between the nitrogen assimilated and the composition of the ash as has been illustrated—points to the conclusion that, at any rate, a large amount of the nitrogen of the chlorophyllous vegetation on the earth's surface is derived from nitrates; while, so far as this is the case, the *raison d'être* of much of the fixed base found in the ashes of plants would seem to be clearly indicated. . . .

"When the more functionally important constituents are available in relative abundance, those which are of less importance in this respect are taken up and retained in less amount than they otherwise would be, the result being determined in great measure by the character of growth induced.

"Luxuriance or vegetative activity is intimately associated with the amount of nitrogen available and taken up. Further, chlorophyll formation to a great extent follows nitrogen assimilation. But the results relating to the increased amount of nonnitrogenous substance yielded in the mixed herbage under the influence of the various manures clearly indicate that the nitrogen being taken up and the chlorophyll formed, the carbon assimilation and the carbohydrate formation depend essentially on the amounts of potash available."

Alfalfa; methods of culture and yields per acre, E. B. VOORHEES and C. B. LANE (*New Jersey Stas. Bul. 148, pp. 3-15, pls. 4*).—This bulletin notes the growing importance of alfalfa on American farms, indicates methods of culture, and points out the usefulness and value of the plant. The yields from the different cuttings of alfalfa grown at the station, the cost of its culture per acre, the chemical composition, and the quantities of the various elements obtained per acre from the different cuttings are recorded in tabular form. The average production of green forage, dry matter, and total protein per acre of alfalfa, compared with corn, red clover, crimson clover, barnyard millet, cowpeas, and oats and peas, are also given. In 1899 and 1900 the yields of green forage were 20.21 and 26.60 tons per acre, respectively. The first cutting, made the latter part of May, was large in each year. The average cost for 3 years of growing alfalfa at the station was $29.20 an acre. On account of the permanent character of the crop, the average cost per acre was reduced as the number of crops increased. The authors recommend leaving alfalfa in the swath after cutting just long enough to become well wilted, and then to put it up into cocks to continue the curing process.

Bromus inermis, F. L. WATROUS, H. H. GRIFFIN, and J. E. PAYNE (*Colorado Sta. Bul. 61, pp. 10*).—This bulletin contains directions for the culture of *Bromus inermis*, and records the cultural tests with this grass on the college grounds and at the Arkansas Valley and the Plains substations since 1892. In summarizing the results the authors report that the growth of *B. inermis* has been very unsatisfactory. The greatest difficulty was experienced in obtaining a stand. The absence of rain after seeding, or even after the young plants had continued to grow, was sure cause of failure. It is believed that under more favorable moisture conditions the grass might succeed. On subirrigated land it made a growth of from 1 to 2 ft. high, but where flooded it became sod bound and made almost no growth.

Culture tests of cereals, EDLER (*Jahrb. Deut. Landw. Gesell., 15 (1900), pp. 221-225*).—A brief discussion on culture tests with grains.

Corn culture, J. F. DUGGAR (*Alabama College Sta. Bul. 111, pp. 95-154, fig. 1*).—This bulletin is a record of the results of experiments in corn culture, comprising variety, fertilizer, seed, and culture tests. Similar work has been previously reported (E. S. R., 9, p. 828). The results obtained during several seasons are discussed and presented in tables. Of 36 varieties of corn tested from 1 to 5 years, no single variety stood at the head in productiveness for more than one year. Mosby gave the highest average yield of varieties grown 5 years; Shaw, of those grown 4 years; Cocke of varieties tested 3 years, and Renfre and Higgins head the list in the 2-year tests. Mexican June corn made a heavy growth of stalks and leaves, but gave an unsatisfactory yield of grain. Seed corn from Virginia seemed to be more productive than seed from Illinois, Delaware, Georgia, and Alabama. As in previous experiments, the difference in the yields obtained from planting middle, butt, and tip kernels were too slight to indicate any real superiority of seed from any particular portion of the ear. Owing to a wet season, corn planted in the water furrow of bedded plats gave small yields, and the method is considered practicable only in well drained, light soils. This season corn planted May 1, in ordinary upland soil, yielded nearly 30 bu. per acre, while a number of varieties planted July 13, on good soil, proved complete failures. In a comparison of medium and thick planting of corn, Golden

Beauty, an early variety, with very small stalks, showed the largest increase in yield due to thick planting, the average increase for 3 varieties being 1.7 bu. per acre. In another series of distance experiments, conducted in 1896 and 1897, the results of both seasons favor planting so that the distance in the drill nearly equals the distance between the rows. The results of cultivation experiments indicated that the first cultivation should be deep and that frequent cultivation should be continued late into the season. Among the different methods of harvesting, the best yields of grain and forage were obtained by cutting and shocking the entire plant, as compared with harvesting the ears alone, the tops and ears, and the leaves and ears.

The fertilizer experiments comprised tests with commercial fertilizers and a number of leguminous crops. Lime was found useless on sandy upland poor in humus and unprofitable on soil containing considerable vegetable matter. Cowpea and velvet bean vines plowed under were effective fertilizers for corn. Beggar weed, as a fertilizer, also increased the yield, but to a lesser extent than velvet beans. The stubble of cowpeas and velvet beans did not produce a residual effect equal to that of the vines. A comparison of hairy vetch, hairy vetch stubble, rye, and rye stubble as manures for corn showed a yield of 8.4 bu. where the rye was plowed under and 17.5 bu. per acre where vetch was used as green manure. Vetch stubble also gave better results than rye stubble. It was found more profitable to harvest vetch for hay and turn under the stubble than to use the entire plant as a fertilizer. Applications of 200 lbs. of cotton-seed meal and 434 lbs. of cotton seed per acre, furnishing equal amounts of nitrogen, were about equally effective. Tests conducted for 2 and 3 years with acid phosphate kainit and cotton-seed meal on sandy soil showed that the use of these fertilizers was unprofitable. On "mulatto" land, cotton-seed meal increased the yield of corn 7.9 bu. while acid phosphate and kainit were ineffective.

Cooperative experiments with cotton in 1899 and 1900, J. F. Duggar (*Alabama College Sta. Bul. 113, pp. 52*).—These experiments are in continuation of work previously reported (E. S. R., 11, p. 139). Of the cooperative soil tests made in 1899 and 1900 in 37 different localities of the State, including the station, 23 gave definite results and these are given in tables and discussed. The results of the rest of the experiments were inconclusive on account of certain vitiating conditions which destroyed their value for comparison. The fertilizers employed were the same as in previous experiments. The weather conditions for both seasons were very unfavorable. The results obtained by each experiment are given, but no conclusions are drawn.

Linseed and flax (*Queensland Agr. Jour., 8 (1901), No. 1, pp. 4-6*).—An article on the possibility of profitable flax growing in Queensland.

Crop and forage notes, 1900, F. C. Burtis (*Oklahoma Sta. Bul. 48, pp. 11*).—This bulletin contains a report of the crops under test at the station in order to determine suitable varieties, the best adapted soils, and the most desirable methods of cultivation. The grass garden at the station is described, and the results with the different grasses and clovers in 1900 briefly noted. Alfalfa was sown in 1898 and 1899 on two fields, but the growth of the crop was not permanent and the second and third year there was only a poor stand left. Rape drilled in rows 30 in. apart and cultivated yielded 23.5 tons of green forage per acre, and on plats where the rape was drilled 6 in. apart or drilled with oats, the yields were 11 and 12.5 tons per acre respectively. Field peas grown with oats yielded at the rate of 15 tons of green forage per acre. The sugar beets grown at the station were too low in quality for factory purposes. For several years cowpeas grown at the station farm as a catch crop after wheat and oats have given good results. A rotation and continuous cropping experiment was begun this season with corn, Kafir corn, and castor beans and the results obtained are noted.

Reports on experiments on the manuring of rye grass and clover hay in 1899, R. P. WRIGHT (*West of Scotland Agr. Col. Rpt. 1899, pp. 17*).—These experiments were conducted on 20 farms in 5 different counties of Scotland, for the purpose of comparing different forms of fertilizers applied in various combinations. The work and its results are discussed in detail and the data given in tables. The use of commercial fertilizers for rye grass and clover gave a large and profitable increase in yield, even in an unfavorable season. In a complete fertilizer applied in spring, superphosphate was more effective than basic slag. Potash was an effective constituent, and was found to be necessary on clays and clay loams, as well as on lighter soils. It was least efficacious on soils in a high state of fertility. As a constituent of a complete fertilizer, potash, at the rate of 1 cwt. per acre, is considered the most profitable. Sulphate of potash and muriate of potash proved to be equally suitable for these crops. A mixture of nitrate of soda and of sulphate of ammonia did not give better returns than either applied separately. Barnyard manure, used in conjunction with either of these nitrogenous fertilizers, resulted in a much larger increase in the crop than when applied alone.

Influence of manures on the botanical composition of grass land, W. SOMERVILLE (*Jour. Bd. Agr.* [*London*], *7* (*1900*), *No. 2*, *pp. 145–166*).—This report on fertilizer experiments on grass land shows that nitrate of soda when used with superphosphate repressed the growth of Agrostis and increased the yield of *Cynosurus cristatus*. When applied alone or with kainit only, the herbage produced was of an inferior type. Its use was unfavorable to the development of leguminous plants and *Plantago lanceolata*. Sulphate of ammonia, as compared with nitrate of soda, produced more Agrostis, *C. cristatus*, and *P. lanceolata* and less cocksfoot (*Dactylis glomerata*) and leguminous plants. Basic slag and superphosphate affected the growth of Agrostis and cocksfoot, but had no general influence on other plants. Superphosphate generally reduced the percentage of Agrostis and cocksfoot, and as compared with basic slag it produced much more Agrostis and less cocksfoot. Kainit markedly increased the yield of leguminous plants, while it decreased the yield of Agrostis. Lime was favorable to the development of *P. lanceolata* and unfavorable to the yield of Agrostis and *Holcus lanatus*.

Culture experiments with forage plants, A. SEMPOLOWSKI (*Deut. Landw. Presse*, *28* (*1091*), *No. 13*, *p. 100*).—Brief descriptions of cultural tests with the flat pea (*Lathyrus sylvestris*), sachaline, soy bean, giant clover "colossal ladino," Hungarian clover (*Trifolium pannonicum*), Siberian vetch (*Vicia sibirica*), hedge vetch (*V. dumetorum*), and red and white lupines.

Cultivation of fodder crops (*Agr. Jour. Cape Good Hope, 18* (*1901*), *No. 1, pp. 13–15*).—A general discussion of the subject.

The present condition of Russian hop culture (*Mitt. Deut. Landw. Gesell.*, *16* (*1901*), *Sup. to No. 6, pp. 37–41*).—An article describing the culture of hops in Russia and the conditions of production.

Experiments at Rothamsted on the changes in the composition of mangels during storage, N. H. J. MILLER (*Jour. Roy. Agr. Soc. England*, *3. ser.*, *11* (*1900*), *pt. 1, pp. 57–64*).—The author reviews the investigations of others on the losses which occur in Swedish turnips, sugar beets, and mangels, and presents the results of his own work with mangels. The mangels were selected from two fields fertilized alike with barnyard manure, basic slag, and sulphate of potash, but one received in addition nitrate of soda at the rate of 550 lbs. per acre. The beets were stored in a brick shed built over a well. They were covered with straw and samples taken for analysis from time to time. The following table shows the results of these analyses as regards changes in composition of the dry matter and percentage losses of organic matter:

Composition of stored mangels.

1898–99.	In dry matter.					Loss of constituents.			
	Organic matter.	Sugar.	Pentosans.	Nitrogen.	Ash.	Dry matter.	Organic matter.	Sugar.	Pentosans.
Series I (nitrated):	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
October 31	93.62	65.65	7.65	1.256	6.38	....	....	....	....
January 6	93.24	68.43	....	1.248	6.76	8.82	9.21	4.96	....
March 28	93.83	68.82	....	1.094	6.17	3.33	3.00	1.3	....
June 20	90.55	69.01	7.84	1.579	9.45	18.47	21.17	14.17	27.4
Series II (no nitrate):									
October 31	92.01	63.04	7.46	1.652	7.99	....	....	....	....
January 6	91.40	60.29	....	1.999	8.60	4.22	4.75	8.40	....
March 28	90.48	61.72	....	2.010	9.52	14.64	16.00	16.42	....
June 20	89.81	59.64	7.24	1.890	10.19	16.03	19.08	20.56	25.8
July 4	91.36	60.11	....	2.056	8.64	15.41	16.00	19.34	....

From the table it will be seen that the nitrate of soda apparently increased the loss of sugar in the beets during storage and likewise of some other constituents. The experiment is being continued.

Variety tests and fertilizer experiments with fodder beets, A. Arnstadt (*Fühling's Landw. Ztg., 49* (*1900*), *No. 22, pp. 835–839*).—The varieties compared, Tannenkrüger, Eckendorfer, and Oliven, yielded per morgen (about 0.6 acre) 30,240, 22,680, and 17,640 kg. of beets, and 3,600, 2,700, and 3,240 kg. of leaves, respectively. The Oliven variety yielded 18 kg. of leaves and the other 2 varieties 12 kg. to each 100 kg. of beets. The Tannenkrüger variety was grown from selected seed obtained directly from the seed grower, while the seed for the other varieties was home grown, and the author believes that this circumstance has had a greater influence on the yield than the variety itself.

The results of the fertilizer experiments show that an application of 50 kg. each of nitrate of soda and superphosphate per morgen in addition to a copious dressing of barnyard manure was insufficient to obtain the largest yield. By doubling these quantities the increase in yield was also doubled. The author observed that a lack in the soil of phosphoric acid not only decreased the yield of beets but retarded their ripening and increased their water content, which was injurious to their keeping qualities.

Report on experiments on the comparative merits of varieties of oats, R. P. Wright and A. N. McAlpine (*West of Scotland Agr. Col. Rpt. 1899, pp. 40*).—These experiments were carried out on 17 farms distributed over the center and southwest of Scotland. The object of the work was to determine the most profitable varieties and to ascertain the effect of climate and soil on their relative productiveness. The experiments and the results are discussed at some length and all the data obtained are given in tables or presented graphically. The varieties tested were Providence, Potato, Sandy, Hamilton, Longhoughton, Newmarket, Tam Finlay, Tartar King, Black Tartar, Pioneer, Waverly, Banner, Improved Ligowo, Abundance, Golden Giant, Siberian, and American Beauty, the last 6 varieties mentioned being Canadian sorts. Pot experiments were made with 12 of these varieties to study their tillering powers and to compare the number of full-sized mature shoots, immature dwarf shoots, undeveloped heads, and very immature shoots not beyond the leafy stage, produced by the different varieties. The weight of produce from each pot and the percentage of kernel, husk, and moisture and the yield of meal were determined and are given in tabular form.

In these tests Banner, Longhoughton, Potato, and Black Tartarian were the best grain-producing varieties and the Potato produced rather more straw, but its grain, although the yields were about the same, was somewhat inferior in quality as compared with Longhoughton. The total yield of the Banner was equal in weight to that of the Potato, but it consisted of less straw and more grain. Black Tartarian was inferior in every respect to Potato, although in some cases it produced exceptionally high and profitable yields. The Pioneer, a black variety, was about equal in yield of straw and grain to Black Tartarian, but inferior to it in quality and milling value. The most productive varieties of straw were Sandy and Tam Finlay. Sandy produced the heaviest total yield of all the varieties but Tam Finlay, and with a very poor yield of grain was distinctly inferior to it in value of crop. Hamilton yielded almost as large a total crop as Sandy and it had a higher percentage of grain, making it the more profitable variety of the two. For combined high production of grain and straw Hamilton proved an excellent variety. These three varieties, Tam Finlay, Sandy, and Hamilton, were resistant to the attacks of tulip root disease, which destroyed other varieties with the exception of Providence which partially resisted the attack. The Providence variety was inferior to Potato on account of its yielding much less grain. Tartar King ripened about 2 weeks earlier than any of the other varieties and Tam Finlay matured about 2 weeks later than this variety and one week later than Potato. The best grain-producing varieties mentioned in the order of total value of crop were: Banner, Longhoughton, Potato, Hamilton, Black Tartarian, and Pioneer, and the best straw-producing varieties given in the same order were: Hamilton, Longhoughton, Sandy, and Tam Finlay. Longhoughton, Potato, and Hamilton were about of equal value. The results further show that the quantity of seed sown per acre is determined to a considerable extent by the variety. It was found that Tartar King and Newmarket required a much heavier seeding than Potato. The different varieties did not differ so much in yield as in the relative production of straw and grain.

The soy bean as a forage and seed crop, C. S. Phelps (*Connecticut Storrs Sta. Bul. 22, pp. 20*).—This bulletin is a popular presentation of directions for the culture of the soy bean, with brief descriptions of the various uses of the crop. The nutritive value of the soy bean is discussed and compared with that of other plants. Figures giving the proportions of total and digestible nutrients of the different crops are compiled from different sources. The bulletin treats largely of work on the soy bean at the station, the results of which have already been published in other station publications.

Hill planting of sugar beets, E. Pluchet (*Sucr. Indig. et Coloniale, 57 (1901), No. 6, pp. 168–171*).—A paper on this subject read at the International Congress of Agriculture held at the Paris Exposition of 1900.

How the beet-sugar industry is growing, R. S. Baker (*Amer. Mo. Rev. of Reviews, 23 (1901), No. 134, pp. 324–328*).—A popular article on the beet-sugar industry in the United States, but discussing principally the condition of the industry in Michigan.

The production of sugar beets in the Province of Saxony and the yields of cereal crops in Eastern and Western Germany, Schulze (*Jahrb. Deut. Landw. Gesell., 15 (1900), pp. 186–196*).—A paper calling attention to the fact that the yield of sugar beets in Saxony is the same as in other German provinces, but that the yield of grain crops is smaller. The question of increasing the yields of cereal crops by different methods of fertilizing the soil is discussed.

German beet-sugar industry, G. H. Murphy (*Sci. Amer. Sup., 51 (1901), No. 1306, pp. 20933*).—A condensed report of the discussions at the 50th annual convention of the German sugar manufacturers, held at Magdeburg May 29 to June 1, 1900.

Prospects of beet-sugar production in Siberia (*Deut. Landw. Presse, 28 (1901), No. 11, p. 84*).

Geographical distribution of the culture of sugar-cane (*Sucr. Indig. et Coloniale, 57 (1901), No. 6, pp. 197–204*).—An article discussing the climatic conditions and limits of the culture of sugar-cane and its distribution in the different parts of the world.

Can wrapper leaf tobacco of the Sumatra type be raised in Connecticut? E. H. JENKINS (*Connecticut State Sta. Rpt. 1900, pt. 3, pp. 322–329, pl. 1*).—This article is a description of an experiment conducted in 1900 to determine whether wrapper leaf tobacco of the Sumatra type could be grown in Connecticut which would compare favorably with imported Sumatra. The tobacco was grown under a frame covered with cheese cloth, and the method of covering and constructing the frame are here described. The cultivation and care given the plants is described, and the advantages accruing from growing tobacco under cover are pointed out. Samples of the tobacco produced in this test were sent to tobacco dealers and experts, and the letters containing the expert opinion concerning the quality of the leaf are reproduced. The result of the experiment demonstrated that "tobacco of the Sumatra type can be raised in Connecticut which is equal in all respects to the average imported Sumatra."

Deep culture and intensive farming in Andalusia, L. GRANDEAU (*Jour. Agr. Prat., 1901, I, No. 7, pp. 209, 210*).—A report on tests of shallow and deep plowing, sowing broadcast and in drills, and using a fertilizer application of 400 kg. superphosphate, 200 kg. potassium chlorid, and 200 kg. sodium nitrate in growing cereals.

Cooperative fertilizer experiments in Lower Austria in 1899 conducted by the Royal Agricultural Society of Vienna, F. W. DAFERT (*Ztschr. Landw. Versuchsw. Oesterr., 3 (1900), No. 2, pp. 81–122, pls. 2*).—This is a report on extensive cooperative experiments with fertilizers for field crops and meadows.

Tropical plants at the agricultural school at Wageningen, C. J. VAN LOOKEREN CAMPAGNE (*Orgaan Ver. Oudleer. Rijks. Landbouwschool, 13 (1901), No. 151, pp. 24–29, figs. 5*).—A description of growing sugar cane, rice, and indigo plants under glass.

HORTICULTURE.

The farmer's vegetable garden, J. W. LLOYD (*Illinois Sta. Bul. 61, pp. 16, figs. 5*).—"In order to secure data regarding the amount of labor involved in the care of a garden and the amount of produce it would yield, a 'farmer's garden' was planted . . . and was managed with a view to furnishing a continuous supply of vegetables throughout the season." A succession of vegetables was obtained by planting varieties of different degrees of earliness, and by planting the same variety at different times. The garden was well cared for throughout the season, cultivation, weeding, and hoeing being given whenever it was found necessary, and these items charged up against the garden. Vegetables were planted in rows, so that horse cultivation could be used to the greatest extent. Diagrams are given showing the shape and arrangement of the garden and the period when each vegetable was in season. Cucumber beetles were controlled by spraying with Bordeaux mixture, and cabbage worms by spraying with white hellebore.

"If nothing is charged for the use of the land nor for the manure, the total cost of the garden may be summarized as follows: Seeds and plants, $5.45; insecticides, $0.50; labor, $26.11; total, $32.06.

"In return for this expenditure the garden furnished a continuous supply of fresh vegetables throughout the growing season, with enough sweet corn for drying, tomatoes for canning, cucumbers, peppers, cabbage, string beans and green tomatoes for pickles, besides onions, beets, carrots, parsnips, salsify, winter radishes, cabbage, and celery for winter use, and parsnips, salsify, and horse-radish left in the ground for use in the spring. . . . These vegetables could not ordinarily have been bought at retail for less than $83.84. This leaves a balance of $51.78 in favor of the garden. What other half acre on the farm would pay as well?"

Horticultural department, C. P. CLOSE (*Utah Sta. Rpt. 1900, pp. XXXIII–XLI*).—The author outlines the work of the year, giving the results of some experiments in forcing radishes and the irrigation of vegetables. The radishes were planted on a number of different soil mixtures, including leaf mold, sand, and manure mixed in various proportions, and the seed planted at various depths from $\frac{1}{8}$ to $\frac{3}{4}$ in. The results, which are tabulated, seem to indicate that plantings from $\frac{3}{8}$ to $\frac{3}{4}$ in. will be most satisfactory. The bed composed of equal parts of manure and sand gave better results than any other mixture. Wherever leaf mold was used the yield was reduced. In the irrigation of vegetables, comparison was made between flooding and applying in furrows. Onions, carrots, beets, potatoes, cabbage, and beans were grown. With the exception of the beans, the largest yields in every instance were obtained on the flooded plats. With onions this gain varied from 48 to 95 per cent, carrots 6 per cent, beets 6 to 46 per cent, potatoes 53 per cent, cabbage 4 per cent. It is thought that had furrows been run on both sides of the plats, instead of only one, the results for furrow irrigation might have been better.

Profitable celery culture, W. H. Jenkins (*Agr. Epitomist, 20* (*1901*), *No. 4, p. 22*).—In setting the plants the author uses a home-made device for making the holes and watering the plants. The machine is like a 2-wheeled cart with pegs placed 2 in. apart around the wheels. These make the holes. The cart carries a tank from which two pieces of hose lead the water down over the rows of holes made by the wheels. The plants are placed in the holes and the soil pressed firmly about them. With the aid of this machine the work of planting is reduced about one-half. The rows are grown 12 and 18 in. apart. A mulch of manure is put in the 18 in. space. The blanching boards are set up so that the two rows 12 in. apart are between the boards. This is a saving of one-half the boards usually used. White Plume and Golden Self Blanching are the varieties most suited for this culture.

Cucumbers, W. Iggulden (*Jour. Hort., 53* (*1901*), *No. 2738, pp. 233, 234*).—The forcing of cucumbers is discussed, the experience of the author being drawn upon.

Melons and melon houses, A. Dean (*Garden, 59* (*1901*), *No. 1531, pp. 214, 215, fig. 1*).—Details of a successful method of forcing muskmelons.

Fertilizer experiments with onions (*Jour. Soc. Nat. Hort. France, 4. ser., 2* (*1901*), *Mar., pp. 185, 186*).—Barnyard manure supplemented by complete commercial fertilizers produced larger onions than either alone.

Sweet potatoes, D. M. Nesbit (*U. S. Dept. Agr., Farmers' Bul. 129, pp. 40*).—A popular bulletin on varieties of sweet potatoes, production in different States, culture, fertilizing, storage, shipping, and exportation of sweet potatoes, with some recipes on methods of cooking, and a brief account of the injurious fungus and insect diseases affecting them, etc.

Saving sweet potatoes for seed (*Agr. Gaz. New South Wales, 12* (*1901*), *No. 2, p. 231*).—Seed potatoes were successfully stored by putting in a box with alternate layers of dry, fine sand.

A vegetation house arranged for pot experiments, W. E. Britton (*Connecticut State Sta. Rpt. 1900, pt. 3, pp. 306, 307, figs. 2*).—A brief illustrated description is given of a vegetation house conveniently arranged for carrying out pot experiments.

Chemical manures in the culture of greenhouse plants (*Belg. Hort. et Agr., 13* (*1901*), *No. 5, pp. 70, 71*).—Formulas are given for applying mixtures of commercial fertilizers to different kinds of greenhouse plants at different periods of growth, the mixtures to be applied dissolved in the water used for watering the plants.

On the use of commercial fertilizers for forcing-house crops, E. H. Jenkins and W. E. Britton (*Connecticut State Sta. Rpt. 1900, pt. 3, pp. 298–306*).—The results secured in plat experiments in the greenhouse with lettuce and carnations, in continuation of those previously reported (E. S. R., 12, p. 550), are given.

Lettuce (pp. 298–301).—Lettuce has been grown in rich sterilized and unsterilized compost, and in coal ashes and peat moss, with various fertilizers. The compost was sterilized by heating for 75 minutes in steam, by the same method noted in an earlier publication (E. S. R., 10, p. 265). The coal ashes used in 1898–99 were mixed with 8 per cent of peat moss, and both screened through a ¼-in. mesh. Commercial fertilizers were added to the plats made up of the coal ashes and peat moss. The same actual amount of nitrogen was given each plat, but 1 plat received it in the form of nitrate of soda, another in the form of cotton-seed meal, and the third in the form of ground bone. Muriate of potash was added to all 3 plats alike, and dissolved bone to the plats which had received nitrate of soda and cotton-seed meal.

The results secured are tabulated, and are summarized as follows: "The crops on the 2 plats of sterilized compost were uniform in quality and much larger and better than any from the 3 plats filled with coal ashes. Where nitrate was used the crop was the smallest; where cotton-seed meal was used the crop was larger by nearly one-quarter, and where bone was used the weight of crop was two and a half times as great as from the nitrate plat."

The following season (1899–1900) similar soils were used and the effect of lime studied. The best results were again obtained with sterilized compost. Of the 2 plats of unsterilized compost used, that to which lime had been added gave a greater total weight of crop and better heads than that on which no lime had been used. In the case of plats of peat and coal ashes fertilized with bone nitrogen, the addition of large amounts of lime (2,240 lbs. per acre) was of no benefit, a heavier yield and better heads being produced upon the plat limed at the rate of 650 lbs. per acre.

"In none of these plats was the lettuce of first-class marketable quality. The heads were not as compact and firm as they should have been, and we are convinced that the texture or mechanical condition, both of the compost and also of the ashes and peat moss, makes it impossible to produce the best lettuce on them, however skillful the fertilization of the soil or management of the house."

Carnations (pp. 301–306).—This experiment was planned primarily to test the effect of lime. Coal ashes were mixed with 5 per cent of peat moss, and both screened to pass a ¼-in. mesh. Six plats of this material were used, and each plat was given the same kind and quantity of commercial fertilizers. Two plats then received in addition 100 gm. each of unleached lime, two others 220 gm., and two others 340 gm. each. Five other plats were filled with compost, to which no fertilizers were added. Three, however, received 100, 220, and 340 gm., respectively, of lime. Daybreak, Portia, and Flora Hill were the varieties used. Top-dressings of nitrate of soda were added in some instances. The conclusions of the authors are as follows:

"It is evident . . . that 100 gm. of slacked lime per plat gave better results than a larger quantity when used with a soil of coal ashes and peat moss and fertilizer chemicals, and that where larger quantities were used the number of flowers was considerably decreased. This was true, both where the fertilizer was all mixed with the soil at time of setting the plants and also where doses of nitrogen were subsequently applied. In the compost soil the greatest number of flowers was harvested from plat 182, which received the maximum quantity of lime. Portia yielded better than Daybreak, averaging from 20 to 28 flowers per plant in the various plats. In no case did Daybreak yield over 18 flowers per plant.

"The chief differences noted from varying quantities of lime were in the varying number of flowers per plant rather than in any marked difference in the average size and weight of the flowers or in the length of stem. The stiffness of the stem was not noticeably affected by the lime."

Orchard notes, F. S. Earle (*Alabama College Sta. Bul. 112, pp. 157–190*).—These notes cover the season of 1900, and are similar in character to those recorded for previous years (E. S. R. 11, p. 1041). They are based on the behavior of the apples, figs, kaki or Japanese persimmons, hybrid oranges, peaches, pears, and plums, grown at the station during the season.

The station experiments show that it is possible to grow thoroughly thrifty, vigorous apple trees on the thin, droughty lands of the station if attention is given to proper cultivation and fertilizers. The station orchard is seeded to hairy vetch in the fall. The following March a strip 3 or 4 ft. wide is plowed each side of the tree rows, and kept cultivated after every rain, so as to form a dust mulch. The vetch in the middle of the rows is left until June, by which time it has ripened its seed and is able to reseed the land when plowed under. Cultivation of the whole area is then continued until the middle of July, when peas are broadcasted and cultivated in. The peas in 1900 made a good growth during the late summer and fall, and were allowed to rot on the ground. "As the peas began to die down the self-sown vetch seed began coming up, and by spring the orchard will be a solid vetch field." Under this treatment the mechanical condition of the soil is being rapidly ameliorated.

A list is given of rust-free varieties of apples, and of those attacked by the rust and the aphis. The green aphis has been controlled by the use of a commercial spray known as "Rose Leaf." Spraying the trees in winter with crude petroleum, for the purpose of destroying the aphis eggs, had no ill effects on the trees. "The effect on the lice, if any, was obscured by the general scarcity of them during the early part of the season." The following is a revised list of apples for general planting in Alabama, the varieties being given in the order of their ripening, and furnishing a succession of fruit from June until early winter: Yellow Transparent, Early Harvest, Red June, Red Astrakhan, Horse, Hackworth, Carter Blue, Thornton Seedling, Kinnard's Choice, York Imperial, Yates, Shockley, and Herschal Cox. Relative to apple growing in Alabama, the author states that—

"As a result of several years' observation and study it seems prudent to strongly urge the increased planting of apples in middle and northern Alabama. It must be fully understood, however, that apples will succeed here only with the best and most intelligent care and cultivation."

Celeste is considered by all odds the best early fig, and Green Ischia the best and most reliable late fig. Madeline is a good fig, ripening intermediate between these two. Tables are given showing the blooming period of 33 varieties of peaches and 43 varieties of plums. The various classes of plums are described and their value for the State noted. Japanese plums are considered the most important type of plums for the region. The following varieties of plums, mentioned in the order of their ripening, are given as the best varieties for general planting in Alabama: Kerr, Red June, Abundance, Burbank, and Orient. The necessity for mixing varieties in orchard planting, which bloom at about the same time, in order to secure fertilization of the blossoms, is pointed out.

The San José scale has been kept in control by spraying with a 20 per cent mechanical mixture of kerosene and water. Crude petroleum applied undiluted did not harm either apple or peach trees.

Orchard experiments, S. T. MAYNARD and G. A. DREW (*Massachusetts Hatch Sta. Bul. 73, pp. 3–9*).—Notes on the methods followed at the station in the culture, fertilizing, and spraying of apples, peaches, pears, grapes, blackberries, raspberries, currants, and strawberries are given. The yields obtained in 1900 with the different fruits are also given, together with a record of the cost of thinning, yield, and value of the fruit from Red Astrakhan, Early Harvest, Hurlbut, Baldwin, and Rhode Island Greening apple trees. In every instance the thinning was done at a financial profit. With Red Astrakhan, Baldwin, and Rhode Island Greening the yields were slightly better on the thinned than on the unthinned trees, while in the other 2 cases the yields were the same. The greatest average profit per tree ($2.05) was obtained by thinning Red Astrakhan. The profits for the other varieties ranged from 55 to 98 cts. per tree. The thinning was performed by employees unaccustomed to the work.

It is believed that with a large orchard and skilled labor the cost of thinning could be considerably reduced.

The varieties of peaches showing the greatest value were Mountain Rose, St. John, Early Crawford, Old Mixon, Champion, and Elberta. To this list Crosby and Dennis may be added for home use. Abundance and Burbank are among the most satisfactory Japanese plums grown, while the best of the American plums are Wild Goose, Hawkeye, Hammar, and Gold or Golden. Cuthbert and Loudon have given the best results with raspberries, with the King as the best early variety. Pomona is considered the best-flavored red currant, and the White Imperial the best among the white kinds. The 6 heaviest yielding strawberries were Sample, Glen Mary, Brandywine, Haverland, Clyde, and Ruby.

The chemical composition of one-year-old wood of orchard fruits according to the four cardinal points, R. OTTO (*Gartenflora, 50 (1901), No. 7, pp. 177–181*).—Branches from apples, pears, and cherries from the north, east, south, and west sides of the trees, respectively, and from the top, lower, and middle portions were taken, carefully dried, and ground into powder and analyzed with respect to dry substance, ash, and nitrogen content. The content of the ash in phosphoric acid, potash, and magnesia was also determined. The results of the analyses are tabulated and discussed. They show no regular variation whatever in the composition of the wood from the different parts of the tree as regards the cardinal points of the compass.

Apples of the Fameuse type, F. A. WAUGH (*Vermont Sta. Bul. 83, pp. 83–92, pls. 4*).—The Fameuse apple is taken as a central type of several different varieties of the Fameuse group, "all differing measurably from Fameuse, but all conforming closely enough to the Fameuse type so that their close relationship with one another and with the Fameuse may be readily recognized by the pomologist." The Shiawassee, McIntosh, etc., belong to this group.

In the opinion of the author, the Fameuse originated in Canada from seed brought from France between 1600 and 1650. It was introduced into Vermont from Canada about 1700.

The Fameuse is a favorite dessert apple almost everywhere, is a profitable commercial variety in several important apple-growing districts, the central being the island of Montreal, and has a strong tendency to reproduce itself from seed. The author states that St. Lawrence presents a closely related but separate type. Jonathan, too, is perhaps closely allied to Fameuse. Historical and descriptive notes are given of 12 varieties of apples belonging to the Fameuse group.

The Montmorency cherries, G. H. POWELL (*Amer. Gard., 22 (1901), No. 329, pp. 266, 267*).—The author considers the Montmorency cherry, Long-Stemmed Montmorency, and Montmorency Ordinaire all synonyms for the same variety, and is convinced that there is but one Montmorency in commercial orchards in America, the Montmorency called Ordinaire, by error.

The date palm for Queensland, T. M. MACKNIGHT (*Queensland Agr. Jour., 8 (1901), No. 3, pp. 197–202*).—A general article giving the habitat of the date palm, botany, methods of propagation and fecundation, treatment of fruits, food constituents, etc. It is believed that Queensland is well adapted to growing the better varieties of dates.

Figs under glass (*Jour. Hort., 53 (1901), No. 2738, p. 246*).—This article discusses the forcing-house management and best varieties of figs to grow under glass.

Analyses of the olive, F. BRACCI (*Staz. Sper. Agr. Ital., 32 (1899), p. 161; abs. in Centbl. Agr. Chem., 29 (1900), No. 10, pp. 673–675*).—Analyses of the wood, leaves, and fruit of the olive and the amounts of fertilizing ingredients removed per hectare are reported.

Pruning and training peach orchards, R. H. PRICE (*Texas Sta. Bul. 58, pp. 27–42, figs. 15*).—A series of cuts are given and explained which show proper and faulty methods of pruning the peach in Texas. The form which a tree assumes in a locality when grown out alone without pruning is believed to furnish a hint as to the correct method of pruning trees in the orchard. For Texas low-topped trees and heading back the ends of the limbs each year are advised. The purposes of pruning are thus succinctly stated by the author:

"If the ends of the limbs are not headed back the fruit will be borne farther away from the trunk of the tree each succeeding year. The limbs will become long and angling. The weight of the fruit on the ends of the long limbs will cause them to droop and frequently break or split off. If the fruit is not thinned off from them, many varieties will overbear one year and so exhaust the trees that they are not apt to bear the next year. Such orchards are liable to fruit every other year. During the heavy fruit year an overloaded tree will make but little wood growth on which to bear the following year.

"Heading back the ends of the young limbs accomplishes several important things: (1) It enables the tree to make new bearing wood for next year; (2) it thins the fruit; (3) it lessens the liability of splitting and breaking of the limbs by making them more stocky; (4) the fruit is borne near the ground, where it is easier to gather; and (5) it keeps the bearing wood nearer the main trunk by causing side branches to come out on the main limbs."

Relative to the Stringfellow method of root pruning, the author states that after careful observations with peach, plum, pear, and apple trees, grown at the station, he is convinced that the theory is not based upon sound physiological principles. The method, however, may have a local value, and wherever experience has proven this to be the case close root pruning may be followed. The principle, however, upon which the Stringfellow root system of pruning is based is not susceptible of wide application. Results secured at other experiment stations in root pruning orchard trees are quoted.

Peach growing in Maryland, H. P. GOULD (*Maryland Sta. Bul. 72, pp. 129–151, figs. 5*).—A discussion of the historical development of the peach industry in Maryland, its present status, the culture of the orchard, and the marketing of the fruit.

The first large peach orchard in Maryland was planted about 1800, in Anne Arundel County. It contained 18,000 to 20,000 seedling trees, and the product was used for making peach brandy. The canning industry came into existence about the middle of the century. At present there are about 3,000,000 trees in the State, five-sixths of which are in the 5 counties of Washington, Kent, Caroline, Anne Arundel, and Queen Anne. It is estimated that there are about 2,000,000 trees in bearing, and the product from these in 1900 was about 2,000,000 packages.

Complete directions are given for locating the orchard, preparing the soil, selection of varieties and stock, setting the trees, starting the top, intercropping, tilling, fertilizing, pruning, thinning the fruit, etc. Cowpeas have given the most general satisfaction in Maryland as a cover crop for peaches. Crimson clover has proven valuable in a few localities. It is believed that leguminous crops should be relied upon to furnish the nitrogen required in the production of the peach crop. A successful fruit grower of the State recommends that peaches for profit should be thinned to about 6 in. apart on a limb.

Relative to marketing peaches, commission men in Pittsburg, Baltimore, and New York unite in recommending the six-basket carrier for choice fruits, and larger size boxes for second-class fruit or culls. The practice of putting poor fruit in fancy packages is condemned.

Observations on the fertilization of peach orchards, E. H. JENKINS (*Connecticut State Sta. Rpt. 1900, pt. 3, pp. 352–354*).—An account is here given of the establishment, in 1894, of a peach orchard on a high hill of gravelly loam some miles from the shore of Long Island Sound. Different portions of the orchard were differently fertilized, and an account has been kept of the number of trees that have died and the number of baskets of fruit collected on the different plats. These are given in tabular form as a matter of record, but a discussion of the experiment is reserved until further results have been obtained.

Abnormal fruit branches of the peach tree, their treatment, G. BELLAIR (*Rev. Hort., 73 (1901), No. 6, pp. 136, 137, figs. 5*).—Popular article with illustrations showing proper method of pruning away abnormal fruit branches.

The sterility of fruit trees and shrubs, J. BURVENICH (*Bul. Arbor. et Flor., 1900, pp. 19–22, 51–54*).

Winter budding, H. M. STRINGFELLOW (*Nat. Nurseryman, 9 (1901), No. 4, p. 178*).—Winter budding is described and its adaptation for fall use pointed out. The author believes that success by this method is more certainly assured if a small piece of waxed cotton cloth is placed over the bud after it is put in place. Chlorosis of peaches and grapes has been overcome by the author by the addition of pulverized sulphate of iron. He believes that if several bushels of ashes and about 10 lbs. of copperas were top-dressed around a peach tree with the yellows it would probably cure it.

The chemical analysis of the coffees of the greater Comoro island, G. BERTRAND (*Compt. Rend. Acad. Sci. Paris, 132 (1901), pp. 161–164; abs. in Chem. Centbl., 1901, I, No. 9, p. 532*).—It was found that while grown upon the same island under like conditions of soil and climate *Coffea arabica* contained 1.34 per cent of caffein, while *C. humblotiana* contained none.

Coffee culture in Queensland—disbudding, H. NEWPORT (*Queensland Agr. Jour., 8 (1901), No. 2, pp. 112–114*).—Once in the life of the coffee plant, usually about the third year, it has been found advisable, in Queensland, to disbud. Only the green immature wood of the primaries need disbudding, and this should be done from 1 to 3 weeks after the blossoms appear. "Disbudding is required from the primaries whenever and only when they attempt to bear on immature or green wood. It is not necessary if the primary has secondaries upon it, and it is not necessary to disbud secondaries or any other form of branch." If, instead of disbudding, the immature wood is allowed to bear, the branches are weakened and die.

Coffee culture in Queensland—picking, H. NEWPORT (*Queensland Agr. Jour., 8 (1901), No 3, pp. 217–221, pl. 1*).—Directions are given as to when and how to pick coffee.

American tea-gardens; actual and possible, L. B. ELLIS (*Amer. Mo. Rev. of Reviews, 23 (1901), No. 134, pp. 315–320, figs. 8*).—A popular description of the tea plantation at Pinehurst, S. C., and a discussion of actual and possible results.

Bush fruits, including gooseberries, raspberries, blackberries, dewberries, C. H. POTTER (*Colorado Sta. Bul. 60, pp. 12*).—Brief cultural notes are given on these crops. Six varieties of gooseberries, 12 of currants, 23 of raspberries, and 12 of blackberries and dewberries are described, and the results secured at the station with each are given.

Brief sketch of vine growing in Russia and of measures adopted for combating the phylloxera (*Aperçu succinct sur les vignobles en Russie et sur les mesures adoptées pour y combattre le phylloxéra. St. Petersburg: Min. Agr. and Imp. Domains, Dept. Agr., 1900, 2 ed., pp. 40*).

Rupestris St. George and bench grafting, F. T. BIOLETTI (*Pacific Rural Press, 61 (1901), No. 14, p. 213*).—The unsatisfactory results obtained in the south of France on moist soils with Rupestris St. George are pointed out, and some data given on the yields obtained from bench-grafted vines and vines grafted in the vineyard for a period of 10 years. The average for the whole time was 7,340 lbs. of grapes yearly per acre for the bench-grafted vines and 4,660 lbs. for the vines grafted in the vineyard.

Flute graft applied to the vine, F. PAULSON (*Rev. Vit., 15 (1901), No. 382, pp. 409–411*).—The use of this graft in reconstructing vineyards on American stocks is coming into larger use, according to the author. Some of the advantages of the method are a longer grafting season—June to September—and a successful taking of the graft, averaging 90 to 95 per cent.

An experiment in vine topping, E. H. RAINFORD (*Queensland Agr. Jour., 8 (1901), No. 3, p. 205*).—In this experiment 20 vines were topped to about 12 in. length above the lowest bunch of grapes shortly after the berries had set, and twice afterwards when the laterals had made sufficient growth to allow it. The bunches on topped vines colored at least a week later than those on the vines not topped, and contained only 16.5 per cent of sugar, as compared with 20 per cent in the grapes grown on the normally treated vines. There was also decidedly less coloring matter in the skins. The results are believed to go some way toward proving that excessive topping is hurtful and not beneficial. The experiment will be continued the coming season.

A collection of reports on experiments in the application of fertilizers, and on the prevention of the Morell disease, C. H. CLAASSEN (*Versamel. Verslag. Rijk Gesubsidieërde Proefvelden, 1899–1900. Department Binnenlandsche Zaken (Netherlands), pp. 30*).—In each case the experiment was carried on by farmers or horticulturists under the direction of the official in charge of the work. The fertilizer experiments were conducted on an orchard, and rhododendrons, hyacinths, pole beans, roses, and grapes. Some of these experiments remain incomplete, and some for various reasons failed to give results. The fertilizer experiment in orchards planted with berry bushes showed a greater profit from the use of commercial fertilizer alone than from either stable manure alone or one-half stable manure with commercial fertilizer. The work on hyacinths was not satisfactory, though commercial fertilizer appears not to be well suited to them. The hyacinth disease appeared in some of the plats, but the figures do not show a clear relation between the fertilizer used and the disease. The disease of cherries caused by *Monilia fructigena* was kept under control by vigorous pruning. Both winter and summer pruning was practiced, with marked improvement in the health and growth of the trees.—H. M. PIETERS.

Something about nuts and nut growing, C. FORKERT (*Amer. Gard., 22 (1901), No. 329, pp. 270, 271*).—Brief notes on the propagation of pecans, with the results of a comparison of the weight of the shell and kernel of a dozen average sized nuts of pecans and English walnuts. The 12 walnuts weighed $4\frac{1}{4}$ oz., of which 2 oz. was meat, while the 12 pecans weighed 4 oz., and $1\frac{1}{8}$ oz. was meat.

Top-grafting native chestnut sprouts, W. E. BRITTON (*Connecticut State Sta. Rpt. 1900, pt. 3, pp. 307–310*).—In continuation of earlier work along this line (E. S. R., 12, p. 558), a further test has been made of the proper time for setting chestnut scions in Connecticut, and of the value of native sprouts as stocks upon which to graft the European and Japanese varieties of chestnuts. The tests were made on 3-year old chestnut sprouts, some of which had attained a height of 14 ft. and had produced burrs. Early frost and a protracted drought in midsummer severely interfered with the test.

Ridgely, Early Reliance, Coe, and McFarland were the varieties used. These were set by cleft-grafting at different times between April 20 and June 12. Two scions were usually set in each stock and the stocks were from 1 to $1\frac{1}{2}$ in. in diameter where cut off. The author states that if 1 of the 2 scions set in each cleft grew, or 50 per cent of the whole number set, it would be all that could be desired, since where both scions grow one should be cut off.

An examination of the data given shows that of the scions set, 50 per cent of Ridgely, 23 per cent of McFarland, 11 per cent of Early Reliance, and 30 per cent of Coe lived. If the percentage of stocks in which scions lived is made the basis of calculation, the percentages are as follows: Ridgely 70, McFarland 33, Early Reliance 22, and Coe 41. The good results in Ridgely are ascribed in part to its European origin, and in part to the fact that the scions were taken from young grafted trees in the vicinity of the station, and were in perfect condition, while the other scions were bruised and damaged by shipping. It is thought that better results would have been obtained with the Japanese varieties if the scions could have been cut from trees in the vicinity.

"A larger percentage of the scions of the Japanese varieties died after growth had commenced than of the European species. A few Ridgely scions were broken off by winds, but besides these only one stock lost Ridgely scions after their growth had begun, while 22 lost McFarland and 43 lost Coe scions which had already started to grow.

"The results of the work of 1900 confirm the conclusions reached in 1898, that the best time for chestnut grafting in Connecticut is about the middle of May, when the stocks are well advanced in foliage."

Of the scions set between May 11 and 25, 42 per cent lived, or stated differently, 60 per cent of the stocks carried living scions.

Pecans in Texas (*Fruitman's Guide, 10 (1900), No. 526, pp. 12, 13*).—A description is here given of the pecan industry of Texas, dealing more especially with the harvesting of the crop.

Raising Ficus elastica from the seed, P. Van Romburgh (*Teysmannia, 9 (1900), No. 7, pp. 351–353*).—Many of the seedlings used in the commercial plantings in Sumatra are obtained by keeping the ground under the trees free from weeds and collecting the seedlings that come up naturally. Seeds of *Ficus elastica* have also been known to germinate freely in the clefts of trees and on old roofs. In all cases the seedlings produced the tuberous thickening said to be characteristic of *F. elastica*. Seedlings for commercial purposes may be grown by sowing the very small seeds thickly on the surface of fine moist garden loam, in earthenware pots, which should be kept under cover. In favorable circumstances the seed will germinate in about 2 weeks, but often a much longer time is required. The young seedlings have tender, light-green leaves, and the nervation differs from that of the mature leaf. Great care is necessary to prevent damping-off. Before being planted in the place where they are to be permanently grown, the seedlings should be transplanted to the nursery and kept there for about a year.—H. M. PIETERS.

Rubber in Guatemala, J. C. McNally (*U. S. Consular Rpts., 65 (1901), No. 246, pp. 371–375*).—The culture of *Castilloa elastica* in Guatemala is popularly described, and estimates given regarding the industry. Good rubber land costs about $100 an acre. About 100,000 trees can be grown on 115 acres. The trees will bring in a return of $1 to $2 apiece, beginning with the seventh year of the plantation, and continue to produce idefinitely.

Hedges, C. L. Zimmerman (*Amer. Gard., 22 (1901), No. 330, p. 288*).—Suggestions on growing and forming hedges, and on the use of native material for the purpose.

Notes on cannas, F. K. Luke (*Rpt. Columbus Hort. Soc., 1900, pp. 150–159, pls. 3*).—Historical and botanical notes on cannas, with short descriptions of 57 varieties.

Ornamental climbers, W. R. Lazenby (*Rpt. Columbus Hort. Soc., 1900, pp. 85–88*).—Descriptive list of a number of climbing ornamentals.

A chat on daffodils, P. Barr (*Sydney: Hort. Assoc. New South Wales, 1900, pp. 18*).—Three papers on daffodils. The first gives some historical data on ancient and on modern daffodils; the second discusses the distinguishing characteristics of daffodils in their many forms and varieties; and the last discusses the production of new daffodils.

FORESTRY.

Third reunion of the International Association of Forestry Experiment Stations at Zurich, G. Hüffel (*Bul. Min. Agr. [France], 20 (1901), No. 1, pp. 148–180*).—An account is given of the meeting of the International Association of Forestry Experiment Stations, which was held at Zurich September 4–11, 1900, with representatives present from most of the continental countries of Europe. Since the previous meeting Russia and Sweden have announced their desire to officially join the association. The report gives a historical review of the association and its aims, and an account of the establishment of the Central Swiss Forestry Station and reviews some of its work. Descriptions are given of the Sihlwald forest, its sylviculture and management. The experiments recently inaugurated at Emmenthal to study the effect of forests on underground water are described briefly. These experiments have not yet progressed sufficiently far to warrant definite conclusions. Among the papers presented for general discussion were those dealing with geographic distribution of forest trees, the transmission by seed of the character of trees, diameter growth of trees, and the preservation of wood by chemical means. The next meeting of the association is to be held at Mariabrunn in 1903 or 1904.

Report of the forest experiment station in Mariabrunn for 1900, J. Friedrich (*Ztschr. Landw. Versuchsw. Oesterr., 4 (1901), No. 3, pp. 317–324*).—A brief report is given on soils and climatology, forest products, forest management, injury and diseases of forest trees, and forest technology. Notes are given upon the planting and present condition of a large number of exotic forest trees. The principal injuries reported are those due to smoke, gas, and similar causes. These are to be given special attention in a later publication.

National forestry, D. E. Hutchins (*Agr. Jour. Cape Good Hope, 18 (1901), Nos. 2, pp. 95–103; 3, pp. 163–173*).—This is a paper in which the forestry conditions of Europe and America are reviewed, and some of the advantages of governmental control of forests are pointed out.

The forest and its influence, J. G. H. Lampadius (*California Cult., 15 (1900), No. 5, pp. 65–68*).

The beech in Austrian forestry, F. Hufnagl (*Die Buchenfrage in der österreichischen Forstwirthschaft. Vienna: Wilhelm Frick, 1901, pp. 79*).

The Velani oak, Trabut (*Bul. Agr. Algérie et Tunisie, 7 (1901), No. 5, pp. 97–103, figs. 3*).—A description is given of *Quercus ægylops*, which is especially adapted to forestry conditions in Algeria. The growth of this tree presents no difficulties, and the author considers it a very valuable species for planting.

Selected trees suitable for shade, wind belts, timber, and fuel reserves, H. F. Macmillan (*Roy. Bot. Gard. Ceylon, Cir., 1. ser., 1900, No. 18, pp. 207–230*).

The world's demand for timber and the supply, R. Zon (*Forester, 7 (1901), No. 2, pp. 41–44*).—A review is given of a number of papers relative to the production, consumption, and supply of timber throughout the world. The average imports and exports of a number of countries are given, and in addition to the home production it is stated that Europe requires from 1,230,000,000 to 1,400,000,000 cu. ft. annually. This amount is secured largely from Austria-Hungary, Russia, Sweden, Norway, the United States, and Canada. As the consumption in some of these countries is almost equal to the production, the equilibrium at present is maintained almost entirely by the supplies obtained from Russia and Canada, and the supplies of these countries are estimated to last but about half a century, after which time there will be a scarcity of timber and as a consequence high prices.

Philippine forest products, F. F. Hilder (*Forester, 7 (1901), No. 2, pp. 27–33*).—A brief account is given of the forests of the Philippines, one peculiarity of them being that no single species of tree covers any great area, but in exploiting the forests in order to secure a cargo of any given kind of timber extensive regions will have to be called upon, as the species are poorly represented by individual specimens. A list of about 50 of the more important timber trees is given, their common and botanical names, together with descriptions of the characteristics of the different woods, notes on their uses, and the principal localities in which they are found. Some of the difficulties of lumbering in that country are pointed out, and as there is almost an entire absence of roads the exploitation of forests will prove expensive and difficult.

The preservation of timber by artificial means, J. H. M. HUME (*Agr. Students' Gaz., n. ser., 10 (1901), No. 3, pp. 74–79*).—The relative value of timber protected by artificial means against decay, and that receiving no special treatment, is shown. Among the various materials used for the preservation of timber, mention is made of paint, tar, varnish, sulphates of iron, zinc, and copper, chlorids of iron, zinc, and mercury, creosote, etc. The use of creosote for preservation of timber is preferred on many accounts, and the method of treating timber with this preservative is described at considerable length. Based upon the current market price of timber, the value of creosoted timber is increased fully 66 per cent for posts and 140 per cent for boards.

The harmfulness of bush fires, H. A. A. NICHOLLS (*Imp. Dept. Agr. West Indies, Pamphlet No. 4, 1901, pp. 29*).—The destructiveness of fires carelessly started or allowed to spread from intentional clearings is shown, and the author urges that severe means should be taken to prevent fires resulting from carelessness. The results of a number of fires, as shown in some of the now barren districts of Saint Dominica are cited as examples of the destructiveness of forest fires and the necessity for reforestation.

The protection of shade trees, E. H. JENKINS and W. E. BRITTON (*Connecticut State Sta. Rpt. 1900, pt. 3, pp. 330–351, pls. 9*).—This is essentially a reprint of Bulletin 131 of the station (E. S. R., 12, p. 957).

Study in Europe for American forest students, O. W. PRICE (*Forester, 7 (1901), No. 1, pp. 11–16, 38–41, figs. 4*).—The author reviews the characteristics of a number of the more prominent regions of Europe which are generally visited by students of forestry, and offers suggestions for the guidance of such students.

SEEDS—WEEDS.

Germination in distilled water, P. P. DEHÉRAIN and E. DEMOUSSY (*Compt. Rend. Acad. Sci. Paris, 132 (1901), No. 9, pp. 523–527*).—The irregularities shown in the germination of seed in distilled water have been observed for a long time, and in 1875 Bœhm published a memoir upon the subject in which he held that the irregularity was due to the absence of lime in the distilled water. He maintained that in the case of beans lime was essential for their germination. His observations are said to have been largely based upon the fact that seeds placed in spring water which contained various lime salts germinated readily, while those placed in the distilled water were either wholly retarded or germinated poorly. The authors have investigated this subject and claim that lime is not necessary to the utilization of the reserve material in the cotyledons of the plant and that beans will germinate readily in pure distilled water. A report is given of their experiments in which beans, lupines, and other seeds were germinated in water which had been twice distilled in a glass still. It is claimed that the experiments of Bœhm were conducted with water which had been kept in copper vessels, and that the amount of copper dissolved by the distilled water was sufficient to prevent germination. The authors conclude that seeds may form their roots and begin their evolution in water absolutely deprived of lime, and that the development of the roots may be checked in distilled water containing very slight traces of copper.

Experiments on increasing the germination of beet seed, Z. ZIELINSKI (*Ztschr. Landw. Versuchsw. Oesterr., 4 (1901), No. 3, pp. 140–143*).—An account is given of experiments to increase the germination of beet seed. Equal lots of seed were treated in different manners, after which they were germinated and comparisons made with similar lots of untreated seed. One lot was soaked for 6 hours in water; another for 15 hours; the third for 15 hours in sodium bichromate, and then 6 hours in water; the fourth was treated with sulphuric acid for 4 hours, after which they were placed in water for 6 hours; the fifth lot was rubbed with emery paper and soaked in water for 6 hours, and the sixth lot was soaked for 15 hours in a solution of concentrated sulphuric acid and sodium bichromate, after which the seeds were placed in water for 6 hours. These experiments were repeated a number of times, and the germinations counted at the end of the sixth and fourteenth days, with the result that in every case the treated seed contained less ungerminated seed bolls at the end of the 14 days than the untreated. In 3 experiments the percentage of ungerminated seed bolls was 39, 25, and 25, respectively. The highest percentage of germination was secured in the seed treated as indicated above for the sixth lot, in which there remained ungerminated at the end of 14 days 8, 6, and 8 per cent respectively. These experiments showed the possibility of increasing the germination of seed by treating them before planting.

Report of the seed-control station of Skara, 1899-1890, S. HAMMAR (*Ber. Verks. Skara Kem. Sta. Frönkontrolanst., 1900, pp. 25–31*).—A report is given of the various seed tests conducted at the laboratory between July 1, 1899, and June 30, 1900; the maximum, minimum, and average germinations of the different kinds of seeds being shown in tabular form.

A report of the seed-control station of Vienna for the year 1900, T. VON WEINZIERL (*Ztschr. Landw. Versuchsw. Oesterr., 4 (1901), No. 3, pp. 273–316*).—A detailed report is given of the investigations conducted at the station during the past year. The number of seed tests made showed a decided increase over those of the previous season. The usual data are given, showing the results of purity, germinability, presence or absence of dodder, the origin of seeds—particularly clover seed, and studies on numerous varieties of seed.

Seed separators, L. FONTAINE (*Rev. Vit., 15 (1901), No. 376, pp. 242–245, figs. 3*).—A description is given of a form of apparatus for the separation of seeds, the principle upon which it is based being the separation by size.

The influence of soil on the distribution of mistletoe and cuscuta in Belgium, E. LAURENT (*Bul. Agr. [Brussels], 16 (1900), No. 6, pp. 457–510, pls. 5, map 1*).—The author has made an extensive study of the distribution of these 2 parasites in Belgium. The mistletoe is reported as occurring on 122 species of plants, a list of the host plants being given. The soils of Belgium are briefly described, particular attention being paid to the lime and magnesium content. While the mistletoe is not entirely confined to calcareous soils, it is found most abundant in those soils containing 1 per cent or more of lime. The same distribution is indicated for the cuscuta. Studies were made on the relation between the composition of the ash of mistletoe and the ash of its host plant, and it was found that there was no direct relation between the two. However, the mineral substances present in the ash of the mistletoe depend upon the host plant and the nature of the soil. In the course of his investigations the author was led to examine into the cause of the infrequent occurrence of the mistletoe upon pear trees, and he claims to have found that the mistletoe secretes a toxic substance which is destructive to many varieties of pear trees. Inoculation experiments were made with the juice obtained by grinding up the mistletoe in a mortar and adding distilled water to the mixture, and when a portion of the mixture was introduced through the bark of the pear tree it set up an infection that was healed with great difficulty or remained as a place for the entrance of the spores of various fungi. When the liquid was heated for 5 minutes at a temperature of 120° C., the wounds were quickly healed, just as was the case when distilled water was injected into the plant. The study of the cuscuta is not reported in the same detail as that made with the mistletoe. Its distribution seems to be governed by the same biological factors as the mistletoe, being most abundantly present upon calcareous soils.

Destruction of charlock (*Jour. Bd. Agr. [London], 7 (1900), No. 3, pp. 353, 354*).—An account is given of experiments conducted under the direction of the agricultural department of the University College of North Wales, in which 3 plats of ⅛ acre each were sprayed with copper sulphate solutions, 2, 3, and 4 per cent solutions being used. The amount of solution applied was at the rate of 50 gal. per acre. The applications, while not entirely satisfactory, destroyed about 60 per cent of the weeds without any permanent injury to the cereal crop over which it was sprayed. Grass and clover seedlings growing in the grain were unaffected by the treatment, and in one instance appeared to have been improved by the application. While not altogether favorable, the results are thought to have more than repaid the expense of the operation, and if this were persisted in for a number of years the weeds would be ultimately eradicated.

DISEASES OF PLANTS.

Notes on the life history of certain Uredineæ, M. A. Carleton (*Abs. in Science, n. ser., 13 (1901), No. 320, pp. 249, 250*).—Notes are given on some investigations of rust fungi conducted by the author. In the case of *Uromyces euphorbiæ* it was demonstrated that this rust is able to propagate itself constantly through the germinating seed of its host and in this way becomes practically a perennial species. As far as known this is the only demonstrated example of this method of propagation among the rust fungi. Culture experiments with the common sunflower rust showed that the Puccinia and Æcidium found on the sunflower are stages of the same species, and it is probable that all the species of Helianthus bear the same rust and that they have no distinction of host forms. The author reports having succeeded in germinating the peculiar thick-walled, one-celled spores of *Puccinia vexans*. These spores are shown to be neither uredospores nor teleutospores, but partake of the nature of both. They seem to be a distinct type of spore form and the author proposes for such spores the name amphispores. Experiments by the author have shown that *Æcidium tuberculatum* is a perennial species in its perennial host *Callirrhoe involucrata*, producing spores able to germinate during the coldest winter.

A tabular review of the Swedish cereal rusts, J. Eriksson (*Ztschr. Pflanzenkrank., 10 (1900), No. 3–4, pp. 142–146*).—A review is given of investigations by the author on the specialization of rust fungi, in which the hosts of the different form species are indicated. Following the classification given by the author, it appears that *Puccinia graminis secalis* occurs on rye, barley, *Triticum repens*, *T. caninum*, *T. desertorum*, *Elymus arenarius*, and *Bromus secalinus;* form *avenæ* on different species of Avena, orchard grass, meadow foxtail, millet, *Lamarkia aurea*, and *Trisetum distichophyllum;* form *tritici* on wheat; form *airæ* on *Aira cæspitosa;* form *agrostis* on various species of Agrostis; and form *poæ* on *Poa* spp. *Puccinia phlei-pratensis* is found on timothy and *Festuca elatior*. *P. glumarum* in different forms occurs on wheat, rye, barley, *Elymus arenarius*, and *Triticum repens*. *P. dispersa* is found only on rye, and *P. triticina* upon wheat. *P. bromina* occurs on a number of species of Bromus, *P. agropyrina* upon *Triticum repens*, *P. holcina* on *Holcus lanatus* and *H. mollis*. *P. triseti* is found upon *Trisetum flavescens*, and *P. simplex* upon barley only. *P. coronifera*, form *avenæ*, occurs on oats; form *alopecuri* upon *Alopecurus* spp., and form *festucæ* upon *Festuca elatior*. *P. coronata calamagrostis* attacks *Calamagrostis* spp., and form *agrostis* is reported on species of Agrostis. For many of these species the æcidial host is unknown.

Culture experiments with a rust fungi, H. Klebahn (*Jahrb. Wiss. Bot. [Pringsheim], 34 (1900), No. 3, pp. 347–404; abs. in Bot. Ztg., 2. Abt., 58 (1900), No. 9, pp. 130, 131*).—Culture experiments with a number of species of rust fungi are reported. A number of species of Melampsora occurring upon willows were studied. Formerly all these species were grouped under *M. salicis*, but a number of forms are now recognized. Four have their cæoma stage on *Larix decidua*, one on *Ribes* spp., one on *Euonymus europæa*, and one on *Orchis latifolia*, and other species of orchids.

Melampsora amygdalinæ proved to be autœcious, occurring in both forms upon *Salix* spp. The experiments with the Puccinia of Carex showed its æcidial to be passed upon species of Ribes. The complex biological group of Puccinias found on *Phalaris arundinacea* were investigated and their æcidial hosts determined. *P. phalaradis* has for its æcidial host *Arum maculatum*. *P. sessilis*, including the form *digraphidis*, has for its æcidial hosts various species of liliaceous plants, and *P. orchidearum* upon several genera and species of orchids.

Seed treatment for the prevention of bunt of wheat (*Jour. Bd. Agr.* [*London*], *7* (*1900*), *No. 3, pp. 352, 353*).—A brief account is given of experiments in which seed of wheat badly affected with smut (*Tilletia caries*) was treated with a solution of copper sulphate at the rate of 1 lb. to 1 gal. of water. This amount of solution was used upon 4 bu. of wheat, being poured over the grain and thoroughly stirred. The resulting crop was entirely free from the disease, while an adjacent plant, grown from a similar lot of untreated seed, gave 4.66 per cent of badly smutted stalks.

Potato scab and its prevention, L. R. Jones and A. W. Edson (*Vermont Sta. Bul. 85, pp. 111–120, figs. 2*).—The cause of the potato scab, its occurrence and appearance, are described in a popular manner. The development and spread of the organism through the soil is shown, and the relative resistance of a number of varieties of potatoes pointed out. Means for prevention of the potato scab are described, among them soil treatment of different kinds, such as rotation of crops, proper selection of fertilizers, use of fungicides on the soil, etc. The disinfecting of seed potatoes as a means for the prevention of the disease is described, soaking them in corrosive sublimate or formalin solutions being recommended. The effect of formaldehyde gas was investigated to a limited extent, and the authors believe that it will prove an advantageous method of treating potatoes for the prevention of scab.

Potato blight and its treatment, D. A. Brodie (*Washington Sta. Bul. 46, pp. 15, figs. 5*).—The author gives a popular description of the fungus *Phytophthora infestans*, which is a cause of considerable injury to the potato crop in his region. The results of experiments in which plants were sprayed with Bordeaux mixture are given. The average increase of the sprayed over the unsprayed areas was nearly 37 per cent. The sprayed plants remained green much longer and were not as severely injured by the ravages of cutworms, which proved very destructive. It is recommended that spraying should begin about the middle of June, and the applications be repeated every 2 weeks during the growing season. Directions are given for the preparation of the Bordeaux mixture.

Unsatisfactory growth and premature death of cane as the result of root disease, Z. Kamerling and H. Suringar (*Reprint from Arch. Java Suikerind., 1900, No. 18, pp. 24*).—A disease of sugar cane that has caused much loss and is commonly known as "dongkellanziekte" was found to consist of 2 diseases, a root rot and another root disease. The latter has its center in Djoca, while the root rot has appeared all over Java and is especially bad along the seacoast. Inquiry among sugar planters has shown that this disease is most destructive on plantations that have been in operation for more than 40 years; that on plantations opened between 1860 and 1880 there is but little root rot, and that those established since 1880 are practically free from it.

It is therefore a trouble met with only on ground that has been long used for growing sugar cane. It is claimed to be the result of soil exhaustion, which is probably dependent upon a change in the physical condition of the soil. Facts to sustain this theory will be given in a future paper.—H. M. PIETERS.

Observations on the mosaic disease of tobacco, A. F. Woods (*Abs. in Science, n. ser., 13* (*1901*), *No. 320, pp. 247, 248*).—As a result of numerous experiments conducted by the author, it is stated that the mosaic disease of tobacco can be artificially produced in a number of ways, as by cutting back plants at any stage of active growth, by repotting or transplanting a plant during active growth and thus stimulating a rapid root development, and by injecting the sterilized juice of diseased plants into a growing bud or pouring it upon the roots of a sound plant. The same disease has been produced by the author on tomatoes, potatoes, petunias, phytolacca, violets, and other plants. The disease seems to be due to a disturbance in the balance between the oxidizing enzyms and the availability of reserve foods of the plant. The introduction of the enzym present in the sterilized juice sets up a series of pathological changes in which the normal enzym of the cell is greatly increased and the availability of the reserve foods decreased. It is believed that the diseases known as peach yellows and the California vine disease are to be similarly explained, and dieback of the orange may also be due to this cause.

Spraying for asparagus rust, F. A. Sirrine (*New York State Sta. Bul. 188, pp. 233–276, pls. 12*).—Notes are given on the history and distribution of the asparagus rust (*Puccinia asparagi*), together with descriptions of the various stages of its life history. The various recommendations that have been given for the control of this disease are reviewed at some length. Burning the infested brush, which has been recommended by a number of writers, is said to be in some cases detrimental, especially if the brush is cut and burned early in the season. This tends to weaken the plants, and if continued would greatly depreciate the crop. The value of resistant varieties is considered, and while some varieties seem less subject than others, there is as yet apparently no variety which is not liable to attack. Soil conditions, as described in Massachusetts Hatch Station Bulletin 61 (E. S. R., 11, p. 159), are reviewed, and the author believes that fogs and dews probably play an important part in the spread of the disease, at least in the region covered by his investigations. Spraying for the prevention of the disease has been recommended by some writers, and the author conducted a series of experiments in which plants were sprayed with Bordeaux mixture containing resin, 3 applications being given. This fungicide was prepared by adding to a 1: 8 formula of Bordeaux mixture a resin mixture composed of 5 lbs. resin, 1 lb. potash lye, 1 lb. fish oil, and 5 gal. of water. This was thoroughly sprayed over the plants in August and September, and the effect upon the subsequent crop noted. The yield of bunches in 1899 was increased 69.5 per cent in the sprayed over the unsprayed plants, and in 1900 a gain of 48 per cent was reported. This fungicide adheres quite readily, and with a thorough application will doubtless prove valuable in combating this disease. The parasitic fungus *Darluca filum* was noticed abundantly, but it has never been observed attacking the winter spores of the rust, and there appear to be indications that this parasite will not materially check the disease where asparagus is grown in large quantities.

A form of power sprayer especially devised for spraying asparagus is described at considerable length. The apparatus is not patented, and it is described in sufficient detail so that any one desiring can manufacture a similar implement.

Protecting asparagus, F. H. Hall and F. A. Sirrine (*New York State Sta. Buls. 188 and 189, popular ed., pp. 14, figs. 5*).—This is a popular summary of bulletins 188 and 189, giving directions for spraying for the prevention of fungus and insect pests.

An investigation on damping off of seedlings, V. Peglion (*Staz. Sper. Agr. Ital., 33 (1900), No. 3, pp. 221–237*).—The fungi usually believed to cause damping off are *Phytophthora omnivora* and *Pythium debaryanum*. In addition to these, the author finds that a number of other fungi attack seedlings in the same manner. Among them are mentioned *Botrytis cinerea*, *Thielaria basicola* and *Phoma beticola*. The action of these different fungi upon the plant is described, and experiments for preventing their attacks are outlined. The author conducted a series of experiments in disinfecting soils by means of heating and by application of carbon bisulphid and formalin. Soil that was known to be infested with *Pythium debaryanum* was heated to 60 and 100° C. and was treated with various amounts of carbon bisulphid and 20 and 30 per cent solutions of formalin. The soil was afterwards seeded to Camelina, which is known to be very susceptible to attacks of this fungus. In every case the treatment had beneficial effect in reducing or totally prohibiting the action of the fungus.

On the diseases of mushrooms and their prevention, G. Delacroix (*Bul. Min. Agr.* [*France*], *19* (*1900*), *No. 5, pp. 889–899*).—A report is given on studies made by the author in the vicinity of Paris of the diseases to which mushrooms are subject. The most serious one is due to a fungus *Mycogone perniciosa*. Its method of attack is described and experiments reported in which various possible means for prevention has been investigated. Sulphate of copper, sulphate of iron, boric acid, and limewater were without effect, while thymol and lysol were found to be valuable in preventing the disease. Lysol, on account of its ready solubility in cold water, is to be preferred. A number of insects which are injurious to mushrooms in the caves are briefly described. Notes are also given on a number of other pests which are more or less troublesome in mushroom growing. One of the most serious troubles in mushroom growing is to prevent the entrance of other species of fungi which are of little or no value, such as *Clitocybe candicans* and *Pleurotus mutilus*. Attacks of *Monilia fimicola* are also mentioned, as well as that of the parasite, *Myceliophtora lutea*. For the prevention of these troubles the author recommends the thorough sterilization of the mushroom beds and spraying around them with some good fungicide, after which the spawn is planted.

A fruit disease survey of western New York in 1900, F. C. Stewart, F. M. Rolfs, and F. H. Hall (*New York State Sta. Bul. 191, pp. 291–331, pls. 4*).—The results of a survey of the western part of the State of New York, embracing 18 counties, are given. The data were obtained in the same manner as those secured for the survey of the Hudson River Valley the previous year. Circulars of inquiry and personal visits were made to different parts of the State, and the amount of damage done by the more common fruit diseases was estimated. Among the apple diseases observed were scab, leaf spot, fruit spot or Baldwin spot, fire blight, canker, crown gall, "hairy root," powdery mildew, and rust. The canker observed is attributed to 3 different organisms, and the authors believe that when more fully understood the apple canker will be found to be caused by at least three distinct organisms, which are strikingly similar in their grosser characters, and as yet have not been sufficiently differentiated to distinguish them without microscopical examination. Of these, the canker caused by *Sphæropsis malorum* is the most troublesome, and a disease hitherto unreported, caused by a species of Cytospora, is the least injurious. Investigations were made to determine the possible identity of Sphæropsis with *Macrophoma malorum*. These fungi differ principally in the character of their spores, but the authors believe that they are entirely distinct. The crown gall was found to be confined chiefly to young trees in the nursery, and it is recommended that all trees showing any trace of the disease be rejected. The "hairy root" disease was observed while examining nursery stock for crown gall. The affected trees have few if any large branch roots, the root system consisting of a multitude of small rootlets which spring from the somewhat thickened main root, giving it a bushy or hairy appearance. This disease has been known for 40 or 50 years among nurserymen, but is seldom sufficiently abundant to cause appreciable loss. Affected seedlings are usually rejected. No cause is known for this trouble.

Among apricot diseases noted are collar rot, injury of trunks and branches, brown spot, and fruit rot. The collar rot is one of the most destructive of apricot diseases. The affected trees show dead bark for a distance of 3 or 4 in. above the union or collar. On recently destroyed trees the injury never extends below the union. As a rule, affected trees wilt rather suddenly during the summer, after having put out their leaves in an apparently normal manner. This disease is not confined to any particular part of the orchard, or to any locality, and so far no satisfactory cause has been observed for it.

Of blackberry diseases observed, the rust, leaf spot, and cane knot were the most destructive. The rusts of blackberry are usually called the orange rust and the white rust, from the nature of the fungus attacking the plant. A report is given of a third which is called the yellow fall rust. This disease is due to *Uredo mülleri*. The fungus does not appear especially severe in its attack and there is no cause for alarm at its occurrence.

The fruit rot, black rot, witches' brooms, and leaf scorch of cherries are reported, and the occurrence of a new fungus on cherry branches is mentioned. This fungus (*Cryptosporium cerasinum*), while occurring rather frequently, is probably not parasitic.

The diseases of currants and gooseberries observed were cane blight, leaf spot, and powdery mildew.

The vineyards of western New York were found to be remarkably free from disease during the season. The black rot and downy mildew were destructive only in a few localities, and the powdery mildew and anthracnose were exceedingly rare. In several localities green grapes showed russet bands and blotches on their skin, which were attributed to weather conditions, probably a light frost after the fruit had set. On many of the russeted fruits one or more seeds were sometimes exposed, and this is believed to be due to the same cause as that producing the russet spots upon the fruit.

Of peach diseases the occurrence of leaf curl, yellows, little peach, brown spot, and a disease of peach trees in the nursery cellar, are among those noted. The brown spot is attributed to the fungus *Helminthosporium carpophilum*. This fungus begins its attack while the fruit is still green, but is most conspicuous on the ripe fruit, where it appears in the form of pink spots and cinnamon brown areas. The spots at first are quite small, and in time a number coalesce, forming irregular areas of cinnamon brown color, the pink discoloration almost entirely disappearing. What appears to be the same fungus was found on the branches of the peach tree, and it is believed that the fungus causing the brown spot is not only parasitic on the twigs, but occurs sometimes on the leaves and knots of the trees. Whether parasitic on leaves or not was not determined. The fungus is known also to attack the apricot fruit. The disease of peaches reported from the nursery cellar was observed in the winter of 1899–1900. The cellar contained about 10,000 peach trees trenched in sand after the usual manner. Some of the trees were wet when put in the cellar, and the sand stuck to the branches. Early in January, it was found that 15 per cent or more of the trees showed dead sections of 1 to 4 in. on the limbs to which there was adhering sand. A fungus was associated with the disease, but failure to produce mature forms made its identity uncertain.

Among the diseases of pear observed are fire blight, leaf scorch, body blight or canker, injury due to winter and drought.

Of the plum diseases, the fruit rot, sun scald, canker, and gum pockets, were the most frequently observed. Associated with the fruit rot on the mummy plum was a fungus which, it is thought, does the twig little or no harm. The species has been identified as *Coniothecium sociale*. The canker of the plum is similar to that described on the apple as due to a species of Cytospora, but the fungus on the 2 different trees seems to be distinct. The same or a similar species has also been observed on apricot and peach. Inoculation experiments were made with spores from a pure culture made from the canker on a Japan plum, in which the disease was readily communicated.

The leaf blight, canker, and powdery mildew of quinces are reported as causing considerable damage, and a number of other diseases occurring less frequently than usual.

A peculiar form of raspberry anthracnose, due to *Glœosporium venetum*, is described. Ordinarily the anthracnose rarely attacks the red raspberries, but during the season it was observed as decidedly injurious to the Cuthbert variety of red raspberry, upon which knots of various sizes were produced. These were of a rough spongy texture, often twice the diameter of the normal cane. When examined late in the summer, the knots were found to be intimately associated with the anthracnose. Similar knots are reported on the variety Thompson, and it is thought that these knots are a peculiar manifestation of the ordinary anthracnose. The raspberry rust, powdery mildew, cane blight, and leaf spot are reported as injuring the crop to some extent.

New or rare fruit diseases in western New York, F. H. Hall and F. C. Stewart (*New York State Sta. Bul. 191, popular ed., pp. 11, pls. 3*).—This is a popular summary of the above bulletin.

A rhizomorphic root rot of fruit trees, E. M. Wilcox (*Oklahoma Sta. Bul. 49, pp. 32, pls. 11*).—The results of investigations by the author on the cause of the root rot of fruit trees are given. This particular disease has been observed for some time occurring in the territory, and is due to one of the mushroom fungi. The distribution of this root rot throughout Oklahoma and the United States is traced, from which it appears to be a widely scattered disease. The most characteristic effect of the attack of the fungus is a great exudation of gum about and from the crown of diseased trees. This gum flow occurs in apple, peach, and cherry trees, according to the author's observation, and is reported in apricot and others. It sometimes happens that the amount of gum exuded is so great as to form a mass of cemented soil about the tree. The leaves are usually discolored, the yellow coloration being one of the prominent symptoms of the disease. In some cases, however, the leaves wilt rapidly during the growing season instead of becoming yellow, and this rapid wilt is the first indication of the disease. Upon examination of trees affected by the disease, typical rhizomorphic strands will be found adhering to the roots. The groups of sporophores, or—as they are commonly called—toadstools, about the base of the tree is positive evidence of the presence of the disease. The changes in the wood caused by the fungus are described, and its spread is said to be through the production of abundant spores and through the spread of the mycelial strands in the soil.

The fungus causing this disease is said to be new, and the name *Clitocybe parasitica* is given it. The technical characteristics are described and remedial and preventive measures suggested. If a single tree is found to be diseased it is recommended that a ditch be dug completely around it at a distance of about 10 ft. The ditch should be about a foot wide and 2 ft. deep, with vertical walls. This will prevent the spread of the fungus through the soil. All infested fruit trees should be removed and burned. This, together with the ditch about the place where the tree has stood, will generally prevent the further spread of the disease. The fungus has also been found to be parasitic upon various species of oak, and these should be treated in the same manner when occurring in or near orchards. Orchards should not be planted on soil known to contain old oak stumps or roots, as they may be affected and spread the disease to the trees when planted. An extensive bibliography on the subject completes the bulletin.

A root rot of fruit trees, E. M. Wilcox and O. M. Morris (*Oklahoma Sta. Bul. 49, popular ed., pp. 11, pls. 2*).—This is a popular summary of the bulletin noted above.

Preliminary report on bitter rot or ripe rot of apples, J. T. Stinson (*Missouri Fruit Sta. Bul. 1, pp. 21*).—A description is given of the ripe or bitter rot of apples, caused by *Glœosporium fructigenum*, together with the results of experiments on the prevention of the disease. The varieties used were Ben Davis and Huntsman, both of which are believed to be especially subject to the disease. Bordeaux mixture was used, from 3 to 5 applications being given the trees. The fruit on the sprayed trees was about 10 days later in ripening than upon the unsprayed trees. The leaves remained on the sprayed trees until after the fruit was gathered, and the percentage of diseased fruits was greatly reduced by the treatment. A circular was sent out by the author to fruit growers in his vicinity to ascertain the extent of the disease and what means were taken to combat it. The results of his inquiry indicate that the disease was rather widely spread and occasioned considerable loss. But little has been done for its prevention in the region covered by the inquiry. The author recommends thorough spraying with Bordeaux mixture or other good fungicide, and gives formulas for their preparation and directions for their application.

The cause and cure of canker in apple and pear trees, P. PASSY (*Gard. Illus., 22 (1900), No. 1134, p. 517*).—The canker, which is said to be a serious disease affecting the branches and stems of fruit trees, especially apple trees and sometimes pears, is due to *Nectria ditissima*, the parasitic nature of which is fully established. The author states that different varieties of apples vary in their susceptibility, some being almost entirely unaffected by the disease; others, like Reinette du Canada, are especially susceptible to it. By experimental inoculations, it was found possible to produce the disease upon a variety of pear with conidial spores taken from another pear tree. As means for the prevention of this disease, the author states the best way is to burn all diseased branches. Where this can not be done, the cankers should be cut out, removing every part attacked by the parasite, together with a portion of the sound wood, and treating the wood with a strong antiseptic, such as Bordeaux mixture, iron sulphate, etc.

The Monilia disease or twig blight of apples and pears, H. MÜLLER-THURGAU (*Centbl. Bakt. u. Par., 2. Abt., 6 (1900), No. 20, pp. 653–657*).—According to the author, during the past season, in May and June, there appeared in the orchards of various parts of Switzerland a serious disease, in which the twigs of apple trees in particular were attacked. There was observed to be some difference in the susceptibility of different varieties, a few escaping serious injury. Shortly after blooming, here and there a twig was seen to wilt. As the disease progressed, others were affected, until half or more of the newer twigs were affected. Examinations of the diseased twigs showed that they were infested with a fungus which is determined as *Monilia fructigena*. The sudden and unusual occurrence of this fungus is attributed partially to frost injuries, although the parasitism is established in a number of instances. As a means of prevention, it is recommended that all the diseased twigs be cut back into the sound wood, and during the winter all material, such as leaves, mummy fruits, etc., which carry the spores, should be collected and burned.

Peach foliage and fungicides, W. C. STURGIS (*Connecticut State Sta. Rpt. 1900, pt. 3, pp. 219–254, pls. 3*).—On account of the serious injury which frequently follows the use of fungicides on peach foliage, the author has conducted an extensive series of experiments in which Bordeaux mixture of different strengths, soda-Bordeaux mixture, ammoniacal copper carbonate solution, copper acetate, and potassium sulphid were tested. The amount of copper present in the Bordeaux mixture varied from 1 to 5 lbs. to 50 gal. of water. The copper-acetate solutions were composed of normal copper acetate as well as the subacetate. The result of spraying these different mixtures on the peach foliage are discussed at some length. Upon peach trees the use of Bordeaux mixture containing more than 2 lbs. of copper sulphate to 50 gal. of water proved injurious to the foliage and to the fruit. Similar effects were observed where the soda-Bordeaux mixture was used, some strengths of the solution proving more injurious to the fruit than where the ordinary Bordeaux mixture was used. The ammoniacal copper-carbonate solution proved injurious in the strengths employed, and the subacetate of copper caused serious defoliation of the trees. The normal copper acetate, used in the same proportion as the subacetate, had only a slightly injurious effect upon the foliage. Potassium sulphid, at the rate of 1 oz. to 3 gal. of water, had no injurious effect upon either foliage or fruit. The author states that the partial defoliation of well-grown peach trees by the application of fungicides of medium strength late in the season may not be attended with any serious or permanent injury, and in some cases a decided advantage may accrue in the earlier ripening of the fruit and its higher color, the free exposure to air and sunshine rendering it less liable to fungus attacks.

From experiments of the past season, the author believes he is justified in recommending the spraying of peach trees with Bordeaux mixture composed of 5 lbs. of copper sulphate, 5 lbs. of lime, and 50 gal. of water, before the buds begin to expand. A second application, in which the amount of copper is reduced to 2 lbs. and lime to 4, should be given the trees just before the blossoms open and once after the fruit has set. These applications are to be followed two or three times during the ripening season with potassium sulphid solution, 1 lb. to 50 gal. of water. The injury resulting from the application of Bordeaux mixture appears to be due to the direct effect of the chemical on the chlorophyll of the leaf, whereby it is disorganized and ceases to perform its normal functions of assimilation. The peculiar susceptibility of the leaves of the peach, apricot, and Japanese plum, as compared with those of the apple, pear, quince, and other fruit trees, does not appear to be connected in any way with the total thickness of the leaves or with the differences in size and distribution of the stomata. Important differences are noted in the arrangement of the spongy parenchyma of the different leaves. In those susceptible to injury it is very dense, with small, intercellular air spaces, while in the nonsusceptible ones the leaves have a loose, open texture. Whether this fact has any direct bearing upon the question of susceptibility has not been determined.

Notes on spraying peaches and plums in 1900, C. O. Townsend and H. P. Gould (*Maryland Sta. Bul. 71, pp. 115–127, figs. 2*).—The occurrence of the fruit rot (*Monilia fructigena*) upon peaches and plums is mentioned and the characteristics of the disease described. The results of experiments in which peaches and plums were sprayed with Bordeaux mixture for the prevention of this disease are given. Dilute Bordeaux mixture in which 3 lbs. of copper sulphate to a barrel of water was used greatly reduced the amount of disease without seriously injuring the foliage. No marked difference was noticed between trees which received the first application March 23 and those sprayed May 26 and June 28. The spraying should be continued well up to the time of ripening of the fruit, and, based upon the authors' experiments, can be done at an expense not to exceed 6 cts. per tree. Not only was the disease almost entirely prevented by this treatment, but the texture and size of the fruit was decidedly improved by the applications. The experiments with plums indicated that plums of the domestic varieties were apparently uninfluenced by the application of the fungicides. The Japan varieties were greatly benefited by the treatment. These are very subject to injury by the strong fungicides, and the amount of copper sulphate to a barrel of solution should not exceed 2 lbs.

Experiments in the control of fumagine of the olive, D. Vidal (*Prog. Agr. et Vit. (Ed L'Est), 22 (1901), No. 4, pp. 121–124*).—This disease of the olive is said to be quite prevalent and is characterized by the presence on the branches, leaves, fruits, and frequently on the trunks of the trees, of black, sooty-like patches. It is the growth of a number of fungi more or less well known which follow attacks of certain insects, in this case *Lecanium oleæ*. Preventive treatment must be directed against the insects upon which the fungus is dependent. The results of investigations carried out in the season of 1900 showed that the best method of treatment was to spray thoroughly with Bordeaux mixture to which turpentine was added. Two sprayings, one in June and the other in September, were found to be sufficient for the eradication of the disease.

The premature falling of fruit, J. Burvenich (*Bul. Arbor. et Flor., 1900, pp. 169–171*).

The Anaheim or California vine disease, C. P. Lounsbury (*Agr. Jour. Cape Good Hope, 18 (1901), No. 2, pp. 90–94*).—An account is given of the disease of grapes which was formerly quite prevalent in California and which has been called the "California vine disease." This disease was formerly described in a publication of this Department (E. S. R., 4, p. 498). The author believes that its spread may be prevented by the planting of resistant varieties, some of which are briefly described.

The causes of gray rot of grapes, J. Dufour (*Chron. Agr. Canton Vaud, 14 (1901), No. 2, pp. 38–42*).—The gray rot of grapes is said to have been exceedingly troublesome in parts of France during the season of 1900. In some regions it was reported to have very seriously diminished the grape crop. The disease is due to *Botrytis cinerea*. The fungus is dependent for its development upon somewhat peculiar atmospheric conditions which were present during the season. August was very dry and warm, followed in September and October by heavy rains, which produced the proper conditions for the rapid development of the fungus.

Treatment of anthracnose, with a comparison of the effects of various sprays and dressings, E. H. Rainford (*Queensland Agr. Jour., 7 (1900), No. 6, pp. 529–532*).—The author has investigated different means for the prevention of grape anthracnose. The object of his experiments was to compare the effect of different sprays and winter treatments. Winter treatments with a 10 per cent solution of sulphuric acid and a mixture of lime and sulphur were compared with sprays of eau celeste, Burgundy mixture, and Bordeaux mixture. The results obtained showed no appreciable superiority of either of the sprays over the other, but the acid dressing proved much more effective than the lime and sulphur mixture. The result of this one experiment seems to indicate that the disease may be controlled; but the experiments have not been carried sufficiently far to warrant definite recommendations regarding them.

The chrysanthemum rust, E. Jacky (*Ztschr. Pflanzenkrank., 10 (1900), No. 3–4, pp. 132–142, figs. 6*).—According to the author, the chrysanthemum rust made its appearance in England in 1895, and was reported 2 years later as occurring on the continent of Europe. The species of rust is *Puccinia chrysanthemi* and it has been claimed to be identical with *P. tanaceti*, but inoculation experiments have shown that the 2 species are not identical. Numerous experiments made by the author and others to determine the hosts of this fungus are reported, from which it appears that it is specialized on *Chrysanthemum indicum*. Inoculations by the author upon other species of Chrysanthemum, *Tanacetum vulgare*, *T. balsamita*, *Artemisia campestris*, *Hieracium aurantiacum*, and the dandelion, were unsuccessful. The fungus is described and its distribution indicated. As means for its prevention the author recommends careful attention and isolation of diseased plants, avoiding rooting any that have been attacked by the rust. The difference in susceptibility of different varieties as reported in England and in the United States is noted, but in Germany the author says no one variety seems more susceptible than the other. It is said that a great many fungicides have been unsuccessfully used for the prevention of this disease, but the author thinks the experiments were not carefully conducted, and is inclined to believe that Bordeaux mixture may be of value in preventing its spread.

A disease of carnations caused by Fusarium dianthi, G. Delacroix (*Compt. Rend. Acad. Sci. Paris, 131 (1900), No. 23, pp. 961–963*).—This disease was first described by L. Mangin (E. S. R., 11, p. 860). Later the author, associated with E. Prillieux, described the disease as due to one of the imperfect fungi, to which the name *Fusarium dianthi*, n. sp., was given. Since that time the studies have been continued and additional information gathered, which confirms them in their opinion as to the cause of this disease. The organism is in the main a soil fungus, and as a preventive treatment it is suggested that all badly diseased material should be burned, contaminated soil should not be used for growing carnations for a number of years, and in forming cuttings to be certain that they do not come from infested regions. Experiments were conducted with carbon bisulphid, sulphate of iron, formaldehyde, and naphthol, from which it was found that all, with the exception of the last, would prevent the germination of the spores and the spread of the disease.

On the parasitism of Fusarium roseum and allied species, L. MANGIN (*Compt. Rend. Acad. Sci. Paris, 131 (1900), No. 26, pp. 1244–1246*).—The author states that in cultivating carnations in a number of media he has been able to demonstrate the parasitism of a number of species of Fusarium, among them *F. roseolum*, *F. commutatum*, *F. roseum*, *F. aurantiacum*, *F. oxysporium*, and *F. pyrochroum*. The characteristics of each of these fungi upon the host are described, from which the author concludes that the parasite causing the disease upon carnations is not new and should not be given the name *F. dianthi* of Prillieux and Delacroix. Experiments conducted for the prevention of this disease have shown that lysol, corrosive sublimate, and naphthol applied to the soils are efficient in preventing the growth of the fungus.

A disease of the locust tree, H. VON SCHRENK (*Abs. in Science, n. ser., 13 (1901), No. 320, p. 247*).—A destructive disease of the black locust (*Robinia pseudacacia*), due to *Polyporus rimosus*, is described. The fungus destroys the heart wood of the tree, leaving a soft yellow mass. The fruiting organs form on the trunk and larger branches, discharging their spores in summer and fall. The mycelium grows only in the heart wood of living trees and dies as soon as the tree is cut down. This is thought to be probably due to changed conditions of aeration, moisture, and temperature, and as a result the fungus is considered as belonging to a special class of saprophytes.

The bacterial diseases of plants, E. F. SMITH (*Abs. in Science, n. ser., 13 (1901), No. 320, p. 249*).—An account is given of diseases caused by bacteria, and the wilt of cucurbits due to *Bacillus tracheiphilus*, the brown rot of solanaceous plants due to *B. solanacearum*, and the black rot of cruciferous plants caused by *Pseudomonas campestris*, are described.

The nematodes of coffee roots, A. ZIMMERMANN (*Meded. 'S Lands Plantentuin, 37 (1900), pp. 1–23, figs. 2*).—The author gives an account of the habits and life history of *Heterodera radicicola*, *Aphelenchus coffeæ*, and *Tylenchus acutocaudatus*. The first-named species is not especially injurious to the roots of coffee in Java. The other species, however, commit serious depredations, and the number of coffee plantations which have been destroyed in Java by the attacks of these worms is estimated at over 4,000. Brief notes are given on the nature of the injuries caused by the parasitic nematodes.

Among the remedies which were tried for the purpose of destroying these worms, ferric sulphate gave promising results, while copper sulphate was used without success. Petroleum, benzin, and creolin were also used without satisfactory results. The application of carbon bisulphid was attended with good success. Experiments were also conducted in manuring the ground around infested plants, digging out and burning infested plants, quarantining infested areas, and thorough cultivation of the ground. Good results were obtained in some cases by planting other crops upon infested ground for a few years.

A considerable number of experiments were tried in grafting Java coffee upon the roots of other plants of the same family in order to determine whether such coffee might be grown upon roots which would resist the attacks of nematodes. In these experiments roots of the following plants were used: *Cinchona succirubra*, *Coffea densiflora*, *Morinda citrifolia*, *Psychotria robusta*, and *Gardenia grandiflora*. Thus far these experiments have been without promising results. The author recommends in cases of infestation by *Aphelenchus coffeæ* or *Tylenchus acutocaudatus* that areas in which the Java coffee is dying out should be thoroughly investigated, and if the nematodes are found, that such areas should not be planted to coffee. It is also suggested that further experiments in grafting coffee upon the roots of other plants might be tried on a small scale.

Literature of plant diseases, W. C. STURGIS (*Connecticut State Sta. Rpt. 1900, pt. 3, pp. 255–297*).—This is in continuation of a bibliography published in a previous report (E. S. R., 10, p. 267) in which the literature relating to plant diseases is brought down to include the years 1887–1900. The list given is not intended as a complete bibliography of the subject, but rather to enable the practical observer of plant diseases to ascertain the principal sources of information regarding the specific cause and means of prevention of various diseases, as reported in the publications of the U. S. Department of Agriculture, and the various State experiment stations.

A condensed handbook of the diseases of cultivated plants in Ohio, A. D. Selby (*Ohio Sta. Bul. 121, pp. 69, figs. 54*).—The author discusses in a popular manner some of the causes of plant diseases and the methods by which they are spread, after which popular descriptions are given of the more common diseases which have been noticed as occurring in Ohio. The diseases are arranged alphabetically under the host plants and where methods of treatment are known they are described. Directions are given for the preparation and use of fungicides and insecticides, with a spray calendar, showing briefly the method of treatment to be followed for different insect and fungus pests.

ENTOMOLOGY.

The sixteenth report of the State entomologist on injurious and other insects of the State of New York, E. P. Felt (*Bul. New York State Mus., 7 (1901), No. 36, pp. 949–1063, pls. 16, figs. 2*).—Popular accounts are given of the gypsy moth and the palmer worm, together with bibliographical references to literature concerning the latter species. A number of experiments were made with insecticides for the destruction of the San José scale. The result showed that a 20 or 25 per cent mechanical mixture of kerosene did not kill all the scales. An application of a 10 per cent mixture in summer was not injurious to the trees, but it was found that the application must be repeated every 10 days, beginning about the middle of June, in order to obtain good results. The use of pure kerosene proved unsatisfactory and is not recommended. A 20 per cent mechanical mixture of crude petroleum did not injure the trees and is reported as one of the most satisfactory remedies to be used in the early spring. Some scales escaped even when a 25 per cent mixture was used, and the latter strength is considered no more efficient than the 20 per cent mixture. A few scales were found alive after spraying with undiluted crude petroleum.

Trees were not injured by application of whale-oil soap at the rate of 2 lbs. to the gallon of water. The results were not so good as those obtained by a 20 per cent mixture of crude petroleum, 2 applications of the whale-oil soap being required to produce the effects which were obtained by 1 application of the crude petroleum. Spraying in summer with whale-oil soap at the rate of 1 lb. to 5 gal. of water was effective in killing young scales. A combination of whale-oil soap with crude petroleum gave good results, but this mixture was no more effective than the crude petroleum alone.

Hydrocyanic-acid gas proved to be very effective, practically all of the scales being killed by the use of 1 oz. of cyanid of potassium to 150 cu. ft. of space. The trees were not injured in the least. The method is highly recommended for all except very large trees, where the expense would be rather great.

Brief notes are given on the fruit-tree bark beetle, plum curculio, flea beetles, elm-leaf beetle, *Chrysochus auratus*, 12-spotted asparagus beetle, grain beetles, snake worm, forest tent caterpillar, fall army worm, elm-bark louse, harlequin cabbage bug, grasshoppers, and *Lophoderus triferana*. The forest tent caterpillar occurred in such numbers that contact insecticides were tested, with good results.

A summary is given of the reports of voluntary observers in different counties of the State. The publications of the entomologist for the year are listed, and a statement is given of the additions to the entomological collections.

Illustrated descriptive catalogue of some of the more injurious and beneficial insects of New York State, E. P. Felt (*Bul. New York State Mus., 8 (1900), No. 37, pp. 52, figs. 83*).—Brief descriptive and economic notes on the common species of insects injurious to fruit trees, small fruits, shade trees, garden crops, and grass and food products, together with brief notes on the beneficial insects and the standard insecticides.

Report of the entomologist, C. P. GILLETTE (*Colorado Sta. Rpt. 1900, pp. 123-131*).—Brief biological and economic notes are given on the codling moth, peach-twig borer, *Cacoecia argyrospila*, *C. semiferana*, leaf crumpler, climbing cutworm, *Alypia octomaculata*, *Philampelus achemon*, pear slug, woolly aphis, apple aphis, Putnam scale, *Chionaspis ortholobis*, leaf hoppers, apple-twig borer, *Lina scripta*, and wheat aphis. Cutworms are reported as occurring in great numbers on alfalfa. They belonged to the species *Carneades tessellata*. A beet army worm (*Laphygma flavimaculata*) was exceedingly injurious in 1899, but was comparatively rare during the past season. The caterpillars did the most damage to early beets and injured only late planted beets near weeds or early beets. Brief notes are also given on a number of other injurious insects, bee paralysis, black brood, and experiments with leaf hoppers, coddling moth, and grasshoppers.

Insect notes, W. E. BRITTON (*Connecticut State Sta. Rpt. 1900, pt. 3, pp. 311-322, fig. 1*).—A brief report is given on experiments with hydrocyanic-acid gas in barn and greenhouse. Treatment of hay infested with clover-hay worm was unsuccessful. The gas could not be made to penetrate very far into the mass of hay. Fumigation with this gas was tried in a greenhouse containing tomato plants which were infested with *Aleurodes vaporariorum*. The house contained 4,800 cu. ft., and 3 oz. potassium cyanid were used for each 1,000 cu. ft. The gas was generated in the afternoon, and the house was kept closed for 30 minutes. Gas was generated in vessels at each end of the greenhouse. All the insects were destroyed, but more or less injury was noted in most of the plants. A smaller quantity of cyanid than 3 oz. per 1,000 cu. ft. is recommended for fumigating tomatoes in greenhouses.

Notes are given on the banding of trees to prevent injury by the fall cankerworm. This paper was published in essentially the same form in Bulletin 26, Division of Entomology, of this Department (E. S. R., 12, p. 860). Brief notes are given in tabular form on the common and scientific names, host plants, locality, etc., of insects which are sent to the station for identification during the season. Elm scale (*Gossyparia ulmi*) occurred in considerable numbers on elm trees in different parts of the State. Spraying with whale-oil soap was found to be effective, as well as treatment with a 10 and 15 per cent mechanical mixture of kerosene and water. Cabbage plusia was successfully controlled by spraying with a 15 per cent mixture of kerosene and water. Brief biological and economic notes are given on book lice, codling moth, forest tent caterpillar, and other injurious insects.

Mechanical mixtures of kerosene and water proved very effective in the treatment of a number of insects. A 10 per cent mixture was successfully used against oyster-shell bark-louse, and apple aphis and pear psylla were destroyed by means of a 15 per cent mixture of the same substance. White flies in greenhouses and the red spider yielded readily to treatment by this insecticide.

The growth of economic entomology in Australia and its relation to agriculture, W. W. FROGGATT (*Agr. Gaz. New South Wales, 12 (1901), No. 1, pp. 131-138*).—The author discusses the economic importance of investigation of various remedies for the control of injurious insects and calls attention to exchanges of beneficial insects between government entomologists of different countries. Brief references are made to various injurious insects by way of illustration of the discussion.

Some of the internal changes which accompany ecdysis in insects, W. L. TOWER (*Proc. Amer. Assoc. Adv. Sci., 49 (1900), p. 231*).—One of the most important changes which precede ecdysis is the development of exuvial glands. These are one-celled, pear-shaped, with the smaller end prolonged into a tube which opens through a pore. The glands enlarge rapidly during the few days immediately preceding ecdysis and pour out their contents when the process of molting occurs. The glands occur on all parts of the body, but are most numerous on the pronotum.

Locusts or grasshoppers, L. Bruner (*Nebraska Sta. Bul. 70, pp. 14, figs. 13*).—An analytical table is presented for the purpose of assisting in the identification of the 10 common species of grasshoppers in the State. The 4 most important ones from an economic standpoint are *Melanoplus bivittatus*, *M. differentialis*, *M. femur-rubrum*, and *M. atlanis*. Brief notes are given on the life history of grasshoppers and on the causes for excessive increase of these insects in certain years. The author discusses the method of killing locusts with fungus diseases. Experiments with a fungus disease imported from South America were without result. Another disease very similar to the South American fungus is reported. Disking or harrowing and the use of hopperdozers are recommended in the destruction of these insects.

A preliminary report of progress of an investigation concerning the life history, habits, injuries, and methods for destroying the Mexican cotton-boll weevil (Anthonomus grandis), F. W. Mally (*Austin, Texas: Von Boeckmann, Schutz & Co., 1901, pp. 45*).—The author describes in considerable detail the life history and habits of this insect. The female eats a hole into the square, form, or young boll, and deposits 1 egg in each hole. The opening is then closed with a small drop of glue. So far as observed the eggs are deposited nowhere else. The larva upon hatching feeds upon the inside portions of the square or form in which the egg has been laid. The whole life cycle is passed in the same situation and extends through 1 month. The species hibernates in the adult stage in the cracks of bark and under rubbish of various kinds.

The adult weevil flies little, if at all, at night, and lantern traps are therefore not recommended. Good success was had in planting trap rows of cotton early in the season, using early varieties. The beetles collect upon these early plants, from which they may be jarred into pans smeared on the bottoms and sides with coal tar or other adhesive substance. This method is recommended as especially effective and economical for small areas of cotton. Since infested squares may be recognized by what is commonly called flaring and later fall to the ground, they may be collected and destroyed before the weevils have had time to mature and escape. In experiments for the purpose of determining the cost of collecting the fallen squares, it was found that during the months of May and June the squares could be gathered for from 5 cts. to 10 cts. per acre, while during July the expense reached 25 cts. an acre. This was for the work of adult negroes. When boys were used the expense was about 6 cts. per acre for the season.

As already indicated the infested squares can be recognized before falling and can be picked off and destroyed. Plowing under fallen squares gives little promise of effectiveness, since experiments indicated that the weevils could make their way to the surface after being buried to a considerable depth. For the purpose of securing early trap plants, it is recommended that the seed of early fruiting varieties be planted or seed grown in a northern latitude. Infested cotton seed may be fumigated with carbon bisulphid at the rate of 1 lb. to from 25 to 50 bu. of seed.

It is well known that squares which do not bloom within 6 weeks of frost very seldom come to maturity. Such squares, therefore, serve chiefly as food and places for egg laying of the weevils. By turning stock into cotton fields late in the summer the young squares containing weevils will be grazed off. The stalks and other portions which are left by cattle may be cut down and piled up so as to serve as attractive hibernating quarters for the weevils. Such piles of refuse may then be burned.

Since the boll weevil is protected against ordinary insecticides during its whole life, special methods of spraying are recommended. The best results were secured by the use of poisoned molasses. A formula for use on trap plants is 2 gal. cane molasses, 2 oz. arsenic boiled in water until dissolved, 4 oz. arsenate of lead, and 46 gal. of water. On the main crop of cotton for use in midsummer the following mixture was found effective: 1 gal. cane molasses, 1 oz. arsenic, 6 oz. arsenate of lead, and 47 gal. of water. The author insists upon the desirability of beginning all lines of treatment as early as possible in the spring.

A supplementary report of investigation of the Mexican boll weevil is appended, in which the author calls attention to the work which has already been done, and the appropriations which will be necessary for continuing the work.

The Mexican cotton-boll weevil, F. W. Mally (*U. S. Dept. Agr., Farmers' Bul. 130, pp. 30, figs. 4*).—The essential facts contained in this bulletin have been noted above from another source.

The root louse of grain and means of combating it, G. del Guercio (*Nuove Relaz. R. Staz. Ent. Agr., 1. ser., 1900, No. 3, pp. 87–94, figs. 4*).—The author describes *Pentaphis trivialis* in all its stages and gives brief notes on its habits and life history. Mention is made of a remedy previously recommended, which consists in mixing double sulpho-carbonate of potash and lime in the soil. The fumes of carbon bisulphid are given off from this compound, which destroy a certain proportion of the lice. The author recommends also the destruction by means of carbon bisulphid of the ants which attend this species of plant louse.

Caterpillar plagues, with an account of the potato pests at Windsor, W. W. Froggatt (*Agr. Gaz. New South Wales, 12 (1901), No. 2, pp. 237–243, pls. 2*).—The author gives an account of an unusually extensive outbreak of injurious caterpillars. The larvæ of *Plusia verticillata* appeared in such numbers as to threaten the utter destruction of potato fields. As many as 200 caterpillars were shaken from a single plant. The caterpillars remained on the underside of uninjured leaves or clung close to the leaf stalk after the leaves had been eaten. Notes are given on the life history of this insect and on its other food plants. The larvæ of *Mamestra ewingii* attacked potato plants in a different manner, gnawing into the main stalk, so that it soon broke off. This species appeared to prefer alfalfa when this plant could be obtained as food.

Considerable damage was also done by the bollworm, and especially by *Nysius vinitor*, which occurred in great numbers and injured the potato stems by sucking out the juices. Spraying with Paris green gave fairly satisfactory results in combating the caterpillars, but better results were obtained by fastening 2 boards together inclined to one another at right angles, and hauling this apparatus between the rows immediately behind men who knocked off the caterpillars by means of brushes. A crude sort of hopperdozer was also constructed, containing tar or kerosene, and the caterpillars were brushed into this apparatus as it was drawn along. These machines proved very effective.

On the origin and distribution of Leptinotarsa decem-lineata, and the part that some of the climatic factors have played in its dissemination, W. L. Tower (*Proc. Amer. Assoc. Adv. Sci., 49 (1900), pp. 225–227*).—An abstract of an article read by the author at this meeting. The parent form of the Colorado potato beetle is considered to be *L. undecem-lineata*, which seems to have originated in South America. The distribution of the beetle in North America was confined to Mexico and the Rocky Mountains until about 1850. In 1859 the beetle was reported as occurring in injurious numbers as far east as the 98th meridian, and during the next 20 years it traveled eastward to the Atlantic Coast and covered the whole country to latitudes 37 to 47° north. The species is double brooded, but it is the second brood which flies most and which consequently is the most concerned in increasing the distribution of the species. The beetle is not a strong flyer, and is unable to make much progress against a strong wind. Its flight is therefore controlled largely by the wind. During August and September there are certain well-defined wind tracks, and the beetle has progressed most rapidly along these lines. The most rapid advance has been made in the track of the westerly winds along the Lakes and down the St. Lawrence Valley. At present the potato beetle is distributed throughout all that portion of North America which lies east of the Rocky Mountains and between latitudes 32 and 55° north. A related species, *L. juncta*, has retreated before the advance of the Colorado potato beetle, and is now confined to a more southern distribution. A number of geographical forms of the potato beetle are apparently being developed, but these forms are not easily determined without accurate and detailed measurements.

The pea weevil and means of combating it, G. Staes (*Tijdschr. Plantenziekten, 6 (1900), No. 3-4, pp. 105-123*).—The author presents a brief account of the insects which most commonly prove injurious to peas. The life history of *Bruchus pisi* is described in detail, and notes are given on the literature of the subject. In combating the attacks of this insect the author recommends planting seed which is free from weevils. This may be accomplished by securing uninfested seed or by treatment of infested seed for the destruction of the weevil. It is recommended that peas be heated in an oven to a temperature of from 50 to 60° C. for a short time, during which they are constantly stirred. Seed peas may be held over a year for the purpose of allowing the weevils to escape, so that they may be destroyed. It is advisable also to destroy any pea pods which may be left in the field. Weevils should be prevented from escaping from infested peas into the fields before planting time.

The cane borer in Louisiana and Hawaii (*Hawaiian Planters' Mo., 20 (1901), No. 1, pp. 22-26*).—Notes on the habits, life history, and most efficient means of combating *Sphenophorus obscurus*.

A little-known asparagus pest (Agromyza simplex), F. A. Sirrine (*New York Sta. Bul. 189, pp. 277-282, figs. 5*).—The adult is a metallic black fly 3 to 4 mm. long, usually found resting on the flowers and branches of asparagus plants. The pupal condition resembles the flaxseed stage of the Hessian fly. The puparia appear as raised spots under the epidermis near the base of the asparagus stems. The process of laying eggs was not observed, but from the fact that mines made by the maggots first start beneath the leaf scale, it is suspected that the eggs are occasionally deposited under or near the leaf scale. The species mines beneath the outer bark, and eats the green portion of the plant between the epidermis and the wood. When several maggots are present they completely girdle the stem. Although the species has been under observation for 4 years, it has not been observed as injurious to cutting beds. During 1900 it did considerable damage to seedling and newly set beds. Infested plants turn yellow and finally die much earlier than they naturally should do.

From the habits of the pest it is apparent that there is little opportunity of applying insecticides. Since eggs for the first brood are deposited early in June, it is recommended that small shoots should not be allowed to grow on cutting beds during the cutting season. It is also advised that old stalks be pulled and burned after they are dead, preferably late in the fall. There are 2 broods of the insect per year.

Natural enemies and artificial remedies for Pieris brassicæ, G. del Guercio (*Nuove Relaz. R. Staz. Ent. Agr., 1. ser., 1900, No. 3, pp. 95-108, figs. 3*).—Among mechanical means for fighting this species destruction of the eggs is recommended as of prime importance, and the destruction of the caterpillars as second in importance. Egg destruction is more practicable in this species than in *P. rapæ* or *P. napi*, since in the case of the first species they are laid in groups of considerable size and have a bright yellow color. Experiments were made with a number of chemicals, such as superphosphate of lime, solutions of potash and soda soaps, soap emulsions with petroleum, benzene and bisulphid of carbon, soap emulsions with heavy oil of tar, and solutions of alkaline tar. The superphosphate of lime had no apparent effect upon the caterpillars. Solutions of potash soap in strengths of from 1½ to 2½ per cent destroyed the caterpillars quickly and did not leave any bad odor upon the plants. The author states that the caterpillars of the cabbage butterfly may be destroyed by much weaker solutions of insecticides than are usually employed. Brief notes are given on the various insect parasites of the species and on the extent and economic importance of this parasitism.

Suggestions about combating the San José scale, H. P. GOULD (*Maryland Sta. Bul. 73, pp. 153-166, figs. 2*).—A number of experiments were conducted for the purpose of determining the effect of different percentages of kerosene on peach trees and on the San José scale. During these experiments it was found that considerable damage was done to peach trees by spraying them with a 20 per cent kerosene mixture during a dormant period, while the same mixture applied during the period between March and the blossoming period gave more satisfactory results. It was found that tobacco whale-oil soap solutions caused some injury to the foliage if they were used of strength sufficient to destroy the adult San José scale. A 5 per cent solution of kerosene had little effect on the scale, while the 20 per cent solution destroyed practically all of the scales. The 5 per cent solution did not injure the foliage, and the 20 per cent solution was only slightly more injurious to the foliage than the 10 per cent solution. The trees should not be sprayed at a time when the solution will freeze, since considerable damage to peaches results from this process. No differences were noted in results whether the kerosene was applied on cloudy or clear days.

A brief popular discussion is given of the comparative value of crude petroleum as an insecticide and regarding whale-oil soap and fumigation with hydrocyanic-acid gas as remedies for the San José scale.

Observations on a new species of scale injurious to citrus fruits in Italy, G. DEL GUERCIO (*Nuove Relaz. R. Staz. Ent. Agr., 1. ser., 1900, No. 3, pp. 3-26, pl. 1*).—The author describes the scale insect in all its stages under the name *Ceroplastes sinensis.* The food plants of this scale are *Citrus aurantium, C. limonum, C. deliciosa,* and *Muhlenbeckia platyclados.* The life history and habits of this scale are described in some detail. For preventing the larvæ from attaching themselves to the woody parts of the plants, the author had good success in using a mixture containing oil of tar, 10 to 15 liters; neutral carbonate of soda, 7 to 10 kg.; water, 80 to 90 liters. Tar soaps also proved effective. For the first treatment concentrated tar soap is recommended, containing soft soap, 1 kg.; water, 3 liters; oil tar, 1 liter. For the second treatment the mixture should contain about 2 per cent oil tar, and the third 1½ per cent. Branches which were painted with the insecticide showed upon examination that all the insects had been destroyed. The scales of other species of scale insects were thoroughly penetrated. In combating this scale it is also recommended that *Muhlenbeckia platyclados* in the vicinity of citrus orchards should be destroyed.

Brief notes are given on the life history, habits, and means of combating *C. rusci* and species of Aspidiotus, Mytilaspis, Diaspis, etc.

Means of infestation by the olive fly and methods of checking its further spread, G. DEL GUERCIO (*Nuove Relaz. R. Staz. Ent. Agr., 1. ser., 1900, No. 3, pp. 27-86, pl. 1, figs. 2*).—The author discusses in a critical manner the literature relating to *Dacus oleæ.* The insect is described in all its stages, including the varieties *funesta* and *flaviventris.* The life history, habits, and metamorphosis of the fly are described in detail, and notes are given on the relative severity of infestation of different varieties of olives. From this study it appears that the fly passes successively from one variety to another of olive from its first appearance in July and August to the time of its greatest prevalence in November and December. Experiments were conducted for the purpose of testing the efficiency of plowing and cultivating the soil in destroying the pupæ of the fly. From these experiments it was found that burying the pupæ in loose soils and rolling and drenching the soil with water had no effect in preventing the flies from emerging. In loose soils inundation did not destroy the pupæ. In compact soils, on the other hand, whether with or without rolling and the use of water, the insects were unable to escape after being buried deeply.

The author gives notes on experiments to determine the influence of temperature on the olive fly. It was found that larvæ exposed to a temperature of from 0 to −6° R. were destroyed in large numbers. The author determined by experiments with bisulphid of carbon that the insects were destroyed when 800 cc. of this substance was used per cubic meter of space.

A number of birds are known to feed upon the olive fly, and among the predaceous and parasitic insects which keep the insect in check the author mentions *Eurytoma rosæ*, *Tricomalus spiracularis*, *Eulophus pectinicornis*, and *Cremastogaster scutellaris*.

A discussion is given of the beneficial effects of the parasitism of the olive fly, the injuries caused by this fly, the remedies in common use against its ravages, remedies which are adapted to deterring the adult insect from depositing its eggs, and remedies devised for the destruction of the egg, larva, and pupa. Among the latter the author mentions hyposulphite of potash and soda, burning over the ground, and injection of cyanid of potash into the plant tissues. Experiments with the last-named remedy gave negative results.

Two strawberry pests, J. B. Smith (*New Jersey Stas. Bul. 149, pp. 17, pls. 2*).—The author has worked out certain hitherto unknown details in the life history of strawberry-leaf roller (*Phoxopteris comptana*). The eggs are laid on the underside of the leaf, and are of a green color and difficult of detection. The larvæ hatch in from 5 to 7 days, crawl upon the upper side of the leaf, and begin the formation of webs. The first full-grown larvæ were obtained on June 8, and the author believes that the larval life occupies about 4 weeks. From these larvæ moths emerged on June 19 and began egg laying on June 22. The complete life cycle is therefore from 42 to 50 days. There are 3 annual broods, of which only the first and second are especially injurious.

The author describes the insect in its various stages, and makes brief mention of parasitic insects which are its natural enemies. As a remedial measure the author recommends spraying with arsenical poisons as soon as the moths are seen flying in considerable numbers, a second time one week later, and a third time after another week.

The strawberry-root louse (*Aphis forbesi*) is reported as causing considerable damage to strawberries. The insect is described in its various stages, and brief popular notes are given on its life history and the remedies which have proved most effective in combating it.

Two new enemies of grapes, G. del Guercio (*Nuove Relaz. R. Staz. Ent. Agr., 1. ser., 1900, No. 3, pp. 410–416, figs. 4*).—*Drepanothrips reuteri* is described in detail, and brief notes are given concerning its life history and injurious habits. Experiments with insecticides in controlling the species showed that the larvæ were killed almost instantly when sprayed with a 2 to $2\frac{1}{2}$ per cent solution of soft soap, and that the same solution was equally effective against the pronymphs and adult insects. A carbolized extract of tobacco was tried in 1, $1\frac{1}{2}$, 2, $2\frac{1}{2}$, and 3 per cent solutions. The weaker strengths stupified the insects but did not kill them. The stronger solutions were very effective.

Another enemy of grapes is found in *Schizoneura ampelorhiza*, which feeds upon the roots of grapevines. The author describes the species in detail. This root louse was found in large numbers in an active form on grapevine roots, but does not produce tubercles such as are caused by the puncture of phylloxera. Infested roots, on the contrary, shrivel up and die. Fortunately the species so far as known has a limited distribution.

Animal parasites—III, E. P. Niles (*Virginia Sta. Bul. 110, pp. 13, figs. 5*).—This bulletin contains brief popular notes on *Gastrophilus equi*, *G. hæmorrhoidalis*, *G. nasalis*, ox bot fly, ox warble fly, and sheep bot fly.

Spraying crops, S. T. MAYNARD and G. A. DREW (*Massachusetts Hatch Sta. Bul. 73, pp. 9-15*).—The chief insecticides used during the year were Paris green, arsenate of lead, arsenic and lime, and kerosene emulsions. The principal fungicides were Bordeaux mixture and a simple solution of copper sulphate. Insecticides were in most instances combined with Bordeaux mixture. For spraying apple trees to combat insect and fungus pests, Paris green was used at the rate of ¼ lb. to 50 gal. of Bordeaux mixture. Arsenate of lead was found to be a better insecticide for use upon the plum. Experiments for testing possible injury to the foliage of peaches, cherries, and Japanese plums showed that the foliage of these trees was injured somewhat by green arsenoid and insect green, but not by arsenate of lead. Brief notes are given on desirable pumps and nozzles.

The poisonous property of a solution of nicotin and its use in the destruction of insects, G. DEL GUERCIO (*Nuove Relaz. R. Staz. Ent. Agr., 1. ser., 1900, No. 3, pp. 124-134*).—The observations reported in this paper were made on experiments with the larvæ of the silkworm. Preliminary experiments in spraying these larvæ with distilled water showed that they were not disturbed by such treatment. Spraying with solutions of various strengths of nicotin caused convulsive movements of the larvæ within a short time, which caused them to fall from the plants, with death as a result in the majority of cases. The author believes that solutions of nicotin act poisonously upon insects by means of vapors, and that these vapors, even in minute quantity, cause irritation, convulsive movements, and ultimate falling of the larvæ from infested plants. Brief notes are given on the comparative effects of pure nicotin, nicotin rendered alkaline and acidulated, and nicotin mixed with soap solution. The treatment with a mixture of 1 part nicotin, 15 to 25 parts soap, and 2,000 parts of water, caused complete paralysis of the caterpillars, which lasted for 24 hours.

The use of carbon bisulphid in horticulture, V. VERMOREL (*Emploi du sulfure de carbone en horticulture. Villefranche (Rhône): Librairie du Progrès agricole et viticole, 1901, pp. 39, figs. 4*).—The author experimented with bisulphid of carbon in the destruction of white grubs (*Melolontha vulgaris*). It was found that 300 kg. per hectare or 30 gm. per square meter gave very satisfactory results in combating these insects. It is necessary to apply the remedy in May soon after the eggs are deposited and while the larvæ are in the younger stages.

Similar results were obtained in using bisulphid of carbon in combating the mole cricket (*Gryllotalpa vulgaris*). The insecticide was applied in the same proportions and was found to be the only remedy which would effectively destroy these insects in the soil. Good results were obtained in fighting rats, moles, and various injurious insects by means of carbon bisulphid. The author discusses in considerable detail the nature and action of bisulphid of carbon, and the apparatus by means of which it can most conveniently be applied.

Tree fumigation in California, C. P. LOUNSBURY (*Agr. Jour. Cape Good Hope, 18 (1901), No. 1, pp. 210-223, figs. 4*).—This article contains a general description of the apparatus and formulæ used in fumigating trees with hydrocyanic-acid gas.

Report of the inspector of fumigation appliances, W. LOCHHEAD (*Toronto: L. K. Cameron, 1901, pp. 15, figs. 7*).—An act requiring fumigation of nursery stock was put into force in the spring of 1899. Fumigation houses and boxes were made and tested, and such as were too hurriedly constructed showed a leakage of gas and had to be repaired. Copies are given of the regulations and instructions for the fumigation of nursery stock, and a detailed account is presented of the equipment necessary for fumigation and the formulas used. A brief discussion is given of the effect of gas treatment on nursery stock. The tender terminals of peach stock were not affected until nearly double the normal dose of cyanid of potash was used for a 1-hour exposure. Apple trees withstood exposure to 6 times the normal dose, plums 3 times, and pears 3 to 4 times. Detailed directions are given for making boxes suitable for fumigating small lots of nursery stock and for the construction of fumigation houses.

Important insecticides, directions for their preparation and use, C. L. MARLATT (*U. S. Dept. Agr., Farmers' Bul. 127, pp. 42, figs. 6*).—This is a revision of Farmers' Bulletin 19 (E. S. R., 6, p. 315). The bulletin has been in part rewritten and revised, in order to include a discussion of some of the more recent insecticide treatments. The chief additions are concerned with an account of the use of pure kerosene and crude oil, the mechanical mixtures of these oils with water, and the distillate emulsion, which is an emulsion of crude oil and soap recommended by the California State Board of Horticulture.

A contribution to the study of the insect fauna of human excrement, L. O. HOWARD (*Proc. Washington Acad. Sci., 2 (1900), pp. 541–604, pls. 2, figs. 22*).—A shorter popular account of these investigations was published in *Pop. Sci. Mo.*, 58 (1901), No. 3, pp. 249–256. The author made extended observations for the purpose of determining the species of flies and other insects which, from their coprophagous habits, may be considered liable to carry the typhoid fever organism from place to place. Many species of insects were bred from human excrement, including 44 species of beetles, a number of Hymenopterous parasites, and 36 species of Diptera, while 41 other species were captured upon excrement. These species are listed and detailed notes are given concerning the habits and life history of the more important Diptera, including *Compsomyia macellaria*, *Sarcophaga sarraceniæ*, *S. trivialis*, *Stomoxys calcitrans*, *Homalomyia canicularis*, *Muscina stabulans*, *Phora femorata*, *Lucilia cæsar*, *Drosophila ampelophila*, *Calliphora erythrocephala*, and other species. The 77 species of Diptera belonged to 21 different families. Extensive collections were made of flies which visit dining rooms or kitchens, and which might, therefore, come in contact with human food. These collections included 23,087 flies in different stages. Of this number, 22,808, or 98.8 per cent, were the common house fly (*Musca domestica*). The remaining 1.2 per cent comprised a number of species, some of which have already been mentioned. The conclusions may be stated as follows: Of the 77 species of flies whose feeding habits might bring them into contact with typhoid organisms only 8 are likely to come in contact with human food. Of these 8 the common house fly is by far the most important and is to be considered a constant source of danger wherever care is not exercised in the disposal or disinfection of excrement from typhoid patients.

The renewing of queens, U. GUBLER (*Rev. Internat. Apicult., 23 (1901), No. 2, pp. 26–28*).—The author concludes from his observations that bees may produce fertile queens from April until October, but that the most favorable time is at the end of the period for collecting honey.

The conditions of sericulture in Italy, E. VERSON (*Ann. R. Staz. Bacol. Padova, 28 (1900), pp. 22–33*).—Brief notes on the statistics of silk culture in Italy from 1880 to 1889.

The possibility of prolonging the life of silkworm chrysalids, E. QUAJAT (*Ann. R. Staz. Bacol. Padova, 28 (1900), pp. 15–21*).—The author conducted experiments to determine the question of whether the life of the silkworm could be prolonged in the chrysalis stage by means of lowering the temperature. While considerable influence was exercised upon the silkworms by the low temperature to which they were subjected, it was found that many of the moths which issued from chrysalids thus treated were in poor condition and laid infertile eggs.

Glandular tissues in the circulatory system of the silkworm, E. VERSON (*Ann. R. Staz. Bacol. Padova, 28 (1900), pp. 69–84, pl. 1*).—The author discusses the literature of the subject and describes in detail hypostigmatic, peritracheal, pericardial, and epigastric glands of the silkworm.

The relation between the weight of the eggs of the pure races and of crossed races of silkworms, E. QUAJAT (*Ann. R. Staz. Bacol. Padova, 28 (1900), pp. 34–39*).—This is a controversial article. The author believes from his own observations that the weight of the eggs of crossed races is not greater than that of a pure race.

Publications relating to sericulture during the year 1900 (*Ann. R. Staz. Bacol. Padova, 28 (1900), pp. 107-116*).—An extensive bibliography of the subject.

FOODS—NUTRITION.

First report on the inspection and analyses of food products under the pure-food law for 1900, B. W. KILGORE, W. M. ALLEN, ET AL. (*North Carolina State Bd. Agr. Bul., 21 (1900), No. 12, pp. 61*).—Details are reported of the examination of a large number of samples of foods and beverages in accordance with the State pure-food law. Fifty-three commercial stock foods were also examined. The following table shows the extent of adulteration of foods and beverages:

Summary of results of the examination of food products.

Food products.	Total number samples.	Percentage of adulteration.
Beers and other alcoholic drinks	35	77.14
Breakfast foods	24	4.17
Butter	11	....
Canned goods:		
Asparagus	9	77.77
Boston baked beans	1	100
Celery	2	100
Corn	70	60
Corn and tomatoes	4	100
Garden peas	37	81
Lima beans	8	62.50
Okra	2	50
Okra and tomatoes	8	100
Pumpkins	8	50
Snap beans	9	77.77
Succotash	14	7.14
Tomatoes	55	63.63
Catsups	36	97.22
Flour	37	....
Lard	11	9
Nonalcoholic summer drinks	33	72.72
Oil	11	18.18
Sauces	7	86
Vinegar	22	59
Total	454	56.04

Gluten contents of Hungarian wheat and flour, T. KOSUTÁNY (*Kisérlet. Közlem., 3 (1900), No. 4 pp. 227-268*).—This article contains detailed comparative analyses of Hungarian and foreign wheats and wheat products. The primary object was to show the relative values of Hungarian flours as compared with those of other countries. Incidentally the theory is advanced that flours possessing the same amount of gluten may possess entirely different food values, since they manifest different physical properties. Comparative tests were made of the tenacity of dough made of flour and water in definite proportions. If 50 gm. of dough could be extended to cover an area of ½ square meter without breaking, the flour was rated as first quality. With poorer grades the same area could not be covered with 75 gm. of dough. The author considers this a more exact method of grading than by the separation of the gluten or the aleurometer or farinometer tests. With the best Hungarian flours tested, a dough tissue of 100 sq. cm. weighed about 0.4 gm., and 33 sheets superimposed upon each other measured less than 1 mm. in thickness. A number of tables are given to show that total nitrogen constituents and gluten are not identical in amount in wheat flours or wheat and do not vary in equal ratio. The article includes the results of the analysis of 178 samples of Hungarian and 16 samples of foreign wheat.—P. FIREMAN.

The chemical composition and nutritive value of barley and its products: V, Bread, A. NIKITIN (*Vestnik. Obsh. Hig. Sudeb. i. Prakt. Med., 1899, p. 1526; abs. in Chem. Ztg., 24 (1901), Repert., pp. 73, 74; Ztschr. Untersuch. Nahr. u. Genussmtl., 3 (1900), No. 10, p. 694*).—The composition of two sorts of rye bread is reported.

The chemical composition and nutritive value of barley and its products. V, Bread, A. NIKITIN (*Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), No. 1, p. 36*).—The author furnishes corrections for the data given in the article noted above.

Concerning a new method of bread making, G. LEBBIN (*Hyg. Rundschau, 10 (1900), pp. 409–415; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), No. 1, pp. 41, 42*).—A process of making bread without previous grinding of the grain is described.

An abnormal fermentation of bread, C. H. ECKLES (*Reprint from Rpt. Iowa Acad. Sci. 1899, pp. 165–173*).—Sticky or slimy bread and the bacteria which cause it were studied, as well as the viscid material formed, the heat of baking, methods of preventing slimy bread, etc. The author noted the rise of temperature in the interior of the loaf after newly baked bread was removed from the oven.

"It is evident that the bacteria causing the [abnormal] fermentation are able to survive the heat of baking. In this connection 2 experiments were made to determine what the temperature inside a loaf of bread is during baking. A thermometer was inserted in the top of a loaf of bread with the bulb in the center. Just as the bread was ready for removal from the oven the temperature was taken at intervals until the reading sank to 150° F. It was observed in both trials that the temperature of the bread raised several degrees within 5 minutes after being removed from the oven, then slowly declined. . . . In the first trial the temperature at the end of 1 hour's baking was 196° F. Five minutes later it reached 206°, then gradually declined to 150° within 2 hours. In the second trial the temperature recorded at the end of baking was 197°, which raised to 208° within 5 minutes, and within 15 minutes sank to 200° F. and reached 150° in about the same time as in the first trial."

Preparation of flour products for microscopical examination, R. WOY (*Ztschr. Oeffentl. Chem., 6 (1900), pp. 213, 214; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), No. 1, p. 42*).

Concerning the carbohydrates of caragheen moss, J. ŠEBOR (*Oesterr. Chem. Ztg., 3 (1900), No. 18, pp. 441–444*).—From an extended chemical study, the author concludes that the carbohydrates in caragheen or Irish moss (*Chondrus crispus*) consist of a complex of galactose, glucose, and fructose, with a little pentosan (possibly xylan) present as an impurity. These bodies are not present in the same proportion as in raffinose. It is regarded as uncertain whether the carbohydrates are present as a mixture or in the form of a complicated molecule. The author inclines to the latter opinion on account of the solubility of the matter in water, its presence in the plant cells in grain-like masses, and its ability to form colloid solutions with water. He believes further that such a complex molecule is built up like starch as a reserve material.

The manufacture of starch, sugar, dextrin, maltose preparation, sugar colors, and invert sugar, W. BERSCH (*Die Fabrication von Stärkezucker, Dextrin, Maltosepräparaten, Zuckercouleur und Invertzucker. Vienna, Pest, Leipsic: A. Hartleben, 1900, figs. 58; rev. in Oesterr. Chem. Ztg., 4 (1901), No. 1, p. 11*).—A handbook.

A process for preparing starch and sugars from horse chestnuts, C. F. CROSS and J. S. REMINGTON (*Deut. Zuckerind., 25 (1900), No. 43, Sup. 1, p. 1632*).—A patented process is described.

The chemical composition and nutritive value of different sorts of meat, A. BEYTHIEN (*Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), No. 1, pp. 1–9*).—Analyses are reported of the muscular tissue and fatty tissue of a number of different cuts of beef, pork (fresh and smoked), and mutton.

The red color of salt meat, J. HALDANE (*Jour. Hyg.* [*Cambridge*], *1* (*1901*), *No. 1, pp. 115–122, fig. 1*).—From a number of experiments the following deductions were drawn: "The red color of cooked salt meat is due to the presence of NO-hemochromogen. The NO-hemochromogen is produced by the decomposition by the the meat of NO-hemoglobin to which the red color of salt meat is due. NO-hemoglobin is formed by the action of nitrite on the NO-hemochromogen, in the absence of oxygen and in the presence of reducing agents.

"The nitrite is formed by reduction within the raw meat of the niter used in salting. The nitrite is distributed by long cooking."

The handling and preserving of raw meat, R. EMMERICH (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, *4* (*1901*), *No. 1, pp. 17, 18*).—The author insists on the need of cleanliness in slaughtering and handling meat.

On the occurrence of tin in preserved meat, together with some observations on the estimation of and the compounds of tin in preserved meat, F. WIRTHLE (*Chem. Ztg.*, *24* (*1900*), *p. 263; Chem. News*, *82* (*1900*), *No. 2144, pp. 308, 309*).

The manufacture and exportation of tasajo, or jerked beef, by River Plata countries (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1899, pp. 399–404*).—The preparation of this sun-dried and salted beef is described and statistics of the amount exported are given.

Eggs and their uses as food, C. F. LANGWORTHY (*U. S. Dept. Agr., Farmers' Bul. 128, pp. 31*).—Eggs and their uses are described and the flavor of eggs, digestibility, marketing and preservation, desiccated eggs, egg powders and egg substitutes, and similar topics are discussed. The bulletin summarizes a considerable amount of the work of the experiment stations and American and foreign investigators, on the subjects treated of.

Lard oil, M. DUYK (*Bul. Assoc. Belge Chim.*, *15* (*1901*), *No. 1, pp. 18, 19*).—Analysis and description of lard oil—"prime steam lard" or neutral—imported into France to be used in the manufacture of oleomargarin.

The soy bean and its products from a chemical and dietetic standpoint, A. NIKITIN (*Vestnik. Obsh. Hig. Subed. i. Prakt. Med.*, *1900, No. 4, pp. 453–469; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl.*, *4* (*1901*), *No. 1, pp. 39, 40*).—The author summarizes the literature of soy bean products with especial reference to food value, quoting many analyses made by himself and other Russian investigators.

Manufacture of cocoanut butter in Mannheim (*Sci. Amer.*, *84* (*1901*), *No. 18, p. 282; U. S. Consular Rpts.*, *66* (*1901*), *No. 248, pp. 63, 64*).—A descriptive article.

Coffee substitutes (*Proc. Agr. Hort. Soc. Madras, 1901, Apr.–June, p. 5*).—A note quoted from G. Watt, on the composition and use as coffee substitute of the seeds of *Spermacoce hispida*.

Studies of theobromin and caffein and the salts they form, T. PAUL (*Archiv. Pharm. 239* (*1901*), *Nos. 1, pp. 48–80; 2, pp. 81–90*).—Studies by methods of physical chemistry.

Acetic acid in foreign countries (*Spec.* [*U. S.*] *Consular Rpts.*, *22* (*1900*), *pt. 1, pp. 83*).—A summary of information received from American consuls in foreign countries on the consumption, price, and importation of acetic acid as well as the form in which it is demanded locally.

The preservation of food, R. C. T. EVANS (*British Food Jour.*, *2* (*1900*), *Nos. 19, pp. 178, 179; 20, pp. 214, 215; 21, p. 245; 22, p. 278*).—A general discussion.

Nutrition investigations at the University of Illinois, H. S. GRINDLEY and J. L. SAMMIS (*U. S. Dept. Agr., Office of Experiment Stations Bul. 91, pp. 7–20*).—The composition of a number of food materials is reported together with dietary studies of a teacher's family and a boarding club of mechanics. The total food consumed per man per day by the former was: Protein, 106 fat 11, and carbohydrates 445 gm. and the fuel value 3,290 calories. Similar values for the latter study were: Protein 118, fat 145, carbohydrates 378 gm., and fuel value 3,382 calories. The average daily cost, including waste, was 28 and 23 cts., respectively. The results are discussed at some length.

Nutrition investigations at the North Dakota Agricultural College, E. F. LADD (*U. S. Dept. Agr., Office of Experiment Stations Bul. 91, pp. 21–26*).—It was found that on an average a club of women students consumed 64 gm. protein, 99 gm. fat, 360 gm. carbohydrates per woman per day, the fuel value being 2,660 calories. The average daily cost of food including waste was 13.8 cts.

Nutrition investigations at Lake Erie College, Ohio, ISABEL BEVIER and ELIZABETH C. SPRAGUE (*U. S. Dept. Agr., Office of Experiment Stations Bul. 91, pp. 27–42*).—As shown by a dietary study, a club which was made up almost entirely of women students and teachers, consumed on an average: Protein 68, fat 115, and carbohydrates 321 gm. per woman per day, the fuel value being 2,665 calories. The cost including waste was 18.3 cts. per day. The results are discussed and compared with those obtained in similar studies elsewhere.

The digestion of various food substances, C. TURLE (*British Food Jour., 2 (1900), Nos. 21, pp. 246, 247; 22, pp. 278, 279*).—A general discussion.

Contribution to the physiology of digestion; function of the spleen in the formation of trypsin, A. HERZEN (*Arch Physiol.* [*Pflüger*], *84 (1901), No. 3–4, pp. 115–229*).—The author cites a number of experiments conducted by himself and his students which lead him to the conclusion that the spleen secretes some substance which possesses the power of changing protrypsin into trypsin.

Contribution to the physiology of digestion: I, Influence of several foods upon the quantity and quality of the gastric juice, A. HERZEN (*Arch. Physiol.* [*Pflüger*], *84 (1901), No. 3–4, pp. 101–114*).—On the basis of experiments made in the author's laboratory, which are not yet reported in full, the effect of a number of foods, including, among others, raw meat, meat juices, and meat broth, on the secretion of gastric juice and its composition, is discussed. The experiments were made with dogs having suitable fistulæ. The experiments are discussed with special reference to the theories advanced by J. P. Pawlow.[1]

Feeding tests with a dog given different nitrogenous materials, K. KORNAUTH (*Ztschr. Landw. Versuchsw. Oesterr., 3 (1900), Nos. 1, pp. 1–25; 2, pp. 133–162*).—In a study of the comparative value of a number of vegetable and animal proteids, the digestibility ot aleuronat, conglutin (from lupines), casein, gelatin, hide powder, and nuclein was determined, as well as the balance of income and outgo of nitrogen and phosphorus. With the exception of the nuclein preparation, which was unpleasantly acid, the nitrogenous substances were as well or better digested than meat meal. Although definite conclusions are not drawn, the experiments, in the author's opinion, do not indicate that the phosphorus of casein was more thoroughly assimilated than that of other foods. On casein gains of nitrogen were accompanied by corresponding gains of phosphorus.

The assimilation of fats, DESGREZ (*Rev. Gen. Sci. Pures et Appl., 1900, July 6; abs. in Ztschr. Untersuch Nahr. u. Genussmtl., 4 (1901), No. 5, p. 206*).—According to the author his experiments demonstrate that fat is converted in the body into glycogen, and not into sugar. In experiments with dogs the amount of glycogen in the muscles was much increased when fat was consumed, while the glycogen in the liver was not increased. The conclusion is therefore drawn that fat is not converted into carbohydrates in the liver, but that the conversion takes place under the influence of the leucocytes.

Concerning lipase, the fat-splitting enzym, and the reversibility of its action, J. H. KASTLE and A. S. LOWENHART (*Amer. Chem. Jour., 24 (1900), No. 6, pp. 491–525*).—Lipase was found in largest amount in the liver, next in the pancreas, kidney, and submaxillary gland. The enzym was tested as to its hydrolizing power

[1] Die Arbeit der Verdauungsdrüsen. Bergmann, Wiesbaden, 1898.

in forming ethyl butyrate. In the experiments a glycerin extract of lipase from the pancreas, prepared by macerating portions of the organ and straining through cloth, was used. Filtering through filter paper almost completely removed the enzym. The enzym was found to be more stable than usually supposed and its action was strongest at 40° C., while it was destroyed at 65 to 70° C.

In studying the effect of lipase on ethereal salts of a homologous series, it was found that the stability of the latter decreases with the increase of the molecular weight of the combined acid.

With concentrated amounts of the enzym or with small amounts of ethereal salts hydrolysis was complete. The authors believe that under other conditions the hydrolizing action of the enzym stops and its action under favorable circumstances is reversed. Experiments are described, wherein ethyl butyrate was formed from butyric acid and alcohol by the action of lipase. The trials were carried on with control experiments and the presence of the butyrate detected by its odor. About 5 per cent of the butyric acid was changed into ethyl butyrate. The bearing of this result on fat absorption, storing, and translocation in the plant is discussed.

The question of the resorption of fat, I. MUNK (*Centbl. Physiol.*, *14* (*1900*), *pp. 121–125, 153–156; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl.*, *4* (*1901*), *No. 5, p. 205*).—A controversial article.

Concerning the influence of butter on the secretion of gastric juice, W. A. WIRSCHILLO (*Vrach* [*St. Petersburg*], *21* (*1900*), *pp. 423, 424; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl.*, *4* (*1901*), *No. 5, p. 206*).—The principal conclusions, which were drawn from experiments made with man in which the stomach contents were examined, follow: Butter diminishes the hydrochloric acid and pepsin of the gastric juice, and hinders the secretion of the gastric juice less when first taken than after a time. The peptonizing power is greater under the influence of butter than without it. Butter diminishes the activity of the glands secreting gastric juice, and the secretion does not continue longer than when no butter is consumed. According to the observer butter should be given an important place in the diet of invalids on account of its nutritive value, pleasant taste, and easy digestibility.

Concerning the quantitative determinations of easily digested carbohydrates (starch and nearly related bodies) in the human feces, J. STRASBURGER (*Arch. Physiol.* [*Pflüger*], *84* (*1901*), *No. 3–4, pp. 173–189*).—As the result of investigations, the author concludes that the small amount of starch present in the feces can be determined quantitatively with the Volhard-Pflüger sugar method.

The silica content of human and animal tissues, H. SCHULZ (*Arch. Physiol.*, [*Pflüger*], *84* (*1900*), *No. 1–2, pp. 67–100; abs. in Chem. Centbl.*, *72* (*1901*), *I, No. 11, p. 636*).—Details of chemical investigations are reported.

ANIMAL PRODUCTION.

Rye as a concentrated feed, W. VON KNIERIEM (*Landw. Jahrb.*, *29* (*1900*), *No. 3, pp. 483–523*).—Tests made at the Peterhof Experimental Farm on the value of rye grain as a concentrated feed are reported and discussed. The investigations include a test with milch cows, a feeding test with pigs, digestion experiments with horses, sheep, rabbits and hens, and chemical and physiological studies of the fat of rye and other feeding stuffs.

Tests with cows (pp. 484–491).—The first test reported was made by A. von Villon. Two cows were fed during 3 periods from November 13 to February 12. The coarse food was 30 lbs. of clover hay daily. During the second period 1 cow was fed in addition 5 lbs. of malt dust, and another cow 5 lbs. of crushed rye daily. But little change was produced by the addition of grain to a ration of such nutritious coarse feed as clover hay. The ration containing the malt dust appeared to have a more favorable influence upon the production of milk than the ration with rye.

A more extended test was made by J. Plohman in a comparison of rye and oats with milch cows. The tests were carried on during different periods of lactation, the cows being given the 2 feeds alternately in order to eliminate the factor of individuality. The coarse feed was 15 lbs. of clover hay, 12 lbs. of straw, and 2 lbs. of cocoanut cake daily. The concentrated feed was 6 lbs. of ground rye or ground oats. The day's rations contained practically the same amounts of protein, the fat being larger in the case of the oatmeal ration.

The test extended from November 25 to January 8, and was divided into 3 periods of 10 days each, with 5 days interval between. In every case it was found that the oatmeal ration gave a larger production of milk than the rye meal ration. The fat content of the dry substance of the milk was higher in every case with the oatmeal ration. The following table shows the result by periods:

Fat in the dry substance of the milk.

	Cow No. 1.		Cow No. 2.	
	Ration.	Fat in total solids.	Ration.	Fat in total solids.
		Per cent.		*Per cent.*
Period 1	Oats	28.77	Rye	26.41
Period 2	Rye	26.24	Oats	26.98
Period 3	Oats	28.67	Rye	24.48

The specific gravity of the milk was in every case lower on the oat ration than on the rye ration. Of the butter made during the different feeding periods, no difference was noticed in the grain or taste, but that made on the rye ration was harder, while that made on the oat ration had a deeper yellow color. No bad effects on the animals were noticed in feeding the rye ration.

As analysis shows, rye grain is poor in fat, and hence it is recommended to feed it with coarse food rich in fat or in connection with oil cake.

Tests with sheep (pp. 491–500).—Tests made by P. Kasimirsky, on the comparative digestibility of rye and oats by two sheep and the effects of these grains on the digestibility of hay, are reported. The ration consisted of 700 gm. of hay and 300 gm. of grain per day. The usual experimental methods were followed, the coefficients of digestibility of the rye and oats alone being calculated from the digestibility of the whole ration, as described in a previous publication (E. S. R., 10, p. 1083). The average results follow:

Coefficients of digestibility of hay, oats, and rye; average of two sheep.

	Protein.	Fat.	Crude fiber.	Nitrogen-free extract.	Ash.
Hay and oats:	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Calculated digestibility of hay alone	68.83	64.08	44.22	48.43	41.57
Calculated digestibility of oats alone	81.61	93.72	71.98	82.35	45.79
Hay and rye:					
Calculated digestibility of hay alone	44.22	67.75	41.08	58.72	....
Calculated digestibility of rye alone	68.00	30.83	7.00	77.20	....

The author calls attention to the fact that when rye formed part of the ration the digestibility of protein and crude fiber of the hay was diminished, while that of the nitrogen-free extract was increased; furthermore, the fat of rye was much less thoroughly digested than the fat of oats.

Tests with pigs (pp. 500–504).—On the basis of tests carried on by Schukowski, the comparative value of rye, barley and milk for pigs, is discussed. Two pigs were fed rye with whole milk for 17 days. Barley was then substituted for rye until the end of the feeding period, which covered 142 days. Two similar pigs were fed barley for 68 days and then rye alone or rye and barley for the remainder of the test. The total gain of the first lot was 127.98 lbs.; of the second, 132.32 lbs. The author states that rye, as distinguished from barley, was not eaten readily when fed in large amounts and that sometimes it was refused altogether. The conclusion was drawn that although large amounts of rye can be successfully fed such rations can not long be continued. To compare whole milk and skim milk, a ration of whole milk and barley was continued with one of the pigs for some 7 months. After a short time on whole milk and barley, a similar pig was fed at the close of the test on skim milk and barley. The author calculates that skim milk made a return of 0.38 ct. per kg.

Tests with horses, rabbits and hens (pp. 504–523).—The author reports and discusses a number of experiments made with horses, rabbits and hens. The comparative digestibility of rye and oats was tested with horses by W. Groot. The grains were fed with clover hay, the daily ration consisting of 4,914 gm. of the former and 8,190 gm. of the latter. The usual experimental methods were followed. The average coefficients of digestibility of the two rations follow:

Coefficients of digestibility of hay and oats, and hay and rye; average for two horses.

	Dry substance.	Protein.	Fat.	Crude fiber.	Nitrogen-free extract.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Hay and oats	51.46	62.80	59.81	35.60	60.26
Hay and rye	52.24	55.84	8.89	31.23	66.11

As pointed out by the author, when oats constituted part of a ration, the fat was much more thoroughly digested than when rye was fed. He believes that the chief reason why oats are such superior feed for horses is that almost no vegetable fat is so easily digested as that of oats. In the tests noted above, the time spent in work was recorded as well as the weight of the horses. The losses in weight were greater on the rye ration than on the oat ration. The fact that variations in weight can serve for judging the value of feeding stuffs is insisted on. The author believes that although oats are much better feed for horses than rye, yet the latter can be fed to advantage in rather large quantities. He recommends that the grain be soaked before feeding and that the horses be gradually accustomed to it. Since rye is deficient in fat, this constituent should be supplied by other feeding stuffs. The low coefficients of digestibility of fat observed when rye was fed is discussed and tests bearing on this subject by Roschnowski, Redych, and R. Slawinski, are briefly reported. Roschnowski found that as an average of two tests, the coefficients of digestibility of rye by rabbits was as follows: Dry matter, 85.95; protein, 68.45; fat, 72.70; nitrogen-free extract, 93.59; crude fiber, 65.97; and ash, 36.15 per cent. According to Redych's results, rabbits digested 98.3 per cent of the fat of cocoanut cake, 94.8 per cent of the fat of oats, and 76 per cent of the fat of rye. Slawinski found that rabbits digested 96.3 per cent of the fat of cocoanut cake; 65.5 per cent of the fat of oat straw, and 55 per cent of the fat of rye straw.

Further studies of the comparative digestibility of rye, oats and barley, and especially of the fat are reported by the author, which were made by W. Grost. Three hens were used, and the daily ration consisted of 70 gm. of the grains tested. The coefficients of digestibility follow:

Coefficients of digestibility of rye, oats, and barley; experiments with hens.

	Dry matter.	Protein.	Fat.	Nitrogen free extract.	Crude fiber.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Rye	76.96	70.72	16.59	87.8	2.4
Oats	49.88	62.34	84.01	60.82	.5
Barley	69.41	75.41	67.43	81.11	.2

In this case also the coefficients of digestibility of the fat of barley was lower than that of the other grains. As the author points out, digestion experiments with poultry present this difficulty, viz, the urine and feces are excreted together; therefore, in determining the coefficients of digestibility of protein, the amount of uric acid and ammonia excreted was determined and the sum deducted from the total nitrogen. The remainder was assumed to represent the nitrogen of the undigested protein.

In discussing these experiments and those reported above (see milch cows, sheep, and pigs), the author draws general deductions concerning rye as a concentrated feed, some of which follow: Rye may be profitably used as a feeding stuff, but some precautions are necessary in the method of feeding, and in the selection of other constituents of the ration. Rye should be soaked or coarsely ground. On account of the low content of the crude fiber and the low coefficients of digestibility of the fat, this grain can not be recommended as a concentrated feed for horses or young cattle. When, on account of its comparatively low cost, rye must be used, the other feeding stuffs should be chosen so that the necessary fat is supplied. No injury to health was observed when rye was fed except in the case of pigs fed this grain alone. Such injury the author believed due to ergot and other impurities.

As bearing upon the low coefficients of digestibility of the fat of rye, the author reports a number of determinations by P. Kotow of the chemical character of the fat from the grain and straw of rye and oats. The results follow:

Comparison of the fat of rye, oats, rye straw, and oat straw.

	Specific gravity.	Melting point.	Unsaponifiable material.	Acid number.	Saponification number.	Ether number.	Insoluble fat.	Iodin number.
		°C.	*Per cent.*				*Per cent.*	
Rye fat	0.9284	29	8.5	12.2	360	347.8	80.2	117.2
Oat fat	.9324	26	7.8	14.8	204	189.2	77.1	98.4
Rye-straw fat	.8278	58	10.2	27.5	110.5	83	55.4	82.2
Oat-straw fat	.8507	57	8.6	18.2	190.8	172.8	56.1	66.5

The differences observed in these fats are discussed, and it is stated that further studies will be reported on the relation between the chemical constituents of fat to its digestibility.

Vetch as concentrated feed, W. VON KNIERIEM (*Landw. Jahrb., 29 (1900), No. 3, pp. 524–540*).—The value of vetch seed (*Vicia sativa*) is discussed, many investigations previously reported b ing cited. The author reports experiments made at the Peterhof Experimental Farm with cows by Schaposchnikoff and A. Buschmann and with pigs by M. von Wichert. The digestibility of vetch seed was tested with rabbits and compared with that of pea meal.

It is stated that because of its cheapness vetch-seed meal has been fed to the dairy herd at the Peterhof Experimental Farm for several years. Increasing amounts were fed, aggregating in one year 1,421 lbs. per head, or a daily average of almost 4 lbs. It favorably influenced the milk yield, the cows ate the vetch-seed meal readily, and it was not detrimental to the health of a single individual.

In an experiment by Schaposchnikoff a cow was feed during 3 periods with 35 lbs. of clover hay. During the second period 5 lbs. of vetch-seed meal was added to the daily ration. With the vetch ration there was a large increase in the yield of milk and in the percentage of protein and a decrease of the percentage of butter fat. The cow ate the vetch with relish, and no unfavorable results were apparent.

In another experiment by A. Buschman, a comparison was made between vetch-seed meal and cocoanut meal. These 2 concentrated feeds were fed in connection with 15 lbs. of trefoil clover and 10 lbs. of oat straw daily. This amount of vetch-seed meal had no bad effect upon the health of the cow, while the yield of milk was 8 per cent higher than with the cocoanut-meal feed. The fat content of the milk was 4.24 per cent during the first cocoanut-meal period, 3.58 during the vetch-seed-meal period, and 4.38 during the concluding cocoanut-meal period.

The test with pigs covered 70 days. Two of the pigs were fed vetch seed alone, vetch and milk, or vetch and barley. For a few days barley alone was given. Two similar pigs were fed barley alone at first, and later barley and milk. The grains were coarsely ground. On the first ration the total gain was 18.265 kg. and on the second 21.726 kg. One pig in each lot was then slaughtered and the feeding continued with the other, hay meal being added to the rations. In 18 days the pig fed the vetch ration gained 10.249 kg. and the pig fed barley 15.579 kg. In this test it was observed that the pigs did not eat the vetch with great relish, and sometimes it was refused. The author believes, however, that vetch seed may be profitably used as a feeding stuff for pigs, although some caution must be observed. On the other hand, vetch was found to be a very satisfactory feeding stuff for milch cows, and at the same time, according to the author, it is very cheap.

Concentrated feed stuffs; condimental stock and poultry foods, J. B. Lindsey (*Massachusetts Hatch Sta. Bul. 71, pp. 40*).—A large number of analyses of feeding stuffs are shown in tables, giving the brand, manufacturer, source, and the protein and fat guaranteed and found. The various feeds are divided into 4 classes, with reference to their protein content. For New England conditions, the most economical concentrated feeds in the author's opinion are cotton-seed meal, corn-gluten meal, gluten feed, dry brewers' grains, malt sprouts, and fine flour middlings. Expensive feeds are wheat bran, linseed meal, and so-called mixed feeds. The latter especially are undesirable, on account of being so often adulterated. Therefore it is usually more economical for the feeder to make his own mixtures. For this purpose tables of desirable mixtures are given. Of the 11 samples of cotton-seed meal not guaranteed, 8 were found to be largely adulterated. Farmers are therefore urged to purchase only guaranteed meals. The gluten meals and feeds were free from adulteration and usually of excellent quality. A large number of the so-called oat feeds were of very inferior quality, and, while costing nearly as much as corn, are only $\frac{1}{2}$ to $\frac{2}{3}$ as valuable.

A large number of analyses of condimental stock foods and condition powders are reported and the substances found in them discussed. They were found to consist principally of cereals, oil meals, and by-products. In some, condiments as fenugreek and gentian were found, as well as various other products, as salt, sulphate of magnesium, soda, charcoal, sulphur, and, in poultry foods especially, ground oyster shells, charcoal, and pepper. The condition powders varied very much in composition, but in general the author believes were of very little value, and in no way merited the strong claims made for them by the manufacturers. Their cost is excessive, and in no case are they necessary to the health of the animal.

Commercial feeding stuffs in the Connecticut market (*Connecticut State Sta. Bul. 133, pp. 29*).—Agents of the station collected in the 25 towns and villages of the State 186 samples of commercial feeding stuffs. The results of analysis are shown, giving the chemical composition, the digestible nutrients, and the cost per ton. A list showing the average weight of 1 qt. of each of the feeds named is also given. With the exception of cotton-seed meal, old-process linseed meal, and hominy chops, the percentages of fat in these feeds was not very unlike, ranging between 2.4 and 5.5 per cent. As the protein is the nutrient which the feeder is chiefly concerned in getting, a comparison is shown of the cost of that ingredient in each of the classes of foods. If 20 lbs. of protein in cotton-seed meal cost \$0.64, then 20 lbs. of protein in gluten meals cost about \$0.85, in gluten feeds \$0.88, in wheat feeds \$1.20, in oats, corn, provender, corn chop, etc., \$1.77, and in oat feeds and other trash \$2.10. This is a rough but practically just statement of the comparative cost of protein in the feeding stuffs analyzed. Cheap and low-grade oat feeds are considered to be of very little value. Corn meal should be produced by the feeder, and he is advised not to buy anything containing less protein than wheat feeds, and especially to avoid purchasing the condimental and medicinal foods, put up usually under proprietary names.

The composition of commercial feeding stuffs sold in Connecticut (*Connecticut State Sta. Rpt. 1900, pp. 361–387*).—A reprint of the above bulletin.

Condimental and medicinal cattle and poultry foods (*Connecticut State Sta. Rpt. 1900, pp. 355–360*).—Reprint of Bulletin 132 of the station (E. S. R., 13, p. 75).

Analyses of commercial feeding stuffs, J. L. HILLS, C. H. JONES, and B. O. WHITE (*Vermont Sta. Bul. 84, pp. 95–107*).—In accordance with the State law regulating the sale of commercial feeding stuffs, 230 samples were analyzed. These included cotton-seed meals, linseed meals, Cleveland flax meal, gluten meals and feeds, oat feeds, corn-and-oat feeds, corn and oats, wheat bran, wheat middlings, mixed wheat feeds, ground oats, corn and bran, hominy chop feed, calf meal, poultry foods, and animal meal.

"A general survey of the analyses discloses no considerable amount of adulteration. There is still some sale of goods containing more or less plentiful proportions of oat hulls, but buyers are coming to understand this better and to purchase accordingly. This is not an adulteration in the eye of the law, provided the composition of the goods is stated and maintained. There are still some sales being made of goods carrying oat hulls, where the guaranty is lacking. Pressure is being brought to bear upon the makers of such mixtures to comply with the law. . . .

"Guaranties were not upheld as well with the gluten feeds samples as with the meals, unless refuge is taken behind the 'dry basis' claim. . . .

"Germ oil meal is a new material on the Vermont market. It is made largely from the germs of the corn kernel, is lower in its protein content than the other glucose by-products, and is very high in fat. The four samples analyzed were uniformly below guaranty. . . .

"Oat feeds and corn and oat feeds are largely made up of the residues from the manufacture of oatmeal and other breakfast foods. They form the outlet for oat hulls and light oats, and contain, as a rule, much more woody fiber (oat hulls) than is found in a good quality of oats or provender. Certain of these goods are fortified with more or less of some highly nitrogenous concentrate like cotton seed or linseed meal. Others are very lacking in protein and are hardly more than oat hulls."

Experiments on the utilization of gorse, A. C. GIRARD (*Ann. Agron., 27 (1901), No. 1, pp. 5–44*).—The composition of gorse was studied, and also its digestibility by a horse and a sheep. The culture of gorse is described and the plant compared with alfalfa.

Contribution to the subject of aspartic acid and asparagin, A. JOLLES (*Arch. Physiol. [Pflüger], 84 (1901), No. 7–10, pp. 446–450*).—From his experiments the author concludes that when aspartic acid is oxidized with permanganate of potash, the nitrogen is obtained in the form of ammonia. When asparagin is oxidized, more than one-half of the nitrogen is obtained as urea, the remainder as ammonia. The experiments are discussed in relation to their bearing upon the oxidation of asparagin by animals.

Rational stock feeding, W. J. SPILLMAN (*Washington Sta. Bul. 48, pp. 48*).—A popular discussion of the principles of stock feeding. This is a revision of an earlier bulletin (E. S. R., 10, p. 583).

Notes on the animal industry of Porto Rico, O. F. COOK (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1899, pp. 663–667, pls. 10*).—Brief notes on feeding stuffs, breeds of cattle, poultry, etc., are given.

Steer-feeding experiments, L. FOSTER and L. A. MERRILL (*Utah Sta. Rpt. 1900, pp. LV–LXIII*).—The cost of raising steers from birth until they were two years old was tested with 4 grade Jerseys. At first they were fed whole milk and later skim milk and grain. The calves were pastured during the summer, and in the winter were fed alfalfa, corn stover, grain, and roots. At the beginning of the test calves 1 and 2 each weighed 58 pounds. They gained on an average of 1.35 and 1.12 lbs. per day, respectively. Calf number 3 weighed 94 lbs. at the beginning of the test and gained on an average of 1.39 lbs. per day. Number 4 weighed 76 lbs. at birth and gained 1.15 lbs. on an average per day. The profit on the calves was $12.78, $8.59, $9.38, and $6.82, respectively. The total cost of raising calves 1 and 2 was $23.30 and $22.05, respectively, while numbers 3 and 4 each cost $19.98.

"It should be remembered that these steers were grade Jerseys, which accounts for their light weights. Grades of any good beef breed would no doubt have given much better returns, but this experiment was intended to show what may be done with grade Jersey steers by those who seek to improve their dairy herds by the use of a Jersey bull. The quality of the meat was excellent, the very best sold at the local markets during the year."

Report on experiments on the winter feeding of cattle, 1898-99, J. W. Paterson (*West of Scotland Agr. Col. Rpt. 1899, pp. 22*).—Tests with 4 lots of steers from December 24, 1898, to April 8, 1899, on the comparative value of the following rations are reported: Linseed cake, decorticated cotton-seed cake and maize meal, bruised oats and decorticated cotton-seed cake, and decorticated cotton-seed cake. In every case Swedish turnips, hay, and straw were fed in addition. The greatest profits were realized on the first ration and the lowest on the second, while the third and fourth ranked between these two. Linseed cake produced more gain than the decorticated cotton-seed cake, but the increase did not compensate for the extra expense. When compared with cotton-seed cake and maize, linseed cake alone was still more unprofitable.

Feeding skim milk to calves, A. L. Haecker (*Nebraska Sta. Bul. 68, pp. 22-29*).—Six grade calves were used. Three calves (lot 1) were taken from their dams a day or two after birth and fed whole milk for about 10 days. Skim milk, to which flaxseed meal was added, was then gradually substituted for whole milk. At the end of 8 weeks the calves were weaned. They were then pastured and later fed in the barn. The average weight of the calves in lot 1 at the beginning of the trial was 90 lbs.; at the end of 5 months, 333 lbs.; and when a year old, 798 lbs. The three calves in lot 2 were allowed to run with their dams for 5 months. The average weight of the calves at birth was 78 lbs.; at the end of 5 months, 347 lbs.; and when a year old, 792 lbs. Record was kept of the milk and butter fat produced by the dams of the calves in lot 1 and the data used in computing the cost of feeding. Among the conclusions were the following:

"As to the quality of the calves in the two lots, it was quite easy at the end of the fifth and sixth periods (of 4 weeks each) to pick out the sucking calves, as they were rounder in body and had better coats, but at one year old this difference could not be detected. . . .

"In conclusion it may be safely said that by careful feeding good steers can be raised on skim milk by using ground feed to replace the lost butter fat.

"The cost of feed for a skim-milk calf raised to six months old was about nine dollars. Where a market for butter is accessible, even cows with a beefy tendency can be milked with profit and their calves raised with little cost and work."

Milk and artificial foods for calves, L. Malpeaux (*Bul. Soc. Vaud. Agr. et Vit.* [*Lausanne*], *1900, No. 143, pp. 774-780*).—A résumé of experiments reported earlier (E. S. R., 12, p. 978).

Sheep-feeding experiments, L. Foster and L. A. Merrill (*Utah Sta. Rpt. 1900, pp. LXIII-LXVIII*).—The comparative value of good wheat, frosted wheat, No. 1 wheat screenings and No. 2 wheat screenings was tested with 4 lots of 24 lambs each. In every case alfalfa was fed with the grains. The authors state that No. 1 wheat screenings consist of alfalfa seeds, clover seeds, and various weed seeds; while screenings No. 2 was made up mostly of cracked, broken and shrunken wheat. At the beginning of the test, which covered 14 weeks, the average weight of the lambs was about 47 lbs. each. On good wheat the average daily gain was 0.19 lb., and on frosted wheat 0.21 lb.; on No. 1 screenings, 0.21 lb., and on No. 2 screenings 0.24 lb., while 4.54, 4.19, 5.32, and 4.38 lbs. of the grains were required per pound of gain, respectively, in addition to about 6½ lbs. of alfalfa. The cost of food eaten per pound of gain in the 4 lots was 4.88, 4.18, 3.24, and 3.95 cts., respectively.

"Taking into account both the rate and the cost of the gains, the results of this experiment indicate that it is more profitable to feed screenings than either good or frosted wheat."

The composition of the different grains fed is reported and the work of the Canadian stations in feeding frozen wheat cited in some detail.

The influence of manures on mutton, W. SOMERVILLE and T. H. MIDDLETON (*Jour. Bd. Agr.* [*London*], *7* (*1900*), *No. 3, pp. 311–331*).—Continuing previous work (E. S. R., 12, p. 75), a test on the effect of different fertilizers on pasture land, as shown by gains in weight made by sheep and by the hay crop, is reported. As in previous years, the fertilizers consisted of cotton-seed cake, lime, and ammonia. One plat, No. 6, served for the purpose of comparison and was not fertilized. Some of the results obtained in the test in 1900, as well as the results obtained in the four years during which the investigation has been continued, are shown in the following table:

Results of different methods of manuring pasturage as shown by production of mutton.

Plats.	Treatment.	Total gains made by sheep in 1900.	Gains in weight of sheep in 4 years in excess of plat 6.	Gain (+) or loss (−) per acre in 4 years. *a*	Total cost of fertilizers per acre in 4 years.
		Pounds.	*Pounds.*		
1	Cotton-seed cake	80	228	+$9.42	$7.90
2	Lime	60	21	−11.04	12.64
3	Basic slag	131	408	+25.64	5.75
4	....do	139	227	+11.89	5.35
5	Superphosphate	137	218	+ 7.72	8.83
6	Untreated throughout	44			
7	Superphosphate and potash	137	255	+ 6.80	12.55
8	Superphosphate and lime	159	279	+ 7.49	13.69
9	Superphosphate and ammonia	128	228	+ 2.98	14.31
10	Dissolved bones	134	234	+ 2.90	14.86
11	Basic slag	89			8.02

a Based on the weight of the sheep.

The hay produced on the different plats in 1900 is reported and the amount compared with the crop of previous years. In discussing the tests the author says:

"Without attempting to draw general conclusions, it may be said that the third and fourth seasons of the Tree Field experiment clearly indicate that manures may modify the value of pasture by affecting the season of growth, as well as by increasing the weight of produce. Under the influence of different manures a late pasture may be made earlier, or a short-lived pasture may be induced to persist far into the autumn. There is nothing new in this assertion; most farmers who have had experience in the manuring of pastures will have remarked it as certainly as they have noted that increased production of meat follows manuring. But just as the Tree Field experiment has afforded an exact means of determining the live-weight increase due to the action of manures, so it promises to throw light on the specific effects of certain fertilizers on the quality, the earliness, and the persistence of pastures. Exact information on these points is much wanted, and the future development of the Tree Field plats promise to be instructive."

Our horse-raising industry (*Landw. Jahrb. Schweiz, 15 (1901), No. 1, pp. 55, tables 3*).—An extended account of horses and horse breeding in Switzerland.

Concerning the shelter and care of draft animals and poultry in winter, E. S. Zürn (*Fühling's Landw. Ztg., 49 (1900), Nos. 22, pp. 839–842; 23, pp. 882–886; 24, pp. 913–915*).—A general discussion.

Breeding thoroughbred poultry, J. J. McCue (*Agr. Gaz. New South Wales, 11 (1900), No. 12, pp. 1075–1087, dgm. 1*).—Selection, reversion, inheritance, the sexes and their power, and line breeding are discussed with relation to poultry.

Ducks and duck breeding, E. Brown (*Jour. Bd. Agr. [London], 7 (1900), No. 3, pp. 300–310, figs. 4*).—A general discussion.

Foreign markets for eggs and poultry, H. E. Alvord, N. B. Ashby, and S. Lowe (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1899, pp. 321–345*).—This includes a number of short articles by the authors mentioned on such subjects as "The report on poultry and egg trade in foreign markets," etc.

The British egg supply, E. Brown (*Jour. Roy. Agr. Soc. England, 3. ser., 11 (1900), pt. 4, pp. 605–645, figs. 11*).—The article contains many statistics and other information regarding the egg industry as well as information on poultry raising and kindred topics.

DAIRY FARMING—DAIRYING.

Alfalfa protein vs. purchased protein in rations for dairy cows, E. B. Voorhees and C. B. Lane (*New Jersey Stas. Bul. 148, pp. 15–22*).—Alfalfa hay was compared with wheat bran and dried brewers' grains in quantities furnishing practically the same amounts of protein. The test included 4 cows and lasted 60 days. The record of each cow is given in detail and the data are summarized and briefly discussed. "The experiment showed that the protein in alfalfa hay could be successfully and profitably substituted in a ration for dairy cows for that contained in wheat bran and dried brewers' grains, and for this purpose is worth \$11.16 per ton, when compared with the wheat bran and dried brewers' grain at \$17 per ton."

Some forage plants for summer feed, T. L. Lyon and A. L. Haecker (*Nebraska Sta. Bul. 69, pp. 30–42*).—This bulletin is a report on experiments with forage plants for the purpose of determining their relative value for pasturage and for soiling and comparing the value of certain of these crops for milk and butter fat production under the two systems of feeding. Similar work has been previously noted (E. S. R., 11, p. 279) and the results are here again briefly reported. The method of conducting the experiments was the same as described in the abstract of the previous work. Rye and sorghum gave the largest amounts of pasturage and corn and millet the smallest amounts among the annual forage plants. Alfalfa and awnless brome grass representing the perennial crops afforded the least pasturage. The brome grass furnished only a little more than half during the same part of the summer. The largest increase in the yield of milk and butter fat was obtained from cowpeas and alfalfa, followed by rye, oats and peas, sorghum, Kafir corn, and awnless brome grass, in the order given. Cowpeas produced the greatest quantity of milk and butter fat from a given area of land. A comparison of alfalfa, sorghum, and corn when used for pasturage and for soiling showed that in the case of each crop from two to three times as much feed was produced from a given area when the crop was used for soiling as when it was pastured. The average daily production of milk and butter fat for the same amount of forage was 1.17 times greater when the cow was pastured on the crop than when it was fed as soiling.

Summer forage crops, J. B. Lindsey (*Massachusetts Hatch Sta. Bul. 72, pp. 16, pls. 4*).—This bulletin gives a concise description of a number of forage crops which have been grown at the station for soiling purposes. The relative advantages of pasturage and soiling, desirable forage crops and crop mixtures, and suitable fertilizers for their culture are discussed. A system of soiling crops for 10 cows is suggested, with the times for seeding and cutting, and the area of each. Several grain mixtures for feeding to cows in connection with the soiling crops are given; and the composition and digestibility of grasses, cereals, legumes, and various fodder mixtures, as well as the number of pounds of digestible dry matter, protein, and carbohydrates in different weights of the several fodder groups are tabulated.

Studies on the rational use of the prickly pear (Opuntia ficus indica) for feeding milch cows, G. Stogia (*Staz. Sper. Agr. Ital., 1900, p. 113; abs. in Centbl. Agr. Chem., 1900, No. 12, pp. 803, 804*).—An experiment was made with 5 cows in feeding cut stems of prickly pear in combination with bran and hay. The prickly pear contained: Protein 0.54 per cent, fat 0.128, carbohydrates 2.6. It was found that 25 kg. prickly pear and 14 kg. good hay made a very desirable ration. The milk secretion was increased by feeding prickly pear in the ration, the water content remaining constant or becoming a little less. It is advisable to expose the prickly pear to the sun for 5 days before feeding. If the plant is young, less than 3 years, it is apt to cause a slight diarrhea; if too old the plant will be somewhat woody.

Report of the Hvilan Control Association, 1899–1900, N. Hansson (*Landtmannen, 11 (1900), No. 29, pp. 457–467*).—This association was formed in 1898 for the purpose of controlling and improving the production of the dairy herds of the members who reside in the district of Hvilan, Sweden. The work described in the present report covers the period from May 1, 1899, to May 1, 1900. Eighteen dairy herds, containing in all about 300 cows, were regularly tested every 21 days during the year by the assistant in charge of the work. The system of feeding practiced on the different farms, as well as the production of the individual cows, was determined, and the economy of the production in each case and for the different herds. The latter is calculated on the basis of so-called "food units," 1 kg. of grain feed being assumed equivalent to 2.5 kg. of hay, 4 kg. of straw, 10 kg. of roots, etc. Some of the average results for the year for 235 cows that finished a whole year's work are as follows: Milk produced per head, 3,327.4 kg.; average fat content, 3.19 per cent; butter fat produced, 106 kg., equivalent to 116.71 kg. butter; cost of producing 1 kg. milk, 1.7 cts., and 1 kg. butter, 44.6 cts. (about 20 cts. a pound). The rations of the cows consisted (per 100 food units) of 38.4 per cent concentrated foods (11.1 per cent oil cakes) and 61.6 per cent of coarse fodder.

The educational value of the work of these control associations, which during the last decade have been formed in large numbers in the Scandinavian countries, and especially in Denmark, can hardly be overestimated. A gradual improvement in the production of the herds and in their economy of production has been wrought, due first of all to the weeding out of the poorest cows in the different herds, and also to the adoption of a better system of feeding and caring for the animals, and to the use of superior pure-bred bulls.—F. W. WOLL.

Report of the Control Association of Vejen and Vicinity, 1899–1900, C. Nyegaard (*Mälkeritid., 13 (1900), No. 37b, pp. 591–638*).—The report gives detailed information concerning the individual production and food consumption of 598 cows in 25 different herds, for the winter and the summer periods, as well as for the whole year, and average annual data for 13 herds for a period of 5 years, 1895–1900. A detailed account is also given of the cost of rearing and keeping young cattle, bulls, and swine on the farms belonging to this Danish control association.—F. W. WOLL.

The dairy herd, H. J. Waters (*Missouri State Bd. Agr. Bul., 1 (1901), No. 1, pp. 64–76*).—A popular article on the selection, breeding, and feeding of dairy cattle.

The influence of the amount of water consumed on the milk secretion, B. Koch (*Jour. Landw., 49 (1901), No. 1, pp. 61–88*).—The object of the experiment was to study the influence of the water consumed upon both the yield and the composition of the milk. Previous work along this line is reviewed at some length. In the present experiment 2 cows were fed similar rations during 4 periods. In the first period of 20 days the cows were given in addition 30 gm. of salt each daily, during the second period of 20 days 80 gm. of salt, during the third period of 10 days 120 gm. of salt, and during the fourth period of 20 days the same as in the first period. The amount of water consumed by each animal was carefully determined. The milkings were made twice daily, at 5 a. m. and 5 p. m. The average daily results are shown in the following table:

Average daily yield and composition of milk.

	Water consumed.	Milk yield.	Dry matter.	Fat.	Nitrogen.
	Kg.	*Kg.*	*Per ct.*	*Per ct.*	*Per ct.*
Cow No. 66:					
Period I	31.5	10.315	12.773	3.895	0.528
Period II	41.2	10.259	12.907	3.934	.527
Period III	36.0	9.935	12.675	3.908	.536
Period IV	30.5	9.561	12.791	3.863	.534
Cow No. 67:					
Period I	41.4	18.695	10.999	3.134	.454
Period II	48.8	16.892	10.860	3.105	.458
Period III	53.5	15.075	10.732	3.046	.468
Period IV	51.9	15.132	10.878	3.010	.460

Bacillus lactis viscosus, a cause of ropiness in milk and cream, A. R. WARD (*Science, n. ser., 13 (1901), No. 322, pp. 324, 325*).—From the examination of creameries in the State of New York, it was found that ropiness in milk from 3 different localities was due to *Bacillus lactis viscosus*. This organism, found in water, multiplies at a temperature as low as 8° C. In the cases coming under the author's observation, the milk was cooled in long open-topped cans in ice water, and the water was found in each instance to contain the organism. By adding to the water potassium bichromate 1 part to 1,000, the trouble was obviated. Although scrupulous care had been observed in sterilizing vessels, the trouble persisted in its appearance, the milk doubtless being inoculated each time from the water in which the cans were cooled.

The changes in milk caused by heating, J. SEBELIEN (*Chem. Ztg., 25 (1901), Nos. 27, pp. 293, 294; 28, pp. 307, 308*).—A compilation of the work of various authorities.

Calcium and sodium citrates in the coagulation of the blood, lymph, and milk, L. SABBATANI (*Atti. R. Accad. Sci. Torino, 36 (1901), pp. 27–53; abs. in Jour. Chem. Soc. [London], 80 (1901), II, No. 461, p. 175*).—The results shown support Vaudin's hypothesis that the citric acid normally in milk assists in keeping the calcium salts in solution. They also tend to confirm the view that calcium in a chemically active condition is necessary to the coagulation of milk.

The bacterial condition of city milk, and the need of health authorities to prevent the sale of milk containing excessive numbers of bacteria, H. W. PARK (*Science, n. ser., 13 (1901), No. 322, pp. 322, 323*).—It was found that during the coldest weather the milk sold in New York City averages about 250,000 bacteria per cubic centimeter, during the cold weather about 2,000,000, and during hot weather about 5,000,000. Investigation showed that the milk sold in other large cities is in about the same condition. Attention is called to the fact that children in cities sicken on the milk supplied in summer, and that where they are put on milk that is sterile, or that contains few bacteria, they as a rule improve rapidly. Any intelligent farmer with sufficient cleanliness and a low temperature can supply milk averaging not over 100,000 bacteria per cubic centimeter; and the author suggests that the sale of milk should be so regulated that that containing more than this number per cubic centimeter should be excluded from the market.

A report upon the examination of milk, E. A. DE SCHWEINITZ (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1899, pp. 147–153*).—The results of the examination of a number of samples of milk obtained from various sources in the city of Washington. The average number of bacteria per cubic centimeter found in the samples of sanitary milk examined between January 1, 1898, and February 1, 1899, was 5,971. The average number of bacteria per cubic centimeter in the samples of pasteurized milk examined during the same time was 266. The total number of bacteria per cubic centimeter in samples obtained from various dairies furnishing milk for the city was found to average over 61,886.

Butter making, C. L. Willoughby (*Missouri State Bd. Agr. Bul., 1 (1901), No. 1, pp. 27–63, fig. 1*).—A popular article on butter making, relating especially to the conditions within the State.

Starters and flavors, G. L. McKay (*Nat. Cream. Buttermakers' Assoc. Rpt. 1901, pp. 133–140*).—A popular article describing the use of starters for ripening cream at the Iowa Agricultural College, Ames.

Moisture in butter, E. H. Farrington (*Nat. Cream. Buttermakers' Assoc. Rpt. 1901, pp. 140–147*).—A résumé of the work of various experiment stations upon the water content of butter and the conditions affecting the same.

A comparison of the yield of salted and unsalted butter and the influence of the aeration of the milk upon the quality of the butter, Sebelien (*Molk. Ztg., 15 (1901), No. 15, pp. 253, 254*).—This is a report of work done by H. P. Lunde, E. Helm, and P. O. Petersen, under the direction of V. Storch, Copenhagen. The experiments covered a period of several months, and the investigations were carried on in 5 different dairies. Butter was made from milk under like conditions. After churning, a portion was washed, worked twice, and salted in the usual manner. Another portion was thoroughly washed and worked once, but not salted. The yield of the unsalted butter averaged 2.4 per cent less than the yield of the salted butter. The lesser yield of the unsalted butter ranged from 1.2 to 3.7 per cent. The loss in washing was 0.26 per cent with the salted and 0.47 per cent with the unsalted butter. The water content of the salted butter was 16.49 per cent, of the unsalted 17.12. The substances other than water and fat were 4.75 per cent in salted and 1.57 per cent in unsalted butter. This difference was largely made up of salt, the salted butter containing 2.45 per cent of that substance. The casein content of the salted butter was 0.97 per cent, of the unsalted 0.80 per cent; milk sugar, salted butter 1.01 per cent, unsalted butter 0.76 per cent.

The results of the aeration of milk upon the quality of the butter were variable. In 19 per cent of the trials the product was improved, in 25 per cent there was no difference, while in 56 per cent of the trials the butter produced by aeration was inferior to the control.

Fishy flavor of butter, the cause and remedy, M. A. O'Callaghan (*Agr. Gaz. New South Wales, 12 (1901), No. 3, pp. 341–346, figs. 8*).—Later work, it is said, corroborates the previous views of the author, that the fishy flavor of butter is caused by the bacterium *Oidium lactis*. By inoculating a portion of milk with this bacterium, fishy flavored butter was produced, while the control portion of the milk produced butter of good flavor. Also by pasteurizing a portion of milk containing this germ the pasteurized milk produced butter of good flavor, while the control transmitted the fishy flavor. As a remedy pasteurization of infected milk is recommended, the bacilli causing the fishy flavor being readily destroyed at 168° F. Cleanliness in and about the dairy is also urged, to prevent the inoculation of the butter during the manipulation of the milk.

Report upon experimental exports of butter, 1898–99, H. E. Alvord (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1899, pp. 154–243*).—This is a statement of the results of the efforts of the United States Department of Agriculture in promoting the exportation of American dairy products. The results of the trial shipments are given in full with the scores of the different shipments and the style of packages. The requirements of European markets, especially those in England, are discussed at some length.

Cooperation in Denmark, A. Vind (*Creamery Jour., 11 (1901), No. 138, p. 3*).—Method of organizing and managing cooperative creameries.

Report of the ninth annual meeting of the National Creamery Buttermakers' Association, St. Paul, Minn., February 18–22, 1901, E. Sudendorf (*Nat. Cream. Buttermakers' Assoc. Rpt. 1901, pp. 184*).

Improvement of cheese-curing rooms, J. W. Robertson and J. A. Ruddick (*Ontario Dept. Agr., Dairy Division Bul. 1, n. ser., 1901, pp. 13, figs. 9*).—An experiment is reported of curing cheese in a room connected with a subearth air duct and with provision for using ice to keep the temperature below 65° F., in comparison with an ordinary first-class curing room with no special means of regulating the temperature, and in a curing room of poor construction. During June and July and part of August, cheeses made under like conditions were taken from the press and distributed in equal numbers in the 3 rooms. When the cheeses were from 3 to 5 weeks old they were placed in cold storage, and at the end of the season were divided into 3 lots, according to the rooms in which they were cured, and were scored by a committee of the Montreal Butter and Cheese Association. It was found that those cheeses cured at a temperature not exceeding 65° F. were very much superior in quality. They were better bodied, more silky in texture, and much milder in flavor, while retaining their moisture better than those cured in the ordinary way. They were rated fully ½ ct. per pound higher in price. The cheeses in the room under control lost 2.53 per cent of moisture, those in the good ordinary room 3.95 per cent, while those in the poor curing room lost 4.45 per cent. Counting the depreciation in value and the loss of moisture, it is estimated that a 50-ton factory would loose in a season $313.90 by not having a curing room in which the temperature could be controlled. This is an amount considerably in excess of the cost of making a curing room. The methods for improving curing rooms with cement floors and walls, the construction of subearth ducts, and the use of ice in racks are figured and discussed. The cost of a subearth duct for a space of 5,000 cu. ft. is estimated at $169.55. An ice rack for use in a curing room may be constructed at a very small cost, the expense of using ice depending almost entirely upon the cost of the ice.

Testing Cheddar cheese, G. S. Thomson (*Jour. Agr. and Ind., South Australia, 4 (1901), No. 8, pp. 632–634*).—Tests were made to determine the value of the acidity apparatus in Cheddar cheese making. In the examination of 14 cheeses it was found that in only 3 instances did the acidity exceed 0.8 per cent at the time of pressing. This shows careful manipulation, by the use of the hot-iron test combined with the burette. At the time of renneting the acid ranged from 0.18 to 0.25 per cent. In general the cheeses made from the milk with the higher percentages of acid scored highest.

In the case of cheese having "holey" and gassy curd, it is suggested that all utensils and cloths used in the manufacture be thoroughly sterilized and the sanitary conditions in and about the factory perfected. Should the trouble persist, the individual milks received should be investigated and the source of the infection located.

Statistics of oleomargarine, oleo oil, and filled cheese, R. A. Pearson (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1899, pp. 287–320*).—Statistics of the production and distribution of oleomargarine, oleo oil, and filled cheese from 1876 to the end of the fiscal year 1899.

VETERINARY SCIENCE AND PRACTICE.

A preliminary report of poison parsnip in western Washington, D. A. Brodie (*Washington Sta. Bul. 45, pp. 12, fig. 1*).—In a herd of dairy cows 16 were taken sick and 6 died within a short time. It was suspected that the cause of death was the presence of *Cicuta vagans* in the hay. In order to determine whether the hay was poisonous, 2 feeding experiments were undertaken. A yearling steer was allowed to eat freely of the hay for 4 days without any bad results. Another yearling was fed about 3 lbs. of *Œnanthe sarmentosa*, which was picked out of the hay. The result was the same as in the first experiment.

It was thought well to try experiments in feeding fresh plants of *C. vagans*. The stem and leaves of 8 plants, collected on May 5, when the plants were about a foot high, were fed to a yearling steer without producing any symptoms of poisoning beyond a slight twitching of the muscles of the nose. A small quantity of roots was fed at the same time to 2 yearlings, with the same results. The plant was tested in the same way July 26 to 31, when in bloom, the roots, stems, and flowers being fed together. Again, August 12 to 15, plants were fed, when the seed was ripe, without causing any bad effects. On November 23, when the new roots had developed sufficiently to be tested, a quantity of the new roots was cut into small pieces and fed to an 8-months-old heifer. The animal died after about 3 hours with violent symptoms. On November 4, 3 roots, which had been cut into small pieces on the previous day, were fed to a heifer without producing any poisonous effects. Two days later the same animal was fed fresh roots and manifested serious symptoms of poisoning, although recovery ultimately resulted. Two other experiments resulted in the death of the animals in from 3 to 3½ hours.

Feeding experiments with *O. sarmentosa*, *Angelica genuflexa*, *A. hendersoni*, *Sium cicutæfolium*, *Heracleum lanatum*, *Conioselinum gmelini* indicated that these plants were not poisonous.

Contagious diseases of animals in foreign countries (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1899, pp. 479–495*).—An account is given of the distribution, virulence, and means of combating the more important contagious diseases in Great Britain, France, Switzerland, German Empire, Hungary, Italy, Sweden, Denmark, Belgium, Netherlands, Norway, and New Zealand.

Report of the chief inspector of stock and registrar of brands for the year 1899, P. R. GORDON (*Queensland Dept. Agr. Rpt. 1899–1900, pp. 79–87*).—This report contains statistical notes on the diseases of sheep and cattle. Fewer cases of contagious pleuro-pneumonia have been reported than during the previous year. The injuries from tick infestation are also being reduced. Inoculation against Texas fever has been largely practiced, and a great proportion of the cattle have become immune to the disease. A number of experiments were tried in dipping cattle to destroy the ticks. The following formula was used with fairly good success: Arsenic 10 lbs., soap 5 lbs., soda wash 28 lbs., Stockholm tar 7½ gal., water 400 gal. It is suggested that certain birds, known as the magpie lark (*Grallina picata*) and the wagtail (*Sauloprocta motasilloides*), which continually hover around tick-infested cattle and frequently perch on their backs, may be instrumental in destroying the ticks. A brief statement is given of the number of marsupials and dingoes destroyed and bounties paid upon them.

Division of veterinary science, J. A. GILRUTH (*New Zealand Dept. Agr. Rpt. 1900, pp. 145–227, pls. 7*).—The author reports four serious outbreaks of anthrax in different localities (pp. 147–154), and gives details of the symptoms and post-mortem findings in these cases. It is believed that the introduction of the disease was due to the importation of infected bones. The evidence for this belief consisted in the fact that the outbreaks occurred on turnip paddocks, and that these paddocks had been recently dressed with manure containing a proportion of bones. In 3 out of the 4 outbreaks the disease was further disseminated by feeding dead carcasses to pigs with disastrous results. The methods which were adopted for preventing the spread of the disease include burying in lime or burning of all anthrax carcasses.

Detailed descriptions are given of 2 outbreaks of swine plague (pp. 154–159). After experiments in serum diagnosis, the author adopted the dilution of 1 part serum to 20 parts of a 24-hour broth culture. In this way a decided agglutination was produced within a few minutes. The location of the chief lesions of the disease differed strikingly from that of previous outbreaks. In other epizootic outbreaks of this disease pneumonia and inflammation of the serous membranes were the chief symptoms, whereas in the outbreak under consideration the lesions were chiefly confined to the alimentary tract. The pathogenic bacillus was isolated in all cases and believed to be the same.

Quite extensive studies were made on tuberculosis of cattle (pp. 159–162). Herds were tested with tuberculin, and a large number of animals were subjected to careful clinical examination for the purpose of determining more accurately the physical symptoms of the disease. The post-mortem findings of 200 cattle condemned for tuberculosis and destroyed are summarized in tabular form.

The author discusses the results of the inspection of meat in slaughterhouses, the subject of compensation for condemned animals, the inspection of dairy cattle on the premises, veterinary education, bacteriological examination of dairy products, and malignant cancerous growths in domestic animals.

The nature and cause of the "bush" disease of cattle and sheep is considered (pp. 186–189). The post-mortem examination of animals dead of this disease indicated a condition of anæmia, with a fatty degeneration of the liver, but no other organic lesion. In some cases in sheep the animals became much emaciated and dropsical. A few specimens of *Strongylus contortus* were found in the stomach of sheep, but not enough to have been responsible for the symptoms. The author believes that the best treatment for this disease consists in a radical change of feed. The exact nature of the trouble remains doubtful.

Brief notes are given on *Strongylus cervicornus* in calves, on red water of cows, strangles in horses, hepatic cirrhosis in horses and cattle, and *S. tentracanthus* in horses.

A number of outbreaks of malignant œdema in sheep and lambs are reported (pp. 194–197). This disease occurs chiefly after shearing sheep and docking lambs. Experiments were made for the purpose of determining the means whereby infection is spread. A small quantity of soil was taken from an infected locality and about ½ gm. was dissolved in 5 cc. sterilized water. After a sediment had formed, the muddy colored liquid was used for inoculating a 3-months-old lamb. The lamb became stiff in the inoculated leg after 24 hours; later the flank was swollen and sensitive to the touch. Death occurred 56 hours after inoculation. Three species of bacilli were isolated from the blood of this animal, 2 being aërobic and 1 anaërobic. Inoculations of pure cultures of the anaërobic bacillus produced marked cases of malignant œdema. For preventing the spread of this disease the author recommends the removal of surface soil of infected yards, which should be placed in a heap where it can thoroughly be mixed with quicklime. The fresh surface should then be treated with strong and cheap antiseptics. In shearing sheep or docking lambs it is imperative that all wounds should be immediately treated with some antiseptic such as carbolized oil.

The author investigated a disease of sheep called suppurative pleurisy and pneumonia (pp. 197–200). An extensive outbreak of this disease occurred in lambs soon after dipping. Post-mortem examination of dead animals showed marked changes in the pericardium. It was distended by the accumulation of a large quantity of serous fluid, and the whole surface was covered by a fibrinous deposit ½ in. in thickness. Affected animals held the head extended and slightly to one side, and the gate was unsteady, with a distinct tendency to fall upon the left side. A detailed description is given of a micro-organism which was found in the fibrinous pus. Pure cultures were made and the disease was reproduced by means of inoculation of lambs.

Brief notes are given on acute facial eczema in sheep, which is believed to be due to eating rape in excessive quantities. A disease among quail recently imported from California was studied with the result that a hemorrhagic condition was found, with a microorganism similar, if not identical, with that of fowl cholera.

The Seventh International Veterinary Congress, B. A. NÖRGAARD (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1899, pp. 534–557*).—The author gives a general account of the work of this congress, which was held at Baden-Baden, Germany, August 7–12, 1899. The paper by Professor Bang, on preventive measures against tuberculosis, is reprinted in full, and brief accounts are given of other discussions on tuberculosis, foot-and-mouth disease, milk inspection, the prevention of swine epizootics, etc.

Researches on the treatment of tuberculous animals according to the method of Landerer, and on the virulence of tubercle bacilli, E. KROMPECHER (*Ann. Inst. Pasteur, 14 (1900), No. 11, pp. 723–749*).—For the purpose of determining the action of cinnamic acid in curing and preventing tuberculosis and of determining the reaction of animals to tubercle bacilli of varying degrees of virulence, the author conducted a large number of experiments, of which the principal results are herein stated. Landerer in work along the same line claimed both curative and preventive power toward tuberculosis for cinnamon. The author employed slightly alkaline, sterilized cinnamate of soda in a 4 per cent solution. Rabbits were inoculated with this substance in the vein of the ear and guinea pigs in the peritoneum or hypodermically. For tubercular material with which to inoculate these animals after a preliminary treatment with cinnamate of soda the author used pure cultures of tubercle bacillus of human origin 3 weeks of age. During some weeks and months the author treated the experimental animals with cinnamate of soda and later inoculated them with the tubercular bacilli. Treatment with cinnamate of soda was given once or twice per week. Rabbits received intravenously each time from 0.1 to 0.4 gm., doses of 0.6 to 0.8 gm. having proved harmful. Guinea pigs received from 0.1 to 0.2 gm. of a 2 per cent solution. These experiments demonstrated that a treatment for a period of $2\frac{1}{2}$ to 4 months, during which the experimental animals received from 1.9 to 3.15 gm. of cinnamate of soda, had no tendency in any case to produce immunity or to retard the course of the disease. The animals which were treated succumbed to generalized tuberculosis in from 1 to 2 months after inoculation, as did also the check animals.

In order to test the supposed therapeutic action of cinnamate of soda, the author inoculated rabbits and guinea pigs with the tubercle bacillus and began a treatment with the cinnamate from 2 to 28 days afterwards. The cinnamate was given regularly twice a week in doses of from 0.10 to 0.15 gm. Animals which were thus treated succumbed to tuberculosis within from 1 to 3 months, as did also the check animals. During these experiments it was noted that intravenous injections of cinnamate of soda produced a marked leucocytosis and hyperæmia of the bone marrow. The animals increased somewhat in size. The conclusion is drawn that cinnamate of soda has no effect in producing immunity against tuberculosis or in curing cases which already exist.

In order to study in detail the virulence of different tubercle bacilli, the author made further studies of 7 cultures, 3 of which were taken from tuberculosis of mammals, 3 from birds, and one from fishes. The results from inoculating guinea pigs with tubercle bacilli from these three sources may be briefly compared. Virulent tubercle bacilli produced a rapidly progressing tuberculosis, with the development of tubercles in which caseous material was formed. Nonvirulent tubercle bacilli, as well as tubercle bacilli from fish, did not cause any apparent disturbances in the health of the animal, although slight microscopic changes were produced, which were characterized by the appearance of giant cells surrounded by other spherical cells.

The author tried experiments to determine the action of tubercle bacilli subjected to a temperature of 120° C. Virulent bacilli subjected to this temperature, when inoculated into rabbits in quantities varying from 1 to 8 cc., produced within 15 days typical caseous processes with giant cells and with stainable tubercle bacilli. All animals inoculated in this manner showed a pronounced decrease in weight. Nonvirulent tubercle bacilli which had been subjected to the same temperature and later inoculated into the body cavity or hypodermically produced no changes in the experimental animals. Inoculations with the tubercle bacilli from fish in quantities of from 2 to 4 cc. had no effect, the health of the animals remaining good, and no changes were revealed by a microscopic study. From these experiments the author concludes that virulent tubercle bacilli are not killed by subjection to a temperature of 120° C.

The author studied the problem of variation in reaction to tuberculin on the part of animals which had been inoculated with tubercle bacilli of different degrees of virulence. It was found that animals inoculated with from 0.1 to 0.25 mg. of virulent tubercle bacilli, after a period of from 2 to 4 weeks, reacted by a rise in temperature of from 1 to $1\frac{1}{2}$°. Animals inoculated with the same amount of nonvirulent tubercle bacilli usually showed an elevation of only a fraction of a degree when tested with tuberculin. Animals which were inoculated with tubercle bacilli from fish did not react to the tuberculin test.

In order to determine the reaction of tuberculous guinea pigs to tuberculins prepared from tubercle bacilli of different degrees of virulence, the author made a number of inoculation experiments. During this study it was found that tuberculous guinea pigs which received from 0.1 to 3 mg. of tuberculin, prepared from virulent tubercle bacilli, showed an elevation of temperature which constantly exceeded 1°. Tuberculous guinea pigs when tested with from 0.2 to 3 mg. of tuberculin from nonvirulent tubercle bacilli of human origin, from fishes, or from tubercle bacilli which had been subjected to a high temperature, reacted with a rise of temperature which never reached 1°.

The period of incubation of tuberculosis in cattle and the age of tubercular lesions, NOCARD (*Rec. Méd. Vét., Paris, 8. ser., 7 (1900), No. 23, pp. 811-815*).—The results of the author's experiments may be stated as follows: Ingestion of tuberculous material rarely causes tuberculosis, while inhalation is believed to be the ordinary method by which the disease is acquired. Enormous quantities of tuberculous material were fed to 4 cows, with the result that 1 resisted infection entirely and no lesions could be found in the other 3, although they responded slightly to the tuberculin test. Experiments indicated that tuberculous material could be inhaled in a state of dry, impalpable dust or in fine particles held in suspension.

The period of incubation of tuberculosis in experimental animals varied from 19 to 32 days. Direct inoculation into the trachea did not give uniform results. The lungs entirely escaped infection. Even in cases infected by inhalations of dry tubercular material the pulmonary alveoli were not attacked, the tubercular lesions being confined to the pleura or periphery of the pulmonary lobes. The mucous layer of the bronchial tubes and active mammary glands showed very slight resistance to infection, and were nearly always centers of tubercular lesions. The author believes that the mammary glands may occasionally be the primary focus of tuberculosis. Intravenous inoculations with virulent tubercle bacilli uniformly gave the most malignant and rapid form of tuberculosis; but since this method of infection can hardly be realized under natural conditions, it is of no great practical importance. The interesting fact was noted in connection with experimental tuberculosis that the tubercles in no case became caseous or calcified.

The growth of tubercle bacilli on acid media, G. JOCHMANN (*Hyg. Rundschau, 11 (1900), No. 1, pp. 1, 2*).—During culture experiments it was found that a medium with an acid reaction had a favorable effect upon the growth of the tubercle bacillus. The author continued his experiments along this line, in order to determine the conditions most suitable for producing a rapid growth of the bacillus.

The most vigorous development was obtained from the use of blood serum of sheep, cattle, and man, to which lactic acid had been added in the proportion of 10 drops of a 1 per cent solution to 50 cc. of blood serum. The blood serum should give a neutral reaction with litmus paper before the lactic acid is added. The most rapid growth was obtained by the use of human blood serum, treated as just described. The author concludes from his experiments that for the culture of the tubercle bacillus a slightly acid medium has a beneficial influence. In media prepared from meat juices the normal acid condition of such juice is very suitable. In the case of media which are naturally alkaline or neutral, good results are obtained by the addition of lactic acid.

Danger from tuberculous animals, E. NOCARD (*Bul. Agr. Algérie et Tunisie, 6 (1900), No. 24, pp. 671–681*).—The author discusses the general problems of the danger of transmission of tuberculosis from animals to man through close association and eating meat and milk products. It is stated that none of the meat of tuberculous animals should be offered for sale without being properly labeled. It is recommended that the various milk products from tuberculous animals should be offered for sale only after pasteurization at a temperature of at least 85° C. It is also suggested that tuberculosis of pigs and goats should be added to the lists of contagious diseases under the supervision of sanitary officers. The danger from the use of milk from tuberculous animals is believed by the author to be much overestimated.

On the seizure and condemnation of tuberculous meat, J. M. WILSON, J. W. MASON, and F. W. MARTIN (*Public Health, 13 (1901), No. 5, pp. 351–358*).—The authors present a discussion concerning the attitude which should be adopted by sanitary officers with respect to the condemnation of tuberculous meat, especially that of animals in which the disease existed in its earlier stages. The authors suggest the practical difficulties of convincing the owners of such animals of the danger of eating the meat, provided the disease was apparently confined to the lungs, liver, or other internal organs.

Legislation with reference to bovine tuberculosis, D. E. SALMON (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 28, pp. 173*).—This bulletin contains a compilation of the laws, rules, and regulations of the different States and Territories with reference to the control of tuberculosis in cattle. It is designed to furnish information to breeders and shippers of cattle.

International congress for the consideration of the best methods for checking or curing tuberculosis, E. A. DE SCHWEINITZ (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1899, pp. 126–133*.—This article contains an account of the delegates and the work of the congress, and brief abstracts of the more important papers read during the sessions.

Anthrax produced in animals by mixing anthrax spores with their regular feed, NIKOLSKY (*Ann. Inst. Pasteur, 14 (1900), No. 12, pp. 794–801*).—The author began his experiments on 5 white rats by feeding bread which had been sprinkled with an emulsion containing anthrax spores grown on gelatin without peptone, at a temperature of 37° C. The rats resisted infection for a considerable time. At the end of 16 days 2 died, 1 on the following day, and 2 on the twenty-first day. An autopsy showed that these animals died of anthrax. In all cases the liver and spleen were enlarged, and a microscopical examination showed the presence of anthrax bacillus in the blood. Similar experiments on gray rats gave negative results, as these animals were not infected after feeding with the spores for over a month. The author conducted similar experiments upon rabbits, which were killed at varying periods after feeding with anthrax spores. The conclusions drawn from these experiments are that animals which receive ordinary fodder infected with anthrax spores develop anthrax as certainly as by any other method of infection. The spores develop in the contents of the intestines in spite of the antagonism of other micro-organisms, and penetrate the walls of the intestines and the lymphatic vessels, and finally enter the blood.

Changes in the anthrax bacillus in decomposing ox blood outside of the body, E. BERNDT (*Centbl. Bakt. u. Par., 1. Abt., 28 (1900), No. 19, pp. 648–651, pl. 1*).—The author presents a brief critical discussion of the literature of this subject. A sample of blood was received from an animal which had died of anthrax, and was subjected to culture for the purpose of making a positive diagnosis. The blood sample was kept under observation for a number of days, and examinations were made each day for the purpose of determining the conditions of the anthrax bacillus. From these investigations it was demonstrated that clearly differentiated anthrax bacilli were to be found in anthrax blood kept in a flask in the dark, at normal temperature, for 13 days. Disintegration of the anthrax bacilli began in the central portions. The segments which were stained blue gradually became less receptive to the coloring matter and exhibited a granular disintegration. The so-called plasma capsule took the stain much longer. Anthrax bacilli with a sharp contour, but without color differentiation, were to be observed 14 days after the blood had been drawn.

The susceptibility of crosses of Algerian merinos to anthrax, MARTINET (*Rec. Méd. Vét., Paris, 8. ser., 7 (1900), No. 23, pp. 108–111*).—In order to determine any possible variation in the susceptibility of different races of sheep to anthrax, the author selected for his experiments a pure-bred merino, a lamb of which both parents were merino crosses, and 2 lambs from crosses of the second generation. The 4 animals were inoculated with anthrax virus which had undergone 2 passages through rabbits. Three of the animals died of anthrax, but the time of resistance varied and indicated that the resistant power toward the anthrax was in inverse proportion to the amount of merino blood present in the animal. The first animal died within 36 hours, the second within 74 hours, the third within 92 hours, while the fourth remained without infection. Other experiments and observations were made along the same line, with similar results. The author recommends crossing of the pure merinos where anthrax is liable to cause losses.

The origin of lingual actinomycosis in cattle, A. BREUER (*Ztschr. Fleisch u. Milchhyg., 11 (1900), No. 4, pp. 103–111*).—The author describes in detail the anatomical structure of the tongues of cattle as related to the development of actinomycosis in this organ. During this study it was observed that the frequency of cases stood in a rather constant relation to the age of the animal. Actinomycosis of the tongue was never observed in animals under 2 years of age, while the number of cases increased rapidly after 3 years, and in cattle of from 8 to 10 or more years of age the tongue was almost always affected in cases of this disease. The author believes that the cause of frequent actinomycosis of the tongue in cattle is to be found in the anatomical structure of this organ. Numerous changes take place, especially during old age, in the dorsal ridge of the tongue, and the author states that the disease invades this organ in consequence of these changes.

Experiments with Texas fever and southern cattle ticks, E. C. SCHROEDER and W. E. COTTON (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1899, pp. 33–52*).—*Growing noninfected ticks and afterwards infecting them* (pp. 33–41).—An attempt was made to grow ticks on animals immune to Texas fever. Horses, mules, dogs, sheep, goats, rabbits, pigeons, and guinea pigs were used without success. Ticks which were taken from a permanently infested field containing cattle recently recovered or sick with Texas fever were placed on a young calf without causing a development of the disease. The second generation of ticks were grown on the same calf with the same result. The third, fourth, and fifth generations were grown on adult cattle without producing Texas fever; while another portion of the fifth generation from adult ticks which were grown on cows from North Carolina, when placed on 2 northern cows, produced Texas fever, with death in one case. Further experiments were conducted along the same line, from which it is concluded that it is possible to obtain a supply of southern cattle ticks which can be grown on susceptible cattle without causing disease, and that noninfectious cattle ticks, after having lived for several successive generations on susceptible cattle without causing disease, may produce fatal cases of Texas fever after having lived for a single generation on an animal from infested territory. The virulence of the infection is in no way influenced by the length of time which has elapsed since the southern animals were removed from the Texas fever area.

A note on the vitality of the southern cattle tick (pp. 41, 42).—Ticks were collected from a cow of the experiment station of the Bureau and placed in cotton-stoppered flasks. Eggs were soon laid, and on March 11 they had nearly all hatched. The young ticks remained without food, except the empty egg shells and dead bodies of the adults, and without water until July 21, when they were placed on a cow. The majority of them were still alive and developed into full-sized adults by August 13. They produced fertilized eggs which subsequently hatched. The possibility is suggested of cattle ticks outliving an infection of Texas fever and becoming annually reinfected in the spring.

A note on the persistence of the Texas fever organism in the blood of cattle (pp. 42, 43).—On October 4, 1895, 2 calves about 5 months old received hypodermic injections of blood from a southern cow. The calves suffered a very mild attack of Texas fever. In August of the following year the blood of these calves was used for inoculating 2 northern cows. Acute cases of Texas fever developed, and one of the animals died. The experiment shows that infectious blood when injected into young cattle in the fall of the year, although producing a very mild attack in them, may render the blood of the young cattle sufficiently virulent to cause fatal cases of Texas fever in adult cattle 10 months later.

An experiment in blood and serum injections in connection with Texas fever investigations (pp. 43–52).—Experiments in inoculation with blood and serum from recovered cattle indicated that large doses of blood or serum may produce a milder form of the disease than small doses. In experiments along this line on 8 cattle; the amount of blood used for inoculation ranged from 10 cc. to 400 cc., and inoculations were made subcutaneously or intravenously. The injections were given on August 1. The first attack of Texas fever began about August 10. The cattle recovered and suffered a second attack about the middle of September. At this time one of the animals died. The results obtained from these experiments showed that the quantity of blood from an immune cow used for inoculation has no influence upon the severity of the inoculation disease, and that no difference is noted in the effects of intravenous and subcutaneous injections. A dose of 10 cc. of blood is recommended as most satisfactory for inoculation purposes. The experiments indicated that the antitoxin which is present in the blood of immune cattle can not be introduced into susceptible cattle in quantities which will serve as a protective agent.

Hemorrhagic septicæmia in cattle, S. D. Brimhall and L. B. Wilson (*Jour. Comp. Med. and Vet. Arch., 21 (1900), No. 12, pp. 722–731*).—Three outbreaks of this disease occurred in Minnesota during the fall of 1900. In 3 herds, containing 67 animals, 37 were affected and all died. The chief symptoms were loss of appetite, fever, lameness, swelling of the legs and submaxillary region, and black or bloody discharges. Death usually occurred in from 6 to 24 hours. The lesions found on post-mortem examination were chiefly hemorrhagic areas in the subcutaneous connective tissue, muscles, lymph glands, and external organs. The cervical lymph glands, heart, spleen, and intestines were most affected. Post-mortem examination was made on 9 animals, and a bacillus was obtained from all cases apparently identical with that of hemorrhagic septicæmia described by other authors. Inoculations of rabbits, guinea pigs, and calves produced the characteristic symptoms of the disease. Experiments in immunizing animals by inoculation with filtered cultures yielded fairly satisfactory results, although the number of experiments was too small to determine the degree of immunity thus produced.

Protective inoculation against foot-and-mouth disease of sheep, as practiced in the immunization of sheep and pigs, LOEFFLER and UHLENHUTH (*Berlin. Thierärztl. Wchnschr., 1900, No. 52, pp. 613–616*).—As previously reported, the authors have produced a serum which rendered young pigs quite immune to this disease. In doses of 0.1 cc. per kg., an immunity was produced which lasted for 3 weeks. In doses of 0.2 to 0.5 cc. per kg., immunity persisted for 8 weeks. The same serum was used successfully in rendering cattle immune from foot-and-mouth disease. Immunity in cattle, however, was only of short duration. In an outbreak of the disease in a herd of 416 sheep, 28 sheep received an injection of serum 2 days after the first appearance of the disease. The sheep were apparently well at the time, but 4 were sick on the day after vaccination. These 4 were probably infected at the time they were vaccinated. All the other vaccinated animals remained healthy. Foot-and-mouth disease broke out in a large herd of swine. A number of the pigs were vaccinated, and all the vaccinated animals showed a perfect immunity to the disease. The authors describe in detail the methods for obtaining the immunizing serum in a rapid and convenient manner.

The nature, cause, and economic importance of ovine caseous lymphadenitis, V. A. NÖRGAARD (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1899, pp. 638–662, pls. 7*).—The first cases of this disease in the United States were reported by Dr. O. B. Hess, from Los Angeles, Cal. Later it was reported from Chicago, Omaha, and Kansas City by inspectors stationed at those places. Usually no characteristic symptoms are observed in affected animals during life. The disease is chronic and the pathological changes develop so slowly as to cause no striking interference with the health of the affected sheep. This is especially true of lambs and sheep which are raised for mutton and which are marketed before they are 2 years old. A careful examination of an affected sheep will disclose an enlargement of one or more of the superficial glands, the precrural and prescapular glands being most frequently attacked. By metastasis the disease may attack the principal organs of the body, causing a chronic broncho-pneumonia, with symptoms of coughing. Several thousand cases are observed annually in slaughterhouses of the United States, and the progress of the pathological changes usually correspond to the age of the animal.

When first infected by the micro-organism of the disease the gland tissue enlarges to several times its original size. Later an abscess is formed with caseous contents of greenish yellow color. In the liver pathological changes are most frequently in the form of large nodules. The kidneys are seldom affected.

The micro-organism of this disease is a short bacillus, with rounded ends. It is aërobic and develops well upon glycerine agar or in peptonized beef bouillon, but most readily on blood serum. Bouillon containing 1 per cent of dextrose in fermentation tubes indicates a fermentation in the bulb with an acid reaction. The organism develops most rapidly at a temperature of 37° C., and is destroyed by exposure for 10 minutes to a temperature of 65° C., or 6 minutes of 70° C. An exposure of 5 days to direct sunlight does not destroy the vitality of the organism. Culture tubes kept at a temperature of 6 to 8° C. for a period of several weeks showed an active development when subsequently incubated at a temperature of 37° C.

In guinea pigs intravenous inoculations of from 3 drops to 0.3 cc. caused death in from 4 to 10 days. Intra-abdominal inoculations of from 0.3 to 0.75 cc. proved fatal in from 8 to 15 days; while subcutaneous injections of from 0.25 to 0.75 cc. caused death in from 15 to 28 days. Guinea pigs fed with oats infected with bouillon cultures of the organism died after from 5 to 8 weeks. In rabbits intra-abdominal inoculation in doses of from 0.25 to 0.75 cc. caused death in from 20 to 32 days; while rabbits inoculated by the subcutaneous method did not die until from the 25th to the 38th day. Experiments on pigeons and fowls indicated that these animals are immune to the disease. Inoculation experiments with sheep produced a chronic form of the disease with apparent recovery of external abscesses in some cases. Feeding experiments with sheep gave negative results. The author believes that the disease has existed in this country for many years. Of 16,000,000 sheep slaughtered in Chicago, Kansas City, and South Omaha during the years 1897–1900, inclusive, only 3,236 were condemned for this disease.

The disease is infectious and due to the bacillus of Preisz, which is pathological to mice, guinea pigs, rabbits, and sheep, but not to pigeons and chickens. It prevails in certain districts in the western part of the United States, and all classes of sheep, whether pure blood, breeded, or common stock, are susceptible. A bibliography of the subject is added.

The organism of sheep pox, E. Nocard (*Compt. Rend. Soc. Biol. Paris, 53 (1901), No. 3, pp. 50, 51*).—The author's investigations on this disease indicated that the blood of animals affected with sheep pox is not virulent at any period of the disease. Experiments were tried on 3 sheep, in inoculating them with the blood from affected animals. All 3 sheep remained without infection, and a subsequent inoculation with fresh virus demonstrated that the injections of blood had had no effect in producing an immunity against sheep pox.

Staggers in sheep, J. D. Stewart (*Agr. Gaz. New South Wales, 11 (1900), No. 12, pp. 1112–1117*).—Outbreaks of a disease in sheep commonly known as "staggers" were reported from Narrabri. The disease was ascribed to several causes, such as micro-organisms and improper feeding, and the poisonous effects of marsh mallow. Various tissues of affected sheep were subjected to microscopical and bacteriological investigations with the result that no micro-organisms were found. A chemical analysis was made of marsh mallow, since this plant constituted one of the chief elements of the feed of the affected sheep. The protein contents of the plant were found to be rather high, and it is suggested that this is due to the presence of an alkaloid. The disease has been known for some time, and has been especially prevalent during the past 2 years. It affects sheep of all ages. The symptoms of shivering or staggering become especially pronounced when the animals are driven hurriedly. Under such circumstances a high temperature and rapid pulse and respiration are noted. Post-mortem examinations failed to determine with certainty the cause of the disease.

Experiments with lime-and-sulphur dip (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1899, pp. 506–508*).—Experiments were made by W. R. Southey to ascertain whether the fleece of sheep was injured by dipping in this mixture. Samples of wool were submitted to experts, who reported that the wool was uninjured, although slight traces of the dip were to be detected.

A comparative study of the biological characters and pathogenesis of Bacillus X, B. icteroides, and the hog-cholera bacillus, W. Reed and J. Carroll (*Jour. Expt. Med., 5 (1900), No. 3, pp. 215–270, pl. 1, figs. 4*).—The authors previously called attention to the resemblance of these bacilli and the similarity of the lesions produced in guinea pigs, rabbits, and dogs by *B. icteroides* to those caused by the hog-cholera bacillus. As a result of this work *B. icteroides* was considered a variety of the hog-cholera bacillus. The present paper contains details of observations upon which these conclusions are based. *B. X* is considered as belonging to the colon group. It is most pathogenic for guinea pigs when injected into the peritoneal cavity. The bacillus is pathogenic for rabbits in quantities of from 1 to 5 cc., whether injected into the body cavity or subcutaneously or intravenously. Rabbits died in from 16 to 43 days after inoculation.

B. icteroides and the hog-cholera bacillus are facultative, anaërobic organisms, which are decolorized by Gram's method, and do not liquefy gelatine. Details are given of the morphology of these bacilli and of their behavior in different culture media. Both bacilli possess a considerable range of pathogenesis for animals. The hog-cholera bacillus is pathogenic, in some degree, for mice, guinea pigs, rabbits, pigeons, dogs, and hogs. The lesions produced by the hog-cholera bacillus are compared with those produced in the same animals by *B. icteroides*, and found to be in general very similar. Details are given of the macroscopical and microscopical pathogenical lesions on animals artificially infected with the bacilli.

The close affinity of *B. icteroides* and the hog-cholera bacillus is indicated by the following facts: Sterilized cultures of *B. icteroides* protected guinea pigs against a fatal dose of the hog-cholera bacillus. Sterilized cultures of the hog-cholera bacillus protected these animals against a fatal dose of *B. icteroides*. Rabbits may be immunized against a virulent culture of the hog-cholera bacillus by repeated doses of a living culture of *B. icteroides* of weak virulence. The bacilli possess, therefore, the power of reciprocal immunization. An equally pronounced reciprocal agglutinative reaction is also obtained from the blood of animals artificially inoculated with *B. icteroides* and the hog-cholera bacillus.

The authors conclude that *B. X* belongs to the colon group, while *B. icteroides* is a member of the hog-cholera group. The channel of infection, the duration of the disease, and the lesions in mice, guinea pigs, and rabbits are the same for *B. icteroides* and the hog-cholera bacillus. *B. icteroides*, when fed to pigs, causes fatal infection, accompanied by diphtheritic and ulcerative lesions in the digestive tract, such as are seen in hogs when infected with the hog-cholera bacillus. The disease may be acquired by exposing hogs in pens already infected with *B. icteroides*, or by feeding them the organisms. While the blood of yellow fever does not exercise a pronounced agglutinative action upon *B. icteroides*, the blood of hog-cholera agglutinates this bacillus in a marked degree.

Hog-cholera and swine-plague investigations in Iowa (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1899, pp. 501, 502*).—The supervision of the work of the Bureau on swine diseases in Iowa is in the hands of Dr. McBirney. Altogether 21,000 animals were treated during the season of 1899. Of the total number of animals treated, about 70.5 per cent survived, while in nontreated herds during the years 1896–1899 only about 31 per cent of the hogs survived.

Our present knowledge of the kidney worm (Sclerostoma pinguicola) of swine, LOUISE TAYLER (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1899, pp. 612–637, figs. 16*).—The author gives an elaborate account of the synonymy of this species, a description of the internal and external anatomy, and a review of the literature relating to this subject. On account of the habits of hogs, any practical measures for preventing infection will meet with difficulty. Feeding from clean troughs and supplying an abundance of pure drinking water will diminish the infestation of the kidney worm, but will probably not entirely prevent the disease. The kidney worms are not transmissible to man in either the egg or adult condition, and ordinary methods of packing or curing kill all the worms. A bibliography of the kidney worm is appended to the article.

Diphtheria in horses, L. COBBETT (*Centbl. Bakt. u. Par., 1. Abt., 28 (1900), No. 19, pp. 631–634*).—A case of diphtheria in a child was traced to a horse which showed a discharge from the nose containing diphtheria bacilli. The animal was killed and cultures made of the bacilli obtained immediately after death. The bacillus thus obtained was not to be distinguished from the diphtheria bacillus, and produced the same pathological lesions when inoculated into guinea pigs. The author believes that the observation is of great practical value as showing the possibility of the presence of diphtheria in the nasal passages and larynx of horses, and also the possibility of human infection from this source. It is suggested also that this may help to explain the observed fact that the blood of normal horses often contains active diphtheria antitoxin.

Experiments with serum and defibrinated blood of animals which had recovered from horse sickness, A. EDINGTON (*Jour. Comp. Path. and Ther., 13 (1900), No. 4, pp. 281–300*).—During these experiments it was found that neither the serum from recovered animals, nor that from animals which had been subjected to a series of inoculations with constantly increasing doses of virulent blood, possessed any appreciative curative action or antitoxic quality. Strengthened serum, when mixed with a fatal dose of virulent blood, deprives the latter of its virulence; and it appears from this experiment that such serum exerts a definite action on the virus. The results were not, however, entirely uniform. While 100 cc. of strengthened serum in most cases prevented 1 cc. of virulent blood from producing any marked elevation of temperature in the susceptible animal, 1 case was observed in which this result was not obtained.

The study of the attenuation of rabies virus by means of heat, W. G. Ouchakoff (*Arch. Sci. Biol. [St. Petersburg], 8 (1900), No. 2, pp. 131–135*).—The author prepared an emulsion from the cerebro-spinal material of a rabbit which had died of rabies. Water was then added, and the whole was passed through a sterile filter. In the preliminary experiments the emulsion was separated into quantities of 3 cc. and placed in test tubes 1 cm. in diameter. These were then subjected for 15 minutes to temperatures of 40, 50, and 60° C. Inoculation experiments with the virus thus treated showed that this virus was destroyed at a temperature between 50 and 60° C. Further experiments showed that when the virus was subjected to a temperature of 52° for a half hour it was only slightly attenuated. A temperature of 53°, however, for 10 minutes greatly attenuated or completely destroyed the virus.

A new form of infectious lung disease in guinea pigs, F. Strada and R. Traina (*Centbl. Bakt. u. Par., 1. Abt., 28 (1900), No. 19, pp. 635–648*).—An extended outbreak of a very fatal lung disease was observed in guinea pigs, and since these animals are of great importance in all pathological laboratories for experimental purposes, the authors undertook an investigation of the nature and cause of the disease. Affected guinea pigs were attacked by fits of coughing, accompanied with asthmatic breathing. Post-mortem examinations showed that the lungs were unusually distended and of a dark brownish-red color, with a peculiar spotted appearance. In some cases large yellowish-colored spots were observed on the surface of the lungs. The lungs in nearly all cases were strongly hepatized. The spleen was normal and kidneys congested. A micro-organism was isolated from the diseased animals and described as new under the name *Bacterium pneumoniæ caviarum.* Detailed descriptions are given of the appearance of this organism and of its behavior on different culture media. A number of inoculation experiments were conducted, with the result that the disease was reproduced with the same symptoms which were observed in cases of natural infection.

Second outbreak of maladie du coït in Nebraska (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1899, pp. 134–144*).—A report is made by Dr. C. M. Day on 24 cases of this disease.

Culture media for biochemic investigations, E. A. de Schweinitz (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1899, pp. 145, 146*).—This article was previously published in the *New York Medical Journal* for March, 1893. A culture medium was used containing for every 1,000 cc. distilled water 0.2 gm. magnesium sulphate, 1 gm. acid potassium sulphate, 10 gm. ammonium sulphate, and 45 gm. glycerine. This liquid was substituted for beef broth in the preparation of agar, or solid nutrient media. For the tubercle bacillus the solution of salts was used containing 7 per cent of glycerine and 1 per cent of peptone, while for the glanders bacillus the media were prepared in the same way, except that 5 per cent of glycerine was used. Later asparagin was substituted for peptone.

Artificial modifications of toxins, with special reference to immunity, J. Ritchie (*Jour. Hyg. (Cambridge), 1 (1901), No. 1, pp. 125–144*).—Extensive experiments on the effects of hydrochloric acid and alkalis.

Disposition of dead animals in foreign cities (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1899, pp. 346–361*).—This article contains information obtained through the Department of State relative to the disposal of bodies of animals, the use of such flesh for cat and dog meat, fat for soap making, hoofs for glue making, bones for fertilizer, hides for leather, etc., and in the case of animals dead of contagious diseases their complete incineration, as practiced in various European cities.

Notes on parasites, 50–52, C. W. STILES and A. HASSALL (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1899, pp. 558–611, pls. 2, figs. 7*).—The muscle fluke belonging to the genus Agamodistomum was found by the trichina inspectors of the Bureau. It is possible that the species is identical with *A. suis* of Europe. It has been reported from Buffalo, New York, by Mr. C. Bullard. It is unlikely that the parasite is transmissible to man, and there is no indication that infested tissue is rendered unfit for food.

The lung fluke (*Paragonimus westermanii*) has been found in tigers, cats, dogs, hogs, and man. The authors give an elaborate bibliography of the species and describe its life history. The occurrence and pathological lesions caused by the worm in different species of hosts are discussed in detail. In 1898 Dr. A. J. Payne forwarded portions of a hog's lung containing specimens of this worm. In all, 52 cases of infestation by this species were reported. In the majority of cysts which were examined 2 specimens of the worm occurred. They were of a pinkish color, nearly or quite round on cross section, and the largest specimens attained a length of 14 mm. and a diameter of 4 mm. The cysts in the lungs were from 12 to 37 mm. in diameter and contained a chocolate-colored semifluid material, in which many eggs were found. These worms have not been diagnosed in hogs, except on post-mortem examination, and the symptoms are therefore not noted. It is probable that the fluke requires an invertebrate intermediate host, probably mollusk, after leaving swine, and that infection could, therefore, not be transmitted directly from hogs to man.

The conical fluke (*Amphistoma cervi*) has been reported from Europe, Asia, Africa, Australia, Canada, and the United States. Specimens of this species in the United States were repeatedly collected from steers during meat inspection at Sioux City, Iowa.

Note on the chicken tick (Argas americanus), A. HASSALL (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1899, pp. 496–500, pl. 1, figs. 7*).—This species is native to tropical America, and is gradually extending its distribution northward. It has been reported from various parts of Texas as causing loss to poultry raisers. For combating the tick the author recommends thorough application of whitewash in a hot condition. The whitewash may be made more effective by adding one quarter of a pound of carbolic acid to each $1\frac{1}{2}$ lbs. of lime. The mixture is then thoroughly applied, so as to fill the cracks of the walls and floors.

AGRICULTURAL ENGINEERING.

Irrigation investigations in California, E. MEAD (*U. S. Senate, 56. Cong., 2. Session, Doc. 108, pp. 73*).—A preliminary report on irrigation investigations conducted in California during 1900 by this Office in cooperation with the California Water and Forest Association. It contains a brief statement of the plan, organization, and outcome of these investigations, with extracts from the reports of the agents and experts in charge of the work in different localities in California.

Irrigation farming in the Southwest, D. A. WILLEY (*Sci. Amer., 84 (1901), No. 4, pp. 53, 54, figs. 4; Tradesman, 44 (1901), No. 12, pp. 51, 52, figs. 3*).—This is an account of the methods followed in the irrigation of rice on the great southern prairie which extends along the coast from the parish of Saint Mary in Louisiana to the Texas line, with notes on the harvesting and thrashing of rice and on the extent of the rice interests of Louisiana and Texas. Originally diversion of water from streams was depended upon exclusively for irrigation of rice fields. In time, however, it was found necessary, in order to insure a reliable supply of water in time of drought, to construct pumping plants for raising water from streams and from wells.

Irrigation studies, E. Mead (*Trans. Amer. Soc. Civ. Engin., 44 (1900), No. 882, pp. 149–180, pl. 1, figs. 10*).—An explanation of the investigations being carried on by the author under the direction of this Office, with descriptions of apparatus and methods.

Irrigation in Hawaii, W. Maxwell (*U. S. Dept. Agr., Office of Experiment Stations Bul. 90, pp. 48, pls. 6, figs. 3*).—This bulletin discusses the climatic, soil, and other conditions as affecting irrigation in Hawaii, and gives the results of irrigation experiments, especially with sugar cane, carried on in the islands by the author for a number of years. It deals with evaporation of moisture from water surfaces and soils, transpiration of moisture by vegetation, power of soils to absorb and retain moisture, salts in Hawaiian soils and waters, duty of water, irrigation practice on the Hawaiian Islands, and study of irrigation at the Hawaiian Experiment Station, including observations on distribution of water and results of overirrigation.

Irrigation in the Hawaiian Islands (*Sci. Amer., 84 (1901), No. 2, p. 20, figs. 3*).—A brief account of a canal dug along the slopes of the great crater of Haleakala, island of Maui, by which a stream of water flowing 50,000,000 gal. daily is brought 22 miles for distribution over a sugar plantation.

Irrigation in the Philippines, G. D. Rice (*Irrig. Age, 15 (1901), No. 6, pp. 186–191*).—This is a brief account of observations on the present status and future prospects of irrigation development in these islands as applied to the culture of coffee, tobacco, chocolate, peanuts, oranges, lemons, and mangoes. Irrigation is now practiced to only a limited extent, but the need and opportunities for its development are very great. "There are very large plantations of rice, tobacco, sugar cane, chocolate, coffee, peanuts, and other products in these islands awaiting proper development by irrigation. At present many of the plantations are in a state of idleness, owing to the continuance of dryness, which might be overcome if the water supplies of the country were properly utilized."

Biennial report of the State Engineer of Idaho, D. W. Ross (*Idaho State Engin. Rpt. 1899–1900, pp. 101, pls. 8, maps 3*).—The subjects treated in this report are the arid and irrigable portions of Idaho; increase of population and irrigation since 1890; irrigation surveys; projects under the Carey Act; irrigation districts; duty and distribution of water, including accounts of investigations carried on in cooperation with this Office; water rights and their adjudication; plans for dams and embankments, and selections of desert lands by the State.

The reservoir system of the Cache la Poudre Valley, E. S. Nettleton (*U. S. Dept. Agr., Office of Experiment Stations Bul. 92, pp. 48, pls. 14*).—This is an account of the experience of the Cache la Poudre Valley in the construction and use of storage reservoirs. The bulletin describes the Cache la Poudre River and Valley, reviews the history of the settlement and development of the valley and the systems of cropping practiced there, and gives detailed accounts of the reservoir systems established by local and individual enterprise in the valley, including their location, construction, filling, and use. It is shown that by means of the water saved from waste by these reservoirs and by the system of rotation in the use of water practiced in the valley, the area capable of being irrigated has been doubled and the irrigation has been more effective and thorough than is usual without the aid of storage reservoirs. The author's general conclusions are as follows:

"(1) Reservoirs in the Cache la Poudre Valley are a paying investment.

"(2) Storage of water in this valley is capable of extension.

"(3) There is a necessity for increasing the carrying capacity of reservoir feeders.

"(4) Reservoir embankments should be better protected from damage by wave action.

"(5) Reservoir outlets should be inspected annually.

"(6) Exchange of water facilitates its distribution and amplifies its use.

"(7) Accurate measurement is essential in the exchange of water.

"(8) The concert of action in the exchange of water appears to have lessened the number of legal conflicts.

"(9) Laws based on the outcome of customs are usually well founded.

"(10) Greater economy in the application of water is attained by alternating rather than prorating in times of scarcity, both among canals and among users from canals."

Seepage gains and losses, L. G. Carpenter (*Colorado Sta. Rpt. 1900, pp. 135–140*).—This is a continuation of previous observations (E. S. R., 11, p. 394) on the Cache la Poudre, Rio Grande, Conejos, and Uncompahgre rivers, and Big Thompson, Little Thompson, St. Vrain, Left Hand, Boulder, South Boulder, Clear, and Bear creeks.

Conveyance of water in irrigation canals, flumes, and pipes, S. Fortier (*Water Supply and Irrig. Papers, U. S. Geol. Survey, No. 43, pp. 86, pls. 15, figs. 27*).—The experience of the author in the construction of irrigation canals and related hydraulic works used in the reclamation of the arid lands is given under the following heads: Irrigation canals, including location, standard cross sections, grades, operating canals in winter, aquatic plants in canals, and flow of water; wooden flumes, including flume lining, framework, protection of ends, carrying capacities, and semicircular flumes; stave pipe, including lumber for staves, steel for bands, construction, location of pipe line, durability, use, and cost; riveted-steel pipe; and cast-iron pipe, including history, manufacture, dimensions and weights, testing and inspecting, laying, durability, and cost.

The Austin dam, T. U. Taylor (*Water Supply and Irrig. Papers, U. S. Geol. Survey, No. 40, pp. 52, pls. 16, figs. 12*).—"In this paper the author describes the preliminary projects, the construction of the dam, the difficulties encountered, the silting up of the storage reservoir, and, finally, the failure of the structure and the probable causes which led to the catastrophe. The attempt is made to present these facts from the engineering standpoint."

Inter or sub irrigation, H. P. Stiles (*California Cult., 16 (1901), No. 4, pp. 49, 52, 53, figs. 3*).—This is a discussion of Woodbridge's system of inter-irrigation, with a description of a subsoil plow devised by the author for breaking up hardpan and preparing the soil of orchards for irrigation.

The organization of irrigation farming, W. Toussaint (*Deut. Landw. Presse, 28 (1901), No. 17, p. 135*).

Reservoirs for irrigation, water power, and domestic supply, J. D. Schuyler (*New York: John Wiley & Sons, 1901, pp. XVIII+414, pls. 80, plans 25, figs. 130*).—This is "an account of various types of dams and the methods and plans of their construction, together with a discussion of the available water supply for irrigation in various sections of arid America; the distribution, application, and use of water; the rainfall and run-off, the evaporation from reservoirs; the effect of silt upon reservoirs, etc." It contains chapters on rock fill, hydraulic fill, masonry, and earthen dams, natural reservoirs, and projected reservoirs.

Irrigation laws of the Northwest Territories of Canada and of Wyoming, J. S. Dennis, F. Bond, and J. M. Wilson (*U. S. Dept. Agr., Office of Experiment Stations Bul. 96, pp. 90, pls. 6*).—This bulletin "gives the texts of the irrigation laws of the Northwest Territories of Canada and of Wyoming, with the regulations, forms, and methods of procedure adopted in their administration and discussions of the principles underlying the laws, and the methods followed in their enforcement."

The windmill, its efficiency and economic use, E. C. MURPHY (*Water Supply and Irrig. Papers, U. S. Geol. Survey, Nos. 41 and 42, pp. 147, pls. 16, figs. 70*).—This is a revision of a previous paper of this series printed in 1897 (E. S. R., 9, p. 796), embodying additional data obtained by recent investigations.

Test of a manure spreader, W. STRECKER (*Mitt. Landw. Inst. Univ. Leipsic, 1901, No. 2, pp. 91–128, figs. 19*).

Practical suggestions for farm buildings, G. G. HILL (*U. S. Dept. Agr., Farmers' Bul. 126, pp. 48, figs. 28*).—This "contains plans and specifications for inexpensive farm buildings, both dwellings and barns, and several suggestions relating thereto."

House drainage and sanitary fitments, G. J. G. JENSEN (*London: Sanitary Publishing Co., 1900, pp. XX+257, pl. 1, figs. 347*).—In this book the attempt is made to present the subject in an untechnical manner and so concisely and simply that it may be readily comprehended by those having no previous knowledge of the subject.

STATISTICS—MISCELLANEOUS.

Thirteenth Annual Report of Colorado Station, 1900 (*Colorado Sta. Rpt. 1900, pp. 77–225*).—This includes a financial statement for the fiscal year ended June 30, 1900; a report of the director giving the regulations of the State board of agriculture governing the operations of the station and detailed plans of station work for 1900, notes on the station staff, list of publications issued during the year, and a general review of the work of the station and substations; an inventory of station equipment; list of exchanges; departmental reports giving detailed accounts of the different lines of station work; a report of the superintendent of the Arkansas Valley Substation giving notes on experiments with cantaloupes, sugar beets, tomatoes, grasses and leguminous plants, potatoes, wheat, and apples; and a report of the superintendent of the Plains Substation, including notes on the fruits, vegetables, and field crops under cultivation, notes on the forest trees planted as wind breaks, observations on soil moisture, and notes on the agricultural conditions of eastern Colorado.

Thirteenth Annual Report of Illinois Station, 1900 (*Illinois Sta. Rpt. 1900, pp. 15*).—A brief statement of the principal lines of station work, a subject list of the bulletins issued since the organization of the station, a detailed financial statement for the fiscal year ended June 30, 1900, and the organization list of the station.

Ninth and Tenth Annual Reports of New Mexico Station, 1899 and 1900 (*New Mexico Sta. Rpts. 1899 and 1900, pp. 15–32, 59–87*).—Reports of the director and heads of departments reviewing the different lines of station work and financial statements for the fiscal years ended June 30, 1899 and 1900. The chemist notes the discovery of a deposit of bat guano in the Territory and gives the composition of the material. Lists of publications of the entomologist each year are given. Reports of the superintendents of the San Juan and Las Vegas substations outlining work in progress are included, the latter containing notes on weather conditions during the calendar year 1899.

Eleventh Annual Report of Utah Station, 1900 (*Utah Sta. Rpt. 1900, pp. LXVIII*).—This contains a report of the director reviewing at some length the history, organization, equipment, work, and publications of the station; a subject list of Bulletins 1–70 of the station; a financial statement for the fiscal year ended June 30, 1900; list of exchanges; and departmental reports giving outlines of investigations in horticulture, irrigation, poultry raising, chemistry, dairying, and stock feeding, together with meteorological observations and some of the results of work along different lines noted elsewhere.

Ninth Annual Report of Washington Station, 1899 (*Washington Sta. Rpt. 1899, pp. 8*).—This contains a report of the director reviewing briefly the different lines of station work and giving a financial statement for the fiscal year ended June 30, 1899.

Tenth Annual Report of Washington Station, 1900 (*Washington Sta. Rpt. 1900, pp. 8*).—This contains a report of the director reviewing briefly the different lines of station work, and giving a financial statement for the fiscal year ended June 30, 1900.

A report on the work and expenditures of the agricultural experiment stations for the year ended June 30, 1900, A. C. True (*U. S. Dept. Agr., Office of Experiment Stations Bul. 93, pp. 181, pls. 8*).—This includes a critical review of the conduct and general management of the stations, with brief abstracts of all station publications received during the fiscal year ended June 30, 1900, and general statistics relative to organization, publications, principal lines of work, revenue, expenditures, etc.

Report on the agricultural resources and capabilities of Hawaii, W. C. Stubbs (*U. S. Dept. Agr., Office of Experiment Stations Bul. 95, pp. 100, pls. 23*).—This bulletin deals with the agricultural conditions and capabilities of the Hawaiian Islands, with special reference to the establishment of an agricultural experiment station. The author visited the islands as special agent of this Department, and the collected information here set forth pertains to subjects of direct agricultural interest. A suitable location for an experiment station was selected, and recommendations regarding its equipment and suggestions as to its lines of work are presented. The physical, geographical, and geological features of the islands, including the soils and the origin of the Hawaiian people, are discussed, and the climate and rainfall are briefly noted. The greater part of the bulletin is devoted to a consideration of the flora of the islands, the production of coffee and sugar, and the growing of fruits and vegetables. Many native and introduced plants are briefly described, and some of the fruit trees and the palms growing on the islands, together with plants bearing seeds in the neighborhood of Honolulu, are enumerated. Stock raising, irrigation, forestry, labor, and land matters, including the history of land titles and land ownership, are each given separate consideration.

Agricultural resources and capabilities of Porto Rico (*U. S. House of Representatives, 56. Cong., 2. Session, Doc. 171, pp. 32, pls. 7*).—This is a report by S. A. Knapp, special agent of the Department of Agriculture, on investigations of the agricultural resources and capabilities of Porto Rico, with special reference to the establishment of an agricultural experiment station in the island. In the discussion of these subjects, climate, soil, water supply, forestry, public roads, the cane-sugar, coffee, and tobacco industries, the culture of corn, rice, fruits, nuts, and vegetables, stock raising, and, in general, the economic conditions of the island are considered and improvements in different lines are suggested. A list of fruits and nuts, including those produced in Porto Rico and others that may safely be introduced, is given. The report concludes with a discussion on the establishment of an experiment station near San Juan.

Crop Reporter (*U. S. Dept. Agr., Division of Statistics Crop Reporter, Vol. II, Nos. 10–12, pp. 8 each*).—Among the articles of a statistical nature included in these numbers are the following: Report of the statistician for the fiscal year 1900, the trans-Atlantic cattle trade, the world's flax crop, interstate commerce, trade opportunities in Southern republics, United States commerce with Japan, crop report for March, agricultural exports, production of wheat in Russia since 1883, the winter grain crops of France, estimates of world's wheat crop, manufacture of beet sugar, crop conditions on April 1, 1901, Bureau of Animal Industry, production of rye in Russia since 1883, Russian wheat crop of 1900, and exports of butter, cheese, and eggs from the United States and Canada.

Sixteenth Annual Report of the Bureau of Animal Industry, 1899 (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1899, pp. 790, pls. 41, figs. 45*).—This contains the report of the chief, reviewing the work of the Bureau during the year; a number of articles noted elsewhere; reprints from the Yearbook of the Department for 1899 of articles entitled Some examples of the development of knowledge concerning animal diseases (E. S. R., 12, p. 488), Administrative work of the Federal Government in relation to the animal industry (E. S. R., 12, p. 488), and Dairy development in the United States (E. S. R., 12, p. 484); reprint of Bulletin 24 of the Bureau entitled Notes upon dairying in California and the export of California butter to the Orient (E. S. R., 12, p. 89); reprint of Farmers' Bulletin 100 entitled Hog raising in the South (E. S. R., 11, p. 381); abstracts of 10 station bulletins reporting investigations along lines embraced in animal industry; brief miscellaneous articles taken in part from correspondence and consular reports, dealing with hog cholera and swine plague investigations in Iowa, a correction to an article appearing in the report of the Bureau for 1898 on the cattle tick and tuberculosis in New South Wales, sale of American thoroughbred horses in England, the exhibit of the Bureau at the Trans-Mississippi and International Exposition at Omaha in 1898, experiments with lime-and-sulphur dip, disinfection of hides of cattle shipped to the United States, injury to hides by branding, successful treatment of lumpy jaw, cattle notes of southwestern Texas, a report concerning the cattle of Porto Rico, Texas cattle, some statistics of cattle and cattle products of the Argentine Republic, decrease in Canadian-British cattle trade, shipments of Venezuelan cattle to Cuba, trade of Liverpool with the United States, United States sausages in Gibraltar, Germany's wool import, Silesian wool, American boots and shoes in Denmark, leather manufactures in Germany, leather industry in Japan, leather industry in Russia, exports and imports of animal products of Cape of Good Hope, Siberian dairy notes, potato bread for horses in Germany, and the distribution of tuburculin, mallein, and blackleg vaccine by the Bureau; a list of sanitary officers for the control of animal diseases in the various States; statistics for 1899 of the number and value of farm animals, the world's wool clip, and the receipts and shipments of farm animals at leading cities; rules and regulations of the Bureau of Animal Industry issued in 1899; and laws for the control of contagious diseases of animals in the different States. The report also contains several statistical articles dealing with the trade of Porto Rico in animals and animal products, imports of animals and animal products into the United Kingdom, imports and exports of animals and animal products, and the number of live stock in foreign countries.

Investigation of the great plains—field notes from trips in eastern Colorado, J. E. Payne (*Colorado Sta. Bul. 59, pp. 16, pls. 2, map 1*).—The author traveled over 1,300 miles, mainly in Kit Carson and Arapahoe counties, interviewing settlers and obtaining information as to the methods employed and results obtained in tree planting, fruit growing, and stock raising. Notes are also given on methods of irrigation, the results obtained with different field crops, character of the soil, weeds, insects, etc.

Farm and dairy industries of America, C. Sealey (*Queensland Agr. Jour., 8 (1901), No. 1, pp. 12–18*).—A report on an extended tour through Canada and the United States.

Perfume farm in Western Australia (*Queensland Agr. Jour., 8 (1901), No. 3, pp. 215, 216, fig. 1*).—A description of a perfume farm lately started in Western Australia. Wild verbena is the plant principally grown at the present time. An illustrated description is given of a box successfully used in extracting scent from flowers.

The plant breeding station at Svalöf in Sweden (*Mitt. Deut. Landw. Gesell., 16 (1901), No. 9, pp. 49–51*).—An article giving the history and describing the management and purpose of the institution.

NOTES.

ALABAMA COLLEGE AND STATION.—F. S. Earle has resigned his position in this institution to accept a position in connection with the botanic gardens at Bronx Park, N. Y.

COLORADO COLLEGE AND STATION.—W. R. Thomas has succeeded P. A. Amiss as principal of the State board of agriculture. Bids are to be called for for the construction of the foundation of a building for the department of irrigation engineering and the offices of the experiment station. This building will cost about $40,000. E. S. G. Titus, who has been acting assistant entomologist of the station for the past year, has accepted the position of assistant to S. A. Forbes, of the Illinois Station and Bureau of Natural History. The board of control has authorized the completion of the sale of what has been called the Divide Substation and transferred the property to the purchaser.

CONNECTICUT STATE STATION.—S. W. Johnson has resigned his position as a member of the station staff. W. E. Britton has been appointed State entomologist under the recent act of the general assembly providing for the inspection of nurseries and for experiments in combating insect pests. The act provides that the State entomologist is to be a member of the station staff and is to receive no other salary than that paid by the station. An annual appropriation of $3,000 is made for carrying on the work. Walter Mulford has been appointed State forester under an act of the general assembly concerning the reclamation of barren lands by tree planting.

IDAHO COLLEGE AND STATION.—John Henry Dye, C. E., a graduate of the University of Michigan, has been elected professor of civil engineering in the college and irrigation engineer of the station.

IOWA COLLEGE AND STATION.—John A. Craig, of the department of animal husbandry of the college and station, has resigned to accept a position as editor in Des Moines, Iowa, his resignation to take effect September 1. W. J. Kennedy, of the University of Illinois, has been elected to succeed Professor Craig. C. H. Eckles, dairy bacteriologist and assistant in the dairy department, has resigned to accept an assistant professorship in charge of dairying at the University of Missouri.

KANSAS COLLEGE AND STATION.—R. W. Clothier, assistant chemist of the station, has resigned to accept the professorship of agriculture and chemistry in the Normal School at Cape Girardeau, Mo. The station has recently completed experiments in the feeding of 130 calves for the production of "baby beef" and is undertaking investigations in pasture and range improvement, and with forage plants in connection with the Bureau of Plant Industry of this Department. At a recent meeting of the board of regents the two departments of chemistry in the college were combined, J. T. Willard being made professor of chemistry and George F. Weida assistant. E. A. Popenoe was relieved of horticultural work, the latter being left for the present in charge of A. Dickens.

MARYLAND STATION.—A. L. Quaintance, M. S., of the Georgia Station, has been appointed associate horticulturist and entomologist. E. P. Sandsten, M. S., a graduate of the Minnesota University, has been appointed general assistant in horticultural work, succeeding H. P. Gould, resigned. F. P. Veitch has resigned as assistant in soil work to accept a position as assistant soil chemist in this Department. The soil investigations which the station has carried on for several years will be discontinued. H. C. Whitford has been appointed to the position vacated by R. H. Pond, assistant plant pathologist. The board of trustees at their annual meeting made provisions for building a house to furnish quarters for the herdsmen and for the dairy and horticultural apprentices at the station.

MAINE STATION.—H. W. Britcher has been appointed assistant zoologist to the station.

MISSOURI STATION.—J. F. Gmelich, of Boonville, has succeeded N. M. Givan as a member of the governing board of the station.

NEBRASKA UNIVERSITY AND STATION.—E. A. Burnett has been made director of the station, *vice* Chancellor E. Benjamin Andrews, who retires from the work of the station. R. W. Thatcher, assistant chemist of the station, has resigned to accept a position as assistant chemist of the Washington Station. H. R. Smith, B. Sc., a graduate of the Michigan Agricultural College, recently acting professor of agriculture in the University of Missouri, has been elected assistant professor of animal husbandry in the university and assistant in animal husbandry at the station, to take effect September 1. W. H. Tuck, laboratory assistant in the department of animal pathology, has resigned to accept a position with a large disinfecting company. J. H. Gain, a graduate of Chicago Veterinary College, has been elected assistant in the department of animal pathology of the station.

NEW MEXICO STATION.—The offices of second assistant chemist and assistant botanist have been discontinued.

NORTH CAROLINA COLLEGE AND STATION.—The college and station passed June 1, 1901, under the control of the State board of agriculture, composed of the following members: S. L. Patterson, chairman of the board of agriculture, Raleigh; J. B. Coffield, Everetts, N. C.; E. L. Daughtridge, Rocky Mount, N. C.; W. M. Dunn, Newbern, N. C.; C. N. Allen, Auburn, N. C.; J. S. Cunningham, Cunningham, N. C.; A. T. McCallum, Red Springs, N. C.; J. P. McRae, Laurinburg, N. C.; L. G. Waugh, Dobson, N. C.; W. A. Graham, Machpelah, N. C.; A. Cannon, Horseshoe, N. C.; Howard Browning, Littleton, N. C.; J. R. Joyce, Reidsville, N. C.; G. E. Flow, Monroe, N. C.; and J. C. Ray, Boone, N. C. The office of professor of agriculture in the college and agriculturist at the station was vacated. A professorship of veterinary science and animal industry and the office of State veterinarian were established. An instructorship in biology in the college and biologist of the station was also established. President G. T. Winston, of the college, resigned as director of the station, and B. W. Kilgore, chemist of the State board of agriculture, was appointed as his successor in the directorship.

NORTH DAKOTA COLLEGE AND STATION.—Two barns, one for horses and the other for cattle, the combined cost of which will be about $18,000, are being constructed to replace the large station barn burned January 5. Experimental work has been undertaken at Edgeley, a little over 100 miles southwest of Fargo, under a small State appropriation made for the establishment of a substation at that place. A $12,000 addition is being made to Mechanical Hall, and the contract has been let for the construction of one wing of a science building.

PENNSYLVANIA STATION.—Enos H. Hess has severed his connection with the station as assistant to the director to assume the management of a large farm at Casanova, Va.

SOUTH CAROLINA COLLEGE AND STATION.—The capacity of the chemical building has been doubled by recent additions. A. P. Anderson, entomologist, has tendered his resignation, to take effect September 1. P. H. Rolfs has resigned to accept a position in the Division of Plant Industry in this Department. He will be pathologist in charge of the Tropical Laboratory at Miami, Fla.

South Dakota Station.—President John W. Heston has been elected acting director of the station.

Utah Station.—W. W. McLaughlin, B. S., has been appointed assistant chemist of the station.

Vermont Station.—A. W. Edson, A. B., assistant botanist of the station, has become student aid in the Bureau of Plant Industry of this Department, and W. J. Morse, B. S., has been appointed to succeed him.

Virginia Station.—John Spencer, V. S., has been appointed assistant veterinarian, *vice* C. McCulloch.

Necrology.—Dr. Charles Mohr, the well-known botanist of the Southern United States, died at Asheville, N. C., July 17, in his seventy-seventh year. Dr. Mohr was born December 28, 1824, at Esslingen-on-the-Neckar, Germany. He was educated as an apothecary, but his natural inclination was in the line of botany. In 1846 he made a trip to South America, returning to Europe early in 1848, soon after which he came to the United States, settling in Mobile, Ala., in 1857, making that his home thereafter. He has long been considered an authority on the forest, medicinal, and other economic plants of the South. In 1885 he prepared and had charge of the collection of medicinal and other useful plants of the South at the New Orleans Exposition. He contributed the information regarding Southern forests to the report on the forests of the United States in the Tenth Census Report and Bulletin 13 of the Division of Forestry. The Timber Pines of the Southern United States was written by him. He also contributed extensively to botanical and pharmaceutical journals, usually treating of economic considerations. At the time of his death there was in course of publication for the Botanical Division of this Department a report on the flora of Alabama, which gives results of forty years of his observations.

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EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Assistant Director.*

EDITORIAL DEPARTMENTS.

Chemistry, Dairy Farming, and Dairying—The Editor and H. W. Lawson.
Meteorology, Fertilizers and Soils (including methods of analysis), and Agricultural Engineering—W. H. Beal.
Botany and Diseases of Plants—Walter H. Evans, Ph. D.
Foods and Animal Production—C. F. Langworthy, Ph. D.
Field Crops—J. I. Schulte.
Entomology and Veterinary Science—E. V. Wilcox, Ph. D.
Horticulture—C. B. Smith.
With the cooperation of the scientific divisions of the Department and the Abstract Committee of the Association of Official Agricultural Chemists.

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EXPERIMENT STATION RECORD.

Vol. XIII. No. 3.

The address of J. Cossar Ewart, M. D., F. R. S., at the recent meeting of the British Association at Glasgow will be of interest to persons who appreciate the frail foundation upon which our knowledge of the science of breeding animals rests and the desirability of systematic experiments directed along that line. Dr. Ewart, who is professor of natural history in the University of Edinburgh, is well known for his investigations in this line, which have extended over a number of years, although the results have been published only in part in zoological and veterinary journals. A number of his papers on the subject of telegony and reversion and the results of breeding zebra hybrids were published in book form in 1899 under the title of The Penycuik Experiments, named for the place where these experiments have been conducted. In that volume he presented the views held by biologists, breeders, and others interested in the question of telegony or "germ infection," a term which he defined as a convenient explanation of many of the obscure phenomena which come under the notice of breeders and fanciers. He there outlined a series of experiments which might be undertaken on that subject and signified his desire to correspond with anyone interested in undertaking some of these experiments.

In the meantime his own experiments have been continued. This year, as president of the zoological section of the British Association, he delivered the opening address, taking for his subject "The experimental study of variation." In this he reviewed the theories of variation and cited many experiments with different kinds of animals. He gave special attention to the subject of the cause of variation—the possible effect of age, ripeness of the germ cells, condition of the soma, change of habitat, environment and use-inheritance, and telegony—and discussed the effects of intercrossing and interbreeding on variation and the swamping effect of intercrossing on new varieties. In regard to the subject of telegony, after carefully considering all the more striking supposed cases of "infection," Dr. Ewart stated very positively that "there is no satisfactory evidence that there has ever been, either in the human family or amongst domestic animals, a single instance of infection." He indicates that the true cause of variation is not likely to be found either in maternal impressions, the direct action of environment, use-inheritance, or telegony. Instead of simply stating that variation is due to the constant recurrence of slight inequalities of the nutrition of the germ cells, he believes that we may assert with some confidence that differences in age, vigor, and health of the parents and differences in the ripeness of the germ cells are potent causes of variation. He holds that intercrossing, though a direct cause of retrogressive variation, is only an indirect cause of progressive variation, while in-and-in breeding at the right moment is a cause of progressive variation. He discusses at some length the "swamping" effects of intercrossing, showing that "progress in a single direction is probably often due to new varieties swamping old—it may be long established—varieties, and that several varieties may be sufficiently exclusive to flourish side by side in the same area and eventually (partly owing to their aloofness, i. e., to differential mating) give rise to several species."

In conclusion Dr. Ewart states his belief that the time has come when a well-equipped institute for biological and other experiments bearing upon these questions should be provided.

The need of such experiments must be patent to all who are familiar with the theories and traditions of stock breeding. Considering the very great progress which has been made in recent years in agricultural science, it is rather remarkable that our knowledge of the laws upon which the breeding of animals for different purposes rests has remained practically at a standstill. While attention has been given to nearly every other line of animal husbandry, this interesting and important field has been passed over, probably on account of the difficulties and the time-consuming nature of such experiments. These, however, should not present themselves as barriers to institutions whose permanence is assured and which can safely lay plans for a long term of years. Stock breeding suggests itself as a most inviting field for experiment station work, and one in which very important, if not epoch making, results are quite within the range of possibility.

In this day of specializing, the field would seem to be sufficiently inviting to attract men who should prepare themselves for it by the very best means possible, and be content to make the subject a life study. What has long been needed is a master mind to work over and digest the theories and traditions on which our so-called principles of breeding rest. They rest too largely at present on experience, rather than on systematic experiments, which affords instances in support of almost any theory. The information needs to be classified and graded, and the wheat separated from the chaff that has been passed down to us through successive manuals on the subject. It would seem that some few of the experiment stations in this country might be in position to enter upon some phase of this work, under the advice of such a competent guide as Dr. Ewart, which, if carried on systematically and in a cooperative way, might be productive of noteworthy results.

The rapid evolution of the soil work of this Department from a subordinate division of the Weather Bureau to a Bureau organization of its own within a period of six years from its inception, and with an appropriation the year of its elevation to a Bureau of over $109,000, gives this line of investigation a prominent position in the activities of the Department. The reorganization of the division into a Bureau of Soils went into effect July 1, and involves the extension of its work along a number of lines of practical utility as well as the strengthening of those developed in the past. The Bureau is charged with the study of soil problems in their relation to practical agriculture; the investigation of the physical and chemical properties of soils, the classification and mapping of soils, to show the distribution of the various soil types, with a view to determining their adaptability to certain crops and their management and treatment; the investigation of alkali problems and their relations to irrigation and to seepage waters; and the investigation of tobacco soils, methods of cultivation and curing of tobacco, introduction of improved varieties, and the marketing of tobacco in foreign countries.

The interest which has been aroused by the investigation of tobacco soils, and especially the successful growth of Sumatra tobacco in Connecticut, has given rise to demand for investigation of tobacco soils in other localities and for soil studies on the adaptability of other crops, notably the sugar beet and certain varieties of fruits at present grown to perfection only on quite restricted areas. During the present year an area of nearly six million acres has already been surveyed and mapped, which has included field work in about a dozen different States, and other sections of the country are being taken up this fall. In several of the Western States this work has included studies of alkali problems, and plans were laid for making a practical demonstration in Utah of the efficiency of drainage in the reclamation of alkali lands. The appointment of Mr. F. D. Gardner, who had this work in hand, to the management of the Porto Rico experiment station, prevented carrying out these plans; but much interest has been expressed in the undertaking, and it is hoped that such a demonstration may be made later.

Following the success in growing Sumatra tobacco under shade on soils of certain definite character in Connecticut, cooperative experiments were undertaken with a number of farmers in Connecticut and Massachusetts on areas as widely separated as possible, on typical soils which were thought adapted to this crop. In this way nearly 43 acres of Sumatra tobacco were grown during the past season under the supervision of the Bureau. While it will naturally be some time before the actual results of this experiment are known, the present indications are that the crop will yield at least double the cost of production, nearly three-fourths of which is due to the erection of the shade and hence is in the nature of a permanent improvement.

Another successful line of work in the tobacco investigations has been the fermenting in bulk of the type of leaf grown in Lancaster County, Pa., instead of in tightly packed cases. The first experiment was made on an old crop which had not fermented by the usual case method, but had developed a considerable amount of black rot. Bulk fermentation proved perfectly successful, the quality of the leaf being improved and the black rot checked entirely. Subsequently over 4,000,000 pounds of tobacco was fermented in bulk under the direction of the Bureau by several of the leading packers, with a total loss of only 35 pounds from black rot and all other causes. The success of this method of fermenting the tobacco, both in improving the quality of the leaf and in controlling the dreaded black rot, appears to be assured, and it is confidently predicted by the packers themselves that the new method will entirely supersede the old, especially where large crops are handled.

A distinctly new line of the soil investigations will be developed under Prof. F. H. King, who has recently been added to the personnel of the Bureau. This will consist of investigations directly related to problems in soil climatology and soil management. The Division of Soils was orignally organized in the Weather Bureau "to investigate the relations of soils to climate and organic life." This feature of its work has not been lost sight of, although it has in large measure been crowded out by the development of the work in other directions. The establishment of this line of research as a permanent feature of the work of the Bureau is in conformity with the general plan of reorganization, and is looked upon as an important step in strengthening and extending its activities.

As at present organized the Bureau embraces the following branches: Administrative, in charge of Milton Whitney; soil chemistry, F. K. Cameron; soil physics, Lyman J. Briggs; soil surveys—eastern division, C. W. Dorsey, western division, T. H. Means; tobacco investigations, M. L. Floyd, and soil climatology, F. H. King. This completes the organization of the Bureau for the present. The plan will be to develop the branches of field and laboratory investigations already provided for and to extend the soil survey as rapidly as possible, establishing new branches only as they may be called for in the development of the present lines.

Several of the colleges in the West are deriving some income from the lands granted them under the Morrill Act by leasing them for grazing purposes. While the rental for such lands is very low, in a number of cases it nets a considerable sum in the aggregate. A decision recently rendered by the supreme court of Montana on the disposition of such funds is of interest in this connection. The leases on lands of the College of Agriculture and Mechanic Arts yield at present about $6,500 a year, and about $16,000 of this money had accumulated in the State treasury. The State attorney-general held that it was not available to the college until it had been specifically appropriated by the legislature. The college authorities thought differently and carried the matter to the supreme court of the State on a mandamus proceeding. The court decided that this money was in the nature of an income from the land scrip, for the expenditure of which provision had been made in the Morrill Act and subscribed to by the State in its acceptance, and hence that it was not subject to further legislative action. This decision places the funds in the hands of the State board of education, which has charge of all the State institutions. The funds may now be appropriated by this board for specific purposes the same as any other funds of the college.

In Wyoming, where about $15,000 has accumulated from the leasing of portions of the land scrip, the legislature has already taken action upon this matter, but of such a nature as practically to withhold the funds from the university. The contention has been made that this money is subject to the same restrictions as prescribed by the Morrill Act for the proceeds from the sale of the land scrip, and that therefore none of the principal can be used. A bill passed the last session of the legislature directing that the principal be invested in 5 per cent par bonds, and the interest applied to the university. Up to the present time such an investment has not been made, and the university, which holds that the money derived from leases is itself in the nature of interest on the land endowment, as the principal has not been encroached upon, is compelled to await the action of the next legislature. Unless this law is repealed it will prevent the university deriving any material benefit from its land grant for a long period, as the constitution of the State prohibits the sale of any of its public lands for less than $10 an acre.

Preliminary plans for a new agricultural building for the use of this Department have recently been accepted by the commission of award appointed for that purpose. Some months since this commission invited architects to submit plans for such a building, outlining the general requirements and some considerations to be taken into account. In compliance with this invitation ten architects submitted plans, which have been passed upon by the commission, resulting in the acceptance of those of Lord & Hewlett, of New York. These plans contemplate a magnificent marble structure of classic design and imposing proportions. The features are a main building or front something over 300 feet in length, with wings at either end extending to the rear for the accommodation of the various laboratories. The front and wings are four stories in height, with a well-lighted basement under the whole, and provide 158,400 square feet of space.

The estimated cost is a little over $2,000,000. It is understood that these plans are of necessity only preliminary, and that a considerable number of changes will be required to adapt them to the needs of the Department. The exterior and the general arrangement, however, have been made to conform to the general plans of the commission now considering the improvement of the parks and public buildings of Washington. It is planned to locate the new building approximately on the present site of the main building, facing the contemplated parkway from the Capitol to the Washington Monument.

It is with deep regret that we chronicle the death of Dr. M. Maercker, of Halle, which occurred on October 19, at the age of 59 years. Dr. Maercker and his services to agriculture and agricultural chemistry are too generally known in this country to need more than passing notice. The agricultural experiment station at Halle, which is the largest and one of the oldest of the German stations, in its present proportions is a monument to his indomitable energy and the confidence which his work inspired. As director of this station for over 30 years, he so systematized the enormous amount of control work which it was called upon to do that he was able, in addition, to carry on a creditable amount of research and a large amount of experimentation of a more practical nature in the field and vegetation house. Remarkably progressive in his ideas, he was impressed with the importance of investigations for practice's sake as well as for science's sake, and probably few of the German stations have had a more direct influence in improving the methods and practice of their constituents than the Halle station. The dominant spirit of the American stations appealed strongly to Dr. Maercker, and their example was, as he declared, an inspiration to him in bringing agricultural experimentation more closely into touch with agricultural practice. As a teacher he was vigorous and inspiring, and as a writer and a speaker his influence was felt far and wide. One of the foremost figures in agriculture of his day, his death will be keenly felt in all the varied lines of activity in which he had been prominent.

THE ASH CONSTITUENTS OF PLANTS; THEIR ESTIMATION AND THEIR IMPORTANCE TO AGRICULTURAL CHEMISTRY AND AGRICULTURE.

B. Tollens, Ph. D.,

Director of the Agricultural-Chemical Laboratory, University of Göttingen.

Part I.—The Ash of Plants, its Preparation and Analysis.

Regarding the origin and importance of the residue remaining after the burning of plants, i. e., the ash elements or "the salts," strange theories were held in the first part of the nineteenth century, even among many of the learned men of that time. At the close of the eighteenth century Theodore de Saussure had demonstrated the soil in which the plants grow to be the source from which the ash elements are derived, and clearly showed these elements to be indispensable to the life of plants. Although his theory received the support of the chemists of that day, as Davy and Berzelius, it was not until after 1840 that its truth became generally accepted. About that time Boussingault[1] in France and Liebig[2] in Germany based their celebrated writings upon those of de Saussure[3] and the fundamental researches of Wiegmann and Polstorff.[4] The importance of the ash constituents of plants and their study was soon very generally conceded by agriculturists as well as by others, and now the matter is accepted beyond any doubt.

De Saussure attempted the most careful estimation of the ash elements of plants, not only the total amount of ash, but also the quantities of the individual constituents; and these determinations by improved methods have been made extensively ever since. When regard is had to absolute accuracy, ash analysis is not as simple as might at first appear, or as some chemists who have given little attention to the subject are inclined to regard it. On the contrary, it requires the exercise of special precautions, as Strecker,[5] among

[1] Economie rurale, 1844.

[2] Die Chemie in ihrer Anwendung auf Agricultur und Physiologie, 1840.

[3] Recherches chimiques sur la végétation. Paris, 1804.

[4] Ueber die anorganischen Bestandtheile der Pflanzen. Braunschweig, 1842.

[5] Ann. Chem. u. Pharm., 73 (1850), p. 346.

others, has pointed out. This is recognized by handbooks of analytical chemistry, such as Fresenius's, for example, which treat the subject of ash analysis at considerable length.

PREPARATION OF THE ASH.

The principle of ash determination is very simple, and while in the case of some materials the incineration is easily made, in the case of many others great difficulties are presented which may cause quite large errors. The following points should be especially noted: (1) The incineration must be complete or nearly so, and no carbon should remain. (2) None of the ash elements should be volatilized, this precaution applying especially to potash and soda, phosphoric acid, sulphuric acid, and chlorin. (3) Further, it should be remembered that elements which occur only in part as highly oxidized inorganic acids but in other forms as well, as, for example, sulphur in proteids or phosphorus as glycerine-phosphoric acid in lecithin, are only present in the completely incinerated ash in the form of acids (sulphuric and phosphoric acids).

In case it is desirable to know how much sulphuric acid, as such, is in the original substance before incinerating, it is extracted with dilute hydrochloric or nitric acid in the cold or with slight heat, and the sulphuric acid precipitated with barium chlorid.[1]

For the combustion of the organic matter various methods have been described since the time of de Saussure, some simple and others more complicated, only a few of which can be noted. De Saussure[2] wrote: "The . . . plants are burned on a large sheet of iron, and the residue incinerated in a crucible at a dark red heat until the carbon particles can not be burned further." He first burned the substance in large quantity on an iron plate to reduce the volume, and then completed the incineration in a crucible (probably of clay). This method is practiced at the present day when a large quantity of ash is desired, and when a sufficiently large platinum crucible is not available one of fire clay is used, the charred mass being transferred to a smaller platinum crucible for completing the operation.

The ordinary platinum vessels, both crucibles and dishes, permit the free access of a current of air. The crucible was formerly heated over a charcoal fire or an alcohol lamp. In the incineration over a coal-gas flame or oven, as is now commonly done, there is the danger that some of the sulphur of the gas may be oxidized and unite with the bases of the ash, thereby causing an error in the sulphuric-acid content. There-

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[1] J. König, Unteruschung landwirthschaftlich und gewerblich wichtiger Stoffe. Berlin: P. Parey, 1898, 2. ed., p. 192.

[2] Chemische Untersuchungen über die Vegetation von Theodore de Saussure, 1804. Translated by A. Wieler. Leipsic: Engelmann, 1890, pt. 2, p. 80.

fore, it has been recommended by Baumert, Counceler,[1] and von Schröder and Reuss[2] to employ an alcohol lamp in exact determinations of the sulphur content of plants, as, for example, in studying the injury to forest trees caused by the sulphur in the gases given off by smelters. In such cases the Berzelius alcohol lamp or one of similar construction should be employed.

When the incineration is carried on in a platinum dish care should be taken to bring the glowing substance into contact with the air, either by frequent stirring, or by suspending a glass tube, for example an ordinary lamp chimney, above the dish to increase the draft.[3] There is always a danger, too, that the substance in the bottom of the dish may be heated too high, while the top portion will not be heated enough, and thus the incineration be uneven. In order that the upper portions of the substance may be properly incinerated the heat must be applied from above, and this is accomplished most simply by laying a platinum cover loosely over the dish, which holds the heat in and reflects it upon the substance.[4] This is accomplished in the method of the Association of Official Agricultural Chemists[5] by the use of a muffle.

If care is not exercised and a too high degree of heat is applied, inaccuracies may follow, due to the volatilization of the alkalis as well as some of the phosphoric[6] and sulphuric acids, or other errors, as the fusing together of the ash inclosing carbon and the formation of silicates which are difficult to decompose.

To avoid the volatilization of sulphuric acid or sulphur in other forms various methods have been employed. For example, W. Mayer[7] found 0.464 per cent of SO_3 in wheat when incinerated with potash and saltpeter, and only 0.04 to 0.06 per cent when incinerated in the ordinary manner. Ulbricht[8] treated clover leaves by heating in nitric acid and drying and then incinerating with saltpeter and potassium carbonate. With this treatment 1.476 per cent of SO_3 was found, while a portion

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[1] Landw. Vers. Stat., 27 (1882), p. 376.

[2] Die Beschädigung der Vegetation durch Rauch. Berlin, 1883, p. 133.

[3] F. Schulze in Fresenius' Anleitung zur quantitativen Analyse. 6. ed., vol. 2, p. 639.

[4] Schloesing, Contribution à l'étude de la chimie agricole, p. 225, in Fremy's Encyclopédie chimique, vol. 10. Paris, 1885.

[5] U. S. Dept. Agr., Division of Chemistry Bul. 46.

[6] Erdmann (Ann. Chem. u. Pharm., 54 (1845), p. 353) and Strecker (Ann. Chem. u. Pharm., 73 (1850), p. 346) have called attention to this point; while according to Lechartier (Compt. Rend. Acad. Sci. Paris, 109 (1889), p. 727) scarcely any phosphoric acid volatilizes, though some sulphuric acid may be driven off. See also Weber (Ann. Phys. u. Chem. [Poggendorff], 81 (1850), p. 402).

[7] Ann. Chem. u. Pharm., 101 (1857), pp. 129–154.

[8] Landw. Vers. Stat., 3 (1861), p. 249.

of the substance burned without the addition of alkalis, etc., yielded only 0.417 per cent.

Many chemists in preparing the ash in platinum dishes, whether over a flame or in the muffle, first extract the fusible salts from the charred substance with water, then dry and incinerate the residue completely, afterwards adding the extract, evaporating, and gently glowing.

SPECIAL INCINERATING APPARATUS.

In order to regulate the admission of air to the substance and at the same time to retain the volatile substances, several forms of apparatus have been proposed in which the substance is burned in a current of air or oxygen, and the volatile portion or fine particles collected. König used simply a glass tube drawn out to a point for discharging a small current of oxygen into the faintly glowing substance.

Mitscherlich[1] and Schloesing[2] heated the substances in a platinum or silver boat placed in a wide glass or porcelain tube, through which a current of carbon dioxid was first passed, until the charring was complete and combustible gases ceased to be given off, and then a current of oxygen, and the incineration completed. By this means there should hardly be any volatilization of substance and no inclosing of carbon by the fusing of the salts. A similar apparatus has been recommended by Reese.[3]

Hlasiwetz[4] employed a double-necked flask, in one opening of which a porcelain tube was placed in a perpendicular position, wide above and narrow below, with a sieve of platinum in the bottom upon which the substance was placed. The substance was ignited and air was drawn through the tube and the bottle by means of an aspirator until the combustion was complete. The products of combustion were passed through the water in the flask, which held any particles carried along mechanically, as alkaline chlorids, etc. The incineration was completed in a platinum dish.

Shuttleworth[5] and Tucker,[6] working in the Agricultural-Chemical Laboratory of the University of Göttingen, have recently made use of another principle. They employed a specially constructed platinum crucible of large size, with a platinum cover carrying a tube reaching to the bottom of the crucible, through which a current of air was con-

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[1] Jour. Prakt. Chem., 36 (1845), p. 232.

[2] Contributions à l'étude de la chimie agricole, p. 225.

[3] Ztschr. Analyt. Chem., 27 (1888), p. 133.

[4] Ann. Chem. u. Pharm., 97 (1856), p. 243.

[5] Jour. Landw., 47 (1899), p. 173 (E. S. R., 11, p. 304).

[6] Ibid., 48 (1900), p. 64 (E. S. R., 11, p. 506).

ducted, and with an arrangement for retaining any particles of volatilized substance. The construction of the two forms of apparatus is shown in the accompanying figures.

A weighed amount of the substance is placed in the crucible without the cover, and charred on a sand bath until no more gases are given off. The cover with the tube for conducting air is then put in place and the crucible heated over a naked flame. The air is forced into the Shuttleworth apparatus (see fig. 1), while in the Tucker apparatus

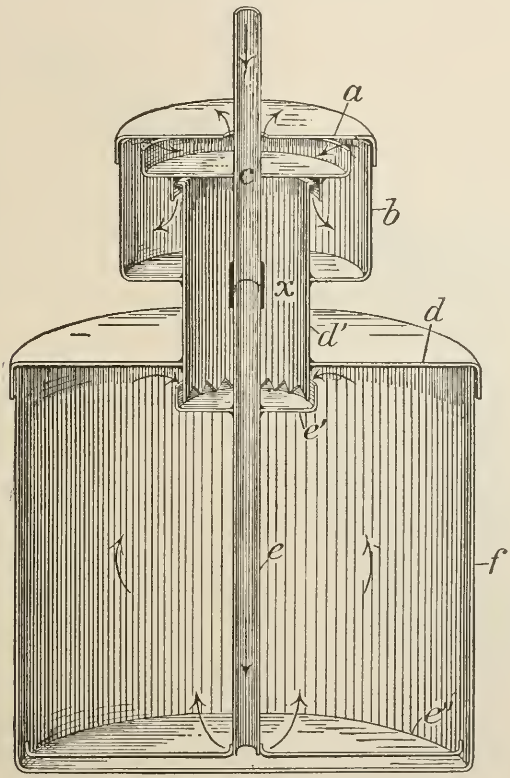

FIG. 1.—Shuttleworth apparatus for ash determination.

(fig. 2) it is drawn through by means of an aspirator, the tube conducting the current of air to the bottom of the crucible carrying a stirrer in both cases. In the Shuttleworth apparatus the loss of light particles of matter is avoided by an attachment to the cover (*d′*, *b*.) containing water (*c*). In the Tucker apparatus the air drawn off is passed through a small flask (*g*) containing water, in which the volatilized chlorids, etc., are collected.

During the combustion the substance is stirred by a platinum stirrer, which in the Shuttleworth apparatus is attached to the tube introducing air into the crucible, and in the Tucker apparatus extends down through the inlet tube.

The Tucker apparatus has the advantage over the Shuttleworth apparatus of simplicity of construction and ease of operation. Again, the cover of the Shuttleworth apparatus is complicated, and forcing the air through is less satisfactory than drawing it through, as in Tucker's apparatus. The conical form of the crucible of Tucker's apparatus is also preferable, permitting the heat to be applied more uniformly.

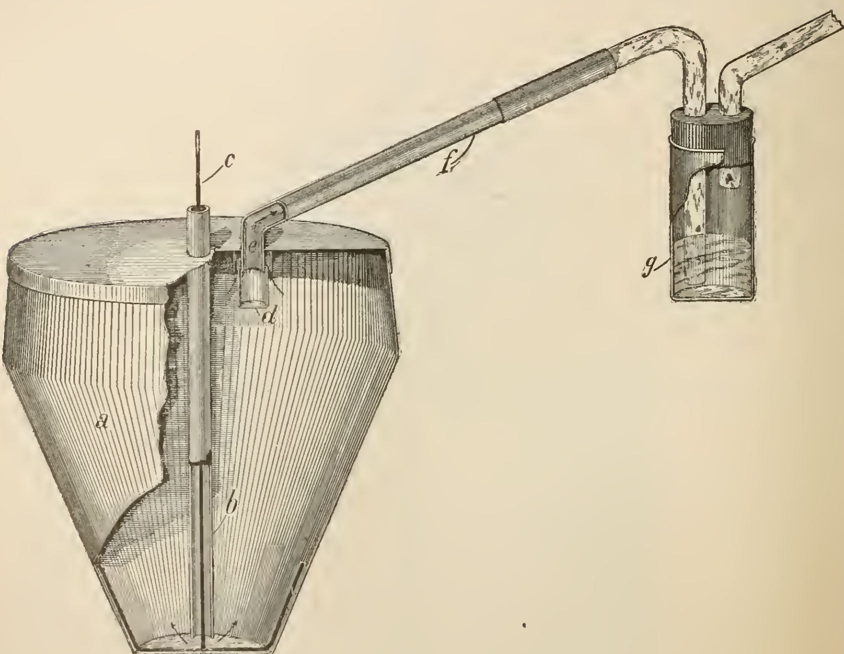

FIG. 2.—Tucker apparatus for ash determination.

With this apparatus, straw, leaves, and potatoes are incinerated in the course of two hours, the charring occupying about 1½ hours, and the completion of the incineration in a current of air requiring not more than a half hour.

H. Wislicenus[1] has recently described an apparatus which embodies the principle of the Tucker apparatus, but consists only of a platinum cover which may be adapted to dishes and crucibles ordinarily found in laboratories, thus doing away with the special crucible.

Another form of incinerating apparatus is the Berthelot bomb, in which the substance is burned, by means of an electrically heated wire, in oxygen under 25 atmospheres pressure. This apparatus has the advantage of excluding every possible loss, and is absolutely closed

[1] Ztschr. Analyt. Chem., 40 (1901), No. 7, p. 441.

during the operation; but the manipulation of it is somewhat difficult, special care being necessary in collecting the products of combustion, and, as Berthelot[1] states, it burns only small amounts at a time. Furthermore, the apparatus is quite expensive, and necessitates a supply of compressed oxygen. The same applies to the modified apparatus constructed by Mahler and by von Hempel and Atwater.[2]

Grouven[3] destroyed organic matter by combustion in superheated steam in iron tubes. In this method the sulphur occurring in plants in such compounds as protein, etc., is not oxidized to sulphuric acid, as in the usual process of burning, but is obtained as sulphuretted hydrogen.

It sometimes happens that the incineration occupies a long time, even in the Shuttleworth and Tucker forms of apparatus exceeding the 2 hours which is usually sufficient; for example, when large quantities of fusible salts and especially alkaline phosphates are present. In such cases the carbon particles are occluded from the action of oxygen of the air; but in burning in an open platinum dish this occurs to a much greater extent, so that the incineration may sometimes require 10 or 12 hours and even longer. In such cases the danger from loss of alkaline salts is naturally great, increasing as the temperature is raised.

In order to prevent the enveloping of particles of carbon, due to the fusing of salts, these salts may be removed prior to the combustion. In the method of Fresenius,[4] mentioned above, the charred substance is extracted with water or acetic acid,[5] the insoluble portion collected on a filter, dried, and incinerated, and the soluble portion then added, evaporated, and gently incinerated. (See also Reichardt.[6]) This operation requires both time and pains.

The fusing of the salts may also result in the formation of silicates which are difficult to decompose with hydroclorie acid, as in the case of straw which contains much silicic acid, and is an important point to be observed, as Shuttleworth[7] has pointed out. In such case the portion of the ash insoluble in hydrochloric acid must be treated with hydrofluoric acid, and the bases contained in that portion estimated separately.

ADMIXTURES TO FACILITATE INCINERATION.

To overcome the difficulties of incineration, attempts have been made for many years to discover some substance to be added to the mass

[1] Ann. Chim. et Phys., 6. ser., 6 (1885), p. 546.
[2] U. S. Dept. Agr., Office of Experiment Stations Bul. 21, p. 123.
[3] Ztschr. Analyt. Chem., 22 (1883), p. 439.
[4] Jour. Prakt. Chem., 70 (1857), p. 85.
[5] Städeler in Wöhler's Mineralanalyse in Beispielen, 1861, 2. ed., p. 188.
[6] Arch. Pharm., 73 (1853), p. 258.
[7] Jour. Landw., 47 (1899), p. 173.

which would prevent the fusing of the salts and unite with the volatile substances, like chlorin, sulphuric acid, and phosphoric acid, so as to avoid their loss.

As an oxygen-furnishing material and to facilitate the incineration Verdeil[1] employed ammonium nitrate, and Keller nitric acid, for animal substances. Platinum sponge was first employed by H. Rose.[2] This material, however, is somewhat expensive. Platinum chlorid, employed by Rose and Fleitman,[3] is similar in its action, but naturally the volatilization of an indeterminable amount of chlorin from the platinum chlorid renders it impossible to accurately determine the chlorin in the ash. Admixtures of iron oxid, as recommended by Gräger,[4] and of ferric nitrate, employed by A. Müller,[5] likewise accelerate the combustion and may be useful in some cases. In employing mercuric oxid, as practiced by Will, the analyst must guard against the mercury vapor given off. The addition of sand likewise facilitates the burning, and Alberti and Hempel[6] recommend in incinerating sugar products, molasses, etc., adding a weighed amount of quartz sand, which is afterwards subtracted from the total weight of the ash. However, by the use of sand chlorin, sulphuric acid, and phosphoric acid are at least partially driven off.

Kassner[7] mixed calcium plumbate (Ca_2PbO_4) with the substance, thereby facilitating the burning, but interfering with the later analysis of the ash. The same objection applies to bismuth nitrate, which Bechamp[8] recommended. Among other admixtures suggested may be mentioned pumice stone, copper oxid, clay, and magnesia, employed by Donath.[9] According to Donath, these are inferior (at least with sugar products) to incineration at first in dilute and later in pure oxygen. Recently H. Wislicenus[10] has suggested moistening the greyish ash with pure hydrogen peroxid, which facilitates the complete combustion of the carbon.

Most frequently, however, admixtures of an alkaline character are employed, and these, while facilitating the combustion, are also of real value in preventing the volatilization of chlorin and sulphuric acid, which otherwise are in danger of being lost. Strecker[11] has employed the addition of baryta, Way and Ogstone[12] barium nitrate,

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[1] Ann. Chem. u. Pharm., 69 (1849), p. 89.
[2] Ann. Phys. u. Chem. [Poggendorff], 80 (1850), p. 101.
[3] Jahresber. Chem., 1849, p. 595.
[4] Ann. Chem. u. Pharm., 111 (1859), p. 124.
[5] Jour. Prakt. Chem., 80 (1860), p. 118.
[6] Ztschr. Ver. Deut. Zuckerind., 1891, p. 743.
[7] Ztschr. Analyt. Chem., 30 (1891), pp. 44, 55; Arch. Pharm., 228 (1890), pp. 171–178.
[8] Compt. Rend. Acad. Sci. Paris, 73 (1871), p. 337.
[9] Ztschr. Ver. Rübenz. Ind., 1891, p. 740.
[10] Ztschr. Analyt. Chem., 40 (1901), No. 7, p. 443.
[11] Ann. Chem. u. Pharm., 73 (1850), p. 346.
[12] Jahresber. Chem., 1849, p. 600; Jour. Roy. Agr. Soc. England, 8 (1847), p. 134.

Slater[1] barium superoxid, Wackenroder[2] lime, calcium carbonate, and calcium acetate, all with good results. Von Schröder and Reuss[3] in the analysis of forest products impregnated the substance with a solution of sodium carbonate previous to charring, to prevent the loss of chlorin and sulphuric acid. Councler[4] added to each gram of substance to be burned 1 cc. of a 10 per cent soda solution, dried, charred, and incinerated over an alcohol lamp. Behaghel von Adlerscron and Bunge[5] earlier showed that in incinerating animal substances correct figures for the chlorin content were obtained only with the addition of sodium carbonate.

Shuttleworth[6] found the addition of a measured quantity of calcium acetate of known calcium content very advantageous, the lime resulting from the higher heating retaining the chlorin and preventing the fusing together of the salts, so that the mass remained porous and difficultly decomposed silicates were not formed. This admixture is especially to be recommended in case of substances like straw, which are rich in silicic acid, with leaves, and with seeds rich in phosphoric acid. With potatoes it is not necessary, as von Daszewski[7] has found, because they are easily and completely incinerated without such addition.

A further advantage of the addition of alkaline substances in the incineration is the avoidance of the formation of pyro-phosphate in the ash and incomplete precipitation of the phosphoric acid, which may result in case of insufficient treatment of the ash solution with nitric acid.[8]

Addition of sulphuric acid in incineration.—In the analysis of molasses and other sugar products, the incineration is now generally carried on with the aid of sulphuric acid, as proposed by Scheibler.[9] This addition simplifies the operation very materially, but the bases are naturally all recovered in the ash as sulphates. As this increases the weight over the bases themselves or their carbonates, a correction must be made in the weight of the sulphate ash, which according to Scheibler should be about one-tenth of the ash. Although this factor is now commonly used for the correction, it is only a conventional factor and by no means accurate under all circumstances. Hence, others, as Biard,[10] Sidersky, von Lippmann, and Wiechmann,[11] have

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[1] Jour. Prakt.-Chem., 65 (1855), p. 253; Chem. Gaz., 1855, Feb., No. 295, p. 53.

[2] Arch. Pharm., 53 (1848), p. 1.

[3] Die Beschädigung der Vegetation durch Rauch, p. 131.

[4] Landw. Vers. Stat., 27 (1882), p. 375.

[5] Ztschr. Analyt. Chem., 12 (1873), p. 390.

[6] Jour. Landw., 47 (1899), p. 173.

[7] Ibid., 48 (1900), p. 223.

[8] Von Raumer, Ztschr. Analyt. Chem., 20 (1881), p. 376.

[9] Ztschr. Ver. Rübenz. Zuckerind., 1864, p. 188; 1867, p. 338.

[10] Ibid., 1891, p. 93.

[11] Ztschr. Analyt. Chem., 35 (1896), p. 699.

preferred to deduct one-fifth of the ash; and, because of this uncertainty, Alberti and Hempel advocate their method of combustion with a known amount of quartz sand, as mentioned above. Hehner[1] has also proposed the addition of sulphuric acid in the combustion of glycerine, using the factor 0.8.

It is apparent that ash prepared with the addition of sulphuric acid can not be employed for the later estimation of that acid, or for chlorin, and probably not for phosphoric acid.

CRUDE ASH—PURE ASH.

The substance secured by the described methods, whether or not with the addition of some material to assist the incineration, is not the true or pure ash, but is regarded as crude ash. This crude ash is of variable composition, but may contain any residue of carbon which escaped combustion, particles of "sand" from the soil which adhered to the substance, and more or less carbon dioxid, combined with the alkali bases when other acids, especially phosphoric, are not present in sufficient quantity. Carbonic acid is driven off from calcium carbonate by intense heating, and also from alkali carbonates when fused with silicic acid. To obtain an ash free from carbonic acid Stutzer and Isbert[2] moistened the ash with nitric acid and then glowed again. This is not always applicable, as the chlorin is also partly or wholly volatilized. As the carbonic acid in the ash is a variable and uncertain quantity, it is best to estimate the amount present and deduct it from the crude ash.

The pure ash may be stated to be the crude ash, less the carbon dioxid, unconsumed carbon, and sand.

DETERMINATION OF CARBON DIOXID.

The carbon dioxid is usually determined by collecting the liberated gas in a weighed potash bulb. The very complete and satisfactory apparatus described by Fresenius is familiar to all. As this is somewhat complicated the writer employs in his laboratory an apparatus similar in part to one described by Vogel,[3] and which has proved to be very efficient. Shuttleworth avoided transferring the ash from the crucible of his apparatus (p. 211) to a special carbonic acid apparatus by using the crucible itself as a generator, with the stirrer (*e*) and upper part of the lid (*a* and *c*) removed. For this purpose he made the joint between the lid and the crucible tight by one or two wide rubber bands, and placed a rubber stopper carrying the acid funnel and the evolution tube in the larger opening (*b*) of the cover. Tucker also

[1] Ztschr. Analyt. Chem., 28 (1889), p. 363; Jour. Soc. Chem. Ind., 8 (1889), No. 1.
[2] Ztschr. Physiol. Chem., 12 (1888), p. 78; Ztschr. Analyt. Chem., 29 (1890), p. 433.
[3] Die Versuchsstation der deutschen Landwirtschaftsgesellschaft. Berlin, 1896, p. 17.

made the determination directly in the crucible, but employed the wash bottle (*g*) of his apparatus (p. 212) in collecting the carbonic acid.

ESTIMATION OF SILICIC ACID.

After driving off the carbonic acid the contents of the generating flask are transferred to a porcelain dish, evaporated to dryness on a water bath with aqua regia, dried at 105 to 110°, as in analysis of silicates, moistened with concentrated hydrochloric acid, and after a half hour heated with warm water. The silicic acid and any unconsumed carbon are filtered out with a Gooch crucible,[1] and the filtrate made up to a definite volume (250 to 500 cc.). The contents of the crucible are dried at 120° and weighed for silicic acid and carbon. After incineration the usually very small amount of carbon is determined by difference.

When silicates not decomposed by hydrochloric acid are formed, the precipitate must be dried at 120° and collected on a filter previously dried at that temperature, and weighed for silicic acid and carbon, after which it should be incinerated, weighed, and the residue subtracted from the previous weight to determine the carbon. The residue from the above, containing silicates, is evaporated with sulphuric acid and hydrofluoric acid or ammonium fluorid to free the silicic acid, and then weighed as sulphate. The sulphuric acid must be determined in the latter and subtracted, in order to determine the bases of the silicates to be deducted from the weight of crude silicic acid, giving the pure silicic acid.

All this is a complicated operation and requires much time and care. It is important, therefore, to avoid the formation of difficultly decomposable silicates. This is accomplished by employing the lowest possible temperature for incineration, and by mixing sodium carbonate, lime, or baryta with the substance. In the writer's laboratory the formation of silicates is avoided by the use of the Shuttleworth or Tucker apparatus and by the addition of calcium acetate.

SEPARATION OF SAND AND SILICIC ACID.

The silicic acid which is obtained by the above-described methods is that which is present in the substance as amorphous silicic acid. Crystallized silicic acid and silicates may also be present in the substance examined, especially with roots, in the form of sand or earth adhering to them.

For the separation of this "sand" from the true silicic acid of the plant, various means have been suggested. Prominent among these is

[1] In the methods of analysis adopted by the Association of Official Agricultural Chemists, November, 1898, p. 77, there is described a hardened filter of Schleicher and Schüll. The silicic acid, sand, and carbon are washed from this into a platinum dish and before incinerating are boiled with a saturated solution of sodium carbonate, sodium hydroxid added, and the silicic acid and sand separated.

boiling the silicic-acid mixture with a solution of sodium carbonate or of sodium hydroxid, neither of which attack the sand but dissolve the amorphous silicic acid derived from the substance itself. To this end the silicic-acid residue after weighing is boiled with a concentrated solution of sodium carbonate, or, according to Fittbogen,[1] with a 5 to 6 per cent solution of sodium hydroxid, in a platinum dish with continuous stirring (to avoid bumping), filtered, washed, and the residue ("sand") weighed. The latter is subtracted from the crude ash in order to obtain the pure ash.

The results of this troublesome operation, however, are not always satisfactory. The difficulties of separating quartz and sand from amorphous silicic acid have been well illustrated in mineral analysis.[2] It is consequently preferable to free the materials to be incinerated from sand and earth as far as possible, in order that the determination and deduction of sand may be avoided.

ANALYSIS OF PURE ASH.

So much has been written upon the determination of the several ash elements that it will be impossible to review the entire subject here. Only brief mention can be made regarding the shortest means for estimating the principal constituents.

While the whole series of mineral elements which occur in plants may be present in the ash, in most cases only the more important ones are considered, and among these the phosphoric acid in particular gives rise to some analytical difficulties.

It is convenient to use 3 aliquots for the analysis, made up as described above, determining the iron and alumina, lime and magnesia in the first, the sulphuric acid in the second, and the potash and soda in the third; a separate solution for the phosphoric acid and chlorin being made up with nitric acid.

In the first aliquot the iron and alumina are precipitated with ammonia and acetic acid, the precipitate being mainly neutral iron phosphate, as aluminum phosphate occurs but rarely in important amounts. If the above is not satisfactory, the precipitate may be dissolved and the constituents determined separately—the phosphoric acid with molybdic acid, the iron by titration with potassium permanganate, and the aluminum by difference or by the method of Berthelot and André[3] of precipitating alumina as phosphate with sodium hyposulphite. The lime is determined in the filtrate from the iron phosphate precipitate by means of ammonium oxalate, and the magnesia in the

[1] Landw. Vers. Stat., 13 (1871), p. 114.

[2] Michaelis, Ber. Deut. Chem. Gesell., 28 (1895), Ref. p. 1020; 29 (1896), Ref. p. 562; Lunge, Ibid., 28 (1895), Ref. p. 1020; 29 (1896), Ref. p. 188.

[3] Ztschr. Analyt. Chem., 35 (1896), p. 630; Ann. Chim. et Phys., 7. ser., 5 (1895), p. 429.

filtrate from the latter with ammonia and sodium phosphate or ammonium phosphate.

In the second aliquot the sulphuric acid is precipitated with barium chlorid, the precipitate being boiled once with dilute hydrochloric acid. The third aliquot is treated with recrystallized barium hydrate to remove the ferric oxid, magnesia, and sulphuric and phosphoric acids, and then with ammonium carbonate to remove the barium and lime. The filtrate is neutralized with hydrochloric acid, evaporated to dryness, and the ammonia driven off, after which the residue is purified by taking up in water, filtering, and evaporating, and the combined weight of the potassium and sodium chlorids obtained. The potash in this residue is determined with platinic chlorid as usual, and the soda found by difference.

The phosphoric acid is precipitated from the nitric acid solution first with molybdic acid and then with magnesia mixture; and the chlorin is precipitated in another portion with silver nitrate.

To avoid contamination of the solutions it is advisable to employ only dishes of platinum or of Berlin or Meissen porcelain, and Jena glass beakers. The calculations are made by means of the atomic weights of Clarke or of the Berlin atomic weight commission. The results must of course be corrected for the chlorin in combination, deducting its equivalent of oxygen from the total.

DEFECTS OF THE DESCRIBED METHOD.

The above described method may possibly be regarded as open to criticism, as it does not take account of all the elements occurring in ash, and does not make an altogether sharp separation of phosphoric acid, lime, and magnesia. It possesses the advantage, however, of being applicable to analysis on a large scale, which can not be said of the theoretically exact methods, as they require too much time, and except in the hands of very expert analysts are liable to lead to error.

Among the limitations of the method it will be noticed that no notice is taken of manganese, although this element is frequently found in plant ash. Pichard[1] found it in considerable amount, especially in fungi, leaves, and grain. It may be estimated in the filtrate from the iron-phosphate precipitate with bromin, the manganese being precipitated as MnO_2. If no manganese is separated it is mixed with other precipitates.

The lime precipitate derived by the above method may contain some phosphoric acid and also some magnesia; and, on the other hand, the lime is not wholly insoluble in the acid solution. These errors may counterbalance each other, but some lime may be thrown down later with the magnesium phosphate.[2] In very exact analysis, either the

[1] Compt. Rend. Acad. Sci. Paris, 126 (1898), p. 550.

[2] Among others see Hornberger, Ztschr. Analyt. Chem., 18 (1879), p. 361; Richardson, Ztschr. Analyt. Chem., 23 (1884), p. 409; Amer. Chem. Jour., 3 (1881), p. 422.

phosphoric acid must be removed before the precipitation of the lime and magnesia, or the precipitates obtained as above must be purified by reprecipitation, the filtrates being added to the principal solutions of lime, magnesia, etc., respectively, and in this way absolute accuracy approximated. This operation, however, is so troublesome, time consuming, and questionable in the hands of any except very skilled analysts that where a number of ash analyses are to be made it becomes wholly impracticable. In most cases the above method or a similar one will suffice, giving results approximately accurate and at all events comparable with each other.

Among those who have sought to remove the difficulties due to phosphoric acid, König[1] attempted to separate it before the precipitation of the lime and magnesia by combining it either with stannic oxid, or with a ferric salt as iron phosphate. He gave the preference to the latter, which is carried out as follows: Sufficient ferric chlorid solution of known strength is added to the solution to unite with the phosphoric acid as $FePO_4$. The solution is made alkaline with soda or ammonia, then slightly acid with acetic acid, some ammonium acetate added, boiled and filtered. In the solution thus freed from phosphoric acid, lime and magnesia may be estimated without difficulty. Hornberger[2] and Ulbricht[3] have employed a similar method.

The above method is not the one which König[4] describes in his manual of agricultural analysis, but a simpler one similar to it. The methods of analysis of the Association of Official Agricultural Chemists adopted in 1898 (p. 78) prescribe the use of ferric chlorid.

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[1] Landw. Vers. Stat., 10 (1868), p. 396.

[2] Ibid., 29 (1883), p. 281.

[3] Ibid., 25 (1880), p. 401.

[4] Die Untersuchung landwirthschaftlich und gewerblich wichtiger Stoffe. Berlin: Parey, 1898, p. 189.

[Concluded in next number.]

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

Methods of chemical soil investigation, G. Berju (*Landw. Vers. Stat., 55 (1901), No. 1–2, pp. 19–31; abs. in Chem. Centbl., 1901, I, No. 14, p. 795*).—Treatment with hydrochloric acid is claimed to give no indication of the available plant food in soil. Dyer's method using 1 liter of 1 per cent citric acid for 100 gm. of soil is considered preferable to using ½ liter of 2 per cent acid for the same amount of soil, because absorption by the soil is less from the weaker solution than from the stronger. In experiments on the length of digestion required, it was found that shaking in a rotary apparatus making 48 revolutions per minute for 6 hours one day and 2 hours the following day was sufficient to extract the soluble potash and lime in every case and the phosphoric acid in most cases. In these experiments 750 cc. of 1 per cent citric acid at a temperature of 18 to 20° C. was used to 75 gm. of soil. Somewhat less was dissolved by 8 hours continuous shaking than by the above method. Longer shaking dissolved a little more phosphoric acid, but the slowly soluble phosphoric acid is not considered practically important. Samples of sandy and loam soils were shaken with 0.1 per cent solutions of potassium nitrate and ammonium chlorid, with and without the addition of 1 per cent citric acid solution. The absorptive power of the soils for potash and ammonia was only very slightly affected by the citric acid. The influence of the absorptive power of soils on the results of chemical analysis is to be further studied.

On the methods of chemical investigation of soils, B. Sjollema (*Chem. Ztg., 25 (1901), No. 29, pp. 311, 312*).—Experiments are reported in which samples of soil of different character were subjected to successive extractions with 1 per cent citric acid. The results show that ordinary methods, such as that of Dyer, do not remove all of the phosphoric acid soluble in 1 per cent citric acid, but that on subsequent treatment with this solvent further amounts of this constituent go into solution, the amounts so dissolved being quite large, but varying with the character of the soil.

On the determination of the potash content of soils, A. Rümpler (*Landw. Vers. Stat., 55 (1901), p. 149; abs. in Chem. Ztg., 25 (1901), No. 18, Repert., p. 62*).—A preliminary note on the determination of the potash extracted from soils by treatment with limewater or solutions of potassium chlorid. There seems to be a definite limit to the extraction of the potash by this method, beyond which further treatment with the solvent fails to remove any more of this constituent. The author believes that the potash removed by the proposed treatment is that occurring in zeolitic silicates and is especially available to plants. Vegetation experiments to further study this subject are to be undertaken.

Analysis of soils, J. A. Murray (*Analyst, 26 (1901), No. 301, pp. 92–96; abs. in Jour. Chem. Soc. [London], 80 (1901), No. 463, II, p. 350*).—A criticism of the method proposed by Hall and others (E. S. R., 12, p. 905). The principal suggestions offered are that (1) the constituents should be reported in ounces per cubic foot; (2) a determination should be made of organic carbon; (3) that undried soils yield a larger proportion of available phosphoric acid than dried; and (4) the stones in the soil should be tested for available plant food.

On a serious error in the method of Kubel-Tiemann for the determination of organic matter in drinking waters, DUYK (*Ann. Chim. Analyt., 6* (*1901*), *pp. 121–124; abs. in Chem. Centbl., 1901, I, No. 20, p. 1113*).—The author finds that sodium chlorid in acid solutions interferes to a marked extent with the oxidation of organic substances dissolved in water. It is therefore necessary before applying such methods to remove the chlorin. For this purpose the author uses silver oxid (Ag_2O).

Determination of nitric nitrogen in water by means of stannous chlorid, H. HENRIET (*Compt. Rend. Acad. Sci. Paris, 132* (*1901*), *No. 16, pp. 966–968*).—At the boiling temperature stannous chlorid in presence of hydrochloric acid converts nitric nitrogen into hydroxylamine hydrochlorid as follows: $3\ SnCl_2+KNO_3+8\ HCl=3\ SnCl_4+NH_2\ OH\ HCl+KCl+2\ H_2O$. This reaction may be used in determining nitrates by adding an excess of stannous chlorid of known strength and titrating the excess with iodin. The stannous chlorid used is prepared by dissolving 14 gm. pure tin in 1 liter of pure hydrochloric acid. The solution is kept in a flask from which air is excluded. The iodin solution is prepared by dissolving 8 or 9 gm. of iodin and 20 gm. of potassium iodid in 1 liter of distilled water. Its strength is determined by titration with sodium hyposulphite, or with a solution of potassium nitrate of known strength.

Apparatus for the determination of nitrogen in nitrates by the Schulze-Tiemann method (*Böhm. Ztschr. Zuckerind., 25* (*1900*), *pp. 356–358; abs. in Chem. Centbl., 1901, I, No. 22, p. 1216, fig. 1*).

On the determination of chlorin in natural waters, its accuracy and significance, E. G. SMITH (*Trans. Wisconsin Acad. Sci., Arts, and Letters, 13* (*1901*), *pt. 1, pp. 359–365*).—This is a brief discussion based upon the author's experience in examination of waters of the accuracy of three methods commonly used for determining chlorin, namely, the gravimetric method, and the volumetric methods of Mohrs and Volhard. Of these the author has found Mohrs' method most reliable, and the modifications of it which he has found necessary for the greatest accuracy are given in detail.

Detection of bicarbonates in waters, E. POZZI-ESCOT (*Ann. Chim. Analyt., 6* (*1901*), *pp. 135, 136; abs. in Chem. Centbl., 1901, I, No. 20, p. 1113*).—For this purpose the author adds to 250 cc. of the water a few drops of a solution of 0.5 gm. of pyrogallol in 5 to 6 cc. of water, to which 2 drops of officinal iron chlorid solution has been added. If carbonates or bicarbonates are present a violet or amethyst color appears. Ammonia interferes with the reaction.

Determination of sulphids, hydrosulphids, and thiosulphates coexisting in solution especially in sulphurous mineral waters, A. GAUTIER (*Compt. Rend. Acad. Sci. Paris, 132* (*1901*), *No. 9, pp. 518–523*).

Notes on recent work of the German Sugar Commission appointed for fixing normal standards, A. HERZFELD (*Ztschr. Ver. Deut. Zuckerind., 1900, pp. 1126–1128; abs. in Jour. Soc. Chem. Ind., 20* (*1901*), *No. 3, p. 268*).—The Brix tables in use at present are based on determinations made by Balling in 1839. The new tables, worked out by the German Sugar Commission, are somewhat higher than the old tables.

Volumetric estimation of invert sugar, F. STOLLE (*Ztschr. Ver. Deut. Zuckerind., 1901, No. 541, II, pp. 111–117; abs. in Jour. Chem. Soc.* [*London*], *80* (*1901*), *No. 462, II, pp. 286, 287*).—By the proposed method a portion of the solution of the invert sugar is added to a known volume of Fehling's solution, the excess of the latter being estimated by titrating with an ammoniacal solution of potassium cyanid. In titrating the color is destroyed by the formation of potassium cuprous cyanid.

The determination of mannose in sugar-cane products, H. PELLET (*Bul. Assoc. Chim. Sucr. et Distill., 18* (*1901*), *No. 10, pp. 758–769*).—Methods of analysis.

A multiple fat extractor, C. L. Penny (*Delaware Sta. Rpt. 1900, pp. 85–93, figs. 2*).—The author describes a device and method the chief object of which is "so to expedite the determination of fat in milk and its products as to make accurate gravimetric determinations economically possible in competition with the speedy volumetric methods now in use. . . . The apparatus devised to this end differs in its principle of action little, if at all, from the well-known Soxhlet extractor. Its chief peculiarity is such an arrangement of parts as admits any number of samples at the same time and under a single operation to the action of the same extracting liquid. This is attained by the use of a single common chamber for all of the samples, in which they are held in shallow capsules placed parallel and close together." Tin-foil capsules containing an absorbent such as sand or asbestus are used. The solvent is that portion of gasoline distilled off at 100° C. The fat is determined by difference. It was found that extraction was approximately complete in 4 and practically complete in 12 hours. The time required for drying the sample at steam heat when a determination of total solids was to be made was from 12 to 14 hours, and for drying the extracted sample from 2 to 4 hours. The method is considered as accurate as the ether extraction method.

A comparison of the Reichert-Meissl numbers obtained in the analysis of butter, M. Siegfeld (*Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), No. 10, pp. 433–446*).—A compilation of the results obtained by different chemists under different conditions from 1879 up to the present time.

Halpen's reaction for cotton-seed oil and the behavior of some American lards toward the same, P. Soltsien (*Ztschr. Oeffentl. Chem., 7 (1901), pp. 25–27; abs. in Jour. Chem. Soc. [London], 80 (1901), No. 462, II, p. 292*).—The author advocates the use of amyl alcohol in the Halpen test, and heats the oil to be tested with 20 per cent of a 1 per cent solution of sulphur in carbon disulphid. The light is not excluded during the heating in boiling water. Several samples of genuine American lard which responded to this test are supposed to be derived from pigs fed on cotton-seed meal.

The optical method of examining fats and waxes, G. Marpmann (*Chem. Rev. Fett u. Harzind., 8 (1901), pp. 65–68; abs. in Chem. Centbl., 1901, I, No. 18, pp. 1015–1017*).—A description is given of the methods and results of determining fats and waxes singly and in combination. A table of fats and waxes is included showing the refraction number obtained with the Zeiss-Wollny apparatus.

The detection of archil in wine, R. Truchon (*Ann. Chim. Analyt., 5 (1900), pp. 444, 445; abs. in Analyst, 26 (1901), No. 302, p. 129*).—Fifty cc. of the wine is acidified with 1 cc. of 10 per cent sulphuric acid and boiled 5 minutes with a little wool which is then washed and immersed in ammonia water. With uncolored wines the wool will assume a green tint; in the presence of archil it turns violet, the intensity indicating the quantity of coloring matter.

The valuation of commercial solutions of lactic acid, F. Jean (*Ann. Chim. Analyt., 5 (1900), pp. 285, 286; abs. in Analyst, 26 (1901), No. 302, p. 132*).

Notes on the proximate analysis of cloves, A. McGill (*Analyst, 26 (1901), No. 302, pp. 123–126*).

The chemical action of Bacillus coli communis and similar organisms on carbohydrates and allied compounds, A. Harden (*Jour. Chem. Soc. [London], 79 (1901), No. 462, pp. 610–628*).—The author found in the fermentation of glucose by *Bacillus coli communis*, that the lactic acid produced while sometimes less, never exceeded one-half of the amount of sugar fermented. Alcohol and acetic acid were produced in about equal amounts. The products of *Bacillus typhosus* were similar except that formic acid was produced instead of a mixture of carbon dioxid and hydrogen. Other bacteria were found to decompose glucose with a different result.

Micro-chemical analysis, H. BEHRENS (*Anleitung zur mikrochemischen analyse. Hamburg: Leopold Voss, 1899, 2. ed. enl., pp. XI + 242, figs. 96*).

Proceedings of the seventeenth annual convention of the Association of Official Agricultural Chemists (*U. S. Dept. Agr., Division of Chemistry Bul. 62, pp. 153*).—This is an account, edited by the secretary, H. W. Wiley, of the meeting held in Washington, D. C., November 16 to 19, 1900, and which has been previously reported (E. S. R., 12, pp. 503–509). The papers read before the meeting and the discussions thereon are reported in full.

BOTANY.

Grasses—I, L. H. PAMMEL, J. B. WEEMS, and F. LAMSON-SCRIBNER (*Iowa Sta. Bul. 54, pp. 71–344, figs. 137*).—Original observations and compiled notes are given relating to the general description of grasses; the growth and minute structure of their roots, stems, leaves, and flowers; a discussion of fertilization and hybrids; and the various phenomena attending germination. Chapters are devoted to cereals in which the more important ones are described, and their production, climatology, and uses as medicines are indicated. Various sugar-producing grasses are enumerated and other economic uses described. The poisonous and injurious effects of certain grasses are mentioned, and notes given on the fungus diseases to which grasses in general are subject.

Our native pasture plants, F. LAMSON-SCRIBNER (*U. S. Dept. Agr. Yearbook 1900, pp. 581–598, pls. 4, figs. 11*).—Descriptions are given of many of our more important native pasture grasses, the author having grouped them under the heads of grasses of wooded regions, mountain meadows, and deer parks, treeless regions, and pasture plants of alkali soils.

Some Arizona grasses, E. D. MERRILL (*U. S. Dept. Agr., Division of Agrostology Circ. 32, pp. 10*).—Critical notes and descriptions of new species and varieties of grasses collected by D. Griffiths and R. H. Forbes, of the Arizona Station, are given.

Aristida purpurea and its allies, E. D. MERRILL (*U. S. Dept. Agr., Division of Agrostology Circ. 34, pp. 8*).—Critical notes and technical descriptions are given of *Aristida purpurea* and the allied species which occur in North America.

Oil-yielding plants cultivated in Egypt, G. BONAPARTE (*Jour. Khediv. Agr. Soc. and School Agr., 3 (1901), No. 1, pp. 14–19*).—The plants cultivated in Egypt for the production of oil are said to be flax, sesame, cotton, safflower, and lettuce. The methods of extraction and character and uses of the oils, as well as the use of the by-products, are described.

The geology and botany of the Upper Peninsula Experiment Station, C. F. WHEELER (*Michigan Sta. Bul. 186, pp. 17–27*).—Notes are given upon the geology of the substation located at Chatham in the northern peninsula of Michigan, and lists and critical notes are given upon the trees, shrubs, and herbaceous plants growing at the station grounds. A list is also given of a number of fungi which were observed causing diseases of cultivated plants at the substation.

Descriptions and illustrations of new species of Micromycetes, F. TASSI (*Bul. Lab. Orto Bot. R. Univ. Siena, 3 (1900), No. 3–4, pp. 117–132, pls. 4*).—Descriptions are given of about 50 species of Micromycetes which have not hitherto been described. Many of them occur on dead or decaying plants, although a few were found to be parasitic on the leaves of living plants. Among the latter class may be mentioned *Phyllosticta yulan*, which is found parasitic on the leaves of *Magnolia yulan; P. edwardsiæ*, on the *Edwardsia microphylla; P. salisburiæ*, parasitic on the leaves of the common *Gingko biloba; Phoma bulbicola*, on bulbs of Freesia; *Ascochyta catalpæ*, on the leaves of *Catalpa speciosa; Bartalinia nervisequa*, on the leaves of *Magnolia grandiflora; Glœosporium coffeicolum*, on the leaves of *Coffea arabica;* and *Pestalozzina celestri*, parasitic on the leaves of *Celastrus buxifolia*.

Edible mushrooms of North Carolina, C. W. Hyams (*North Carolina Sta. Bul. 177, pp. 27–58*).—Notes are given on the food value of mushrooms, directions for their collection, and descriptions of a number of the more important mushrooms occuring in the State.

The sexual reproduction of fungi, P. A. Dangeard (*Botaniste, 7. ser., 1900, No. 3–4, pp. 89–130*).—A critical review is given of some of the recent literature relating to the reproduction of fungi.

On the evaporation of water by plants, F. Yanovchik (*Selsk. Khoz. i Lyesor., 197 (1900), June, pp. 487–508*).—Three series of experiments are described which were carried out at the Kherson Experiment Field in 1898 and 1899. The amount of water evaporated was determined by the aid of a special apparatus which is fully described. In the series of experiments made in 1898 with spring wheat, the humidity of the soil was kept in 3 vessels at 50 per cent, in 1 at 40 per cent, and in 2 at 30 per cent of saturation, which corresponds to 16, 12.8 and 9.6 per cent of water, respectively, in the soil. The evaporation per gram of dry matter from the vessels with 50 per cent humidity was 512, 532, and 555 gm., respectively; from the vessel with 40 per cent humidity, 484 gm.; and from the 2 vessels with 30 per cent humidity, 591 and 578 gm., respectively. In 1899, 2 series of experiments were carried out. In the first series the soil contained 18.7 per cent water and was kept in 6 vessels at this optimum of humidity and in 2 at 14 per cent. In 2 vessels barley was grown, in 2 oats, and in 4 spring wheat. In 2 of the vessels with wheat, the soil was maintained at 14 per cent of humidity. The evaporation per gram of dry matter was as follows: From barley, 471.8 and 470.6 gm.; from oats, 666 and 615.3 gm.; from wheat (with optimum humidity), 542.9 and 518.2 gm.; and from wheat (with 14 per cent humidity), 452.2 and 466.4 gm. of water. In the second half of the summer another series of experiments was carried out with barley, but not so much with a view of establishing the normal amounts of water evaporated (the season being too much advanced), as for a comparison of the amounts of water evaporated by different varieties of barley. The soil was kept at the optimum humidity. There evaporation per gram of dry matter from two-rowed barley, 456.7 and 404.7 gm.; square head barley, 378.9 and 400.4 gm.; Guymalaye barley, 329.6 and 335 gm.; and Trifurcate barley, 314.5 gm. of water.—P. FIREMAN.

On the presence of invertin or sucrose in grapes, V. Martinand (*Compt. Rend. Acad. Sci. Paris, 131 (1900), No. 20, pp. 808–810*).—The author states that he has found invertin present in the juice of the grapes of all varieties that he has been able to obtain. A method of separation is described, as well as some of the properties of the substance. Invertin acts upon sucrose best at a temperature of 54 to 56° C. The quantity of acetic acid, which limits its maximum action, lies between 5 and 13 parts per thousand. It does not pass through a porcelain filter, and is partially arrested by the filter paper ordinarily employed in laboratories. Its properties in general are very similar to those of the diastase secreted by *Aspergillus niger*. The quantity of sucrose found in the grapes is comparatively large, as shown by the amount of sugar which it is able to invert. It is also found present in the leaves of the grape, 2.5 gm. of fresh leaves furnishing a unit of sucrose. Its action in fermenting must is stated, and it is further said that it is never found in wine that has been well oxidized, nor in wines which are attacked by bacterial diseases.

Concerning a diastase which inverts saccharose in white wines, B. Fallot and L. Michon (*Rev. Vit., 1900, Nos. 347, pp. 141–144; 348, pp. 179–181; 349, pp. 197–201*).

On the exosmosis of diastases of plants, J. Laurent (*Compt. Rend. Acad. Sci. Paris, 131 (1900), No. 21, pp. 848–851*).—From cultures with sterile media, the author has shown that starch may be utilized by young maize plantlets, their roots not only absorbing a small quantity of soluble starch which is formed during the sterilization of the liquid at 120° C., but starch paste was liquefied and served as a nutrient to the plant. Similar experiments were conducted with wheat, peas, and buckwheat, together with another series with maize, in which the radicle after attaining a length of from 1 to 5 cm. was immersed in starch paste. It was found upon germination that a part of the amylase formed in the seed was transferred from the plant by exosmosis, the seeds rejecting it to their advantage. At the same time the starch material was acted upon by the ferment and converted into a form capable of being utilized by the young plants. This phenomenon occurs only during the process of germination, older plants being unable to utilize starch through the exosmosis of amylase.

Experiments on the question of the formation of albuminoids by plants in darkness, M. IWANOFF (*Landw. Vers. Stat., 55 (1901), No. 1–2, pp. 78–94*).—A brief review is given of some of the literature relating to the formation of proteids by plants in darkness, and results of the author's experiments with kohl-rabi, carrots, and potatoes. These roots and tubers were divided, and analyses made of a portion, the other part being planted in pots and kept in darkness. After an interval of 2 or 3 months, analyses were made of the portions planted and it was found that the albuminoids had increased in an appreciable amount.

On the influence of various inoculating materials on tubercle formation and yield of leguminous plants, F. NOBBE and L. HILTNER (*Landw. Vers. Stat., 55 (1901), No. 1–2, pp. 141–148, fig. 1*).—A report is given of experiments in which various dilutions and concentrations of inoculation material were tested to ascertain the effect of such material upon the development of tubercles upon the roots of leguminous plants, as well as upon the total product. The experiments covered a number of years. The results obtained showed that there was a comparatively slight difference in the dry matter and nitrogen content of plants which had received the different strengths of inoculating material, the weakest and strongest solutions giving almost identical results. In the experiments the authors employed a normal strength of Nitragin, and it was used in strengths varying from 0.01 normal to 100 times the normal bacterial content.

Physiological and anatomical investigations of the cuscutas, M. MIRANDE (*Extr. Bul. Sci. France et Belg., 25 (1900), pp. 284, pls. 16*).

A guide to botanical investigations and vegetable physiological experiments, F. SCHLEICHERT (*Anleitung zu botanischen Beobachtungen und pflanzenphysiologischen Experimenten. Langensalza: Hermann Beyer & Sons, 1901, pp. VIII + 182, figs. 64*).

List of publications of the Division of Botany, F. V. COVILLE (*U. S. Dept. Agr., Division of Botany Circ. 30, pp. 10*).—A classified list of the publications of the Division of Botany from its establishment in 1869 to date is given.

ZOOLOGY.

Birds useful to agriculture, E. H. FORBUSH (*Massachusetts State Bd. Agr. Rpt. 1900, pp. 36–61, pls. 4*).—The author discusses the various ways in which birds are beneficial to the farmer. The subjects considered include the use of guano and special notes on the feeding habits of hawks, owls, cuckoos, woodpeckers, goatsuckers, flycatchers, crows, blackbirds, sparrows, swallows, wrens, creepers, and warblers.

Birds as protectors of woodlands, E. H. FORBUSH (*Massachusetts State Bd. Agr. Rpt. 1900, pp. 300–321, figs. 3*).—A discussion is given of the feeding habits of birds with special reference to their beneficial action in destroying caterpillars and other insects which are injurious to trees. Lists are given of the birds which feed on the gypsy moth, brown tail moth, forest tent caterpillar, apple-tree tent caterpillar, cankerworms, white-marked tussock moth, May beetles, and plant lice. Observations are given on the birds which are especially useful in the destruction of the eggs of injurious insects on trees during winter. Brief notes are given on the injuries to trees which may be done by certain birds in eating off the buds or in boring into the bark of sound trees.

How birds affect the orchard, F. E. L. Beal (*U. S. Dept. Agr. Yearbook 1900, pp. 291–304, figs. 5*).—A brief discussion of the economic relationship of woodpeckers, titmice, nuthatches, cuckoos, warblers, birds of prey, shrikes, catbirds, etc., with especial reference to their harmful and beneficial actions in cultivated orchards.

The food of nestling birds, S. D. Judd (*U. S. Dept. Agr. Yearbook 1900, pp. 411–436, pls. 5, figs. 9*).—The author investigated the food materials of nestling birds as compared with those of adults of the same species. A large number of species were studied, and it is concluded that the young of all birds excepting doves and pigeons are fed at first almost exclusively on an animal diet and that later the diet is gradually changed so as to include vegetable materials. The parent birds frequently carry insect food to the young while their own diet is chiefly vegetable.

The relationship of crows to agriculture, J. Jablonowski (*Kisérlet. Közlem., 4 (1901), No. 2, pp. 143–182, figs. 3*).—An elaborate discussion is given of the feeding habits and economic relation of *Corvus frugilegus* and *C. cornix*.

Protection of birds and game. Directory of state officials and organizations for 1901, T. S. Palmer (*U. S. Dept. Agr., Division of Biological Survey Circ. 33, pp. 10*).—The present circular contains a corrected directory of officials, and organizations concerned with the protection of birds and game in the United States and Canada.

Directions for the destruction of prairie dogs, C. H. Merriam (*U. S. Dept. Agr., Division of Biological Survey Circ. 32, pp. 2*).—The use of poisoned grain as a bait and of carbon bisulphid in burrows is recommended.

Rabbit destruction (*Jour. Agr. and Ind. South Australia, 4 (1901), No. 8, pp. 639, 640*).—Formulas are given for preparing poisoned water containing arsenic, strychnin, or cyanid of potash, and for making poisoned baits, such as phosphorized pollard, phosphorized wheat, and baits poisoned with arsenic and strychnin. For destroying the rabbits in burrows, the use of bisulphid of carbon is recommended and also the use of pieces of absorbent cloth saturated with kerosene and sprinkled with sulphur. These rags are to be lighted and pushed well into the burrow.

METEOROLOGY.

Amplification of weather forecasts, A. J. Henry (*U. S. Dept. Agr. Yearbook 1900, pp. 107–114, pls. 3, fig. 1*).—This paper explains the Government system of weather forecasting with a view to encouraging "the making of local predictions by persons whose working hours are spent for the most part in the open air." The generalizations given apply to all parts of the country east of the Rocky Mountains, but it is believed that they will be found most useful in the middle and upper Mississippi and Ohio valleys, the Lake region, and the Middle States.

Hot waves: Conditions which produce them, and their effect on agriculture, A. T. Burrows (*U. S. Dept. Agr. Yearbook 1900, pp. 325–336, pls. 3*).—This article discusses the extent and character of injury caused by hot waves, periods of occurrence, sections affected, and meteorological conditions producing hot waves. "With the present fragmentary knowledge of the basic cause of meteorological changes, we are confined to the statement that during a hot wave the eastward circulation of the atmosphere, both upper and lower, is for the time being almost totally suspended, and that radiation is at the same time at a minimum. A careful study of the weather charts covering such periods leads to the belief that it is quite practicable to forecast high temperatures for a period of from 4 to 5 days, but predictions for a longer time are, for the present at least, the merest guesswork and not entitled to credence."

Meteorological observations, W. T. ELLIS, R. ROBERTSON, S. A. BEDFORD, A. MACKAY, and T. A. SHARPE (*Canada Expt. Farms Rpts. 1900, pp. 43, 44, 280, 281, 389, 434, 475*).—This includes monthly summaries of observations during 1900 on temperature and precipitation, total snowfall and rainfall during 11 years, 1890–1900, and a monthly record of sunshine during 1898, 1899, and 1900, at the Central Experimental Farm at Ottawa; notes on the weather and a monthly summary of maximum and minimum temperatures during the year ended November 30, 1900, at Nappan, Nova Scotia; a monthly record of maximum and minimum temperatures, rainfall, snowfall, and sunshine during the year ended November 30, 1900, at Brandon, Manitoba; similar observations for the same period at experimental farm, Indian Head, Northwest Territories; and a record of highest and lowest temperatures, rainfall, snowfall, and sunshine during the year ended November 30, 1900, and during 4 preceding years, 1896–1899, at Agassiz, British Columbia.

Report of the meteorologist, W. H. BISHOP (*Delaware Sta. Rpt. 1900, pp. 239–249*).—Monthly summaries of observations at 6 different places in Delaware on temperature, pressure, precipitation, relative humidity, and prevailing winds during the year ended June 30, 1900, and a summary of observations on temperature and precipitation during the calendar year 1899 are given.

The summary for 1899 is as follows:

Annual summary of meteorological observations in Delaware, 1899.

Locality.	Temperature.			Total rainfall.	Number of days on which 0.01 in. or more of rain fell.
	Highest.	Lowest.	Mean.		
	Deg. F.	*Deg. F.*	*Deg. F.*	*Inches.*	
Newark	95 (June and July)	−11.5 (Feb.)	51.1	38.33	89
Middletown	99 (June)	−11 (Feb.)	52.7	40.15	75
Dover	95 (June)	−14 (Feb.)	53.3	40.80	77
Milford	97 (June)	−12 (Feb.)	55.7	34.62	79
Seaford	99 (June)	−11 (Feb.)	54.5	43.77	81
Millsboro	100 (June)	−10 (Feb.)	54	43.86	88

Meteorological observations (*Maine Sta. Bul. 69, pp. 196, 197*).—This is a monthly summary of observations at Orono during 1900 on atmospheric pressure, temperature, precipitation, cloudiness, and wind movement. The mean temperature for the year was 43.46° F. (mean for 32 years 42.54°), mean pressure 29.79 in., precipitation 53.80 in. (mean for 32 years 45.33), and number of cloudy days 153.

Annual report of the central station for meteorology and terrestrial magnetism, Vienna (*Jahrb. K. K. Central-Anst. Met. u. Erdmagnet., Vienna, 1900, pp. 192*).—This is mainly a collection of tables giving (1) daily observations on atmospheric pressure, temperature, moisture, direction, and force of the wind, and precipitation at 20 stations in Austria during 1899; (2) hourly and daily observations on pressure, temperature, wind, rain, sunshine, and soil temperatures at Vienna and at a few of the other stations of the first class during 1899; and (3) observations on temperature fluctuations in Lower Austria in the winter of 1898–99.

Agricultural meteorology (*Météorologie agricole. Paris: Paul Dupont, 1900, pp. 51, figs. 4*).—This pamphlet, prepared for use at the Exposition at Paris in 1900, gives a brief history of the Russian weather service and an account of the organization of special service for agricultural meteorology in 1897; and a descriptive list of the apparatus, reports, charts, etc., illustrating methods and results, exhibited at the exposition. There is also included an account of work on forest meteorology, and of the charts exhibited at the exposition showing results of such observations.

Meteorological observations in 1899, R. GUERIN (*Observaciones meteorológicas correspondientes al año de 1899; observaciones meteorológicas practicadas en varios lugares de la República. Guatemala: Tipografía Nacional, 1900, pp. 57*).—Daily and monthly summaries are given of observations on temperature, pressure, humidity, rainfall, etc., at the central laboratory at Guatemala and by cooperating observers in different parts of the republic.

Formation of hail and surfusion, Rosenstiehl (*Grêle, 2 (1901), No. 6, pp. 3–8*).—A discussion of the theories of the formation of hail.

Cannonading against hail in Belgium, J. Vandervaeren (*Rev. Gén. Agron. [Louvain], 10 (1901), Nos. 4, pp. 145–163, figs. 8; 5, pp. 201–216, pl. 1*).—The extent and results of this method of protection against hail in Belgium are reported, the conclusion being that it has been decidedly profitable in protecting glass houses and crops.

Protection against hail, J. Roberto (*Grêle, 2 (1901), Nos. 6, pp. 9–15; 7, pp. 11–16, figs. 2; 8, pp. 6–10*).

An easily constructed barometer, G. W. Russell (*Amer. Chem. Jour., 25 (1901), No. 6, pp. 508–510, fig. 1*).

WATER—SOILS.

Development and distribution of nitrates and other soluble salts in cultivated soils, F. H. King and A. R. Whitson (*Wisconsin Sta. Bul. 85, pp. 48, figs. 11*).—This is in large part a reprint, with more detailed data, of an account of investigations already noted from another publication of the station (E. S. R., 13, p. 24), but contains also accounts not previously reported of investigations on the limit of nitric nitrogen in field soil at which the leaves of corn and oats turn yellow, difference between the amounts of nitric nitrogen under growing crops and in cultivated fallow ground at the same time, distribution of nitrates and other soluble salts in soil under growing corn as it comes into full tassel, the strength of soil solutions under field crops, results of Warington's nitric nitrogen studies at Rothamsted, method of determining soluble salts and nitric nitrogen in field soils, sensitiveness of the methods used in the study of nitric nitrogen and soluble salts, and possible error in results due to the methods.

The investigations reported in this bulletin were made on 9 plats of soil aggregating 10 acres, and covered the first, second, third, and fourth feet of soil separately in each case. The objects were to study the variations in the amount of nitric nitrogen and soluble salts in the soil under different conditions of cropping and culture, to determine the amounts of nitric nitrogen in the soil required for the healthy growth of crops, to trace the relations, if any, between the amount of nitric nitrogen and total soluble salts in the soil water and that of the deeper ground water wells, and to devise an accurate, rapid, and sensitive method for the determination of nitric nitrogen in soils. The conclusions drawn from the work are as follows:

"(1) The nitrates and total soluble salts in the surface foot start in the spring comparatively small in amount, then increase somewhat rapidly until June 1 on clover and oat ground, and until July 1 on corn and potato ground; from these dates they fall more or less rapidly until August 1, when crops are growing most vigorously. After this date they remain nearly constant with a general tendency to rise slightly until September. In the third and fourth feet the seasonal changes are comparatively small and show but little progression, and they are not marked in the second foot.

"(2) The amounts of nitrates and of soluble salts in the soil under the clover and oat crops were much smaller than in the soil under corn and potato crops through the entire season, the greatest differences occurring during the month of June.

"(3) There has been no strong concordance between the yields of dry matter per acre and the amounts of nitrates found in the soils during the season, but where the yields have been relatively quite small, there too has been found a marked deficiency of both nitrates and total soluble salts. In the case of the 3 corn crops the largest yields of dry matter are associated with the largest total soluble salts.

"(4) The relation between the amount of nitrates in a soil and the total soluble salts varies between wide limits, when the salts are measured by the electrical method. It occasionally happens that there may be as much or even more nitrates than the total salts indicated. This may be due to the destruction of bicarbonates by the nitric acid when it is forming.

"(5) The amount of nitrates and soluble salts under growing crops and in fallow ground at the same time is very different. Our observations show a relation for nitrates of 10.88 lbs. in the surface foot per acre as a mean, to 473.65 lbs. for immediately adjacent fallow ground at the same time.

"(6) It was found that stirring the soil once per week, as compared with the stirring of it once in two weeks, left the soil after 91 days with 98.16 as compared with 53.01 lbs. of nitric nitrogen per million of dry soil. In the second series of experiments, which covered 258 days, the soil stirred once per week had acquired a mean of 225.41 parts, and that once in two weeks 158.79 parts per million of dry soil, showing the largest gains with the more frequent cultivation.

"(7) It was found that stirring the soil to depths of 1 in., 2 in., 3 in., and 4 in. during an interval of 258 days resulted in an increasing amount of nitric nitrogen until the 3 in. depth was passed, but that cultivation 4 in. deep gave a smaller nitrification than the 3 in. depth did.

"(8) In the plant house cylinders nitrification appears to have taken place to a depth of 3 ft., but was most rapid in the surface foot.

"(9) There was 22 per cent more nitric nitrogen developed in soil upon which clover had grown than from that after corn, and 13 per cent more than from that after oats, during the same time, under like conditions.

"(10) Virgin soil which had grown corn continuously the same number of years that like soil had grown clover contained, at the beginning of the cultivation experiment, nearly three times as much nitric nitrogen as that upon which the clover had grown, and it closed the cultivation period with 17 per cent more.

"(11) Virgin soil growing oats began the cultivation experiment, after the same number of years of cropping as the soil bearing clover, with 2.6 times as much nitric nitrogen, and closed the 91 days with 13.8 per cent more.

"(12) Clover and alfalfa appear to hold the nitric nitrogen in the soil down to a lower limit than corn, oats, and potatoes do, but when the crop is removed from the ground nitrification appears to go on faster in the clover and alfalfa soil.

"(13) The amount of nitric nitrogen left in the surface foot of soil before crops begin to turn yellow for lack of available nitrogen becomes very small, the amount found being 0.213 parts per million where oats were yet green, and 0.025 parts per million where they were turning yellow. In corn it was found as low as 0.95 parts where corn was green, and 0.10 parts per million where it was strongly yellow.

"(14) The amounts of nitric nitrogen and of soluble salts were found greatest between the rows of corn, as they were coming into tassel, and least, directly beneath hills, except in the surface 6 in., and in the fourth foot where the relations were slightly reversed.

"(15) The amounts of nitric nitrogen and of total soluble salts are less in the deeper ground water of wells of this vicinity than in the soil moisture of the fourth foot, the nitric nitrogen being only about one-third of the amount.

"(16) Observations indicate that when the textural equilibrium of soils is destroyed in the presence of salts in solution the reflocculation and regranulation of the soil may take out of solution a portion of the salts, leaving a smaller percentage present after establishing the new equilibrium."

The soil solution for the determination of nitric nitrogen was prepared by kneading for 2 or 3 minutes in a mortar 50 gm. of the soil in a close muslin sack with 250 cc. of a 0.1 per cent solution of formaldehyde containing 5.36 cc. of a saturated solution of potash alum. The solution was then wrung from the sack and allowed to settle. Fifty cubic centimeters of the clear solution was evaporated to dryness on a water bath, 12 to 20 drops of disulphonic acid were added, and after standing at least 10 minutes with thorough stirring 20 cc. of distilled water and enough ammonia to make the solution alkaline were added. The nitric nitrogen was determined by the colorimetric method, using standard solutions of potassium nitrate. Total soluble salts were determined by electrical resistance, according to Whitney's method. A table is given showing the amount of soluble salts for different readings of the instrument calculated from a solution curve determined for these investigations. Duplicate determinations of nitric nitrogen by the method described showed quite satisfactory agreement, but it was found necessary to protect the solutions from denitrification by the use of formalin and to make the determinations as promptly as possible. It was found "that solutions to which formalin had been added lost none of their nitrates in 4 days, while duplicate solutions to which no formalin had been added lost from 12.2 to 71.6 per cent of their nitrates in that time. . . . This protection of the formalin against denitrification is not permanent and in some cases samples rich in nitrates have lost the whole on standing 5 weeks. In other cases we have observed notable losses on standing 2 to 3 days, this being greater than 50 per cent as a mean of 5 cases."

As stated above, the electrical method for total soluble salts seemed to be subject to an error due to the absorptive power of soils for soluble salts. In 2 series of experiments in which soil was made into a paste (1) with distilled water containing 100 parts per million of potassium nitrate, and (2) with drain water containing 195 parts of soluble salts per million, the results were as follows:

Amounts of soluble salts actually present and found by electrical method.

	Amount in soil.	Amount added.	Total.	Amount found.	Amount absorbed.
Series 1	44.172	17.2	61.172	46.10	15.072
Series 2	44.172	38.82	82.992	69.72	13.272

"These results indicate that the making of the soil paste with dilute soil solutions resulted in fixing some of those salts in an insoluble form. Another set of observations in clearing turbid solutions gave similar results both with nitrates and with other salts, which makes it appear that breaking down the soil texture will throw out of solution soluble salts already contained in them."

Nitrification in northwest soils, F. T. Shutt (*Canada Expt. Farms Rpts. 1900, pp. 159–161*).—The progress of nitrification was studied in the soils used in the observations on soil moisture referred to on page 233. "The method adopted was to weigh out 100 gm. of the fresh soil and add thereto 1,000 cc. of ammonia-free distilled water and shake the mixture well for 1 hour. It was then allowed to settle for 1 hour and the free ammonia in an aliquot part at once determined. A further quantity was at the same time set aside in contact with a zinc-copper couple (by means of which nitrates are reduced to ammonia) and at the expiration of 24 hours distilled. From the free ammonia in the distillate the amount previously found deducted and the remainder calculated to nitrogen, and recorded as nitrogen in nitrates in one million parts of the water-free soil." The results are set forth in the subjoined table:

Nitrates and nitrites in soils at different dates.

[Parts per million of water-free soil.]

Date.	Brandon soil.		Date.	Indian Head soil.	
	In fallow, 1900. In crop, 1899.	In crop, 1900. In fallow, 1899.		In fallow, 1900. In crop, 1899.	In crop, 1900. In fallow, 1899.
1900.			1900.		
May 11	10.62	11.45	May 8	3.37	16.22
June 11	15.21	28.20	June 8	6.93	25.70
July 11	10.99	7.65	July 8	22.30	20.00
Aug. 11	17.94	8.42	Aug. 8	22.70	17.20
Sept. 11	10.67	5.51	Sept. 8	16.71	7.20
Oct. 11	4.55	7.91	Oct. 8	12.20	7.32
Nov. 11	2.53	6.40	Nov. 8	3.99	3.97

"It is to be confessed that the present investigation gives support to the view that the nitrates are largely lost to the surface soil during the late autumn months, but whether this occurs in normal seasons to the extent here indicated is very doubtful."

The origin of nitrates in caverns earth, W. H. Hess (*Jour. Geol., 8 (1900), pp. 129–134; abs. in Tech. Quart., 14 (1901), No. 1, Rev. Chem., p. 45*).—Analyses and other data are cited to show that "the nitrates are not derived from the excrement of bats, as popularly supposed, but have their origin in the oxidation or nitrification of organic matter in the surface soil through the agency of bacteria, and the subsequent leaching of the nitrates so formed downward into caverns, where they slowly accumulate with other salts as the water escapes by evaporation."

Nitrates in cave earths, H. W. Nichols (*Jour. Geol., 9 (1901), No. 3, pp. 236–243*).—An argument to disprove Hess's hypothesis above referred to.

Soil solutions: Their nature and functions, and the classification of alkali lands, F. K. Cameron (*U. S. Dept. Agr., Division of Soils Bul. 17, pp. 39*).—This bulletin[1] discusses the nature and function of soil solutions, including the mutual effect of electrolytes, hydrolysis, rôle of iron, calcium, carbon dioxid, and organic matter in the soil, some possible functions of hydrous silicates, acidity of soils, supposed poisonous action of heavy metals, soil analyses, and absorption by soils; the classification of alkali lands, including the formation of alkali, methods of analysis, limitations of the classification, and descriptions of Pecos, Fresno, Salt Lake, Billings, and modified types of alkali; and occasional occurrence of alkali in humid regions—in Maryland, Florida, and various other localities.

As regards the nature and functions of soil solutions, the following general conclusions are drawn:

"(1) The mineral, and to a large extent the organic, components of the soil are electrolytes, and soil solutions are mainly solutions of electrolytes.

"(2) The hypotheses of electrolytic dissociation and hydrolysis in aqueous solution give rational explanations for many phenomena hitherto regarded as inexplicable or exceedingly obscure.

"(3) The rational procedure in the chemical investigation of the soil, from the point of view of its relation to crop culture, is to study the soil solution and in what manner it is modified by contact with the solid and gaseous components of the soil."

The classification of alkali as "black" or "white," depending upon the presence or absence of sodium carbonate, is condemned as "inadequate in view of our present knowledge of alkali phenomena." A classification based "on chemical grounds, considering alkali conditions or the result of the action of aqueous solutions of certain soluble salts" is tentatively proposed. Four classes of alkali are considered, the predominating features in the formation of which are, (1) the action of the sodium chlorid on gypsum, resulting in the formation of sodium sulphate and calcium chlorid, typified in alkali soils of the Pecos Valley, New Mexico; (2) the action of sodium chlorid on calcium carbonate resulting in the formation of sodium carbonate and calcium chlorid as occurring typically about Fresno, Cal.; (3) the simultaneous action of sodium chlorid upon gypsum and calcium carbonate resulting in the formation of only small quantities of soluble carbonates, a very common form typified in the alkali of the Salt Lake Valley, Utah; and (4) the interaction almost exclusively of soluble sulphates, not a common class, occurring typically about Billings, Mont. Modifications of the types described are more or less frequently found.

A number of cases of the occurrence of soluble salts in the soils of a humid region are cited as evidence "that the essential differences between conditions obtaining in the soils of humid and arid regions are rather those of degree than of kind; that the fundamental forces at work are in reality the same, and that the study of the phenomena presented in one area can and should be of the greatest value in interpreting those of another area."

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[1] See U. S. Dept. Agr. Rpt. No. 64 (E. S. R., 12, p. 522).

Objects and methods of investigating certain physical properties of soils, L. J. Briggs (*U. S. Dept. Agr. Yearbook 1900, pp. 397–410, pls. 2, figs. 2*).—This article explains the importance of certain of the physical properties of soil—texture, structure, relation to water and salts in solution, temperature, flocculation, etc.—and describes briefly methods for mechanical analysis of soils and for the determination of structure, water content, temperature, and soluble salts; the methods given being in the main those which have been worked out in the Division of Soils of the Department.

Conservation of soil moisture, F. T. Shutt (*Canada Expt. Farms Rpts. 1900, pp. 154–159*).—Observations on soil moisture at Brandon, Manitoba, and Indian Head, Northwest Territories, are reported. The plan of the investigation was as follows:

"Early in the spring on each of the farms two areas having as far as possible soil of a similar character were selected, the one intended to be fallowed during the present season, and which had been cropped in 1899; the second area to be cropped, but which had been fallowed in 1899. Samples from each of these areas were taken, month by month, from May to November, inclusive, to 2 depths—the first representing the upper 8 in.; the second the depth from 8 to 16 in. These samples, taken in special canisters, were immediately on collection forwarded to the laboratory. On their arrival each canister of soil was at once weighed and its contents thoroughly mixed, sampled, and the moisture determined in duplicate. From the average weight of the canister of water-free soil (obtained from the 7 monthly determinations) and the percentage of moisture, the amounts of water in tons and pounds per acre were calculated. The canisters ($2\frac{1}{2}$ in. by 8 in.) used were very stout and open at both ends. In taking the samples they were thrust into the ground until level with the surface and then removed with the aid of a sharp spade, and covered with deep and close-fitting caps. To prevent any possible evaporation en route, 'electric' tape was used to cover the edge of the cap or lid where it fitted over the canister."

The season of 1899 was characterized by a plentiful but normal precipitation; that of 1900 was exceedingly dry during the earlier months of the summer and unusually wet during the middle and later months of the summer. Under these conditions it was found that the soils which had been in fallow the previous year contained during May, June, and July more moisture than those which had been cropped the preceding year, but "there was a constant tendency for the soil moisture in both fallowed and cropped soil during the latter months of the experiment to approximate."

Canadian soils, F. T. Shutt (*Canada Expt. Farms Rpts. 1900, pp. 148–154*).—Chemical analyses of a surface soil and 2 samples of hardpan (at depths of 2 and 5 ft.) from British Columbia, 4 samples of soil from Northwest Territories, and 1 from Nova Scotia are reported, with a discussion of their fertilizer requirements and suggestions as to their treatment.

Soils of the Upper Peninsula, A. C. Lane (*Michigan Sta. Bul. 186, pp. 43–45*).—A brief discussion of the characteristics of the soils of the Upper Peninsula of Michigan.

Soils of Mississippi—plant food and productiveness, W. L. Hutchinson (*Mississippi Sta. Bul. 66, pp. 23, figs. 5*).—Tables based on analyses previously reported (E. S. R., 12, p. 1022) are given which show the phosphoric acid, potash, nitrogen, and lime per acre to a depth of 4 in. in 76 samples of prairie soils, 8 of Yazoo-Mississippi delta soils, and 46 of sandy and sandy-loam soils.

"The results show that the prairie soils, and also most of the soils in the northeastern prairie region, contain relatively large amounts of the ingredients reported in the tables, which are the important ones. The amount of phosphoric acid in the sandy, sandy-loam, basin, and brown silt-loam soils is relatively small, and it is on these lands that commercial fertilizers are constantly used under all crops. These lands should also have the benefit of stable manure and cowpeas, with superphosphates under crops following the cowpeas.

"Soils containing 1,000 lbs., or over, of phosphoric acid per acre, in the upper 4 in. of soil, have enough of this ingredient for large crops. . . . As the amount of this ingredient, in the surface soil, falls materially below 1,000 lbs. per acre, the demand for phosphates is apparent in proportion to the deficiency, provided all other essential conditions for large yields are present.

"The supply of potash seems to be ample everywhere in the State and we have no evidence that any of our soils require the use of fertilizers containing potash to increase the yields. The results do not indicate the minimum amount of potash in the soil that is adequate for good crops.

"Nitrogenous fertilizers increase the yields of most of the soils in the State, and where nitrogen is added by growing cowpeas, velvet beans, vetch, and melilotus, which also add organic matter to a soil and improve its texture, results of the most satisfactory kind are obtained.

"Some of our soil work also indicates that, where the amount of phosphoric acid in a soil is abnormally high, the cotton plant will use several times as much of this ingredient as it needs for normal development. This is probably true of other substances as well. . . .

"Lime, in large amounts, undoubtedly influences the texture of a soil; it may also have to do with the solubility of the plant food in a soil, but, with good texture, soils will produce well even though the amount of lime present is small. The brown loam soils do not contain much lime, and yet, in proportion to the amount of plant food present, they are probably the most productive lands we have. The texture of these soils is good."

The construction and use of graded and level embankments and terraces to prevent washing of soils is explained. The reclaiming of washed lands, the value and use of stable manure and restorative crops, and the use of commercial fertilizers are also discussed.

Bacteriological studies of drinking water, F. D. Chester (*Delaware Sta. Rpt. 1900, pp. 66–76, figs. 2*).—On account of a serious outbreak of typhoid fever in the city of Wilmington attention was directed to a spring from which many people obtained drinking water, and water from this source was analyzed and tested for the presence of pathogenic bacteria. Two organisms were isolated, one a variety of coli bacillus, and another belonging to the hemorrhagic septicæmia or swine-plague group. Details are given concerning the cultural and morphological characters of these 2 organisms. Since the organism of the hog-cholera group is closely related to the typhus bacillus, its presence in the water is considered as indicating a fæcal contamination.

Water from farm homesteads, F. T. Shutt (*Canada Expt. Farms Rpts. 1900, pp. 191–194*).—Tabulated analyses are given of 41 samples of well waters examined during the year.

FERTILIZERS.

Basic superphosphate, its preparation and use as a manure, J. Hughes (*Jour. Soc. Chem. Ind., 20 (1901), No. 4, pp. 325–332*).—The history of the manufacture and use of superphosphates is briefly reviewed; tests of the solubility of various phosphates in weak citric acid (1 part to 1,000 parts of water) are reported; and the preparation of basic superphosphate by mixing slaked lime (15 parts) with ordinary superphosphate (85 parts) is described. The results of tests of the solubility of the product in water, weak citric acid, and ammonium citrate (2.5 per cent solution) are given. None of the phosphoric acid was soluble in water, but from 12 to 13 per cent was soluble in the weak citric acid (1:1,000) and about 10 per cent in ammonium citrate, being more soluble in these reagents than basic slag. The basic superphosphate is claimed to be especially suited to acid soils or those deficient in lime.

Twelve years' experiment with Thomas slag, A. ANDOUARD (*L'Engrais, 16 (1901), No. 19, pp. 447, 448*).—A brief summary of the results obtained by Wagner, Maercker, the author, and others.

Statistics of the manufacture and use of Thomas slag (*Deut. Landw. Presse, 28 (1901), No. 31, pp. 270, 271*).

A fertilizer experiment with crude phosphate, F. W. DAFERT (*Ztschr. Landw. Versuchw. Oesterr., 4 (1901), No. 5, pp. 627–629*).—Previous experiments by the author (E. S. R., 12, p. 839) showed that Algerian phosphate was quite effective as a source of phosphoric acid for summer barley and oats. The experiments here reported show that it is also very effective as a fertilizer for clover.

Report of the agricultural chemical laboratory of the Ministry of Agriculture and Imperial Domains in St. Petersburg for 1898, P. S. KOSSOVICH (*St. Petersburg: Department of Agriculture, 1900, pp. 242; rev. in Selsk. Khoz. i Lyesov., 199 (1900), Oct., pp. 237, 238*).—This report contains two articles which may be mentioned here: (1) Availability for plants of the phosphoric acid of the Russian phosphorites, and (2) ability of plants to utilize the phosphoric acid of phosphorites. According to experiments reported, plants may be divided with regard to their ability to avail themselves of the phosphoric acid of the phosphorites into 4 groups: (1) Plants with high capacity—mustard, buckwheat, hemp, winter rye; (2) plants with medium capacity—peas, barley, summer rye, beets; (3) plants with a low capacity—potatoes, oats, vetches; and, lastly, (4) plants almost devoid of this capacity—millet, flax, and clover.—P. FIREMAN.

Nitrate of soda and sulphate of ammonia, H. BACHMANN (*Fühling's Landw. Ztg., 50 (1901), No. 11, pp. 386, 387*).—The results of comparative tests of nitrate of soda (8 cwt. per hectare) and sulphate of ammonia (6 cwt. per hectare) on potatoes, fodder beets, and kohl-rabi are briefly reported. In these experiments the sulphate of ammonia was apparently more effective than nitrate of soda.

The regulation of the trade in nitrate of soda, M. ULLMANN (*Die Regelung des Verkehrs mit Chilisalpeter. Melle: F. E. Haag, 1901, pp. 25, pls. 4*).—This pamphlet includes an account of the action of a commission of the Society for the Protection of the Chemical Industry in Germany regarding the regulation of trade in nitrate of soda, a discussion of the basis of guarantees of purity, and a brief review of experiments regarding the poisonous property of nitrate containing perchlorate.

Experiments at the Bavarian moor culture station on the action of potash fertilizers on upland moors, A. BAUMANN (*Vrtljschr. Bayer. Landw. Rath., 6 1901), No. 1, pp. 20–35*).—Comparative tests of kainit and concentrated and basic potash salts are reported.

The consumption of potash salts in 1900, MAIZIÈRES (*L'Engrais, 16 (1901), No. 23, pp. 542–544*).—Statistics for various countries.

Fertilizing with lime refuse from gas works (*Deut. Landw. Presse, 28 (1901), No. 34, p. 297*).—The handling and the fertilizing value of this material is briefly discussed. Three weeks' exposure to the air is claimed to be sufficient to decompose poisonous sulphur compounds.

An analysis of the Leeds gas liquor, A. W. COOKE (*Jour. Soc. Chem. Ind., 20 (1901), No. 3, pp. 225, 226*).—A complete analysis.

Fish fertilizers, MAIZIÈRES (*L'Engrais, 16 (1901), No. 17, pp. 398, 399*).—Mainly statistics of the industry in the United States.

Manuring the soil, J. FIELDS (*Oklahoma Sta. Bul. 50, p. 11*).—A popular discussion of this subject.

A report on the demonstration experiments with fertilizers carried out by the Agricultural Society of Vienna in lower Austria during the year 1900 (*Ztschr. Landw. Versuchw. Oesterr., 4 (1901), No. 5, pp. 596–626, pl. 1*).—A detailed account is given of 72 cooperative experiments with oats, 49 with barley, 38 with wheat, 2 with meadow grasses, 2 with potatoes, 1 with flax, and 1 with clover.

The organization and results of cooperative fertilizer experiments in Bavaria, H. Dubbers (*Vrtljschr. Bayer. Landw. Rath., 6 (1901), No. 1, pp. 35–43*).—The results of cooperative experiments with fertilizers on grains, potatoes, beets, alfalfa, and meadows are briefly reported.

Organization of fertilizer experiments (*Deut. Landw. Presse, 28 (1901), No. 37, pp. 326, 327*).—The plan of cooperative experiments which have been undertaken in Bavaria for the purpose of making a systematic study of fertilizer requirements is described, and some of the results with barley, oats, potatoes, roots, hay, and alfalfa are reported.

Commercial fertilizers and humus, K. de Vrieze (*Deut. Landw. Presse, 28 (1901), No. 34, pp. 296, 297*).—An argument to prove that the continued use of commercial fertilizers does not necessarily result in a decline in the humus content of soils.

Fertilizers, F. T. Shutt (*Canada Expt. Farms Rpts. 1900, pp. 161–166*).—Analyses of 6 samples of marl, 3 samples of gypsum, 2 of wood ashes, and 1 of wool waste are reported, with discussion of their value as fertilizers.

Fertilizer inspection, C. D. Woods (*Maine Sta. Bul. 72, pp. 42–48*).—This bulletin contains analyses of 136 brands of fertilizers (manufacturers' samples) licensed before March 9, 1901, with a summary of the chief provisions of the State fertilizer law.

Fertilizer inspection in North Carolina, B. W. Kilgore (*Bul. North Carolina State Bd. Agr., 22 (1901), No. 4, pp. 3–30, 36*).—The names and guaranteed composition of fertilizers registered for 1901, and analyses and valuations of 201 samples of fertilizers examined during the spring of 1901, with the usual explanations regarding freight rates, valuation, etc., and a note on the increased trade in fertilizers in the State during the year.

Official report on commercial fertilizers inspected, analyzed, and licensed to be sold in the State of Ohio during 1900 (*Ohio State Board of Agriculture, 1901, pp. 85*).

Commercial fertilizers, J. H. Stewart and B. H. Hite (*West Virginia Sta. Bul. 72, pp. 32*).—This bulletin gives the results of analyses and valuations of 287 samples of fertilizing materials examined during the year 1900.

Analyses of licensed commercial fertilizers, 1901, R. H. Shaw and A. Vivian (*Wisconsin Sta. Bul. 86, pp. 10*).—This bulletin contains the text of the Wisconsin fertilizer law, notes on the sources of fertilizing ingredients in fertilizers and on valuation of fertilizers, and analyses of 5 samples of fertilizers sold in the State during the year.

Draft bill to regulate the sale of agricultural fertilizers and feeding stuffs (*Jour. Jamaica Agr. Soc., 5 (1901), No. 3, pp. 120–122*).—The text of an act passed in 1901, providing for the inspection of fertilizers and feeding stuffs sold in Jamaica.

Recent contributions to knowledge relating to the fertilizer industry, von Grueber (*Chem. Ztg., 25 (1901), No. 35, pp. 373–377*).—A general summary.

FIELD CROPS.

Field experiments, J. Atkinson (*Iowa Sta. Bul. 55, pp. 362–384, figs. 7*).—These experiments comprised variety and culture tests with corn, oats, barley, spring wheat, spelt, sorghum, rape, kohl-rabi, soy beans, and sugar beets. Nineteen varieties of corn selected out of 50 varieties grown in 1898 and 1899 were given a further test in 1900. The best yielding varieties were of selected stock. The varieties giving the best returns, mentioned in the order of their productiveness, were: Reid Yellow Dent, Legal Tender, Snow Flake White, Seckler Perfection, and Champion White Pearl, yielding from 90.9 to 100.3 bu. per acre. Wisconsin Earliest Dent, with a yield of 52.5 bu. per acre, was the least productive. The other varieties, given in the order of their yields, were: Golden Beauty, Mammoth Cuban, Western Yellow Dent, Nebraska White Prize, Lenocher Homestead, Star Leaming, Iowa Silver Mine, Western White Dent, Iowa Gold Mine, Pride of the North, and Goddard King of Earlies, all yielding over 67 bu. per acre. The average results for two years show yields of 71.9 bu. per acre with deep cultivation, and 82.4 bu. when shallow cultivation was given. Several of the most important varieties tested are described, and a number of typical and imperfect ears are figured, and the selection of corn is discussed. A score card for judging ears is presented.

Of 35 varieties of oats tested for 2 years in succession 12 gave an average yield of over 50 bu. per acre. New Salt Lake gave the best yield, 58.8 bu. per acre, followed by Silver Mine with 58.7 bu., Nebraska Gold Mine with 58.2, and Green Mountain with 57.5 bu. per acre. The earliest variety, Early Champion, ripening July 6, gave an average yield per acre of 55.2 bu. White Russian, the latest variety, ripened July 25, and gave the lowest average yield per acre, 39.3 bu. Early Champion and Early Dawson are recommended as being little apt to rust and well suited as nurse crops for clover and grasses.

Of 19 varieties of barley grown for three years in succession, Mansbury, Common 6-rowed, Success, Champion Beardless, and Black Hulless, with average yields of 74.4, 70.4, 56.9, 53.8, and 44.4 bu. per acre, respectively, were best suited to Iowa conditions.

The yields for the season of 1900 of a number of cross-bred wheats grown since 1898 are reported. Of 24 varieties, the best yielding were Minnesota No. 71, Early Java, Minnesota No. 185, White Russian, Preston, Minnesota No. 188, and Minnesota No. 66, giving a yield of 33, 30.5, 27.5, 27.5, 26.8, 26.7, and 25.7 bu. per acre, respectively. All varieties yielded over 19 bu. per acre. Early Java, a promising variety obtained from southern Nebraska, ripened July 20. Growing wheat and oats in a mixture of different proportions gave better yields than growing either alone. A mixture of 4 pecks of oats and 4 of wheat yielded 1,860 lbs. per acre, a better yield than any other proportion of oats and wheat for seed. Spelt yielded 2,200 lbs. of thrashed grain per acre in 1899 and 1,960 lbs. in 1900. Sorghum sown May 21 and cut August 27 yielded 29 tons of green fodder or 12 tons of sorghum hay per acre. The use of 40, 80, or 120 lbs. of seed per acre gave practically the same results as to yield, but the thicker-sown crop grew better and contained more water and less saccharine matter than the crop from thinner sowings. Sorghum, sown after barley had been harvested in July, was about 7 feet high and in full head by September 20. It was cut September 29 and gave 21 tons of green sorghum per acre, which cured into 7 tons of hay.

Rape sown May 24 and harvested on September 10 yielded 21 tons per acre in 1898, and in 1899 60 bu. of oats and 18 tons of rape were grown on an acre when 6 pecks of oats and 1 lb. of rape were sown together in the spring. In 1900 rape and oats sown together were successful only on the higher and poorer land. On bottom land the rape completely smothered the oats, even when sown 10 days later. Successful culture tests of kohl-rabi and soy beans are reported. Owing to a wet season the work with sugar beets did not give satisfactory results.

Field experiments with farm crops, W. Saunders, J. H. Grisdale, W. T. Macoun, R. Robertson, S. A. Bedford, A. Mackay, and T. A. Sharpe (*Canada Expt. Farms Rpts. 1900, pp. 7–42, 82–95, 127–132, 137, 138, 177–184, 281–300, 334, 338–362, 391–409, 437–456, pls. 3*).—As in preceding years, variety, culture, and fertilizer tests with cereals, root and forage crops were carried on at the experimental farms in Ottawa, the Maritime Provinces, Manitoba, British Columbia, and the Northwest Territories (E. S. R., 12, p. 535). The results of the variety tests with the different crops in 1900 have been previously reported (E. S. R., 13, p. 34). The plan and scope of the experiments this season were practically the same as described in preceding abstracts, and the results are reported in the usual form. Owing to the prevalence of drought the results were not uniformly satisfactory. The cultural experiments consisted of early and late sowings of turnips, carrots, sugar beets, mangels, potatoes, and flax; distance experiments with corn, soy beans, horse beans, and potatoes; early and late harvesting of root crops; rotation tests; thick and thin seeding of flax; sowing selected seed of barley; growing mixed-grain crops; sowing wheat, oats, and barley; and planting potatoes at different depths, etc. The fertilizer experiments included tests of barnyard manure and different commercial fertilizers and of clover as a green manure for cereal crops. At Ottawa, turnips and carrots sown May 16 and pulled November 6 gave better returns than when sown May 30 and harvested October 16. Mangels showed only a small advantage from early sowing this season. In previous tests the results of planting potatoes at different dates have indicated that planting after June 24 would not give a fair crop, but in 1900 a good crop was obtained from a planting on July 7. At the station in the Maritime Provinces, turnips, mangels, and carrots were planted on May 28 and June 12, and the yields in every case were in favor of the earlier planting. A similar test was made at the other stations, but owing to an unfavorable season the results were quite irregular, although in general they favored planting on the earlier date. Experiments in sowing flax at the rate of 40 and 80 lbs. per acre on different dates at 4 of the stations gave varying results, due to some extent to the season. The differences in yield were small in many cases. At the station in the Maritime Provinces the yield of flaxseed was in favor of the heavier and early seeding, while the yield of straw was irregular. The best yields of flax straw at the Manitoba Station were obtained from the heavy seeding made in either of the first three weeks of May, but the yield of seed in this case was not much affected by either the date of seeding or quantity sown. The results at the Experimental Farm of the Northwest Territories showed the best yield of seed from the light sowing made May 29, and the best yield of straw from the light sowing made May 22. At the British Columbia Station the yields of straw were all in favor of light seeding, while the yields of seed were in favor of the heavy seeding, and the results on the whole favored sowing at an early date. Sugar beets planted June 2 at the Manitoba Station gave better results than beets planted May 19.

In the distance experiments corn was grown in rows 21, 28, 35, and 42 in. apart, respectively. The best yields in the Maritime Provinces, Manitoba, and Northwest Territories were obtained from rows 21 in. apart, while at Ottawa the results seemed to be in favor of 35 and 42 in. when cut in the early milk stage. Much the best single yield, however, 30 tons and 536 lbs. per acre, when cut in the early milk stage, was obtained from selected Leaming corn sown in rows 21 in. apart. In British Columbia corn was grown in hills and drills at these different distances, in the one case the plants being thinned to 6 in. apart in the row, and in the other to 3 or 4 in a hill. In general, the results in both cases favored planting 21 in. apart. Soy beans and horse beans were grown in rows 21, 28, and 35 in. apart at several of the stations. At the Maritime Provinces farm 21 in. was found best for soy beans and 35 in. for horse beans, while at Ottawa the results with horse beans were the same, but with soy beans were best at 28 in. In Manitoba and the Northwest Territories rows 35 in. apart gave the best yields for both crops, while in British Columbia 28 in. for soy beans and 35 in. for horse beans were found the best distances. Potatoes planted 10, 12, 14, 16, and 18 in. apart in rows 2½ ft. distant at Ottawa for 5 successive years have given an average yield in favor of planting 12 in. apart in the row.

A test of various cuttings for potato planting, including seed ends and whole potatoes and cuttings of 1, 2, 3, and 4 eyes, was conducted at the Manitoba farm, the best average results being from the cuttings with 2 eyes, and a good yield from the seed ends. The whole tuber used as a set gave the largest yield, but the product was very irregular.

Of 10 varieties of barley grown from selected seed at Ottawa, all gave an increasing yield except Danish Chevalier, a two-rowed variety, which gave a crop of 2 bu. and 24 lbs. per acre less from selected than from unselected seed. The increase in yield ranged from 40 lbs. to 8 bu. and 40 lbs. per acre. At the same station in a similar test with spring wheat 6 varieties gave a larger yield from selected seed as compared with unselected seed, while 2 varieties gave the same yield from both kinds of seed. The same test with wheat and barley at the Manitoba Station resulted in yields sometimes in favor of selected and sometimes in favor of unselected seeds.

At Ottawa a test of growing oats after different crops resulted in the best yields after horse beans. The smallest crops were obtained after millet, flax, and soy beans. Trials were also made of plowing under green clover for oats, corn, and potatoes, and in every case an advantage was apparent in the yield. Spring wheat grown after different crops in Manitoba gave much larger yields when preceded by leguminous crops than by cereals.

One series of fertilizer experiments at Ottawa was made with fresh and rotted barnyard manure, fresh slaked lime, superphosphate and Thomas slag, all applied singly to spring wheat and oats. The results did not differ much, and it is concluded that the land contained all the available plant food the crops could utilize. In a second series of experiments with different fertilizers on wheat, barley, and oats the best average results for 13 years have been with barnyard manure (about equal parts of horse manure and cow manure), and slightly better results have been secured from the use of fresh manure than from well-rotted manure.

The itemized cost of growing different crops at the Central farm are reported, with an estimate of the cost of digestible dry matter in each crop.

At the Ottawa Station an experiment was conducted in planting potatoes at different depths from 1 to 8 in. Level cultivation was adopted and so but little soil was thrown on the potatoes after planting. The best average yields for three years were obtained from planting 1 in. deep. As in previous years, it was found that most of the tubers were formed within 4 in. of the surface of the soil, even where the seed had been planted deeper, and where the sets were planted less than 4 in. deep nearly all the tubers were formed between that and the surface of the soil. At the farm in the Maritime Provinces barnyard manure was compared with commercial fertilizers on early potatoes, the results with the different fertilizers showing the largest yields from the plants treated with manure.

Some experiments were made at different stations to compare the growth of various grains as mixtures and as pure grains. At Ottawa the best yields of grain were obtained from a mixture of 1 bu. each of barley, oats, and peas, and a mixture composed of ½ bu. of wheat, 1 bu. of oats, ¾ bu. of peas, and ¾ bu. of barley. The yields of grain of these two mixtures grown on 2-acre plats were practically the same, but the yield of oats alone, which was the largest in the series, was about one-third greater. As in the previous year in the Maritime Provinces a seeding mixture of 2 bu. of oats, 1 bu. of barley, and ½ bu. of peas gave a higher yield of grain than oats grown alone, and sowing this mixture at the rate of 3 bu. per acre gave larger yields than smaller amounts. In British Columbia a mixture of 1 bu. each of peas, oats, and barley gave slightly better yields than a similar mixture of peas, oats, and wheat.

There was practically no difference in yield of clover from seed inoculated with Nitragin and from untreated seed at the British Columbia farm.

The highest average yields in experiments of sowing wheat, oats, and barley 1, 2, and 3 in. deep at the Manitoba Station were obtained from the medium depth of sowing. A variety test with 56 varieties of tobacco was conducted at the Central Station as to the time of ripening and productiveness. The results of only 6 varieties, all of which had fully matured September 7, are recorded in a table. No conclusions are drawn.

The results of a comparative chemical study of Red Fife, Preston, Stanley, and

Percy wheats and moisture determinations of a number of Manitoba wheats made at the station are recorded.

On account of the unfavorable season the sugar-beet analyses show unsatisfactory results.

Field crops, vegetables, and fruits, L. M. Geismar (*Michigan Sta. Bul. 186, pp. 8–17, pls. 8*).—This bulletin is the first report of the branch station in the Upper Peninsula. The work here set forth includes mainly experimental cultures made in 1900. Meteorological observations for a part of the season are reported in tables and the results of cultural and variety tests are briefly given. Tests on trial plats were made with oats, barley, spring rye, field peas, potatoes, rape, pumpkins, millet, and corn. Swedish turnips, beets, mangels, carrots, parsnips, salsify, lettuce, radishes, cabbage, onions, sugar beets, celery, and beans were tested in addition to the crops already mentioned. In most cases satisfactory and promising results were obtained, but in some instances abnormal weather conditions which prevailed interfered with the trials. The varieties of strawberries, gooseberries, currants, raspberries, blackberries, grapes, apples, pears, plums, and cherries, which made the best growth, are enumerated.

What varieties of cereals have given the best results in East Germany and what has been done to improve them? Gisevius (*Jahrb. Deut. Landw. Gesell., 15 (1900), pp. 225–246*).—In this paper the varieties of spring and winter oats, spring and winter rye, oats, barley, and potatoes which have given the best results are enumerated.

Range grass and forage plant experiments at Highmore, South Dakota, F. Lamson-Scribner (*U. S. Dept. Agr., Division of Agrostology Circ. 33, pp. 5*).—This circular is a report of progress in experiments begun in 1899 (E. S. R., 11, p. 1032). It is based upon notes made by L. W. Carter, who had immediate charge of the work, and consists of brief records by plats. The grasses which gave promise the first year and again gave good results last year were: Smooth bunch grass (*Poa lævigata*), Nevada blue grass (*P. nevadensis*), King's fescue (*Festuca kingii*), Oregon brome grass (*Bromus unioloides*). Japanese barnyard millet, common or foxtail millet, amber cane, Egyptian corn and milo maize, and Dwarf Victoria rape produced good yields.

The culture of winter barley, A. Schmid (*Deut. Landw. Presse, 28 (1901), No. 7, p. 48*).—An article on the culture of winter barley, with a discussion of its value for feeding purposes.

Seed corn and some standard varieties for Illinois, A. D. Shamel (*Illinois Sta. Bul. 63, pp. 29–56, figs. 13, map 1*).—This bulletin treats of the necessary qualities of seed corn, presents a list of the various characteristics of corn by which varieties may be systematically studied, and describes a number of varieties adapted to Illinois conditions. In the discussion of seed corn the author considers uniformity, vitality, and pedigree. The varieties described are Reid Yellow Dent, Golden Eagle, Iowa Silver Mine, Riley Favorite, White Superior, Leaming, and Boone County White. The description of each variety includes its history and a detailed enumeration of the characteristics of the ear, which are also illustrated in the figures. Abstracts from the constitution and by-laws of the Illinois Seed Corn Breeders' Association are appended.

Experiments with American varieties of corn, E. Ramm and C. Momsen (*Deut. Landw. Presse, 28 (1901), No. 10, p. 72, figs. 3*).—The results with Mitchell Extra Early, Early Giant, and Extra Early grown from American seed are reported. The Mitchell Extra Early was the only variety that ripened its grain.

Researches on the utilization of furze, A. C. Girard (*Ann. Agron., 27 (1901), No. 1, pp. 5–16*).—A discussion of the utilization of furze (*Ulex europea*) for bedding for stock and as a fertilizer and a green manure. Chemical analyses of the plant are reported.

Oats as grain and fodder, J. M. Bartlett (*Maine Sta. Bul. 70, pp. 9–24*).—This bulletin discusses the importance and value of oats as grain and fodder and reports the results of analyses of oats grown in different parts of the State. Samples collected from 11 different regions, representing nearly all the oat growing sections of the State, were analyzed and the results are given in the following table:

Composition of the grain of oats grown in different parts of Maine.

Variety.	Weight per bushel.	Water.	Ash.	Protein.	Crude fiber.	Nitrogen-free extract.	Fat.	Heat of combustion per gram.
	Pounds.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Calories.*
Variety not given	....	8.39	3.03	10.63	13.92	59.27	4.76	4.247
Do	....	8.66	3.59	11.69	13.47	57.88	4.71	4.215
Do	....	8.73	3.01	13.00	12.13	58.20	4.93	4.270
Do	....	11.15	2.92	12.56	11.28	57.70	4.39	4.161
Do	....	8.07	3.41	12.13	13.24	58.26	4.89	4.218
Do	34	11.35	3.95	10.75	9.33	61.27	3.35	4.203
Do	34	10.20	3.67	11.13	9.13	60.23	5.64	4.300
Scottish Chief	33½	10.23	3.19	10.88	8.31	62.17	5.22	4.250
Liberty	31½	10.18	3.43	11.38	9.19	60.28	5.54	4.232
Weston	34½	10.92	3.08	11.25	8.64	60.25	5.86	4.285
Common	35	9.84	3.42	9.93	10.29	61.13	5.39	4.258
White Russian	34½	9.21	3.14	12.75	10.10	58.36	6.44	4.376
Parker	41½	11.69	2.91	11.56	10.62	57.29	5.93	4.294
Common Western	32½	9.09	3.91	12.57	11.71	56.08	6.64	....
Siberian	37	11.16	2.85	12.12	9.18	59.03	5.66	....
Hogan	41	9.46	2.84	11.50	11.03	60.13	5.04	4.291

The results show that there is not so great a difference in the composition of light and heavy oats as is usually supposed, and the author concludes that the food value is about the same. Previously reported analyses of oat hay cut at different stages of growth, of different parts of the oat plant, of oat and pea and oat and vetch hays, and oats and oat products, and digestion coefficients of these substances obtained in experiments with sheep are tabulated (E. S. R., 11, pp. 964, 965, and 971).

Old and new varieties of oats and the composition of the straw and the grain, A. P. Aitken (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 13* (*1901*), *pp. 276–295*).—This paper discusses the strength, quality and quantity of the straw, the weight, color and quality of the grain, and the tillering power of Waverly, Tartar King, Potato, Pioneer, Abundance, Goldfinder and American Beauty oats. The advantage of changing seed is shown by tabulated results of experiments in this line. The straw and grain of the different varieties were analyzed and the results are shown in tables and discussed at some length. The report on the test of varieties upon which this article is based has been previously noted. (E. S. R., 13, p. 131.)

Variety tests with oats, H. Biedenkopf (*Sächs. Landw. Ztschr., 49* (*1901*), *No. 4, pp. 65–70*).

Ramie congress in Paris, A. Schulte (*Beihefte Tropenpflanzer, 5* (*1901*), *No. 2, pp. 53–58*).—An article discussing the ramie decorticating machines tested in connection with the congress held at the Paris Exposition of 1900.

Correlative variation in rye, C. Debruyker (*Handelingen van het derde Vlaamsch Natuur—en Geneeskundig Congress. Antwerp, 1899, pp. 76–88*).—In a previous paper the author has shown that correlation exists between the length of the culm and the head, and the upper internode and the head of the rye plant. The deviation from the average length was greater in the head than in the first internode. This paper is the second contribution on the subject, and the purpose of the experiment here described was to determine whether descendants of plants showing such correlation would also show similar correlation. In one bed (No. 3) seeds were planted from plants of which both the spikes and the upper internodes were as near the average as possible. In beds 1 and 2 the seeds were taken from plants having the shortest heads, those in No. 1 being from plants with the shortest internodes and those in No. 2 from plants with the longest internodes. In beds 4 and 5, seeds from the longest ears were sown, those in No. 4 being from plants with the shortest internodes and those in No. 5 from plants with the longest internodes. Seeds from heads midway between the shortest and the average were planted in bed No. 6, while bed No. 7 was planted with seeds from heads intermediate between the longest and the average. The seeds were planted separately and at convenient distances. The results from these plants and those from the mother plants are compared in a table. In 1897 the results showed great variations in the length of the upper internode, but in the progeny of these plants there was no great difference in the lengths of the first internodes and the heads. The characteristics, therefore, which distinguished the mother plant had entirely disappeared. This result is attributed to unusually favorable conditions of growth which overcame the influence of heredity. The correlation in the length of the upper internodes and of the heads is expressed as 1:1.5 for the experiments in 1897 and as 1:1 for the results obtained in beds 3, 4, and 5 in 1898. No general conclusions are drawn from these results, but the author states that when rye plants are grown under favorable conditions heredity has no apparent influence on the length of the first internodes, the culm, and the head, nor on the correlation between the lengths of the first internode and the head.—H. M. PIETERS.

Sorghum in 1899 and 1900, C. L. PENNY (*Delaware Sta. Rpt. 1900, pp. 77–85*).—The work of selective propagation hitherto reported (E. S. R., 11, p. 141) was continued in 1899, while in 1900 the possible increase in yield of sugar per acre was studied. This work has been previously discussed from a different standpoint (E. S. R., 13, p. 42). Tables are given presenting the results in detail and giving a summary of the crops for 1898 to 1900, inclusive. The experiments were conducted in 3 different localities of the State. The results from one locality show that cane grown in rows 40 in. apart on one plat and 34½ in. apart on another, containing about 20,500 and 62,000 stalks per acre, respectively, had practically the same percentage of sugar in the juice, while the purity of the thinly planted cane was 78.5 and of the thickly planted, 81.4. Thick planting increased the available sugar per ton of cane from 219 to 222 lbs. and almost doubled the yield of cane. The available sugar per acre was increased in this case from 2,416 to 4,866 lbs. Very rich cane exceeding 18 per cent of sugar in the juice did not give a high yield of cane per acre. An apparent falling off in the richness of the cane in the crops of recent years compared with those obtained in 1897 (E. S. R., 10, p. 345) is reported, but the author states that in the locality which produced the above-mentioned high yield of sugar the cane has never been notably richer. The conclusion is that close planting decreases the size of the stalks, but it is believed that so far in this work a limit of crowding which would result in a loss in the yield of sugar has not yet been reached.

Soy beans in Kansas in 1900, H. M. COTTRELL, D. H. OTIS, and J. G. HANEY (*Kansas Sta. Bul. 100, pp. 57–115, pls. 5, map 1*).—This bulletin reports the results of cultural tests with soy beans at the station and throughout the State. Reports were received from 292 farmers representing 75 of the 105 counties of the State, and the individual reports are here presented in condensed form and reviewed. At the station 59.5 acres of Early Yellow soy beans were grown, and 16 varieties of soy beans were tested on a 22-acre field, but owing to drought the yields were not satisfactory. Experiments made at the station during 12 years show that the Early Yellow is the best of the varieties tested for Kansas conditions. Suggestions on soil inoculation for soy beans and cultural directions are given. The majority of the farmers connected with the cooperative test considered soy beans a profitable crop.

Variety tests with sugar beets (*Bl. Zuckerrübenbau, 8 (1901), No. 3, pp. 38–40*).—A report on variety tests of sugar beets in Sicily.

The world's exhibit of leaf tobacco at the Paris Exposition of 1900, M. L. FLOYD (*U. S. Dept. Agr. Yearbook 1900, pp. 157–166, pls. 2*).—This article briefly describes by countries the leaf tobacco exhibits worthy of note at the Paris Exposition of 1900. The collective exhibit made by this Department and the exhibits of American tobaccos made by individuals are discussed, and the types of tobacco leaf in the individual exhibit to which awards were made are pointed out. A description is given of the awards and the methods of making them and the lessons taught by the tobacco exhibits from the different countries are set forth.

Report on experiments on the manuring of turnips in 1899, R. P. Wright (*West of Scotland Agr. Col. Rpt. 1899, pp. 14*).—These experiments were conducted on 13 farms in 6 counties of Scotland, for the purpose of testing the value of various fertilizers used in different combinations for growing turnips. The kinds and quantities of fertilizers applied, their cost, and the increase in yield due to their use, together with the total yields, are given in tables. The author draws no definite conclusions, but makes the following statements:

"In some seasons nitrate of soda applied wholly as a top-dressing to the turnip crop is distinctly less effective than when it is applied either wholly or partially in the drills.

"Potash forms an essential and a profitable constituent of an artificial manure for turnips, and its omission reduces both the crop and the profits."

Successful wheat growing in semiarid districts, M. A. Carleton (*U. S. Dept. Agr. Yearbook 1900, pp. 529–542, pls. 4*).—The successful culture of wheat in that region of the Great Plains lying between the 99th and 102d meridian is discussed in this article and the types of varieties of wheat best adapted for the semiarid regions are described. The author states that varieties may be selected from the red spring wheats and the macaroni wheats of Russian and Siberian origin, which on account of being more resistant to adverse conditions would produce larger average yields than the varieties now grown in the region to which he refers. The conditions under which these wheats are grown in Russia are pointed out and the methods of culture described. Cultural directions for growing wheat in the semiarid region are given and a method for maintaining and improving the quality of wheat is suggested.

A five-year rotation and subsoiling, G. Heuzé (*Jour. Agr. Prat., 1901, I, No. 6, pp. 187, 188*).—A discussion on the management of calcareous soils wet in winter and dry in summer.

Commercial plant introduction, J. G. Smith (*U. S. Dept. Agr. Yearbook 1900, pp. 131–144*).—This article discusses the work of plant introduction by the Department of Agriculture and points out the results that have accrued from successful importations. The plant introduction work as outlined by the author comprises the introduction of new crops, improved strains of crops and of new varieties for plant breeders. The plants and crops introduced during the past four years have been tested as a rule by the experiment stations and the results obtained are here briefly summarized.

Report on plant-breeding establishments, Edler (*Jahrb. Deut. Landw. Gesell., 15 (1900), pp. 403–426*).—A report on 11 private seed-growing and plant-breeding establishments in Germany.

The breeding of agricultural plants, C. Fruwirth (*Die Züchtung landwirtschaftlicher Kulturpflanzen. Berlin: Paul Parey, 1900, pp. 267*).—The book treats of breeding cereals, beets, potatoes, grasses, and other forage plants. The physiological phase of plant breeding and the methods of selection and crossing are discussed. A chapter on the management of plant breeding is also given.

HORTICULTURE.

Fruits, vegetables, flowers, and ornamental shrubs at the experimental farms in Canada, W. T. Macoun, W. S. Blair, S. A. Bedford, A. Mackay, T. A. Sharpe (*Canada Expt. Farms Rpts. 1900, pp. 97–119, 123–127, 132–143, 314–333, 368–389, 409–427, 456–475*).—Reports are here given on the fruits, vegetables, flowers, and ornamental shrubs grown at the Central Station in Ottawa, and at each of the branch stations in the Maritime Provinces, Manitoba, Northwest Territories, and British Columbia. The reports are similar in character to those for 1899 (E. S. R., 12, p. 548). The preponderance of data given relates to comparison of varieties and tests of their adaptability to the various localities in which the stations are located. The better varieties of fruits and vegetables, as shown by the station tests, are given in lists for the benefit of farmers. Cultural directions for strawberries are given in two of the papers.

At the Central Station common red and mammoth clovers, sown broadcast at the rate of 12 lbs. per acre, have made the best cover crops for orchards. On light soils, however, alfalfa, seeded at the rate of 15 lbs. per acre, has done best. Hairy vetch (*Vicia villosa*) has proved especially valuable in dry districts where it is difficult to get a catch of clover. It has not proved hardy at Ottawa.

W. T. Macoun includes in his report a descriptive list of good woody and annual climbers which may be used for decorative purposes.

In the Maritime Provinces no difference was found in the time string beans were ready for market, whether planted in hills 2 by 3 ft. apart or in rows. Further experiments in soaking sweet corn seed in warm water 12 hours before sowing showed no apparent difference in the growth of the resulting plants, whether they were soaked or not soaked, and it would appear that there is no gain whatever in soaking sweet corn for seed.

Good results are reported from the Manitoba Station with cross-bred apples. A good crop of saskatoon (*Amelanchier alnifolia*), a native fruit, was secured during the season.

Treatment of winter muskmelons, A. Griffin (*Florists' Exchange, 13 (1901), No. 14, p. 391, fig. 1*).—The seeds are sown in 3-in. flower pots, the plants repotted when the first rough leaf is partly developed, one plant in each pot, and later planted out in the benches 2 ft. apart in a compost of loam and cow manure made firm. The plants are staked and trellised and when about 5 or 6 ft. high the growing point is taken out. The main laterals, which are then thrown out, are stopped when they have made 4 or 5 leaves. Fruit should not be allowed to develop on these laterals; but should be grown on the sublaterals, which spring from the axile of the leaves of the main laterals. The fruit is not allowed to set until 4 or 5 flowers have developed on a plant. The plants should be stopped about 3 leaves above the fruit. When the plants are about 2 ft. high a "collar" of lime ½ in. thick and 2 or 3 in. from the stem is placed around the plant to prevent canker. While the fruit is ripening only enough water is given to keep the plants from wilting. The temperature of the house is maintained at about 65° F. at night and runs up to 80° in the daytime.

Melons in pots, C. Edwards (*Garden, 59 (1901), No. 1534, p. 266*).—The author grows melons in 10-in. pots rammed two-thirds full of a rather heavy loam. On this the plants are placed and soil added to just cover the ball. The pots are kept in a small greenhouse having a night temperature of 65° F. and a day temperature 10° higher. From 1 to 4 melons are grown on the trellised vines.

The "Fikongo" (Brachystelma bingeri): A new asclepiad of the French Soudan with edible tubers, A. Chevalier (*Rev. Cult. Coloniales, 8 (1901), No. 70, pp. 65–71, fig. 1*).—A botanical description is given of this plant, which is said to form an important part of the diet of the natives. The roots have the appearance of turnips and taste something like them. The histology of the plant is also given.

Testing commercial varieties of vegetables, W. W. Tracy, jr. (*U. S. Dept. Agr. Yearbook 1900, pp. 543–555*).—The author announces the inauguration by the Botanical Division of this Department of a series of thorough tests and accurate descriptions of trade varieties of vegetables grown in this country. The advantages of such tests and descriptions are pointed out, requisites of adequate testing given, and the details of methods followed by the Division in testing varieties briefly noted. Lettuce will be one of the first subjects investigated. As an example of the inaccurate naming of certain varieties of this vegetable, the case of Black Seeded Tennis Ball is stated. Of this variety 34 alleged synonyms were found in seedsmen's catalogues, then of these 34 names there were numerous alleged synonyms, then synonyms of these, until altogether 151 names were collected. Many of these alleged synonyms, however, are known to be entirely distinct varieties. It is to obtain accurate reliable information along these lines with different vegetables that this work is being undertaken.

The development of the trucking interests, F. S. Earle (*U. S. Dept. Agr. Yearbook 1900, pp. 437-452*).—A historical and geographical review of truck farming in this country, with popular accounts of transportation, marketing, packing, and grading of truck produce.

Growth of the North Carolina trucking industry (*Bul. North Carolina State Bd. Agr., 22 (1901), No. 4, pp. 31, 32*).—Some statistics are given of the vegetables, muskmelons, dewberries, strawberries, potatoes, etc., shipped from the trucking district along the Atlantic coast of North Carolina in 1900, with comparative data for earlier years in some instances. The production of strawberries has increased from 5,254,016 qt. in 1897 to 11,044,064 qt. in 1900.

Report of the horticulturist, G. H. Powell (*Delaware Sta. Rpt. 1900, pp. 99-141, figs. 9*).—This report covers the following subjects: The sour cherries of America, pollination and thinning of pears, and a preliminary report on the pollination of apples. The nomenclature in use in cherry literature is discussed, and the probable origin of the words Amarelle, Kentish, Morello, Griotte, and Weichsel, is pointed out.

The sour cherry (*Prunus cerasus*) is arranged in 4 groups: Montmorency group, (English) Morello, Brusseler Braune, and Vladimir. Historical and descriptive notes are given on the more important varieties under each group. For commercial orchards in the East the author prefers Montmorency and Morello. Where earliness is the principal end sought, Richmond is recommended. Other varieties that seem worthy of trial are as follows: "*Montmorency group.*—June Amarelle, King, Lancaster, Sklanka, Wier No. 2; *Morello group.*—Double Natte; *Brusseler Braune group.*—Bessarabian, Brusseler Braune. For the West the Ostheim may be added to the Morello group, also Wragg, where it differs from Morello; and for Canada the Ostheim, Minnesota, and Kloskov Morello."

In the experimental work with Kieffer pears, the problems studied were the degree of fertility or sterility of the variety, the influence of several different pears used as pollenizers, and the behavior of the variety in different places. Pollen from Duchess, Bartlett, Howell, Lawrence, Garber, Le Conte, and Kieffer was used. Out of 873 crosses on Kieffer, 647 or 76.4 per cent started to grow. When Kieffer was pollenized by itself only 25 out of 596 pollenized blossoms started to grow. This is but 4.2 per cent. There was a considerable variation in the susceptibility of the Kieffer to its own pollen in different localities.

The vegetative influence of the pollen from different sources was noted. In the case of self-pollenized Kieffer blossoms the pear starts slowly into growth, very gradually assumes a dark green color, and is retarded in subsequent development. "The cross-fertilized pear, on the other hand, begins a most active development immediately, and at the end of 2 weeks is twice the size of the self-fertilized fruit."

For practical purposes, the author states that Kieffer should be considered self-sterile in Delaware. There is no entirely satisfactory variety for use as a pollenizer for Kieffer. The Garber seems to be one of the most promising. Le Conte is considered undesirable, as it is susceptible to core rot. Dwarf Bartlett, Duchess, Manning, or Howell may be used. The practical orchard deductions from the experiment are to the effect that while Kieffer may bear in solid blocks, better fruit is obtained if it is cross pollenized, and for this purpose every third row in the orchard should be planted to a variety other than Kieffer.

In the experiment in thinning Kieffer pears, the fruit was removed when the pears were about the size of a robin's egg. The trees were 8 years of age, about 20 ft. high, and loaded with fruit. The pears were thinned so that no two were closer than 6 in. It required about 20 minutes to thin each tree and the cost was about 5 cts. per tree. The number of pears per ⅝ bu. basket averaged 80 on the thinned trees, and on 6 check trees it averaged 92. On the thinned trees 83 per cent of the fruit was No. 1 grade, while on the unthinned trees but 61 per cent was of No. 1 grade. A wind storm interfered with the experiment so that no conclusions regarding the profit of thinning could be drawn.

Some observations were made on the number of blossoms that appear on pear trees and the fruits that set. One 6-year-old Kieffer tree produced 3,910 blossoms, 11 per cent of which set fruit, and 7 per cent matured fruit. The tree was overloaded. A 5-year-old Bartlett tree produced 2,151 blossoms, but 3 per cent of which matured fruit and the tree was not well filled. A 5-year-old Howell tree produced 1,258 blossoms, 5 per cent of which matured fruit.

The cross-pollinating experiments with apples were made with Stayman pollenized by itself, and by Paragon, York Imperial, and Missouri Pippin; Paragon pollenized by itself and by Stayman; York Imperial pollenized by itself and by Missouri Pippin, and Missouri Pippin pollenized by itself and by York Imperial. The results obtained show that for practical orchard purposes all these varieties may be considered self-sterile. York Imperial is weakly self-fertile. There was a complete lack of affinity between the pistils and pollen of Stayman and Paragon, no fruit developing whatever when these varieties were intercrossed.

Commercial pear culture, M. B. WAITE (*U. S. Dept. Agr. Yearbook 1900, pp. 369–396, pls. 3*).—A popular discussion of the subject, including detailed directions for locating, planting, cultivating, fertilizing, and pruning commercial pear orchards in different sections of the country; picking, packing, and marketing of fruit; and spraying the trees for protection from insects and diseases.

Some notes on pears for export, G. QUINN (*Jour. Agr. and Ind. South Australia, 4 (1901), No. 9, pp. 703–709, figs. 6*).—The author believes that pears for shipping should be carefully padded from each other by means of wood wool. Brief descriptions are given of the following pears considered of importance in the Australian shipping trade: Josephine de Malines, Winter Nelis, Glou Morceau, Vicar of Winkfield, Beurre Clairgeau, and L'Inconnue.

Native plums, E. S. GOFF (*Wisconsin Sta. Bul. 87, pp. 31, figs. 12*).—This bulletin considers the following topics: Methods of plum culture, the culinary uses of native plums, varieties, blooming period of plums, thickness of the skins, and the longevity of Americana plums. Some data are also presented on the self-fertility or sterility of native plums.

A mulch of marsh hay 6 in. deep was applied to an orchard in grass. The mulch was put on in the winter after the ground had been packed by rain. The sod was completely killed by the mulch except where there was quack grass. The benefits from the mulch were shown in a more healthy foliage and an increase in the size and quantity of the fruit produced. Some advantages claimed for this sort of mulch are that it saves the labor of cultivation; prevents the damage that cultivation causes to the trees; makes a clean cover for the ground, which is so desirable at packing time; and adds fertilizing materials to the soil as it decays. If kept 4 in. deep it prevents the growth of weeds. Its chief advantage, however, is in the superior quality and size of the fruit grown. The strongest objection to its use seems to be its tendency to induce the roots to grow almost on top of the ground, which makes them much more easily affected by cold in severe winters. The mulch also increases the danger from fire.

The author states that in order to secure the finest fruit and to prevent deterioration in the size from year to year, thinning is necessary with most of the Americana varieties. Thinning decreases the total yield. In experiments at the station, thinning to 1 in. apart decreased the yield about 35 per cent and thinning to 2 in. apart about 61 per cent. "Where the market does not discriminate in price between medium sized and large plums, thinning will not pay unless the trees decidedly overbear. In this case it will pay for the benefit of the trees." In thinning, all plums stung by the curculio should be removed. Early thinning is desirable, but late thinning is better than none. The plums should be left not nearer than $1\frac{1}{2}$ to 2 in. apart. The value in thinning Japaneses trees, the author thinks, is largely confined to the good effects on the tree itself.

Seedling trees of native plums at the station when not transplanted sometimes bear freely the third year after planting. If transplanted the third spring, they bear the following season. The plan followed by the station in testing seedlings is to thin out the trees in the nursery row to 4 ft. apart the third spring after planting, which allows of the fruiting of a part of the trees. Those thinned out are set in the orchard 5 ft. apart each way. It is claimed that the fruit borne by the seedling trees the first 2 bearing years will largely pay the cost of growing them.

Descriptions of a number of native varieties, supplementary to those previously given (E. S. R., 10, p. 45), are recorded. The varieties considered most promising for market are Aitkin, Barnsback, Bomberger, Brittlewood, De Soto, Japan Cross, Diana, Etta, Freeman, Hammer, Haag (when sprayed for rot), Hart De Soto, Nellie Blanche, North Star, Ocheeda, Piper, Poole Pride, Quaker, Silas Wilson, Springer, Surprise, and Wyant. "These varieties have been large in size, productive, and, with few exceptions, excellent in quality."

Under the caption of culinary uses for plums, directions are given for canning, drying, preserving, and otherwise putting up plums.

In order to determine whether inclosing the blossoms in paper sacks, as is done in experiments on the self-fertility or sterility of plums, has a harmful effect by shutting out light, the ends of the branches of several varieties which gave evidence of blossoming freely were inserted in large glass beakers, the mouth of the beakers being closed with 2 thicknesses of cheese cloth. The branches in the beakers blossomed normally and produced pollen in abundance, but in not a single instance did fruit set. These results are taken as confirming the conclusions of Waugh that practically all varieties of plums are sterile to their own pollen and must be cross fertilized. The weight of the anthers, dimensions of the pollen grains, and number of stamens of 21 varieties of *Prunus americana*, 3 each of *P. domestica*, *P. triflora*, and *P. hortulana*, and 1 each of *P. myrobalana* and *P. angustifolia*, are shown in tabular form. The author states that he is able to trace no relation between the productiveness of varieties and the size of their anthers and pollen grains. The blooming season of a large number of varieties is given and the author states that a comparison of the records of previous years shows that the order of blooming of different varieties is fairly constant from year to year.

To determine whether native varieties might not be propagated in the same manner as the Marianna plum by cuttings, cuttings were taken from all the main varieties and seedlings of the Americana, Chickasaw, and Hortulana species. These were placed in the propagating bed in the spring and subjected to mild bottom heat for several weeks. "With the single exception of the Marianna, all failed to root."

An objection frequently made to Americana plums is the thickness and toughness of the skins. "As a guide to breeding with the view of reducing the thickness of the skin in the Americana plums, a brief study has been made of the skin of . . . 2 varieties of the Americana species, and 1 each of the Domestica, Triflora, Hortulana, and Chickasaw species." Illustrations are given of a cross-section of the skin of the different varieties magnified about 15 times. The skin of Wildgoose (Hortulana) was found thinnest of all the varieties under observation. As this species is regarded as a hybrid between the Chickasaw and Americana species, "there is every reason to hope that other hybrids between the Chickasaw or Hortulana species and the Americana plums may produce the thinness of skin that is so much desired." Some suggestions are given for breeding the native plums, and as a guide to those interested in the subject, the following list is offered for plum breeding with the belief expressed that the different varieties mentioned possess in a high degree the qualities assigned to them: "Surprise for quality, Brittlewood for size, Freeman for color, Aitkin for earliness, and Wildgoose for thinness of skin."

Notes on the prune, principally from a Californian point of view, S. C. LAMB (*Jour. Roy. Hort. Soc.* [*London*], *23* (*1900*), *No. 3, pp. 350–376, figs. 17, map 1*).—This discusses the introduction and development of the prune industry in California, and gives methods of culture employed, including methods of grading, drying, and packing. The principal varieties of California prunes are described in considerable detail, and notes given on diseases and insect enemies of prunes, and their control.

The date palm and its culture, W. T. SWINGLE (*U. S. Dept. Agr. Yearbook 1900, pp. 453–490, pls. 9, figs. 4*).—A popular account is given of the history, importation, and culture of the date palm in this country. The date palm is shown to be adapted to only a few localities in the southwestern part of the country, which have a hot and dry climate. The Colorado Desert, it is believed, will probably prove the best date growing region in the country, if not in the world. There are also many places in Arizona and California where the culture of date palms can be undertaken with good hope of success, as well as in some few localities in New Mexico, Texas, and Nevada. In 1899–1900 420 young date palms, comprising about 27 of the best known western Sahara varieties, including the famous Deglet noor variety, were imported by this Department and are now being grown experimentally in the Salt River Valley, Arizona. About 3 dozen plants of the Rhars, considered one of the best early dates for drying, were also sent to California and are now being grown experimentally under the auspices of the University of California.

Fig drying, C. H. GORMAN (*Agr. Gaz. New South Wales, 12* (*1901*), *No. 3, pp. 367–369, fig. 1*).—Specific directions for drying figs and packing for shipment.

Grape fruit classified, (*Rural Californian, 24* (*1901*), *No. 4, pp. 132, 133*).—The California committee on pomelo culture finds a total of 10 varieties of grape fruit grown in that State, of which Thursby, Foggs Improved Sweet, Nectar, and Seedless are highly recommended. All 10 varieties are briefly described.

Pineapple culture in southwest Florida, F. G. TISE (*Rural New Yorker, 60* (*1901*), *No. 2676, p. 338*).—The methods practiced are noted in detail.

Propagating the mango, J. B. BEACH (*Florida Agr., 28* (*1901*), *No. 18, p. 273*).—The author has had some success in budding mangoes, but inarching has resulted most satisfactorily.

Frost and fruits, A. C. FULLER (*Pacific Rural Press, 61* (*1901*), *No. 19, p. 292*).—The author presents some data to show the value of burr clover and grasses in the prune orchard as a protection against frost.

Orchard cover crops, J. CRAIG (*Proc. West. New York Hort. Soc. 1901, pp. 12–17*).—The benefits of cover crops and the plants most suited for the purpose are discussed.

Mistakes in orchard management and how they may be avoided, J. ETTLE (*Jour. Roy. Hort. Soc.* [*London*], *25* (*1901*), *No. 3, pp. 256–285, figs. 33*).—This is a popular discussion of the practical details of orchard work and of the mistakes made in selecting varieties and seeds, planting, staking, pruning, and manuring trees. The work is considered from the standpoint of nurserymen, landlord, and tenant.

Common mistakes in fruit culture, G. BUNYARD (*Jour. Roy. Hort. Soc.* [*London*], *25* (*1901*), *No. 3, pp. 317–322*).—Common mistakes in the setting, watering, cultivation, pruning, root pruning, fruit thinning, and purchasing trees are pointed out, with suggestions in each instance as to right methods.

Shade in coffee culture, O. F. COOK (*U. S. Dept. Agr., Division of Botany Bul. 25, pp. 79, pls. 16*).—A review of the literature on the value of shade in coffee culture, together with an extensive list of all the common names used for shade trees and crops grown with coffee in the various regions of the world. The conclusions of the author relative to the importance of shade in coffee culture are as follows:

"A canvass of the subject of shade in coffee culture shows that there is no basis in reason or in observed fact for the belief that shade is a general necessity for the coffee plant, even when grown at low elevations. On the contrary, it is extremely probable that the beneficial effects resulting from shade are quite apart from the shadow cast upon the coffee tree. The beneficial effects connected with shade arise from the protection afforded against drought, erosion, and winds. The planting of shade trees for these purposes is accordingly determined by local conditions of climate and soil, and furnishes no reason for the general planting of shade trees. In regions not affected by injurious climatic extremes the planting of shade trees is justified from the cultural standpoint only by the increased fertility imparted to the soil by means of the nitrogen-fixing root tubercles of leguminous species. This view has not been made the subject of experimental demonstration, but it seems to accord with all the facts thus far ascertained. The benefits of leguminous fertilizing are quite apart from the shading of the coffee, and under suitable cultural conditions are also to be secured from shrubs and herbs belonging to the same natural family. The relative utility and availability of the various shade trees and soiling crops is a subject of vast importance in coffee culture and in other agricultural industries of the Tropics. The combinations of such cultures as coffee and cacao with leguminous trees and plants of maximum cultural and commercial value afford many complex, scientific, and practical problems bearing upon the rise of mixed farming in the Tropics, and are thus worthy of serious experimental attention."

Strawberries, E. W. Wooster (*Trans. Maine State Pomol. Soc. 1897, pp. 88–95*).—Methods of strawberry culture in Maine are discussed and some figures given showing the cost and profits of growing an acre of berries. The total cost for preparing the ground, setting plants, harvesting, and marketing the crop was $430.50. The product was 5,000 qts. of berries which sold for 12 cts. per quart, or $600—net gain, $169.50.

Experiments on the manuring of vines in the department of Aude, M. G. Barbut (*Essais sur la fumure des vignes dans le département de l'Aude en 1899. Paris, 1900, pp. 32*).—The value of nitrate of soda as a fertilizer for vineyards was compared with sulphate of ammonia, oil cake, dried blood, barnyard manure, and a number of complete commercial fertilizers, omitting in some cases one essential element. The tests were carried out in 3 vine-growing districts and in 12 different vineyards. An analysis is given of the soil in each instance, and the variety of grapes grown noted. The results, which are given in tabular form, show the nitrate generally superior to other forms of nitrogenous fertilizers for grapes.

The vine in New South Wales (*Sci. Amer. Sup., 51 (1901), No. 1323, pp. 21212, 21213*).—Historical notes on the development of the industry, with some statistical data on its present status.

Raisin drying (*Gard. and Field, 26 (1901), No. 10, p. 185*).—Outline of the sun drying and lye processes.

Cold storage, L. C. Corbett (*West Virginia Sta. Bul. 74, pp. 51–80, figs. 3*).—Besides a discussion of the profits of cold storage, the results of some experiments with apples and chestnuts in cold storage are given, and chapters added on "Moisture in cold storage," as stated by J. E. Seibel in his Compend of mechanical refrigeration; and "Materials of construction," as stated by A. J. Wallace-Taylor in his publication on Refrigerating and ice making. The author outlines a plan for the building of a cold-storage room, giving methods of construction and materials used.

From a number of calculations which the author makes, it is deduced that cold-storage houses on the farm will pay when they have a capacity of at least a thousand barrels of fruit. The greater the capacity of the storage house the relatively cheaper the cost of construction and of storage per barrel.

Where field stone is abundant, grout walls, which are durable, effective, and cheap, can be built. Sewer pipes laid deep underground for a considerable distance may be used for reducing the temperature of the storage room.

Practical experience in West Virginia has shown that the later the Willow and Rome Beauty can be placed in cold storage without being actually frozen on the trees, the better they will keep. In comparing the loss of weight of headed and open barrels of apples in cold storage for 150 days, the loss in the headed barrel, which weighed in the beginning 139½ lbs., was 4 lbs., while the loss in the barrel weighing the same but not headed was 4½ lbs. The greatest loss in the stored fruit occurred during the first month of storage.

A record is given of experiments in keeping apples in sealed darkened jars, sealed clear glass jars, and on the open shelf in a dark chamber and in a light chamber, in cold storage. The results show an advantage in favor of storing in closed receptacles as against open crates. Of the varieties placed on open shelves, the York Imperial lost least in weight and the Baldwin most. The fruit in the light, with the exception of York Imperial, lost more in weight than fruit in darkness. From the beginning of the test, January 4, up to March 5, all the fruit kept in perfect condition. After this date Baldwins were affected by the dry rot and the York Imperials with "scald." On March 26 Greenings were also affected by "scald." In regard to this the author is of the opinion that "when the true cause for 'scald' is discovered it will be a direct result of the physiological condition of the apple when it went into storage."

The fruit was analyzed when it was put in cold storage in January, and again the latter part of April. Very little change took place. The acid content decreased slightly, and there was a slight falling off of sugar content with Ben Davis, York Imperial, and Rhode Island Greening, and a slight gain with Baldwin.

In the cold storage of chestnuts, a quantity weighing nearly 177 lbs. was spread in a rack 4 in. deep, 30 in. wide, and 6 ft. long, covered top and bottom with a wire screen. After spreading the nuts in the cage it was suspended from the ceiling of the cold chamber, and temperature maintained at 32° F. "Under these conditions the loss of weight was 11 lbs. 3 oz. The quality of the kernel was maintained in a remarkable manner, and by some the nuts in May were adjudged better than in the fall. The insects, too, were so completely benumbed, if not entirely killed, that they did no damage to the nuts after being placed in store." The opinions of a number of horticulturists and commission men on the quality of the nuts and the probable profits in storing chestnuts are quoted, and are to the effect that while the quality of the stored nuts is satisfactory, there is as yet no market for them after the regular chestnut season closes in December.

A table, quoted from Seibel, is given, showing the temperature for keeping a number of fruits and vegetables in cold storage.

The influence of refrigeration on the fruit industry, W. A. TAYLOR (*U. S. Dept. Agr. Yearbook 1900, pp. 561–580, pls. 5*).—This reviews the historical development of refrigeration and cold storage; shows the influence of refrigeration as exercised in the development of certain fruit and vegetable districts; the effects of refrigeration upon the apple trade, etc. The value of cold storage and refrigeration in transit on the development of the fruit industry is brought out especially.

Cold or cool storage of fruit, W. CRUMP, G. BUNYARD, ET AL. (*Garden, 59 (1901), No. 1534, pp. 266, 267*).—The desirability and proper mode of underground cellar storage for apples in England are pointed out.

Memorandum respecting cold storage and the utility of collecting stations (*Ontario: Govt., 1900, pp. 16*).—The value of cold storage in furthering agriculture and foreign shipments of fruit, vegetables, and other farm produce is pointed out.

Canning and pulping fruit (*Jour. Dept. Agr. West. Australia, 3 (1901), No. 3, pp. 211–214*).—Directions are given for canning apricots, peaches, plums, pears, figs, gooseberries, and tomatoes, and for putting up the same without sugar.

Nomenclature, S. A. Beach (*Proc. West. New York Hort. Soc. 1901, pp. 76–78*).—Synonyms for a number of the more important orchard and small fruits are given.

Carnations, C. H. Herbert (*Garden, 59 (1901), No. 1537, pp. 317, 318*).—The culture, fertilizing, seed sowing, and classification of carnations are popularly considered.

The tulip, J. Douglas (*Gard. Chron., 3. ser., 29 (1901), No. 748, pp. 264–266*).—Notes on the history, changes of fashion, culture, and raising of seedling tulips.

Native California bulbs, C. H. Shinn (*Land of Sunshine, 14 (1901), No. 4, pp. 276–289, figs. 10*).—The work of Carl Purdy in developing the California native bulb industry is outlined.

FORESTRY.

Forest extension in the middle West, W. L. Hall (*U. S. Dept. Agr. Yearbook 1900, pp. 145–156, pls. 4*).—The author maintains that the time has arrived for the extensive development of forest plantations throughout the middle West, and suggests plans for carrying out the work. While in the past there has been considerable tree planting, it has generally been aimlessly done, without system in planting or management, and as a result there are but few thrifty plantations. A number of successful plantations are briefly described and the purposes for which timber may be grown and the best varieties suited for different purposes are indicated. Among the species adapted to planting throughout the middle West, the author enumerates osage orange, black locust, hardy catalpa, red cedar, black walnut, bur, post, and white oaks, green and white ash, tamarack, and Russian mulberry. These trees are not all adapted to the same conditions, and the hardy catalpa is believed to offer a better prospect for successful growing than any other. The author indicates the different portions of the country to which the above species are best adapted. Brief suggestions for future plantations are given and attention called to the plan of preparing working systems in cooperation with the Bureau of Forestry of this Department.

Practical forestry in the southern Appalachians, O. W. Price (*U. S. Dept. Agr. Yearbook 1900, pp. 357–368, pls. 6*).—The general characteristics of the mountain region of western North Carolina and eastern Tennessee are described. This region is noted for the richness of its forest flora, and the distribution of species is indicated. The local systems of lumbering are described, showing that not only is there no provision made for future crop, but that the methods pursued are very wasteful. The occurrence and effect of forest fires in this region are commented upon. It appears that by far the greatest number of fires are the result of burning over the woods under the belief that better pasturage will be obtained. Suggestions are given for the proper management of this forest region, and the means for successful reproduction of the desirable species are shown.

Our forest reservations, J. W. Toumey (*Pop. Sci. Mo., 59 (1901), No. 2, pp. 115–128, figs. 13*).—The author popularly describes the forest conditions found in the National and State forest reserves, shows some of the advantages to be derived from the establishment of reserves, and points out some of the chief enemies of forestry, such as overgrazing, forest fires, etc.

Forestry in the British colonies, W. Brown (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 13 (1901), pp. 236–244*).—A brief review is given of forestry as practiced in the British Colonies of Canada, Australia, and Cape of Good Hope. In the Cape of Good Hope region, South Australia, New South Wales, and Western Australia beginnings have been made which are more or less promising; while in Victoria, New Zealand, Tasmania, and Queensland but little has been done in the way of forestry management. In Canada some independent forestry has been begun, but little has been accomplished thus far.

The forest of Fontainebleau, France, E. M. Moir (*Indian Forester, 27 (1901),* *No. 4, pp. 174–181*).—A description is given of the state forests of Fontainebleau, and the principal species of trees are described. Oak with an undergrowth of beech and hornbeam occupies about 46 per cent of the forest, Scotch fir about 20 per cent, and the remainder consists of mixed forest. The author describes the different working plans under which the forest has been managed. The first were prepared in 1861, modified in 1880, and still further amended in 1892, under which plan it is now being worked. The net annual income derived from the state forest is said to be about 28 francs per hectare.

Forest trees and shrubs, S. A. BEDFORD (*Canada Expt. Farms Repts. 1900, pp. 372–376*).—Notes are given on the present condition of the forest tree and shrub plantation, hedges, and arboretum. The past season was a very unfavorable one for forest tree growth, as a long continued spring drought interfered in a marked degree with seedlings, cuttings, and newly planted trees. A list of about 90 species and varieties of trees and shrubs, which have withstood the winter at Manitoba, is given. A report is given on the present condition of the hedges which were begun in 1895, in which the adaptability of the different plants for hedge purposes is briefly described. During the season covered by the report, planting in the arboretum was continued, particular attention being paid to maple, poplar, and other rapid growing trees; and a list of the new varieties added during 1900 is given.

SEEDS—WEEDS.

The quality of clover seed offered in the French market, E. SCHRIBAUX (*Jour. Agr. Prat., 1901, I, No. 11, pp. 342, 343*).—The author calls attention to the poor quality of clover seed now in the French market. The hot summer of 1900 proved very detrimental to the proper development and ripening of seeds, and as a result seed merchants have mixed their old stocks with the new to the detriment of the quality. Of 422 samples of clover seed already examined, the author found only 58.7 per cent which gave a germination amounting to 85 per cent or more, while 15 per cent germinated less than 50 per cent of its seeds. The specimens examined showed a decided increase in the amount of cuscuta, and the author suggests that purchasers of clover seed should exercise care in seeing that the quality is the best to be obtained. Other things being equal, the author shows a decided preference for the smaller sized seeds and recommends their purchase even at an increased price. For sowing in France he recommends that clover seeds should be obtained from the northern or cooler parts of Europe. Seed coming from the south of Europe and from America is said not to be suited to French conditions.

The seed industry in Germany (*Florists' Exchange, 13 (1901), No. 6, p. 123*).—A brief sketch is given of the seed industry, together with statistics of the area devoted to many varieties and their production.

Dodder in alfalfa, J. WHITELEY (*Queensland Agr. Jour., 8 (1901), No. 5, p. 333*).—The author recommends for the destruction of dodder growing in alfalfa fields the cutting of the alfalfa in infested regions and destroying it by fire. The cut-over areas are then to be covered with a mulch of straw or dry grass, 4 to 6 in. in depth. This mulch effectually chokes the dodder but will admit the alfalfa growing through it.

A new treatment for the destruction of cuscuta, CHEFDEBIEN (*Rev. Vit., 15 (1901), No. 385, pp. 498–500*).—The author recommends for the destruction of cuscuta in meadows where irrigation is possible the thorough flooding of the fields, after cutting away the grass in the infested regions; and, a day or two after the soil is dried over the parts of the field affected by the dodder, to sow broadcast nitrate of soda at the rate of 250 to 380 kg. per hectare. The best form in which the nitrate of soda is used is a crystalline form. This fertilizer and the irrigation have the effect of stimulating the growth of the grasses and the nitrate of soda, which is present in the crystalline form, is sufficiently injurious to the dodder to destroy it. In meadows or alfalfa fields not capable of irrigation, it is recommended that the infested spots be cut, artificially watered, and then treated with the nitrate of soda in the same manner as recommended above.

The water hyacinth (*Queensland Agr. Jour., 8 (1901), No. 5, pp. 368, 369*).—Notes are given upon the rapid spread of the water hyacinth in some of the rivers of Australia.

Eradication of charlock by spraying, W. SOMERVILLE (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 13 (1901), pp. 10–17*).—A popular account is given of the occurrence of charlock, the nature of injury produced by it upon various crops, and a review given of the experiments which have been conducted for its eradication by spraying with solutions of copper and iron sulphate. The results obtained are briefly summarized and suggestions given for the preparation of the herbicides, the proper time for spraying, form of spraying machines, etc.

Spraying for the destruction of mustard, J. FLETCHER (*Canada Expt. Farms Rpts. 1900, pp. 248, 249*).—Experiments were conducted under the author's direction, in which the efficiency of spraying wild mustard with solutions of copper sulphate was tested. The results were in the main satisfactory, although the experiments were carried out rather late in the season. In general, it seems that, when young, charlock may be destroyed with a 2 per cent solution of copper sulphate at the rate of 40 gal. per acre, but if the plants are in flower as much as 60 gal. of a 4 per cent solution will be required.

Investigations on the effect of various salt solutions upon weeds and cultivated plants, B. STEGLICH (*Ztschr. Pflanzenkrank., 11 (1901), No. 1, pp. 31–33*).—A report is given of a number of experiments on the effect of a 20 per cent solution of iron sulphate, 15 and 30 per cent solutions of sodium nitrate, ammonium sulphate, potassium chlorid, and magnesium chlorid, when sprayed over cultivated plants and weeds. Cereals were not permanently injured by any of the solutions, and beets were only seriously affected by the iron sulphate solution. Potatoes were either seriously injured or killed by all of them, and serious injury followed the use of the stronger solutions upon beans, peas, vetches, young clover, lupines, and flax, and slight injury was observed on old clover plants. The only weeds that were killed by all of the different solutions were wild radish and charlock. Thistles were injured by the stronger solutions. The sow thistle was seriously affected by the stronger solutions of ammonium sulphate and potassium chlorid, and the same solutions were proved injurious to some extent upon species of Rumex. Knotweed (*Polygonum persicaria*) was killed by the 30 per cent solutions of sodium nitrate and calcium chlorid, while other species of knotweeds were not affected by the chemicals.

Weed-killing compounds, F. T. SHUTT (*Canada Expt. Farms Rpts. 1900, p. 187*).—A report is given of an analysis of Harvesta, a chemical compound which is sold for the purpose of destroying weeds in gravel paths. The analysis showed the compound to consist of arsenite of soda and common salt. Formulas are given for the preparation of a number of other weed-killing compounds. As all these chemicals seriously injure soils intended for cultivation, they should be used only where culture is not contemplated.

DISEASES OF PLANTS.

Report of the mycologist, F. D. CHESTER (*Delaware Sta. Rpt. 1900, pp. 36–46, figs. 7*).—In continuation of the report of the previous year (E. S. R., 12, p. 761), the work carried on for the treatment of apple scab is reviewed and a summary given of the results obtained the fifth consecutive year. During the season covered by this report both treated and untreated trees yielded good crops. The Winesap trees showed little difference to be attributed to the spraying. In the case of the Strawberry apples the results were more evident, as the yield of first-class fruit on the sprayed trees was considerably in excess of that upon the unsprayed ones.

Notes are given on the bacterial pear blight caused by *Bacillus amylovorus*, and the organism described. A number of inoculation experiments were conducted from which it was found that only the more tender and succulent parts of trees become infested and that second-year wood is not liable to become diseased even when injured or punctured. No infection results from the mere contact of the organisms with the surface of plants, and mechanical contact of blighted with healthy portions of trees is not liable to result in infection. As a means for preventing the spread of this disease the author recommends pruning of the blighted terminal shoots, and several weeks after blooming is suggested as the best time for performing this operation, since at that time all the infection of the year is liable to show itself.

The canker in apple and pear trees, due to *Sphæropsis malorum*, is described at some length. This disease has been quite injurious in some parts of the State. It is frequently mistaken for fire blight, but can be readily distinguished by the shrinking and cracking of the bark over the infected areas. All diseased wood should be cut out and burned and the main trunk and body of the trees be protected with a wash of whale-oil soap, slaked lime, water, and wood ashes, or ordinary Bordeaux mixture with enough lime added to bring it to the consistency of whitewash.

Pear blight and pear canker, F. D. Chester (*Delaware Sta. Bul. 52, pp. 8, figs. 7*).—This is essentially a reprint from the Annual Report of the Station for 1900. (See above.)

Investigations on a parasite of flax, E. Laurent (*Bul. Agr.* [*Brussels*], *16* (*1900*), *No. 6, pp. 511–554, pl. 1*).—A report is given of a study made to ascertain the cause of a blight of flax. The author claims that it is due to the fungus *Asterocystis radicis*. This fungus plays an essential rôle in the development of the disease, although it is frequently followed by a number of other fungi. In addition to flax, it has been found that this fungus is parasitic upon the roots of a number of other plants, especially when the plants are young. Among the known host plants are mentioned spinach, radish, beets, peas, beans, alfalfa, white clover, cress, mustard, spurry, and flax. The fungus, it is found, can enter the roots only at a certain stage in their development, and the author conducted an extensive series of experiments to determine this period. In the case of flax, it is not possible to gain entrance after the thirteenth or fourteenth day from germination. It develops in the parenchyma and root hairs of the young root. It is propagated immediately by zoospores, which are very sensible to drying and to fungicides. For the preservation of the fungus, there are developed within the roots winter spores which are liberated by the decay of the roots. As a means for preventing the disease, rotation of crops is recommended, but it is stated that flax should not be grown on infested soil for at least 7 years after the fungus is known to be present in the soil.

Treatment of oats for smut, A. D. Shamel (*Illinois Sta. Bul. 64, pp. 57–72, figs. 6*).—The amount and nature of oat smut are described, and suggestions given for prevention by means of the hot water and formalin treatments. Experiments were conducted in which the seed was heated in water at temperatures of 125, 132, 137, and 140° F., and the amount of smut, yield of grain and straw determined. Similar areas were sown with seed taken from the same lot, but not given any treatment, which showed from $2\frac{1}{2}$ to 9 per cent smut in the crop, the yield of grain varying from $27\frac{1}{2}$ to 46 bu.; while in the different treatments the amount of smut varied from 0 to 5 per cent, and the grain crop from $22\frac{1}{2}$ to 50 bu. The same varieties of oats were submerged in a formalin solution, consisting of 1 pt. of formalin to 25 gal. of water. The oats were placed in sacks and immersed for 10 minutes, after which they were immediately sown. The resulting crop contained no smut, and the yield of grain was 31.2 to 69.3 bu. per acre.

Formalin as a preventive of oat smut, W. Stuart (*Indiana Sta. Bul. 87, pp.*

26).—The results of 3 years' observation on the use of formalin as a means for the prevention of oat smut are given. In the investigations considerable variation was found in the content of formalin as sold by chemical supply firms. The variation consisted not only of differences in quantity, but in the specific gravity of the solution. In the experiments the different strengths of solution were reduced so as to be comparable. Comparisons were made between hot water and formalin for the prevention of oat smut, in which the hot water proved entirely efficient, seed treated 10 minutes at 135° F. being wholly without smut, while those soaked in formalin solutions showed a few smutted plants. The efficiency of the formalin was thoroughly established, and the ease with which it may be applied renders it preferable to the hot-water treatment. The effect of sprinkling or soaking the seed was tested. The seed which was sprinkled was spread on a floor and thoroughly moistened with formalin solution. The effect of this treatment was compared with seed soaked for from ½ to 4 hours, the sprinkling method being found less efficient. The comparative value of formalin purchased in bulk and that which is put on the market in pound bottles was tested, in which no material difference was found in the two kinds of formalin used. Apparently the cheaper formalin was just as efficient as the more costly article purchased in the makers' bottles. In the course of the investigations the effect of thorough screening of seed for smut prevention was tested, in which a portion of badly smutted seed was thoroughly screened and passed through a fanning mill and then seeded, which gave a decrease of 17 per cent in the amount of smut in the crop. The influence of formalin on the yield of grain showed some remarkable results in the crop of 1899. The gains on the plats in which the seed had been soaked in formalin solutions varied from 26 to 86 per cent over the yield obtained on the check plats. The experiments were repeated in 1900, and while there was an increase noted for the treated seed, it was less than that reported for the previous year. The resistance of the smut spores to formalin and hot water was tested, with results already noted (E. S. R., 12, p. 768). It is shown that the smut spores are less resistant than grain, and that the solution continues to act upon the spores as long as the seed is wet.

The author recommends the use of a 1:60 formalin solution in which seed is soaked from 1 to 2 hours, or ½ hour soaking in a 1:45 solution. If the seed is sprinkled a 1:45 solution is recommended and the seed should be covered from 2 to 4 hours. As this strength of solution is slightly injurious to the germination of the seed, a greater amount of seed should be sown. The cost of treatment is said to be 1⅗ cts. per bushel. The practical advantage obtained from treating seed oats with formalin varies from \$1.60 to \$4.20 per acre, as shown by the author's experiments.

The prevention of oat smut, E. S. Goff (*Wisconsin Sta. Spec. Bul., Mar., 1901, pp. 4, figs. 1*).—A popular description is given of oat smut, the amount of injury caused by the fungus, and methods of prevention. The principal means suggested is the use of formaldehyde in which it is recommended that the seed be soaked or sprinkled with 1 lb. of formalin to 45 gal. of water. The cost of the treatment of the seed oats for 25 acres is placed at \$1.20, and the increased yield due to the lack of smut would give a net profit of \$11.80.

The value of formaldehyde for the prevention of potato scab and directions for its use are also mentioned.

Formalin and Massel powder as preventives of smut in oats and barley, W. Saunders (*Canada Expt. Farms Rpts. 1900, p. 12*).—Oats and barley were treated with a solution of formalin for different lengths of time, and with a fungicide known as Massel powder. In every case the amount of disease in the treated plats was less than in those plats the seed of which had not been given any treatment, but there was little preference as to the method of treatment.

Experiments to prevent smut in oats and barley, R. Robertson (*Canada Expt. Farms Rpts. 1900, pp. 283–285*).—A report is given of experiments in which formalin and Massel powder were tested for the prevention of smuts of these crops. The results obtained are decidedly in favor of the formalin treatment.

Test of smut preventives for wheat, S. A. BEDFORD (*Canada Expt. Farms Rpts. 1900, p. 342*).—A brief report is given in which copper sulphate, formalin, and Massel powder were tested for preventing the smut on Red Fife wheat. The treatment in all cases practically prevented the occurrence of smut, while the plats in which the seed had not been treated gave more than 10 per cent smutted heads.

Test of smut preventives for oats and barley, S. A. BEDFORD (*Canada Expt. Farms Rpts. 1900, pp. 348–350*).—Formalin and Massel powder as means for the prevention of the smut of oats and barley were tested, and in the case of the oats the report shows that the Massel powder did not possess much value as a preventive, while formalin treatments practically prevented all smut. In the experiments with barley the best results were obtained where the seed had been soaked for 5 to 15 minutes in a solution of 4½ oz. formalin to 10 gal. of water.

Test of copper sulphate as a preventive of smut in wheat, A. MACKAY (*Canada Expt. Farms Rpts. 1900, p. 394*).—A brief account is given of experiments with copper sulphate as a preventive of smut in spring wheat, in which seed soaked for 15 minutes gave a crop of wheat free from smut.

Test of formalin and Massel powder for the prevention of smut in oats and barley, A. MACKAY (*Canada Expt. Farms Rpts. 1900, pp. 397–399*).—The efficiency of both these fungicides for the prevention of smut of oats and barley is shown. The formalin treatment, in which the seed is soaked for 1 hour, gave the best results.

Formalin and Massel powder as preventives for smut, T. A. SHARPE (*Canada Expt. Farms Rpts. 1900, pp. 454, 455*).—In the experiments reported none of the treatments seemed to be efficient in preventing the occurrence of smut to any appreciable degree.

Experiments with Bordeaux mixture as a preventive of potato rot, W. S. BLAIR (*Canada Expt. Farms Rpts. 1900, pp. 334, 335*).—A brief report is given of spraying experiments with Bordeaux mixture on 9 varieties of potatoes, which were given 4 applications of the fungicide. The unsprayed plants at the end of the season were badly blighted, while the sprayed ones remained green and were practically free from rot. With a single exception, the yield from the sprayed plats of all varieties was in excess of that from the unsprayed.

Diseases of sugar cane, Z. KAMERLING and H. SURINGAR (*Gecombin. Meded. Proefstats. Oost- en West Java. Oost Java, 3. ser., 1900, No. 22; West Java, 1900, No. 50; reprinted from Arch. Java Suikerind., 1900, No. 24, pp. 28*).—The authors describe unsatisfactory growth and premature death of sugar cane as a result of the root rot, susceptibility of varieties to the disease, effect of fertilizing and culture on the root rot, and a bacterial disease of sugar cane.

The first symptom of root disease in the sugar cane is the unsatisfactory growth due to the inadequate water supply, which is interfered with by reason of the decay of the roots. New roots are formed above the diseased ones, but these in turn soon become affected until finally the root system is reduced to a dense mat in about 6 cm. of surface soil. During the first severe drought the plants wilt, and soon the dead leaves have the grayish-brown appearance characteristic of this disease. If diseased plants are removed to healthy soil the new roots formed among the decaying ones remain healthy, seeming to show that the disease is caused by unfavorable soil conditions. Inoculation experiments with juice from diseased canes failed to give results, but it was observed that canes into which distilled water had been injected made a better growth than those receiving either healthy or diseased juice.

The effects of wilting and premature death may be partly overcome by flooding the fields as soon as the presence of the disease is noticed. Cutting off the leaves to prevent evaporation is also practiced. Plants that die prematurely should be cut at once in order to save what juice there is. The juice is easily worked, but is small in quantity and of poor quality. Tables are given showing that the purity quotient as well as the percentage of available sugar is much lower in diseased than in healthy tissue.

Experiments with fertilizers generally gave negative results, though manure was of some benefit from increasing the humus in the soil. Lime also had a beneficial effect in a few cases. It was not possible to control the disease by draining the soil, although this had some influence in retarding its appearance. All experiments indicate that the root rot is due in some manner still unexplained to the physical condition of the soil.

Regarding the resistance of varieties the author found that all varieties are liable to the disease, but the kind known as Djamprohriel is the most resistant.

In 1898 a disease of sugar cane was described under the name of bacteriosis, by Raciborski. It is characterized by the decay of the tissue in the lower part of the stem, the decay being accompanied by a strong sour odor. It appears most frequently where plants suffer from too much water, the immediate cause being certain usually harmless ground bacteria, which multiply in the cells already broken down by an excess of water and an insufficient supply of air. The disease is not truly parasitic, but is due to the unfavorable conditions under which the cane grows. Infection experiments all failed except when conditions were provided similar to those under which the plants become diseased in the field, and in those cases the check plants as well as the infected ones became diseased.—H. M. PIETERS.

Finger and toe of cruciferous plants (*Jour. Bd. Agr.* [*London*], *7* (*1900*), *No. 3, pp. 350–352*).—A brief account is given of the disease generally known as club root of cruciferous plants, and the use of lime at the rate of 3 tons per acre is recommended as a preventive treatment. As the fungus causing this disease attacks a great number of plants of the mustard family, special attention should be paid to weeds, such as charlock, wild mustard, and shepherd's purse.

Notes on celery blight, C. O. TOWNSEND (*Maryland Sta. Bul. 74, pp. 167–182, figs. 9*).—A description is given of the celery blight (*Cercospora apii*) and an account of observations and experiments made in 1898, 1899, and 1900, in which the effect of shading and spraying the plants with ammoniacal copper carbonate solution and Bordeaux mixture is given. As a result of the experiments it is shown that the celery blight may be kept under control by the use of either of the fungicides. The tabular report shows the best results were obtained where the plants were sprayed once a week with Bordeaux mixture, but the author believes that ammoniacal copper carbonate would prove as satisfactory should the treatment be begun when the plants are in the seed bed and continue throughout the season until the weather becomes cool enough to prevent the development of the fungus. Shading retarded to some extent the progress of the disease, but did not prevent it completely.

Onion smut, A. D. SELBY (*Ohio Sta. Bul. 122, pp. 71–84, figs. 4*).—A brief account is given of the history of the onion smut fungus (*Urocystis cepulæ*), its distribution and manner of infection are described, and general directions given for the prevention of its spread. A preliminary account is given of experiments conducted for the prevention of this disease. Trials with sulphur and a solution of formaldehyde, and the use of phosphatic fertilizers were made in 1899 without any definite results. In 1890 field trials were made with the use of sulphur, various solutions of formaldehyde, salicylate of soda, salicylic acid, and lime. The results of these different treatments are shown in tabular form, and it appears that the germination of the seed was injured to some extent by a treatment of sulphur, salicylic acid, salicylate of soda, and lime slaked by sprinkling water upon it after application; while favorable influence on germination was exerted by the formalin and possibly by soil treatment of lime. The results obtained by the different treatments showed a decided superiority for the plats which had received formalin and lime, and based upon the preliminary experiment given the author recommends the application of formalin at the rate of

1 lb. to 35 to 50 gal. of water, to be applied with a sprinkler on the scattered seeds, after which they are promptly covered with earth; or the application of stone lime, spreading it before slaking and either covering or harrowing the ground soon after. Further experiments are to be conducted to establish the commercial value of the methods indicated.

The Fusicladiums of fruit trees, R. ADERHOLD (*Centbl. Bakt. u. Par., 2. Abt., 6 (1900), No. 18, pp. 593–595, pl. 1*).—In a previous paper[1] the author gave the results of his investigations on *Fusicladium dendriticum* and *F. pirinum*, and showed that they were associated in their perithecial form with *Venturia inæqualis* and *V. pirina*. In the present paper studies on the host plants and scientific relationships are discussed, especial attention being given to *F. cerasi*. For this species the author describes the perithecial form as *Venturia cerasi*, n. sp. Its host plants are said to be the various stone fruits in cultivation and doubtless many of the wild species of Prunus. The host plants for *F. dendriticum* are said to be *Pyrus malus* and its related species. A variety also occurs on Sorbus, and in all probability attacks various species of Cratægus. *F. pirinum* attacks species of Pyrus belonging to the group Pirophora. Infection experiments with *F. pirinum* showed the spores began germination at about 2° C., and were very active between 10 and 20° C. The entrance of the mycelium to the host plant is believed to be due to the presence of a ferment. The period of incubation was found to be from 12 to 14 days. As a means for combating these diseases, the author recommends the collection and burning of all fallen leaves, winter spraying with a strong copper sulphate solution, and 3 applications of Bordeaux mixture during the growing season.

The Fusicladiums of fruit trees, R. ADERHOLD (*Landw. Jahrb., 29 (1900), No. 4–5, pp. 541–588, pls. 4*).—The author describes at length a number of species of Fusicladium which occur on the more common fruit trees. The biology of the fungi, their scientific relationships, and numerous inoculation experiments are given, together with suggestions for the prevention of the diseases. The substance of this paper is noted above.

Monilia fructigena as a cause of diseases of fruit trees, L. MONTEMARTINI (*Riv. Patol. Veg., 8 (1900), Nos. 7–12, pp. 210–218*).—A description is given of this fungus, which causes the rot of many fruits. Its parasitism and methods of propagation are described. Various remedial measures are suggested, among them the use of sulphur on the ripening fruit, or spraying with Bordeaux mixture. A bibliography of about 50 titles relating to this subject concludes the paper.

The fungus diseases of orange trees in Brazil, F. NOACK (*Ztschr. Pflanzenkrank., 10 (1900), No. 6, pp. 321–335, pl. 1*).—The author describes a number of diseases of orange trees caused by parasitic fungi, several of the species of which have been hitherto undescribed. The fungi causing these diseases are *Mycosphærella loefgreni*, n. sp., *Septoria loefgreni*, n. sp., *Ophionectria coccicola*, *Colletotrichum glœosporioides*, *Glœosporium spegazzini*, and *Didymella citri*, n. sp. The technical characters of the new species are given, the nature of their attack upon the host, and, so far as known, suggestions given for the prevention of the disease.

Diseases of the pear, L. DE NOBELE (*Bul. Arbor. et Flor., 1900, pp. 45–48, 124–127, 138–140, 199–201, 238–240*).

A monograph of the Peronosporaceæ, A. N. BERLESE (*Riv. Patol. Veg., 9 (1900), Nos. 1–5, pp. 1–126, figs. 21*).—This contribution is in continuation of a previous paper (E. S. R., 10, p. 561), treating of the downy mildews, etc. In the present paper the genera Cystopus, Phytophthora, Basidiophora, Plasmopora, and Sclerospora are described. The morphological and biological characters of the fungi are described at some length, in addition to the usual systematic diagnosis of the species. Where the fungi are the cause of diseases of important economic crops the method of attack

[1] Landw. Jahrb., 1896, p. 875.

and means for prevention are discussed at considerable length. The number of species recognized by the author are as follows: Cystopus, 13; Phytophthora, 4; Basidiophora, 1; Plasmopora, 18; Sclerospora, 4.

Concerning a grape disease in the Caucasus region, L. Montemartini and R. Farneti (*Atti Inst. Bot. Univ. Pavia, 2. ser., 7 (1900), pp. 15; abs. in Bot. Centbl., 85 (1901), No. 12, pp. 204, 205*).—The authors have made a study of the fungus causing a disease of grapes in the Caucasus, the general appearance of which is similar to that of the black rot. It differs, however, from the black-rot fungus, *Physalospora* [*Lœstadia*] *bidwellii*, and also from that more recently described as *Guignardia reniformis*. The name given the organism causing the disease is *Physalospora woroninii*, a description of which is given.

Grape rots in Ohio, A. D. Selby (*Ohio Sta. Bul. 123, pp. 85–94, figs. 3*).—A brief account is given of the different diseases to which the grapes are subject, particular attention being paid the black rot and the white or ripe rot. The influence of soil and variety upon the amount of disease is shown, and suggestions given for the prevention of these diseases by the use of fungicides.

Experiments in the prevention of grape rot, A. D. Selby and J. F. Hicks (*Ohio Sta. Bul. 123, pp. 94–102*).—A report is given of a series of experiments conducted in an Ohio vineyard in which the vines were given 7 or 8 sprayings of Bordeaux mixture, formalin solution, salicylic acid and lime, and salicylate of soda. The applications were begun April 18 and continued at intervals of about 2 weeks until the middle of August. The black rot appeared at about the usual time and destroyed nearly all the crops in the unsprayed rows, and the rows sprayed with salicylate of soda and the salicylic acid-lime solution were severely injured. The cost of spraying with 4 applications of Bordeaux mixture, followed by 3 of ammoniacal copper carbonate solution, is given at $11.39 per acre. On the unsprayed portion there were practically no marketable crops. The most favorable results were obtained where 5 applications of Bordeaux mixture were followed by 3 of ammoniacal copper carbonate. The effect of omitting some of the applications was tested and it was found that the omission of spraying the young shoots just before blossoming showed as a result a loss of 90 per cent from black rot. Earlier or later omissions of spraying showed no decided loss. The total beneficial result on the vineyard experimented upon, which contained Concord grapes, was a saving of about 50 per cent of the marketable crop. Upon more favorable soils better results have been obtained. The standard strength of Bordeaux mixture (4 lbs. of copper sulphate, 4 lbs. of lime, and 50 gal. of water) proved equally as efficient as greater strengths, and shorter intervals than 2 weeks between sprayings are recommended after June 20.

Hexenbesen on cacao trees, J. Ritzema-Bos (*Orgaan Ver. Oudleer. Rijks. Landbouwschool, 12 (1900), No. 149, pp. 220–224, figs. 3*).—The author examined branches of cacao trees affected with a disease resembling the well-known hexenbesen of the cherry. The growths are thicker than the twigs upon which they are borne. They are upright, twisted, and bear small curled leaves, on one of which were formed spores of a species of Exoascus. The disease is attributed to a new species called provisionally *Exoascus theobromæ*. The remedy suggested is persistently cutting out the abnormal growths and burning them.—H. M. PIETERS.

The dwarf mistletoe in Michigan, C. F. Wheeler (*Michigan Sta. Bul. 186, pp. 27, 28, pls. 4*).—A brief account is given of the occurrence of the dwarf mistletoe (*Arceuthobium pusillum*). This mistletoe was observed on black spruce in tamarack swamps a short distance from the station. It was noticed in a number of other places and seems to be widely distributed in the upper peninsula, having been observed in nearly every tamarack swamp to a distance of a hundred miles. In some of the swamps nearly every tree had been killed. The parasite stimulates the branches of the tree to extra growth, forming witches' brooms of considerable size, and when a number of branches are affected the tree dies as a result of the attack. A fungus

(*Wallrothiella arceuthobii*) was found parasitic in the fruit of the mistletoe, and it is thought that the fungus will to a considerable extent check the spread of the pest.

Fungus diseases of forest trees, H. von Schrenk (*U. S. Dept. Agr. Yearbook 1900, pp. 199–210, pls. 5*).—The author describes some of the more important fungus diseases to which forest trees are subject, giving special reference to such as render the wood unfit for lumber. The general nature of wood-destroying fungi is described and the method by which trees become infected indicated. Among the more destructive fungi the author describes *Trametes pini*, *Polyporus schweinitzii*, *P. sulfureus*, *P. igniarius*, *P. nigricans*, *P. annosus*, *P. rimosus*, and *P. juniperinus*. In order to save the timber it is recommended that as soon as dead or severely attacked, diseased timber should be cut. This will prevent depreciation in the value of timber and also the scattering of the spores to other trees, thus spreading the disease.

A disease of elm trees, B. G. Aliño (*Jour. Roy. Hort. Soc. [London], 23 (1900), No. 3, pp. 343–345*).—A disease affecting elm trees near Tarancon, Spain, is described. The trees at this place are largely cultivated for timber, but have recently been troubled with a disease which while not apparent on the living trees, shows itself very plainly in the timber. The trees appear healthy and there is no external sign of deterioration, nor of any fungi or insects. They seem to be in a normal condition, the foliage being abundant and fruit fully up to the normal. They continue in this condition until full grown, when cracks appear in the trunk, generally on the surface at first but increasing in depth with the age of the tree until in old specimens the cracks pierce to the heart of the tree. It often happens that no injury is present when a tree is cut, but the wood after being worked falls to pieces. The author has made a careful study of the subject, but has been unable to determine definitely the cause of this peculiar behavior of the trees. As no parasites are present it is believed to be a disturbance of the physiological functions of the tree.

Concerning some fungi occurring on tropical culture plants, A. Zimmermann (*Centbl. Bakt. u. Par., 2. Abt., 7 (1901), Nos. 3, pp. 101–106; 4, pp. 139–147, figs. 24*).—Critical notes are given and new species described of a number of fungi which have been observed on economic plants in various parts of Java. The host plants in most cases were tea, coffee, cacao, betel, and *Melia azedarach*.

Two new smuts on Eriocaulon septangulare, G. P. Clinton (*Rhodora, 3 (1901), No. 28, pp. 79–82, figs. 2*).—Descriptions are given of 2 new species of smuts, namely, *Tolyposporium eriocauli* and *Ustilago eriocauli*.

A new disease of Caragana arborescens, A. von Jaczewski (*Ztschr. Pflanzenkrank., 10 (1900), No. 6, pp. 340–343*).—A description is given of a fungus disease of Caragana, which is due to attacks of an undescribed species, to which the name *Pleospora caraganæ* is given. This was previously noted from a Russian publication (E. S. R., 12, p. 859).

Chlorosis, a physiological study, C. Chevalier (*Belg. Hort. et Agr., 12 (1900), No. 9, pp. 132, 133*).

Description of the infection house and system of experiments of the Dahlem experimental field, C. von Tubeuf (*Arb. K. Gesundheitsamte, Biol. Abt., 2 (1901), No. 1, pp. 161–163, figs. 4*).

ENTOMOLOGY.

Report of the entomologist, J. Fletcher (*Canada Expt. Farms Rpts. 1900, pp. 195–248, figs. 18*).—Hessian fly was unusually destructtve during the season. In some stems of infested wheat, this insect was found associated with the wheat stem maggot. The Hessian fly was active and laid eggs considerably later in the fall than is usually the case, thus necessitating a delay in the fall wheat sowing for a week or more. The wheat stem sawfly (*Cephus pygmæus*) is reported as injurious in the Northwest Territory. For combating this insect the author recommends burning or plowing under the stubble, burning unused straw in the spring, and summer fallowing every other year. Red-backed cutworm (*Carneades ochrogaster*) was injurious to turnips and other garden plants. Grasshoppers caused considerable damage to field crops but were successfully combated by burning and plowing stubble fields and by the use of hopper-dozers and poisoned bait. The species chiefly concerned were *Melanoplus packardii*, *M. atlanis*, and *Camnula pellucida*. Brief notes are given on the occurrence and injuries of white grubs, the pea weevil, the destructive pea aphis, and pea moths (*Semasia nigricana*). In combating the last-named insect the author recommends 3 sprayings with Paris green, 1 when the blossoms begin to fall, the second a week later, and a third after another 10 days.

Descriptive and economic notes are presented on the variegated cutworm (*Peridroma saucia*), and spotted cutworm (*Noctua c-nigrum*). The author describes these species in detail and gives a summary of reports of correspondents concerning their appearance and injuries. Notes are also given on parasites and predaceous enemies of these species, and a general discussion is given of the approved remedies for fighting cutworms. The cabbage plusia is reported as having attacked chrysanthemums, smilax, and other plants, as well as cabbages. Experiments with the San José scale showed that while whale-oil soap at the strength of 2 lbs. to 1 gal. of warm water killed many of the scales, it was not as effective as the crude petroleum. The latter insecticide gave good results when used with a mechanical mixture of water, containing 30 per cent of the petroleum. This mixture caused no damage to apple trees, but should be used with care on plum and peach trees. A few San José scale escaped on every tree which was treated, and the author believes that a combination of whale-oil soap and crude petroleum may be more effective. The palmer worm caused considerable damage to apple trees on the northern shore of Lake Ontario. Greenhouse leaf tier (*Phlyctænia ferrugalis*) caused some loss by its attack upon roses, violets, and chrysanthemums. As a remedial treatment the author recommends hand picking of leaves on which caterpillars are found. *Cacœcia parallela* is reported as an enemy of rose bushes in greenhouses. It attacks the leaves and draws them together by means of silk threads. In fighting this insect the author recommends hand picking of the caterpillars and spraying or fumigation with hydrocyanic-acid gas.

Brief notes are given on a number of insects injurious to forage crops, fruits, and vegetables.

A report on apiary experiments is made by John Fixter. The natural stores of 4 colonies were extracted on September 17, and in all 8 lbs. of sugar were fed to these bees. At the beginning of the feeding the average weight of hives and colonies was 33½ lbs., and at the close 52½ lbs. Experiments were made in wintering bees and in noting the effect upon the strength of the colony of various times of moving from the winter quarters. On March 10, 18 colonies were moved, 6 being placed in a sheltered apiary, 6 in a house apiary, and 6 in an exposed apiary. The balance of the colonies were taken from their winter quarters on April 8. On April 18 an examination of the colonies showed that in every instance those that were set out first had more brood and eggs and appeared to be more active than those which were set out later. A list of plants, trees, and shrubs on which bees were seen working is given. The results of experiments with comb foundations and sections showed that the smaller the sheet of foundation which was used, the more holes or gaps there were around the comb in the sections. The author recommends, therefore, that full sheets of foundation be used.

Report of the entomologist, E. D. SANDERSON (*Delaware Sta. Rpt. 1900, pp. 142–238, figs. 19, pls. 5*).—An article on the strawberry root-louse and the destructive pea louse (pp. 143–186) has already been noted (E. S. R., 12, p. 970).

Notes are given on a number of apple insects, including *Aphis sorbi*, *A. padi*, *Steganoptycha pyricolana*, *Cacœcia rosaceana*, etc. Similar notes were published in Division of Entomology Bulletin 26 (E. S. R., 12, p. 861).

A few experiments with crude petroleum as a remedy for San José scale on pear trees indicated that a 25 per cent mechanical mixture was as effective as undiluted petroleum.

Biological and economic notes are given on *Mesograpta polita*, *Myzus porosus*, a number of insects injurious to clover, horse bots, striped cucumber beetles, bollworm, harlequin cabbage bug, and corn root-louse.

A paper on hydrocyanic-acid gas as an insecticide for low-growing plants has been previously noted (E. S. R., 12, p. 861).

The diffusion of hydrocyanic-acid vapor in an inclosed space is discussed by C. L. Penny. Preliminary experiments in taking samples of air from fumigating rooms were made by the use of 5-gallon Seltzer bottles, from which the air was exhausted and into which the gas could be admitted by a movement of the stopcock. Analysis of the air and gas mixture thus obtained indicated that immediately after the generation of the hydrocyanic-acid gas there is an excess of gas around the generator. Within 2 minutes' time this excess disappears, leaving only one-third of the normal quantity of gas near the generator, while $2\frac{1}{2}$ times the normal quantity is found at the opposite end of the fumigating box. This excess rapidly diminishes and the gas increases in density around the generator so that a tendency toward equilibrium is noted, although more than 20 minutes is required for the establishment of a perfect equilibrium. These experiments were conducted in a box with a capacity of 60 cu. ft., with dimensions 8 by 3 by $2\frac{1}{2}$ ft. Similar experiments were made in boxes of different sizes and shapes, and it is concluded that in spontaneous diffusion within a closed space the quantity of hydrocyanic-acid gas at a given point may be as low as 23 per cent of the normal quantity and as high as 27.2 per cent. Inequality does not persist for a great length of time, but is sufficient to render it certain that the amount of cyanid of potassium used per cubic foot is no guarantee of a sufficient amount of gas in all parts of the space to be fumigated, or of too little to injure the plants.

Experiments in a room 20 by 19 by 10 ft. indicated that when a generator is placed near one wall, the gas rises vertically from the generator and, following the ceiling, descends on the opposite side of the room and completes the circuit by returning along the floor. Of the total amount of hydrocyanic-acid gas, about 5 per cent remains in the generators, 7 per cent is lost by leakage or surface condensation on the walls of the room, while 88 per cent is diffused and becomes effective for insecticide purposes.

The results of these experiments were made use of in further experiments in fumigating boxes. It was found that when gas was allowed to diffuse spontaneously from 1 generator, the diffusion was very unequal for a considerable length of time, and that it was possible for an animal like the guinea pig to live at least 37 minutes in the fumigation box. It is recommended that the generator be placed below the part of the fumigating box which contains the plants and that communication be made by means of numerous slits, so as to insure the rapid and equal diffusion of the gas.

Insect attacks in 1900, R. S. MacDougall (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 13 (1901), pp. 296–305, figs. 7*).—*Phyllopertha horticola* is described in detail in its various stages. The adult beetle injures forest and orchard trees by feeding upon the leaves. The eggs are deposited in the soils of gardens and grass lawns, and the grass and fruit are injured chiefly by attacks upon the roots. It is recommended that adult beetles be shaken from trees early in the morning into some catching apparatus, and that infested soil be treated with from 3 to 4 tons of gas lime per acre.

Onion fly (*Phorbia ceparum*) is reported as having caused considerable injury during the year. Brief notes are given on the life history of the species. Infested plants may be recognized by the leaves changing to a yellow color. For combating this pest the use of kainit and nitrate of soda about the roots of plants is recommended, as well as scattering sand mixed with kerosene around the base.

Carrot fly (*Psila rosæ*) is described and brief notes given on its habits. In combating this insect the author recommends spraying with kerosene emulsion immediately after sowing, again after germination, and a third time after the carrots are thinned. Infested carrots should be removed and fed or otherwise disposed of.

Notes are given on *Sirex gigas* and *S. juvencus*, which are injurious to spruce, fir, larch, and pine. Notes are given on the habits and life history of these species. The eggs are usually deposited in diseased trees or such as have been accidentally wounded. Such trees should be felled and removed from the forest.

Some insects injurious to the violet, rose, and other ornamental plants, F. H. CHITTENDEN (*U. S. Dept. Agr., Division of Entomology Bul. 27, n. ser., pp. 114, pls. 4, figs. 29*).—The observations reported in this bulletin relate chiefly to insects which attack violets, but include, also, accounts of several greenhouse insects and species which are injurious to the rose, morning glory, and other ornamental plants.

Greenhouse leaf tier (*Phlyctænia rubigalis*) (pp. 7–26) attacks various greenhouse plants, including violets, and also celery, beets, cabbage, and tobacco. It feeds upon the underside of the leaves. The species is described in all its stages and notes are given on the nomenclature, distribution, literature, and food plants of the insect. The species hibernates in the larval state, but in warm greenhouses there is no true hibernating period. Hand picking, attracting the moths to light, the use of arsenical sprays, and fumigation with tobacco and hydrocyanic-acid gas, are recommended. The chief reliance should be placed on fumigation by the latter method. Detailed directions are given for the application of this remedy.

Violet sawfly (*Emphytus canadensis*) (pp. 26–35) is described and illustrated in all its stages. The larvæ feed on the lower side of the leaf by cutting holes on the surface. Eggs are laid in the substance of the leaf. Parthenogenesis is sometimes observed in this species. The treatment which is recommended is the same as for the greenhouse leaf tier.

Two-spotted red spider (*Tetranychus bimaculatus*) (pp. 35–42) is described and notes are given on its distribution, food plants, and literature relating to the species. As a remedy for this mite it is recommended that plants be sprayed with sulphur mixed with water at the rate of 1 oz. to the gallon, or with kerosene emulsion, whale-oil soap, or similar soap solutions. With violets good results have been obtained by repeated spraying with water or with a solution of a neutral soap in water. Violets should be sprayed in this manner about 3 times a week.

Black aphis (*Rhopalosiphum violæ*) (pp. 42–47) is described and illustrated. Notes are given on the injury caused by this species and on the literature relating to this species. Fumigation with hydrocyanic-acid gas or spraying with a solution of neutral soap and water is reported as an efficient remedy against this species.

Violet gall fly (*Diplosis violicola*) (pp. 47–50) folds violet leaves in such a way as to bring the upper surfaces together, forming a so-called gall. The species is described and brief notes are given on the extent of its injuries. Fumigation with hydrocyanic-acid gas and the use of buhach is recommended.

Descriptive, biological, and economic notes are presented on a number of species of cutworms and owlet moths (pp. 50–74). The species which are considered include *Peridroma saucia*, *Noctua c-nigrum*, *Prodenia commelinæ*, *P. ornithogalli*, *P. eudiopta*, and the fall army worm. It is recommended that soil for greenhouses should not be taken from areas which have been recently covered with grass or weeds, since cutworms may be contained in such soil. Cutworms are destroyed to some extent by fumigation for other insects, but the best remedy is the use of green bait, such as clover or other plants, poisoned with Paris green, or a bait known as bran arsenic mash.

For white grubs in greenhouses (pp. 74–77) the author recommends the use of bisulphid of carbon, kerosene emulsion, and poisoned baits. The last-named method is perhaps most effective. Complaints which have been received concerning injuries in greenhouses from the larvæ of *Allorhina nitida* were so indefinite that the author attributes the injury to cutworms.

Wireworms (pp. 77, 78) may be combated by the use of strong brine or salted fertilizers in the soil, when the plants will endure these substances. The form of bait recommended for these insects consists in slices of potatoes or other vegetables poisoned with arsenic.

A number of miscellaneous insects injurious to violets are discussed (pp. 79–83) and brief notes given on the methods for combating them.

Rosebud worm (*Penthina nimbatana*) (pp. 83–87) is described and illustrated and notes are given on its injuries and distribution. This species and also rose-leaf tier (*P. cyanana*) may be combated in the same manner as recommended for the greenhouse leaf tier. Brief notes are also given on *Cacœcia rosaceana*, *C. rosana*, and other species.

Fuller's rose beetle (*Aramigus fulleri*) (pp. 88–96) is described in all its stages and notes are given on the literature, distribution, and food habits of the insect. It is recommended that the beetles be destroyed by hand picking and jarring and that the larvæ be treated by injections of carbon bisulphid into the soil, or the use of kerosene emulsion and tobacco waste about the roots of the plants.

A flower beetle (*Hoplia callipyge*) (pp. 96–98) is reported as injurious to roses in parts of California. The life history of this species is not well understood, but the author recommends a line of treatment similar to that which should be adopted against the rose chafer.

Rose curculio (*Rhynchites bicolor*) (pp. 98–100) is reported as injuring roses by boring holes in the buds. The species has become of economic importance in a number of localities. Hand picking and jarring the bushes is recommended, as well as spraying with Paris green at the rate of 1 lb. to 150 gal. of water. Brief notes are also presented on other insects injurious to the rose, including *Cladius pectinicornis*, *Trichius piger*, *Elaphidion villosum*, and *Heliothis rhexiæ*.

Morning-glory leaf cutter (*Loxostege obliteralis*) (pp. 102–108) is reported as causing considerable damage to morning glories by gnawing the leafstalks on the upper side near the leaf, so that the leaves hang down and wilt. The species also occurs on peppermint and spearmint. Notes are given on its life history and habits. Spraying with arsenicals is recommended for combating this species.

Fickle midge (*Sciara inconstans*) (pp. 108–113) is described in its different stages and notes are given from correspondents on the distribution of the species. The author recommends fumigation with hydrocyanic-acid gas for the adults and the use of tobacco, bisulphid of carbon, or kerosene emulsion, about the soil of affected plants, as treatment for the larvæ.

Insect enemies of tree and fruit, and how to control them, E. C. GREEN (*Trans. Illinois Hort. Soc., n. ser., 34 (1900), pp. 114–125*).—Brief notes on insecticide methods which are most effective in controlling scale insects, tree hoppers, borers, leaf-eating caterpillars, plum curculio, and codling moth.

Insect and animal life on the Upper Peninsula Experiment Station, R. H. PETTIT (*Michigan Sta. Bul. 186, pp. 28–42, pl. 1, figs. 6*).—Brief notes are given on a species of tree-hoppers and leaf bugs, including the holly-hock bug (*Orthotylus delicatus*), fall army worm, white-marked tussock moth, fall webworm, cabbage worms, mosquitoes, wheat-head fly, flat-headed apple-tree borer, cherry-tree leaf beetle, *Phorocera doryphoræ* and *Xylococcus betulæ*. A list is given of the moths, molluscs, spiders, and insects which were found in the Upper Peninsula.

Chronological account of the Royal Entomological Station at Florence from 1886-1897, G. DEL GUERCIO (*Nuove Relaz. R. Staz. Ent. Agr., 1. ser., 1900, No. 3, pp. 161–369*).—In this article the author has brought together notes on the insects injurious to various cultivated crops and the dates of their appearance as reported to the station for a series of years.

Insects injurious to beets (*Landtmannen, 11 (1900), No. 46, pp. 571–574.*)—An account is given of the habits and life history of *Cassida nebulosa*, which is reported as being very injurious to beets. Its natural food plants are said to be species of Chenopodium and Atriplex. Spraying with Paris green proved very effective in the destruction of the pest.

Mites injurious to field crops, A. Berlese (*Riv. Patol. Veg., 8 (1900), No. 7–12, pp. 227–297, figs. 61*).—This paper contains descriptions, biological and economic notes on a large number of genera, including Pediculoides, Bryobia, Tetranychus, Tarsonemus, etc. A bibliography is given of literature relating to the subject.

The destructive green-pea louse, F. H. Chittenden (*U. S. Dept. Agr., Division of Entomology Circ. 43, 2. ser., pp. 8, figs. 3*).—A brief description is given of the insect in its different stages, together with an account of the extent of injury to peas and other plants upon which it depredates. Mention is made of a number of natural enemies of this insect, including the lady beetles, lace-wing flies, red mites, syrphus flies, and a parasitic fungus *Empusa aphidis*. Among the artificial remedies which are recommended for controlling this insect, mention should be made of the use of kerosene-soap emulsion, the brush and cultivator method, the brush and pan method, and rotation of crops.

Experiments with lime mixtures for the eradication of scale insects, W. T. Macoun (*Canada Expt. Farms Rpts. 1900, pp. 119–123*).—Experiments in whitewashing trees to retard the swelling of buds in the spring showed that this treatment was effective in destroying the oyster-shell bark-louse. The formula used was lime 60 lbs., water 24 gal., skim milk 6 gal. This produced a thick mixture which was difficult to spray. The trees were sprayed 6 times, and since this was considered too expensive for treatment against scale insects, experiments were tried to determine how many applications were necessary for this purpose. In these experiments 2 lbs. of lime were used to the gallon of water, and the trees were sprayed on November 17, 20, 27, and December 7. The mixture did not adhere as well as when skim milk was used, and began to peel off after a period of 10 days. The results indicated, however, that 2 sprayings were quite sufficient to give satisfactory results in destroying the oyster-shell bark-louse.

Further experiments were made to determine the minimum strength of lime necessary to obtain satisfactory results. These experiments, while not leading to definite conclusions in all respects, indicated that the best time to spray for this purpose is in autumn rather than winter or spring. An apple tree was sprayed twice with a solution containing 2 lbs. of lime, 1 gal. of water, 1 quart skim milk, 5 oz. of salt. The second spraying was done when the leaf buds were opening. No injury resulted to the tree. Experiments with lime mixtures on peach trees infested with the San José scale, and on plum trees infested with the New York scale, indicated that these scales were not destroyed by this method.

Experiments in Italy in destroying the scale lice of cultivated plants, G. Del Guercio (*Nuove Relaz. R. Staz. Ent. Agr., 1. ser., 1900, No. 3, pp. 417–420*).—The experiments reported in this article were carried out with the assistance of Prof. E. Baroni. These experiments showed that a single treatment with a soap emulsion of oil of tar containing 1 per cent of tar was quite efficient against young scale lice just hatched, but did not completely rid the plants of infestation. A 2 or 3 per cent solution of the same mixture was very effective and plants thus treated seemed to make a vigorous growth.

The San José scale, J. Ritzema-Bos (*Tijdschr. Plantenziekten, 6 (1900), No. 5–6, pp. 152–159*).—The author discusses the dangers from importing San José scale on nursery stock and fruit, and concludes that there is little likelihood that San José scale which are imported on fruit will escape into orchards.

San José scale, Y. Sjöstedt (*Svenska Trädgårdsfor. Tidskr., 1900, Nos. 10, pp. 153–156; 11–12, pp. 180–182, figs. 6*).—A general account of the habits, life history, and remedies for this insect.

Pure kerosene for San José scale (*Agr. Gaz. New South Wales, 12* (*1901*), *No. 2, p. 236*).—Apple trees were painted with pure kerosene during a dormant condition. The scales were all killed by the application and the trees were not injured.

Classification of Aspidiotus, G. Leonardi (*Riv. Patol. Veg., 8* (*1900*), *No. 7–12, pp. 298–369, figs. 22*).

The scale insect and mite enemies of citrus trees, C. L. Marlatt (*U. S. Dept. Agr. Yearbook 1900, pp. 247–290, pls. 6, figs. 25*).—The author presents a general account of the life history and habits of scale insects, with especial reference to those which are injurious to citrus trees. A discussion is also given of the various methods which have been found most successful in treating these insects, including various sprays and fumigation with hydrocyanic-acid gas. Special descriptive, biological, and economic notes are given on *Mytilaspis gloveri*, *M. citricola*, *Aspidiotus ficus*, *A. aurantii*, *A. hederæ*, *Parlatoria pergandei*, *Chionaspis citri*, *Lecanium oleæ*, *L. hesperidum*, *L. hemisphæricum*, *Ceroplastes floridensis*, *C. cirripediformis*, *Icerya purchasi*, *Dactylopius citri*, *Aleyrodes citri*, *Phytoptus oleivorus*, and *Tetranychus sexmaculatus*.

Phylloxera, J. A. Ortiz (*Bol. Ofic. Agr. Ganadera, 1* (*1901*), *Mar., pp. 63–67*).—A general description of the insect and a historical account of its introduction into Argentina.

Smyrna fig culture in the United States, L. O. Howard (*U. S. Dept. Agr. Yearbook 1900, pp. 79–106, pls. 7, figs. 7*).—This article contains a historical account of the introduction of the fig insect into California, with brief notes on the possibility of fig culture in the United States. The various stages of *Blastophaga grossorum* are described and illustrated.

Insects injurious to pine trees, K. Hagström (*Landtmannen, 11* (*1900*), *No. 51, pp. 821, 822*).—The life history and injurious habits of *Hylesinus piniperda* are described in considerable detail. As a remedy against this insect it is suggested that a few pine trees be felled in January and allowed to remain upon the ground until the larvæ are ready to change into the pupal condition. The bark may then be stripped from such logs and burned along with the larvæ.

Mites injurious to animals, R. S. MacDougall (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 13* (*1901*), *pp. 244–276, figs. 8*).—A general scheme of classification for mites is presented and a discussion is given of injurious ticks and approved remedies for combating the common species which are injurious to animals. Among the mites which are discussed in the report, mention may be made of *Demodex folliculorum*, *Trombidium holosericeum*, *Leptus autumnalis*, species of Sarcoptes, Psoroptes, and Symbiotes, which cause mange on domestic animals, sheep tick, dog tick, and chicken mite. A general discussion is given to the subject of dips for use in the treatment of sheep scab.

Protection of animals against the attacks of flies, G. del Guercio (*Nuove Relaz. R. Staz. Ent. Agr., 1. ser., 1900, No. 3, pp. 421–424*).—The author had considerable success in driving away forest flies (*Hippobosca equina*) by the use of a solution of olive oil and kerosene. Similar experiments were tried in protecting cattle against the attacks of *Tabanus autumnalis*, *T. bovinus*, and *T. morio*. An animal treated with this solution was observed for a period of 2 hours in a locality where the Tabanidæ were numerous, and during this time only 3 skin punctures were made and those were in locations which had not been reached by the insecticide. Another animal which was left without an application of the insecticide was seriously bitten by the flies. The mixture recommended by the author contains 100 parts of olive oil and 5 parts of kerosene.

Parasites of insect pests, C. Harper (*Jour. Dept. Agr. West. Australia, 3* (*1901*), *No. 2, pp. 114–122*).—This article contains notes on a dipterous parasite of grasshoppers and observations on parasites of the fruit fly and black scale. Notes are also presented by A. Despeissis on injurious rabbits, the fertilization of the Smyrna fig, and on the codling moth and bumblebee.

Dust spray, J. J. Kiser (*Trans. Illinois Hort. Soc., n. ser., 34 (1900), pp. 218–223*).—The author discusses the effectiveness and convenience of application of insecticides and fungicides in a dry form.

Chemistry of insecticides and fungicides, F. T. Shutt (*Canada Expt. Farms Rpts. 1900, pp. 185–187*).—The author made analyses of whale-oil soap and Arborine. The efficient action of whale-oil soap is supposed to require that the soap be made of potash rather than soda, since the former mixture is soft soap and the latter hard soap. Analyses of a number of the samples were made for determining the water and potash content. As compared with what is considered the standard for such soaps, these samples were somewhat deficient in potash. As whale-oil soap is frequently considered a stimulant to the growth of trees, the author made an estimate of the amount of potash in an ordinary application of this insecticide. When 2 lbs. of soap are used per gallon and about 2 gal. of the solution sprayed upon a mature tree, it is estimated that 14 lbs. of potash are sprayed upon each acre of ground. It is not believed that the potash is absorbed through the leaves, but that after being washed off upon the ground it gains entrance to trees by root absorption.

The samples of Arborine analyzed indicated that the substance is essentially a mixture of ocher, sulphur, and asafetida. It is stated that it probably acts as a deterrent against the attacks of certain insects, but that the price asked for the compound is too great in comparison with the cost of the constituents.

Bibliography of the more improtant contributions to American economic entomology, VII, N. Banks (*U. S. Dept. Agr., Division of Enotmology, pp. 113*).—A list is given containing 1,383 titles of entomological articles which appeared during the years 1897–1899, inclusive. A considerable portion of the titles listed are newspaper articles.

FOODS—NUTRITION.

A new process of bread making, G. Lebbin (*Hyg. Rundschau, 10 (1900), No. 9, pp. 409–415*).—Experiments are reported on a process of bread making in which the grain is soaked, and on the composition of the bread, and its digestibility as determined in 2 trials.

Leguminous bread, R. Fanto (*Ztschr. Angew. Chem., 1900, pp. 979, 980; abs. in Jour. Soc. Chem. Ind., 19 (1900), No. 11, p. 1031*).—A flour suitable for bread making, according to the author, is obtained by mixing bean meal and wheat gluten. Bread made in different ways from such flour mixtures is described.

Malted bread, Goodfellow (*Sanitary Home, 3 (1901), No. 5, pp. 116–118*).—A synopsis of a lecture printed in the "Epicure."

The food value of meats, Helen T. Sheldon (*Agr. Student, 7 (1901), No. 8, pp. 154, 155*).—A brief summary.

When is meat spoiled? C. Mai (*Ztschr. Untersuch. Nahr u. Genussmtl., 4 (1901), No. 1, pp. 18–21*).—Experimental data are reported. According to the author decomposition of meat may be divided into 4 stages. The first is not characterized by the presence of chemical decomposition products, although after 3 or 4 days the ratio of ammonia to total nitrogen is increased. In the second stage amin bases of the aliphatic series, especially trymethylamin can be detected as well as amido acids. The third stage is one of marked decomposition. It is characterized by the odor, etc. In this stage, the amido acids disappear and fatty acids are observed and also, at times, indol and skatol. The amins become so abundant that they may be easily isolated. Finally ptomaines, for instance, putrescin, are observed. In the fourth stage, all these bodies slowly disappear, being replaced by simpler decomposition products, until finally only ammonia is noted. Naturally the first two stages are those which are of most interest to students of nutrition. If the ammonia content of any sample of meat or meat product exceeds the normal, such goods can not longer be recommended, and if more than a trace of trymethylamin occurs, the meat is spoiled from a chemical standpoint. In case of sausages, the skins are characterized by the early occurrence of hydrogen sulphid, indol, and skatol, as well as relatively large amounts of amins and fatty acids. Therefore especial attention should be paid to the skins of the sausage and the material immediately adjoining, as this portion shows the first indications of decay.

Contribution to the subject of the elementary composition and the heat of combustion of the muscular tissue of different animals, A. Köhler (*Ztschr. Physiol. Chem., 31 (1901), No. 5–6, pp. 479–519*).—The elementary composition of the heat of combustion of a number of kinds and cuts of meat are reported in detail and the analytical methods followed are described. The average values for several sorts of meat follow:

Average composition of a number of kinds and cuts of meat.

	Carbon.	Hydrogen.	Nitrogen.	Sulphur.	Oxygen.	Heat of combustion per gram.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Calories.*
Beef	52.54	7.14	16.67	0.52	33.12	5,677.6
Pork	52.71	7.17	16.60	.59	22.95	5,675.8
Mutton	52.53	7.19	16.61	.69	22.96	5,638.7
Rabbit	52.83	7.10	16.90	......	......	5,616.6
Chicken	52.36	6.99	16.88	.5	23.28	5,617.3
Horseflesh	52.64	7.10	15.55	.64	24.08	5,599.0

The author concludes from his observations and the work of other investigators that it is not possible to extract all the fat from animal food even if the extraction is long continued.

Contribution to the examination and judging of egg pastes, A. Beythien and E. Wrampelmeyer (*Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), No. 4, pp. 145–156*).—Method and results are given of the analyses of a number of samples of egg noodles and similar goods.

The value of potatoes as food, C. F. Langworthy (*U. S. Dept. Agr. Yearbook 1900, pp. 337–348, figs. 3*).—The botanical structure, chemical composition, and nutritive value of potatoes are discussed, together with the effects of cooking, flavor, and other related topics.

Food value of the sweet potato (*Queensland Agr. Jour., 7 (1901), No. 4, p. 300*).—A brief note quoting composition.

The sweet potato, G. McCarthy (*Bul. North Carolina State Bd. Agr., 22 (1901), No. 4, pp. 33–35*).—A descriptive article giving also methods of preparation for the table.

Rice cookbook, Mrs. S. A. Knapp (*Houston, Tex.: S. F. B. Morse, 1901, pp. 1–48, figs. 15, dgms. 2*).—The food value of rice is discussed at some length, and a large number of recipes given for cooking rice.

The dietetic value of sugar, H. W. Gardner (*Birmingham: Hall & English, 1901, pp. 15; British Med. Jour., 1901, No. 2104, pp. 1010–1013*).—A general article summarizing the modern views on the subject, read before the Shropshire and Mid-Wales Branch of the British Medical Association.

The crude fiber content of shelled cocoa, F. Filsinger (*Ztschr. Oeffentl. Chem., 6 (1900), pp. 223–227, 471; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), No. 9, pp. 400, 401*).—Results of analytical studies are reported and discussed.

Analyses of Paraguay tea, K. Dieterich (*Ber. Pharm. Gesell., 11 (1901), p. 253; abs. in Chem. Ztg., 25 (1901), No. 48, p. 184*).—The caffein content of a sample of the crop of 1898 was 0.85 per cent. A sample of the crop of 1900 contained 1.22 per cent and a cultivated article of that year 1.28 per cent.

The composition and judging of raisin wine, A. SCHNUGAUS (*Arch. Pharm., 239 (1901), No. 2, pp. 91–95*).—A descriptive article with analyses.

The dietary on troop ships (*British Med. Jour., 1901, No. 2097, p. 598*).—A brief note on the diet on British hired troop ships.

The new workhouse dietary order (*British Med. Jour., 1901, No. 2098, pp. 679–681*).—Extracts from the tables of dietaries recently ordered by the Government for the British workhouses.

The new workhouse dietaries (*British Med. Jour., 1901, No. 2098, p. 659*).—A brief discussion.

Some of the singular foods of the Filipinos, G. D. RICE (*Sci. Amer., 84 (1901), No. 3, p. 35, fig. 1*).—Notes on the use of grasshoppers, moths, and bats as food.

Are the teachings of science regarding food economy practical? A. P. BRYANT (*Dietet. and Hyg. Gaz., 17 (1901), No. 4, pp. 198–200*).—The possibility of the practical application of scientific studies of nutrition is pointed out.

The use and abuse of food preservatives, W. D. BIGELOW (*U. S. Dept. Agr. Yearbook 1900, pp. 551–560*).—The history of food preservatives is briefly reviewed and the important characteristics of a number of the more common ones are described. The author also discussed the restrictions which should attend the use of preservatives.

Report of the State Food Commissioner of Illinois, A. H. JONES (*Illinois State Food Com. Rpt. 1899–1900, pp. 122*).—A compilation of the laws of Illinois covering the inspection and sale of food products and the first year's work of the food commissioner in carrying out the provisions of those enactments.

Report of the Dairy and Food Commissioner of the State of Michigan, 1900 (*Michigan State Dairy and Food Com. Rpt. 1900, pp. 245*).—This volume includes the usual reports of inspection of foods, dairies, cheese factories and creameries, together with results of analyses for the detection of adulterants and related topics.

Fourteenth annual report of the Ohio Dairy and Food Commissioner, 1899, J. E. BLACKBURN (*Ohio State Dairy and Food Com. Rpt. 1899, pp. 317*).—Reports are given of the analyses made under the State pure-food laws of foods, condiments, and drugs. Court decisions are also included, as well as the usual statistical matter.

ANIMAL PRODUCTION.

Fodders and feeding stuffs, F. T. SHUTT (*Canada Expt. Farms Rpts. 1900, pp. 166–177*).—The author reports the composition of rape at different stages of growth, and of a number of different varieties of Lathyrus, of vetch, mangels, carrots, turnips, sugar beets, cotton-seed meal, bran, cocoanut meal, corn meal, low-grade flour feed, and condimental stock feed. The composition of the different sorts of Lathyrus and vetch follows:

Composition of varieties of Lathyrus and vetch.

	Water.	Protein.	Fat.	Nitrogen-free extract.	Fiber.	Ash.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Wild pea from North Bay (*Lathyrus maritimus*)	81.01	4.22	0.24	7.63	5.35	1.55
Grass pea (*Lathyrus sativus*)	87.06	3.03	.11	4.74	3.66	1.40
Wagner's Wood Pea (*Lathyrus sylvestris* var. *Wagneri*)	83.66	4.49	.05	5.05	5.60	1.15
Purple-tufted vetch (*Vicia cracca*)	74.91	5.49	.12	10.20	7.20	2.08

Wheat and molasses in the feeding of farm animals, L. MARTIN (*Jour. Soc. Agr. Brabant-Hainaut, 1900, pp. 699, 700*).—A discussion of the subject.

Feeding stuff inspection, C. D. Woods and J. M. Bartlett (*Maine Sta. Bul. 71, pp. 25–40*).—In accordance with the State law, the protein and fat were determined in a large number of samples (collected in December, 1900) of cotton-seed meal, gluten meal, gluten feed, oil meal, cereal food by-products, and mixed feeds.

Fattening steers of different types on clover, with and without grain, R. S. Shaw (*Montana Sta. Bul. 27, pp. 3–10*).—To learn whether local farm products can be profitably used in finishing range steers for market, to what extent it is profitable to use grain with clover in a fattening ration, and to compare the relative values of typical beef animals as meat producers with those of the dairy type, a test was made with 16 steers showing Shorthorn, Hereford, Angus, Jersey, and Holstein blood. The steers were so divided that lot 2 contained 6 animals of good beef type, showing only Shorthorn and Hereford blood; lot 3 contained 5 animals of the dairy type, showing a mixture of Jersey, Holstein, Angus, and native blood, while lot 1 contained the 5 animals remaining after the others were selected. Lot 1 was fed clover only, while lots 2 and 3 were fed clover and barley. The steers weighed not far from 1,200 lbs. each at the beginning of the test, which covered 71 days. The average daily gain in the three lots was 1.73, 2.55, and 2.1 lbs. per head respectively; the cost of food per pound of gain being 6.12, 4.84, and 5.56 cents. The steers in lot 1 consumed on an average 35.3 lbs. of clover per head per day; those in lot 2, 25.5 lbs. clover and 7.9 lbs. barley; and those in lot 3, 21.6 lbs. clover and 8.6 lbs. barley. The net profits on feeding the three lots were $20.78, $33.71, and $23.44, respectively.

The steers were provided with temporary sheds and in the author's opinion this form of shelter is satisfactory. Some of the other conclusions follow:

"In our Montana valleys, where clover or alfalfa can be grown, these crops can be profitably used in the production of beef in a finished form. And the quality of these foods is such, owing to favorable conditions for the curing and storing of the hays, that only a comparatively small amount of grain is needed along with them to secure the best results.

"Barley can be profitably used in conjunction with clover and alfalfa under our State conditions. Only small quantities of grain are necessary to give maximum results. The quantity need not exceed three-quarters of a pound of grain per day for each hundred pounds of live weight. Any excess above this amount will not give a proportionately greater gain and will materially increase the cost of production. . . .

"In selecting steers to feed it is essential that only those of the beef type be used."

Steer experiments, J. H. Grisdale (*Canada Expt. Farms Rpts. 1900, pp. 73–79*).—The gains made by 3 lots of 9 steers each were studied. Lots 1 and 2 were dehorned; lot 1 was tied and lot 2 was loose. The steers in lot 3 were not dehorned, but were tied. All the steers weighed about 960 lbs. each at the beginning of the test. They were feed roots, silage, straw, and grain. In 184 days the average daily gain per steer in the 3 lots was 1.36, 1.30, and 1.49 lbs. respectively, the cost per pound of gain being 5.9, 6.5, and 6.2 cts. respectively.

The comparative gains made by yearlings, two-year-olds, and three-year-olds were tested with 2 lots of 9 animals each. Both lots were fed roots, silage, straw, and grain, the test covering some 6 months. The yearlings averaged a daily gain of 1.11 lbs., at a cost of 5 cts. per lb. Corresponding values for the two-year-olds were 1.49 lbs. and 6.2 cts., and for the three-year-olds, 1.53 lbs. and 6.8 cts.

A limited ration and a full fattening ration were compared with 2 lots of 5 steer calves each. The limited ration consisted principally of skim milk, oats, shorts, silage, and hay; the full ration, of skim milk, oats and corn, oil meal, bran, silage, and hay. In the 28 weeks of the test the average daily gain per steer on the former ration was 1.31 lbs., at a cost of 2.35 cts. per lb., and on the latter, 1.44 lbs., at a cost of 2.32 cts. per pound.

Steer feeding—dehorning, R. Robertson, S. A. Bedford, and A. Mackay (*Canada Expt. Farms Rpts. 1900, pp. 303–308, 363–365, and 428–430*).—At the Experimental Farm for the Maritime Provinces the advantages of dehorning steers were tested with 12 steers. The steers were fed loose and tied in stalls. The principal deductions follow: "Dehorning reduced the weight of a 1,200 pound steer about 50 pounds. It required about two weeks' feeding to regain the weight lost. . . . Dehorning is of no advantage when steers are tied up in stalls, except for the comfort it gives to those caring for them. The feeding of dehorned steers in a loose box is an advantage (1) in increased gain in flesh; (2) less cost for labor in attending them; (3) manure better made, requiring about 50 per cent more straw to keep them clean, which may be an advantage or a disadvantage, according to the situation and opinion of the feeder."

The comparative merits of a medium and a heavy ration were tested with 2 lots of steers. According to the author, "there did not appear to be any gain in flesh from extra feeding," while the heavier ration was the more expensive.

The effects of dehorning cattle were tested at the Brandon Experimental Farm with 3 lots of 5 steers each. In 133 days the dehorned steers tied in stalls gained 950 lbs.; those not tied gained 964 lbs. In the same time 5 steers which had not been dehorned gained 968 lbs. "The experiment, as a test of dehorning, was a very successful one, and would lead us to the conclusion that dehorning has very little effect on the animal either one way or the other."

At the Indian Head Experimental Farm a dehorning experiment was made with 3 lots of 5 animals each, all weighing about 1,200 lbs. at the beginning of the trial. They were fed a mixed ration for 16 weeks. The average gains follow: Steers, dehorned, tied in stalls, 281 lbs.; dehorned, not tied, 235 lbs.; not dehorned, tied in stalls, 234 lbs.

Fattening lambs on clover, with and without grain, R. S. Shaw (*Montana Sta. Bul. 27, pp. 11–22*).—The value of grain supplementing clover in feeding lambs for market was studied with 60 lambs divided into 3 equal lots. After a preliminary period lot 1 was fed on clover and damaged wheat, lot 2 on clover only, and lot 3 on clover and oats. Lots 1 and 3 were also given some roots. The lambs weighed about 77 lbs. at the beginning of the test, which lasted 90 days. The average daily gain of the three lots was 0.32, 0.27, and 0.35 lb. per head, respectively, the average cost per pound of gain being 3.22, 3.54, and 4.39 cents. The lambs in lot 1 consumed 6.38 lbs. of clover and 2.8 lbs. of wheat per pound of gain; those in lot 2 consumed 11.8 lbs. of clover, while in lot 3 the amounts eaten were 6.10 lbs. clover and 2.65 lbs. oats. The net profit per head for the 3 lots was 96, 82, and 62 cents, respectively.

The results obtained in feeding 20 Shropshire lambs were compared with those obtained under similar conditions in a previous test (E. S. R., 12, p. 72) with 16 Merino grade lambs, the former being of the mutton type and the latter of the wool type. The Shropshires in 10 months gained 10.58 lbs., consuming 6.10 lbs. of clover and 2.64 lbs. of grain per pound of gain, while the Merinos in the same time gained 8.97 lbs., consuming 6.43 lbs. of clover and 2.64 lbs. of grain. The cost of food per pound of gain in the two lots was 4.39 and 4.62 cts., respectively. Some of the author's conclusions follow:

"The less expensive grains can be profitably used along with clover in mutton production. They will increase the gains and improve the quality. Grains at a high price . . . render the cost of feeding too high unless used in very small amounts."

Sheep-feeding experiments at Mains of Airleywight, A. P. Aitken (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 13 (1901), pp. 176–205*).—The author reports work undertaken by W. Hutcheson to supplement previous experiments (E. S. R., 12, p. 173) regarding the comparative value of common feeding stuffs for sheep. The test was begun with 7 lots of 20 sheep each. All the lots except number 7 were fed a basal ration of turnips and hay. In addition lots 2 to 6 were given, respectively, undecorticated cotton-seed cake, undecorticated cotton-seed cake and crushed maize, crushed maize, dried distillery grains, and linseed cake. Lot 7 was fed turnips and linseed cake but no hay. In 105 days of the test the average gain in lot 1 was 22.1 lbs., in the other lots the gains ranged from 34.8 lbs. with lot 4 to 39.0 lbs. with lot 5. The general deductions were summarized as follows:

"It pays to give sheep some by-fodder along with turnips and hay, but with good feeding turnips the profit is not great.

"The giving of a by-fodder shortens the time of fattening and increases the weight of the mutton (in this instance by 5 lbs. or so), but this additional weight is probably got at the sacrifice of flavor.

"Sheep fatten sooner upon turnips and linseed-cake than they do when hay is given in addition, and it does not seem that the addition of hay is attended with profit. In this instance it caused a loss of 82 cts. per head at least.

"A mixture of undecorticated cotton-cake and maize is better than the cake alone, and it is probable that a mixture of feeding-stuffs or a change of feeding-stuff as fattening proceeds is preferable to strict adherence to any one kind of by-fodder.

"Dried distillery grains has produced the best quality of mutton, but the advantage it possesses over other kinds of by-fodder is not so apparent in this as on former occasions. This is probably due to the inferior quality of the grains used."

Sheep, J. H. Grisdale and R. Robertson (*Canada Expt. Farms Rpts. 1900, pp. 81, 82, 310*).—Statements are made concerning the flocks at the Central Experimental Farm and the Nappan Experimental Farm; and the care and management of breeding ewes is discussed.

Experiments in pork production, L. Foster and L. A. Merrill (*Utah Sta. Bul. 70, pp. 343–414, figs. 7*).—Tests covering several years are reported on summer feeding and winter feeding. In the former the value of mixed pasturage, alfalfa pasturage, and the effects of exercise were the principal questions studied. The tests on winter feeding were made with special reference to the value of roots and alfalfa hay. The comparative value of spayed vs. unspayed sows and of sows vs. barrows was studied, and on the basis of the investigations as a whole a number of general questions are discussed, including the effects of feeding balanced rations, wet, dry, and soaked grain, the comparative value of different grains, grain vs. grain and skim milk, and whole milk and grain.

Summer feeding (pp. 348–384).—The feeding experiments conducted in the summer extended from 1897 to 1899, and were made with a total of 31 lots. Some of the lots were pastured (generally on mixed grasses and clover); some were fed in pens and others in yards. The rations fed consisted of skim milk or whey, grain and alfalfa, alone or in combination. The lots fed in pens and yards had less exercise than those fed in pasture, and this point is discussed in connection with the tests. Special tests were also made of the comparative value of mixed pasturage (grasses and clover) and alfalfa pasturage, and of feeding grain after pasturage.

Winter feeding (pp. 385–408).—The winter-feeding tests began in 1894 and continued until 1899, some 34 lots being included. Some of the earlier ones were conducted by A. A. Mills. In part of the tests a number of the pigs were fed in pens; others in yards. Wet and dry rations were studied as well as the comparative value of sugar beets and alfalfa, supplemented by grain. Generally speaking, the rations consisted of skim milk, whey, and mixed grasses in different proportions, alone or with alfalfa or beets. The principal deductions drawn from the summer and winter feeding tests follow:

"In pork production economic use may be made of pasture in connection with a full-grain ration. This is shown not only by the average results of all the experiments conducted, but also by every point of comparison in each separate test. The average shows the gains of the pasture sets to be 33 per cent the higher and to have been made on 10 per cent less grain.

"The average results of four seasons' experiments show quite conclusively that mixed pasture is not beneficial to pigs having a full supply of grain and skim milk.

"The average of the 7 trials, made in both pens and yards, gives results favorable to grass feeding in connection with grain rations. The pen sets having green stuff made 33 per cent greater gains than those without, and required 40 pounds less grain for each 100 pounds of gain.

"Pasture with grain rations, averaging all the experiments, gave slightly better results than green stuff cut and fed in connection with grain in pens and yards. Where lands are cheap and labor comparatively dear, it seems advisable to follow the pasture method.

"Pigs running on pasture with partial grain rations produced gains at the least cost per hundred pounds, the quantities of food required standing in the following relation: Full grain ration 100, three-fourths 94, one-half 82, and one-fourth 66. But the total gains of those receiving full-grain rations were so much greater that even with the smaller rate of profit the total net gain per pig very much exceeded that of the partial ration.

"In the quantity of grain required for 100 lbs. of gain the sets having a one-fourth grain ration excelled in every test requiring the lowest amount and giving the highest percentage of profit.

"In rate of gain the sets receiving a full grain ration were the best in all cases, making the largest total gain and giving decidedly the highest total profit.

"Alfalfa without other food, whether pastured by pigs or cut and fed to them in pens, furnished only enough nutriment for bare maintenance. When additional food was given the rates of gain were nearly proportional to the extra quantities they received.

"Alfalfa supplies a good supplementary food in connection with bran and grain, but it is too coarse and bulky to be fed alone to the pig, whose digestive tract is especially adapted to concentrates. Alfalfa hay and sugar beets each give profitable returns in connection with a limited grain ration in winter feeding.

"In 2 out of 3 experiments better results were obtained by feeding bran and corn meal or ground wheat dry than wet. The average of the 3 tests gives a result slightly favorable to the dry food in rate of gain, but favorable to the wet in the amount of food required for 100 lbs. gain."

Miscellaneous tests (pp. 408–412).—The value of rape for fall feeding was tested with 6 pigs weighing about 50 lbs. each. They were fed in a movable pen for 49 days and given daily 1 lb. of bran and chopped wheat, 1:1, per head, in addition to the rape. The average daily gain per head was 0.204 lb.

In one of the winter feeding tests part of the animals were barrows; the remainder sows. According to the authors the comparison "does not show a marked difference in gains, no more than might easily result from the variation of the pigs selected. Representing the average daily gains of the sows by 100, the barrows stand 95. The above results show but little difference in the feeding qualities of barrows and unspayed sows."

Gains made by spayed and unspayed sows were compared with 2 lots of 3 animals each. The spayed sows weighed 142 and the unspayed 178 lbs. at the beginning of the trial, which covered 116 days. They were fed barley, bran, potatoes, milk, and whey. The average daily gain per head of the spayed sows was 0.82 lb. and of the unspayed, 0.86 lb.

"In the several tests reported the feeding qualities of unspayed sows were found to be fully equal to or slightly better than those of barrows.

"In a single test with spayed and unspayed sows, the results were slightly favorable to the open sows."

Feeding pigs on grain alone, grain and sugar beets, and grain and alfalfa, R. S. Shaw (*Montana Sta. Bul. 27, pp. 23–32*).—A test was made with 3 lots of 7 pigs each. During the first period (40 days) of the test lot 1 was given damaged wheat and oats 2:1, and during the second period (26 days) barley and oats 2:1. Lot 2 was fed smaller amounts of the same grain mixture and sugar beets in addition, while lot 3 was fed the same grain mixture with alfalfa hay. The pigs weighed on an average 112 lbs. each at the beginning of the trial. The average daily gain per head of the three lots while on the wheat ration was 1.04, 1.06, and 1.00 lbs., respectively, while on the barley ration the corresponding gain was 1.46, 1.50, and 1.49 lbs. Considering the test as a whole, the pigs in lot 1 required 5.32 lbs. of grain per pound of gain, while those in lots 2 and 3 required 4.26 and 4.86 lbs., respectively. On lot 1 there was a net profit of $1.80 per head; on lot 2, of $2.28; and on lot 3, of $1.87. Some of the author's conclusions follow:

"A straight grain ration, though it produces a rapid gain, is the most expensive method of feeding. Damaged grain can not be utilized to better advantage than when converted into pork. Grains seldom reach a market price in Montana at which they can not be marketed to equal advantage in the form of pork.

"Sugar beets are a valuable adjunct to use along with grain foods for fattening hogs. While the small percentage of [nutritive material] contained in them is of value, the beneficial effects produced on digestion and the assimilation of other foods is very marked. The figures indicate that by their use a saving of grain is effected, and the quality of the meat improved.

"Alfalfa as a food adjunct for fattening hogs is valuable. While it should not be forced into a ration, cut and mixed with meal in such large quantity as to render it bulky, small quantities can be used to good advantage in this way, or supplied whole in racks. It lessens the cost of production, aids in keeping the animals in a good thrifty condition, and improves the quality of the meat produced. We have not found its use equal to sugar beets or mangels."

Molasses and maize germ molasses; feeding experiments with pigs, M. Gerlach (*Jahresber. Landw. Vers. Stat., Jersitz.-bei-Posen, 1898–99; abs. in Centbl. Agr. Chem., 30 (1901), No. 2, p. 104*).—The pigs fed maize germ and molasses made better gains than those fed meal.

Pigs, J. H. Grisdale (*Canada Expt. Farms Rpts. 1900, pp. 79–81*).—Statements are made concerning the cost of gain by pigs pastured on clover, fed steamed clover, mangels and skim milk in addition to grain, and also by 3 lots fed grain alone. One of these was fed three times a day; another was fed with a self-feeder. The cost of a pound of gain ranged from 4.2 cts. on clover pasturage and grain to 2.24 cts. on skim milk and grain.

Swine, R. Robertson (*Canada Expt. Farms Rpts. 1900, pp. 308–310*).—In addition to statistics regarding pigs kept at the Experimental Farm for the Maritime Provinces 2 tests are briefly reported. A lot of 16 pigs was pastured on good clover for 90 days and fed shorts, corn meal, and skim milk in addition. Eight similar pigs were fed in pens the same grain ration. All the pigs were then fed corn meal and skim milk for 90 days. The pigs fed part of the time on pasture made much larger gains than those fed in pens.

Buckwheat, shorts, corn meal, and crushed oats (2:1) and pea meal and crushed oats (2:1) were compared with 4 lots of 4 pigs each, skim milk being fed in addition to the grain. The average daily gain of the 4 lots was 95.14, 94.45, 94.45, and 95.32 lbs., respectively.

Swine, S. A. Bradford and A. Mackay (*Canada Expt. Farms Rpts. 1900, pp. 366–367, 430*).—Notes on the pigs at the Brandon and Indian Head Experimental Farms.

Pumpkins, J. H. Grisdale (*Canada Expt. Farms Rpts. 1900, pp. 93, 94*).—A feeding experiment with pigs is reported. "One lot fed on raw pumpkins did fairly well, making a gain of 745 lbs. in 107 days, at a cost of $3.08 per 100 lbs. gain. They ate 2,090 lbs. pumpkins and 1,981 lbs. meal half corn, half oats, peas and barley equal parts.

"Another lot of 6 pigs, fed on cooked pumpkins, did exceedingly well, making 706 lbs. increase in 99 days, at a cost of $2.96 per 100 lbs. gain. They ate 7,500 lbs. pumpkins and 1,602 lbs. meal."

The Jerusalem artichoke (*Helianthus tuberosus*), J. H. GRISDALE (*Canada Expt. Farms Rpts. 1900, pp. 94, 95*).—Six cross-bred pigs were allowed the run of a field of artichokes 10 sq. rods in extent, from October 3 to October 24. They were fed 1½ lbs. of mixed grain per day each in addition to the artichokes, which they gathered. These were eaten greedily. The average daily gain was 1.57 lbs. at a cost of 1.8 cts. per lb.

Rape (*Brassica napus*), J. H. GRISDALE (*Canada Expt. Farms Rpts. 1900, pp. 91–93*).—A test of the value of rape for pigs is briefly reported. Six pigs pastured on a plat of 30 sq. rods of rape for 114 days and fed grain in addition made an average daily gain of 1.12 lbs. per pig. The profit per pig was $4.73.

The market classes of horses, E. DAVENPORT (*Illinois Sta. Bul. 62, pp. 18–28, fig. 1*).—Road, carriage and coach, cab, bus, and draft horses and trotters are described, and their uses pointed out. The fact is noted that aside from these standard classes, horses are required for special purposes. The discussion is summarized as follows:

"Market classes and types are fixed not by the breeds but by the uses to which horses are put. As these uses are definite, the type and the class are fixed.

"As these uses are exceedingly varied, there are often wide gaps between the market classes. A horse that drops between the classes is a cheap horse, no matter how good an animal, either because there is little use for him or because the supply is unlimited. The best horse to breed is one that most fully meets a definite, constant, and strong demand, and has therefore a high average selling price.

"The cavalry horse and the fire horse are good examples of valuable horses that the breeder can not undertake to produce because the demand is too limited. The demand for them will always be satisfied from the general supply. Phenomenally high prices are as much due to the fancy of the individual purchaser as to the character of the animal. In any event they are seldom realized and are to be sought by the dealer and not by the breeder, as they represent but one out of hundreds or even thousands—too few to breed for.

"The farmer should keep himself acquainted with standard classes in steady demand at uniformly good prices, breed these, and pay no regard to high speed, phenomenal sales, or fancy values."

Horses, J. H. GRISDALE (*Canada Expt. Farms Rpts. 1900, pp. 67–69*).—Statements are made concerning the horses at the Ottawa Experimental Farm, and the gains or losses in weight are recorded for several horses on oats and barley, corn and oats, ground and unground, and on corn alone.

Horses, A. MACKAY (*Canada Expt. Farms Rpts. 1900, p. 431*).—A note on the horses at the Indian Head Experimental Farm.

French stud farm "Le Hara du Pin" (*Orgaan Ver. Oudleer. Rijks Landbouwschool, 13 (1901), No. 154, p. 86*).—A descriptive article.

Concerning the metabolism of horses, N. ZUNTZ (*Landw. Vers. Stat., 55 (1901), No. 1–2, pp. 117–128*).—A controversial article.

Experimental contributions to the theory of heredity, J. C. EWART (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 13 (1901), pp. 81–134, figs. 20*).—The author reports and discusses his investigations in crossing zebras and horses with especial reference to reversion and telegony (E. S. R., 11, p. 1077).

Poultry raising, H. C. GARDINER (*Montana Sta. Bul. 26, pp. 28, pls. 4, dgms. 2*).—The station poultry equipment is described and general statements made concerning breeds, incubation, buildings, brooders, and similar topics, while a test on the value of the flashing point of several samples of oil used for heating incubators is reported.

To compare the relative merits of a lime and salt solution and a solution of water glass for preserving eggs, some 30 doz. eggs were preserved by the 2 methods for about 6 months. According to the author, "when examined the water glass was found to be the best pickle, although the lime and salt served its purpose very well; still the whites of the eggs preserved in this mixture were much more watery than the whites of those preserved in the water glass. These were difficult to distinguish from fresh eggs since the white was quite firm and the yolk stood up upon it just as though fresh. Another advantage in the water glass is that it does not seem to affect the shell of the egg as the lime mixture does, eggs from the lime and salt mixture being much more liable to crack either in cooking or handling."

The comparative value of a rather varied ration (meat, vegetables, and grain), a meat ration (meat, meal, and grain), a vegetable ration (vegetables, meal, and grain), and a ration of grain alone, was tested with 4 lots each containing 15 hens and 1 cock. In 3 months the total number of eggs laid by the 4 lots was 431, 407, 366, and 342, respectively. The fertility of the eggs from different pens was tested with an incubator. Of the eggs laid by the 4 lots, 232, 229, 223, and 239, respectively, were fertile. Definite conclusions are not drawn, but the author believes that "the percentage of fertility and strength of germ depends to considerable extent upon the conditions and feed of breeding birds."

Analyses are reported of the eggs from the different pens, but no marked differences in composition were observed. Other deductions follow:

"Variety rations give best results in feeding for eggs. Poultry feeding is very profitable under present market conditions in Montana. Special care should be given to number of hens placed with cock in securing best results from breeding birds. Feeding breeding birds should be carefully studied, with special care not to overfeed."

Poultry experiments, J. H. Stewart and H. Atwood (*West Virginia Sta. Bul. 71, pp. 385–402, figs. 2*).—The poultry houses recently built at the station are described and several feeding tests reported. The influence of warm houses upon the production of eggs was tested with 2 lots, each containing 12 Rhode Island Red pullets and 1 cock. The lots were fed on a mixed grain ration for 150 days beginning Nov. 24, under similar conditions except that lot 1 was kept in a poultry house in which special precautions were taken to insure warmth. The total number of eggs produced per fowl in warm houses was 52.39; in cold houses, 41.36.

Meat meal was compared with ground fresh meat and bone with 2 lots each containing 17 Plymouth Rock hens and 1 cock. Lot 1 was fed the meat meal and lot 2 the green bone. In this and the other tests reported they were also fed mixed grains. At the beginning of the test all the fowls weighed on an average 4.72 lbs. each; at the close, the 2 lots averaged 5.75 and 5.91 lbs. per fowl, respectively. In 120 days of the test, the hens in the 2 lots laid on an average 38.24 and 32.60 eggs, respectively. The former weighed on an average 12.75 lbs. per hundred eggs; the latter, 11.94 lbs.

In raising broilers, the object is to force them as rapidly as possible. The comparative value for this purpose of rations with wide and narrow nutritive ratios, was tested with 2 lots of 25 chicks each, the breeds represented being White Wyandottes and White Leghorns. Lot 1 was fed the nitrogenous ration and lot 2, the carbonaceous ration, the former being made up of grain, whole and ground, with green bone, and the latter of vegetable foods only, namely, whole and ground grain, including corn, wheat, and oats. The average weight of the chicks in the 2 lots at the beginning of the test was 0.92 and 0.98 lb., respectively. The total gain in 120 days of the test was 3.08 and 1.92 lbs. per chick, the cost of a pound of gain being 6.1 and 6.2 cents, respectively. "Neither ration had the proper composition for economical gains, one being too wide and the other too narrow. The influence of the food upon the health and development of the fowls was, however, very marked. The nitrogenous chickens were vigorous and hearty at all times, while the carbonaceous ones were sickly, poorly feathered, and had very little appetite for their food. A certain amount of animal protein seems to be necessary for poultry, and perhaps the poor development of the carbonaceous lot was caused as much by this factor as by the composition of the ration. Of the two breeds, the White Leghorns seemed to be much better able to thrive on the carbonaceous ration than the White Wyandottes, for they were much better feathered, and more vigorous than the White Wyandottes in the same pen."

The importance of a liberal supply of green food for laying hens was tested with 2 lots of White Leghorns about 5 years old. Each lot contained 20 hens and 2 cocks. The test covered 12 periods of 30 days each. Both lots were fed a mixed ration, largely grain, and the poultry runs furnished some grass. In addition, an abundance of cabbage, rape, and apples was fed to the lots alternately, to do away with the effects of individual peculiarities. During the test the fowls receiving green food consumed a total of 58 lbs. each of ground bone and beef scrap; those receiving no green food, 61 lbs. per fowl. The average weight of the fowls receiving green food was 3.89 lbs.; of those receiving no green food, 3.86 lbs. The total number of eggs produced per fowl on green food was 114.52; on a ration containing no green food, 90.39 per fowl. The eggs on the former ration weighed 11.89 lbs. per hundred; on the latter, 11.88 lbs.

The influence of an unrestricted range upon the hatching of eggs was also tested. Half of the station flock of White Leghorn fowls was allowed to remain undisturbed in the house and yard to which they were accustomed. The remainder of the flock was allowed to run at large. Both lots were fed the same ration. The eggs were tested in incubators; 80.5 per cent of those from poultry having free range and 24.4 per cent from those confined were unfertile. Of the fertile eggs, 83 per cent hatched in the former and 67.5 per cent in the latter case.

Poultry experiments, J. H. Stewart and H. Atwood (*West Virginia Sta. Bul. 73, pp. 35–47*).—Three tests on the loss of eggs during incubation are reported. The authors summarize the results as follows:

"Fertile eggs, when incubated in a normal manner, decrease in weight. The eggs which hatched lost 4.17 per cent of their weight during the first 5 days of incubation. During the 7 succeeding days they lost 6.35 per cent of the weight of the eggs at the end of the fifth day, and during the next 7 days lost 6.98 per cent of their weight at the end of the twelfth day. One hundred fertile eggs of average size will lose 234.9 gm., or 8.28 oz., during the first 5 days of incubation; 341.8 gm., or 12.05 oz., during the next 7 days; and 352.8 gm., or 12.44 oz., during the next 7 days.

"The unfertile eggs lost 3.6 per cent of their original weight during the first 5 days of incubation. During the 7 succeeding days they lost 5.6 per cent of what they weighed at the end of the fifth day, and during the next 7 days lost 5.6 per cent of their weight on the twelfth day. One hundred unfertile eggs will lose 217.2 gm., or 7.66 oz., during the first 5 days; 323.3 gm., or 11.40 oz., during the next 7 days; 306.9 gm., or 10.82 oz., during the next 7 days."

Report of the poultry manager, A. G. Gilbert (*Canada Expt. Farms Rpts. 1900, pp. 251–277, pls. 2, figs. 10*).—The usual data are given regarding the poultry kept at the Ottawa Station, the growth of chickens, number of eggs laid, and similar topics. General directions are also given for the management of chickens, turkeys, ducks, and geese, and the characteristics of a number of breeds of chickens are discussed. A comparison of the number of eggs hatched by hens and in incubators led to the following conclusions:

"Early spring eggs from hens which have laid steadily all winter and have been gently stimulated to do so, are not likely to produce a satisfactory percentage of strong germs. Eggs from the same hens after they have run outside give much better results. The condition of the laying stock at the end of the winter seems to be the source of the trouble."

The relative merits of a number of methods of preserving eggs were tested, including immersion in saturated limewater, in a solution containing 2 per cent sodium silicate, in a solution containing 5 per cent gum arabic and 1 per cent formalin, in one containing 5 per cent gum arabic and 5 per cent salicylic acid, and in one containing 5 per cent dextrin and 5 per cent salicylic acid. Eggs were also dipped for a moment in sulphuric acid, then washed and stored in a large bottle; others were dipped momentarily in sulphuric acid, washed and dipped in alkaline ammonium oxalate, then stored in a large bottle. Some of the eggs stored in limewater were first rubbed with vaseline.

"These experiments corroborate many of the results obtained last year, and give further proof of the excellence of the eggs preserved in saturated limewater. We think that, on the whole, 2 per cent sodium silicate gives better results than the 10 per cent solution experimented with last year, but we are also of the opinion that limewater is superior to both as an egg preservative. Moreover, it is cheaper and pleasanter to handle."

The eggs preserved in a solution containing 1 per cent formalin developed a marked flavor on poaching; a sample of those in the solution containing 5 per cent gum arabic and 5 per cent salicylic acid, "though not unsightly, had a most nauseating odor and was quite unfit for food." The eggs preserved in dextrin solution and those dipped in sulphuric acid were all bad.

Poultry, 1899–1900, R. Robertson, S. A. Bedford, and A. Mackay (*Canada Expt. Farms Rpts. 1900, pp. 311 and 368*).—A brief report regarding the poultry kept at the Maritime Provinces, Brandon, and Indian Head Experimental Farms.

Squab raising, G. H. Pollard (*Reliable Poultry Jour., 8 (1901), No. 4, pp. 396–399, figs. 6*).—Squab raising for market is discussed with special reference to feeding and care, preparation for market, cost of raising and related topics.

DAIRY FARMING—DAIRYING.

The development of a dairy herd, A. T. Neale (*Delaware Sta. Rpt. 1900, pp. 8–13*).—Brief notes are given on the establishment of a dairy herd at the station, and an experiment in which the utilization of weevil-eaten cowpeas for calves was tested and a trial of different rations for milch cows are reported. Feeding weevil-eaten cowpeas to 12 heifers as a substitute for wheat bran at the same price per ton resulted in a saving of $7.20 per month. A table shows the daily yield of butter from each of 3 cows at intervals from March 7 to July 30, during which time 9 rations, including different kinds of pasture, were compared. The results are briefly discussed.

Dairy studies, C. L. Penny (*Delaware Sta. Rpt. 1900, pp. 93–96*).—A comparison in tabular form is made of the records of 13 cows belonging to a private herd during 2 lactation periods. The annual amount of fluctuation in yield of fat ranged from 102 to 259 per cent and averaged 137 per cent. "Thus it seems from this experience that the average annual yield of butter fat may be expected to change about three-tenths of itself from one period of lactation to the next, and any conclusion drawn from a single year's test must be received with the reservation that it will probably increase or diminish in the following year in that proportion and possibly in a greater proportion." The production of the herd averaged 7,087 lbs. of milk and 354 lbs. of butter during the first lactation period, and 6,874 lbs. of milk and 322 lbs. of butter during the second.

In discussing briefly compensation in yield the author says: "When one entire lactation period is compared with another, in the great majority of cases even partial compensation between weight of milk and percentage of fat does not exist. Whatever cause may tend to increase the average flow of milk through a lactation period, in the great majority of cases increases also the percentage of fat." Earlier work along this line was published in the report of the station for 1898 (E. S. R., 11, p. 485).

Dairy herd records, J. H. Grisdale and R. Robertson (*Canada Expt. Farms Rpts. 1900, pp. 69–71, 302, 303*).—Records for one year of 20 cows at the Central Experimental Farm and of 32 cows at the Experimental Farm for the Maritime Provinces are summarized in tabular form.

Dairy Bulletin (*Ontario Agr. Col. and Expt. Farm Bul. 114, pp. 40*).—This is made up of introductory remarks by H. H. Dean on the feeding and care of dairy cows and on the payment for milk at factories, and short popular articles as follows: Hints on the care of milk for creameries and cheese factories, by R. W. Stratton; Cheese-making, by G. H. Barr; Milk testing, by J. A. McFeeters; The alkaline solution—its preparation and use, by R. Harcourt; Separators and the separation of milk, by M. Sprague; Butter making, by J. Stonehouse; Hand cream separators, by T. A. Wiancko; and Butter making on the farm, by Laura Rose.

Jerseys: Some notes on their origin, improvement, merits, and local history, A. Gorrie (*Queensland Agr. Jour., 8 (1901), No. 5, pp. 348–351, figs. 4*).—A popular article relating more especially to the history of the Jersey cattle in Queensland, Australia.

The red Danish milch cattle, Bohsen (*Milch Ztg., 30 (1901), No. 22, pp. 338–342, figs. 7*).

Alfalfa for dairymen, G. F. Weston (*Hoard's Dairyman, 32 (1901), No. 19, pp. 410, 411*).—A popular article on the history of alfalfa, method of culture and value as a food for dairy cattle. This paper was prepared at Biltmore Farm, North Carolina, and considers especially the conditions in that section.

Alcohol in spent distillery wash used as a food for cows, G. Heinzelmann (*Ztschr. Spiritusind., 24 (1901), pp. 107, 108; abs. in Jour. Soc. Chem. Ind., 20 (1901), No. 5, p. 491*).—The author states that milk and butter from cows fed on spent wash from a distillery had an objectionable potato-like or alcoholic odor. The trouble was found to be due to the presence of from 0.2 to 2.8 per cent of alcohol left in the wash by reason of defective distillation.

Milking, J. Petersen (*Agr. Jour. Cape Good Hope, 18 (1901), No. 8, pp. 472–477*).—A prize-winning essay on How to milk, composed at the Dalum Agricultural College, Odense, Denmark. Translation by A. Muller.

Time of milking, J. H. Grisdale (*Canada Expt. Farms Rpts. 1900, pp. 71–73*).—Tabulated data are given for an experiment in which the effect of milking cows at equal and unequal intervals was studied. The test included 4 cows and covered 3 periods of 10 days each with short transition periods. During the first and third periods the cows were milked at 6 a. m. and 4.30 p. m., and during the second period at 6 a. m. and 6 p. m. The results showed that where the intervals between milkings were unequal the richer milk was produced after the shorter interval, and that where the intervals between milkings were equal there was no appreciable difference in either the quantity or the quality of the milk, morning and evening.

Progress of dairying in Kansas, D. H. Otis (*Creamery Jour., 11 (1901), No. 142, pp. 6, 7*).—A description of the growth and present status of the dairy industry in Kansas. Some statistical matter is incorporated.

Denmark's dairy progress, M. Mortensen (*Creamery Jour., 11 (1901), No. 140, pp. 20, 21, figs. 3.*)—Short biographies of T. R. Segelcke, V. Storch, and N. J. Fjord, and their great work in establishing the dairy industry of Denmark.

Solids in cow's milk. The diurnal variations in the amounts of fat and solids-not-fat, H. Ingle (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 13 (1901), pp. 218–236*).—The results are presented of 700 or 800 analyses of the milk of 18 cows, extending over a period of 21 days, each cow's milk being collected and analyzed separately morning and evening. The cows were milked at their usual time, 6 a. m. and 3 p. m., showing very unequal intervals between the milkings. In some cases the amount of fat was below 2 per cent, while in others ranging above 6 per cent, one case of 7 per cent being noted. Samples from certain animals contained less than 2 or 3 per cent, and within a few days they contained 5 or 6 per cent. The milk from cows near the end of the lactation period showed the least variation from day to day, and was, as a rule, of higher quality than that from cows yielding a large amount. The difference between the morning's and evening's milk was mostly in the percentage of fat, the remainder of the solids showing little variation. A cow yielding large quantities of milk gave a product lower in solids-not-fat than those near the end of lactation. The average composition of the morning's milk was fat 3.2 per cent, solids-not-fat 9.2 per cent; evening's milk, fat 4.5 per cent, solids-not-fat, 8.9 per cent.

Variation in milk tests, F. W. BOUSKA (*Hoard's Dairyman, 32 (1901), No. 24, pp. 512, 513*).—A discussion of the causes of the changes in the milk tests with the same animal from day to day.

Variations in milk tests, T. L. HAECKER (*Hoard's Dairyman, 32 (1901), No. 22, pp. 470, 471*).—An address before the Lincoln, Nebr., convention, outlining results at the Minnesota Experiment Station.

The physical state in which fat exists in cream, H. D. and S. O. RICHMOND (*Analyst, 26 (1901), No. 302, pp. 117–123*).—It was found that there was a distinct change in the density of cream at about the melting point of fat, while no such change was observed with separated milk. This led the authors to study the question whether fat in milk was always liquid, as it was expected that owing to the different heat capacities of solid and liquid fat, there would be a change in the rate of heating at the melting point of the fat. The plan adopted in studying this question was to heat 20 cc. of cream in a tube with a stirrer bearing a thermometer reading to 0.1° C., the readings being made every 15 seconds. The estimations were made with cream that had been kept in the refrigerator 18 hours, and with cream that had been heated to 50° C. and rapidly cooled down to 15°. The results are given in tables and also platted. With well cooled cream it appears that there was a change in the specific heat capacity, and a slight though distinct absorption of heat at about 34°. With heated cream rapidly cooled, a very slight change occurred at this point. The only possible change that could produce these results is the melting of the fat. The authors conclude that in well cooled cream the fat is solid, while with rapidly cooled cream it is mostly liquid, though there is a distinct indication that it had become slightly solidified in a quarter of an hour. The melting is practically instantaneous.

Detection and estimation of preservatives in milk, M. W. BLYTH (*Analyst, 26 (1901), No. 303, pp. 148–151*).—The author proposes a method for detecting preservatives in milk which permits the examination of a large number of samples in a short time. Ten cc. of the suspected milk and of a control sample known to be free from preservatives are measured into test tubes. To each there is added a strong, slightly alkaline solution of litmus. If the tubes are not of the same color, a half normal solution of sodium hydrate is added drop by drop to the suspected sample until it is of the same color as the check. The tubes are then plugged with cotton, and both heated in the water bath for 10 min. at 80° C. They are afterwards inoculated with ½ cc. of a solution of ½ cc. of sour milk in 100 cc. of water, shaken, and kept 24 hours at a temperature between 15 and 22° C. Tubes containing preservatives will remain blue or pink, while those without will become white in the same way as the check. The length of time it takes for the blue or pink color to become white depends upon the quantity of the preservative present. Having found the samples which contain preservatives, the nature of them must be determined by the ordinary methods.

This method is also recommended for the determination of the amount of formic aldehyde in the sample. A series of samples is made up with known amounts of this preservative, and the quantity in the sample under investigation is estimated by comparison.

Pasteurization and milk preservation, with a chapter on the city milk supply, J. H. Monrad (*Winnetka, Ill.: Pub. by the author [1901], 2 ed. enl., pp. 137, figs. 124.*

Report of the committee on milk and cream regulations to the Board of Agriculture of Great Britain (*Public Health, 13 (1901), No. 8, pp. 580–587*).—The committee was appointed to inquire and report as to what regulations might be made for determining the deficiency in the normal constituents of milk and cream or the addition of extraneous matter which should be taken as an indication of adulteration. The effect of feeding, weather, period of lactation, intervals of milking, etc., are discussed. Among other considerations it is reported to be the sense of the committee that when the total milk solids are less than 12 per cent and the butter fat less than 3.25 per cent, the milk shall be deemed to be deficient and either mixed with separated milk, or water, or some portion of its normal fat removed.

The acid proof micro-organisms of dairy products, E. Schütz (*Landw. Jahrb., 30 (1901), No. 1–2, pp. 223–257, figs. 4*).—The author has made a study of tubercle and similar bacilli in milk and butter and presents a table for identifying the several species discussed. The literature of the subject is reviewed and a bibliography appended.

Milk for creameries, J. A. Ruddick (*Ontario Dept. Agr., Dairy Division Bul. 3, n. ser., 1901, pp. 7*).—Directions for the creamery owners, the butter maker and the patrons on the handling of milk for creameries.

American butter in Hawaii, J. D. Avery, jr. (*Creamery Jour., 11 (1901), No. 140, pp. 1, 2*).—A discussion of the production and trade in butter and eggs in the Territory of Hawaii.

The composition of Dutch butter, J. Clark (*Analyst, 26 (1901), No. 302, pp. 113–117*).—The author made a large number of analyses of butter from the North of the Netherlands, employing the Leffmann-Beam method. From the results, he finds the average volatile acid content to be 5.17 per cent. In 7 samples this fell below 4.5 per cent. In several of the latter cases the author was able to prove the genuineness of the butter. The low volatile acid content was not due to adulteration of the butter, but to natural causes which seemed to appear mainly from about the middle of September to the middle of November. This is said to be due to the exposure of the cattle and indifferent feeding.

Low Reichert-Meissl value of Dutch butter L. T. Reicher (*Ztschr. Angew. Chem., 14 (1901) No. 6, pp. 125–129*).—The author made extended investigations in the Amsterdam public laboratory of butter from the same cows from 1894 to 1901. The maximum and minimum results for each year are given in tables. The numbers are frequently very low, those in the autumn being invariably less than those obtained during the rest of the year.

The influence of the food and weather upon the Reichert-Meissl number of Holland butter, A. J. Swaving (*Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), No. 13, pp. 577–585*).—The experiment was carried out at the Experiment Station at Goes, Netherlands, with 8 cows. The age of the animal, time of calving, food, manner of feeding, etc., were noted. The refractometer, Reichert-Meissl, Hehner, Hübl, and Crismer numbers were determined, together with the specific gravity of the butters.

It was found that late pasturing, because of the nature of the food, lowered the Reichert-Meissl number and increased the Crismer number of the butter fat. The early stabling of the cows raised the Reichert-Meissl number, while the Crismer number did not exceed the limit of 57°. The alteration in the feeding caused directly a change in the composition of the fat, resulting in the lowering of the Reichert-Meissl number and the increasing of the refractometer, the Crismer number, etc. It would appear that late pasturing causes no particular lowering of the Reichert-Meissl number provided forage crops were fed in conjunction.

Faults in creamery butter, G. L. McKay (*Creamery Jour., 11 (1901), No. 140, p. 18*).—A discussion of the use of salt and the production of the proper percentage of water.

The Cole butter-making process, F. T. Shutt (*Canada Expt. Farms Rpts. 1900, pp. 188–191*).—"This method or process consists simply of blowing air, previously warmed by water to a temperature between 70° and 80° F., through well ripened cream contained in a cylindrical glass vessel 21 in. high and 13 in. in diameter." The promoter of this method claimed that 20 to 30 per cent more butter could be obtained than by any other method. Two trials were made. In the first the loss of fat in the buttermilk was 5.07 per cent of the total fat supplied in the cream. In the second trial the Cole process was compared with the ordinary method on the same lot of cream. Twenty-seven lbs. of cream was used in each case, the yield of butter being, respectively, 8.125 and 8.656 lbs. and the loss of fat in the buttermilk, respectively, 4.61 and 0.54 per cent of the total fat supplied in the cream, showing that less butter could be obtained by the Cole process and that the loss of fat in the buttermilk was greater. The author gives data and quotes authorities to show that there is no formation of fat from albuminoids during the ripening of cream.

The payment for milk in cooperative creameries on the basis of quality, M. Henseval (*Bul. Agr.* [*Brussels*], *17 (1901), No. 3, pp. 324–332*).—A discussion of paying for milk on the basis of quality, together with the results of the comparison of different milks and mixtures of the same.

Export butter trade, G. S. Thomson (*Jour. Agr. and Ind. South Australia, 4 (1901), No. 10, pp. 801–805*).—A report of the exportation of butter from Australia to England during the past season with special reference to the grading of the product.

Butter and egg storage in Belgium (*Station, Farm, and Dairy, 4 (1901), No. 42, pp. 940, 941*).

A simple apparatus for simultaneously estimating the fat and the water in butter, H. Poda (*Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), No. 11, pp. 492–496, figs. 5*).—In the described method the sample of butter is treated with concentrated sulphuric acid in a specially constructed apparatus and is heated in boiling water for some time. The tube is afterwards whirled and the amount of resulting fat and nonfat read off on a scale marked upon the cylinder.

A comparison of results shows the method to vary not more than 0.2 per cent from the usual method. The apparatus is claimed to be applicable to the work of creameries, and 6 examinations may be completed within half an hour.

Milk for cheese factories, J. A. Ruddick (*Ontario Dept. Agr., Dairy Division Bul. 2, n. ser., 1901, pp. 7*).—Directions for the factory owners, the cheese maker, and patrons on the handling of milk for cheese factories.

Cheese making, M. A. O'Callaghan (*Agr. Gaz., New South Wales, 12 (1901), No. 6, pp. 702–707*).—Methods employed in England in making Cheddar cheese, Coulommiers or soft new milk cheese, Gervais cream cheese, Cambridgeshire cream cheese, Port du Salut, and Cream cheese.

Cause and prevention of acidy cheese, J. A. Ruddick (*Amer. Cheesemaker, 16 (1901), No. 185, p. 4*).—Cheese more or less faded in color and showing a rough surface is called "acidy" or "acid cut." As a rule such cheese is made from overripe milk in which too much acid is developed before the curd has been sufficiently firmed. If the whey is all removed while the curd is still in a soft condition it is difficult to expel the surplus. The remedy for sour cheese is to get rid of the whey quickly so that the curd will be firm before the acid develops. This may be accomplished by cutting the curd finer and running off a portion of the whey as soon as the heating is finished or even before. However, the whey should not be wholly removed until the curd has acquired the desired firmness and elasticity. It should be remembered that such handling of the curd causes a considerable loss in yield. This may be avoided by having milk in a less acid condition.

Manufacture of soft cheese, E. B. von Heyne (*Hoard's Dairyman, 32 (1901), No. 18, p. 384*).—Methods employed in the manufacture of Fromage de Brie, Camembert, and Neufchatel cheese in Minnesota.

Condition of the cheese industry in New Zealand, J. A. Ruddick (*Amer. Cheesemaker, 16 (1901), No. 184, pp. 1, 2*).

Dairy products at the Paris Exposition of 1900, H. E. Alvord (*U. S. Dept. Agr. Yearbook 1900, pp. 599–624, pls. 5*).—A detailed account of the exhibits of different countries and the awards of the jury.

VETERINARY SCIENCE AND PRACTICE.

The stock-poisoning plants of Montana, preliminary report, V. K. Chesnut and E. V. Wilcox (*U. S. Dept. Agr., Division of Botany Bul. 26, pp. 150, pls. 37*).—This bulletin contains a report on an investigation of the poisonous plants of the State during 1900, together with observations previously made along the same line. The subjects considered in the report include the following: Summer and winter ranges for sheep; effect of alkali on stock; herding and other details of the management of sheep; water supply on the ranges; altitude of the ranges; climatic conditions of the season of 1900; influence of heavy rain storms, snow storms, driving and trailing sheep, hunger, state of vegetation, and stage of the growth of plants, upon the poisoning of sheep; acclimatization of stock to the range; variation and localization of the poisonous substances in plants; variations in the feeding habits of stock, with reference to poisonous plants; extent of stock poisoning; experiments on rabbits; displacing poisonous plants by forage plants; herding stock away from dangerous areas; eradication of poisonous plants by digging; popular methods of treating poisoned animals; permanganate of potash as a chemical antidote and directions for using it; method of drenching; bloat; nonpoisonous plants which are mechanically dangerous, and a special discussion of the more important poisonous plants, species of less importance, plants which are suspected of being poisonous, and doubtful plants which have been suspected. The most important poisonous plants of Montana are considered to be *Zygadenus venenosus, Delphinium glaucum, D. bicolor, Cicuta occidentalis, Aragallus spicatus, A. lagopus, A. splendens, Lupinus leucophyllus, L. sericeus,* and *L. cyaneus.* Besides these more important species, evidence is given on the poisonous nature of 12 plants of less economic importance, and brief notes are given on the economic value or harmlessness of 14 species which have been suspected by stockmen of being poisonous. Besides these species brief notes are given on 23 other plants which have been suspected of being poisonous, but concerning which evidence is not sufficient to warrant a positive declaration.

Many experiments were made in the treatment of poisoned animals and especially promising results were obtained from the use of permanganate of potash as an oxidizing agent to be administered as soon as possible after the symptoms of poisoning are manifested. From experiments with this substance on sheep and cattle it was found that the majority of animals recover from the effects of poisoning rather rapidly after administration of solutions of potassium permanganate directly into the stomach. The methods for administering the permanganate included drenching the animals and injecting through the body walls directly into the stomach. No striking advantage was noted in favor of one or the other method, but the direct injection into the stomach is perhaps to be preferred where the stockman has had some experience in administering medicines in this manner.

Experiments on sheep and cattle were supplemented by numerous experiments on rabbits during which these animals were fed on specimens of suspected plants or extracts made from these plants.

Some poisonous plants of the northern stock ranges, V. K. Chesnut (*U. S. Dept. Agr. Yearbook 1900, pp. 305–324, pls. 3, figs. 4*).—This article contains notes on some of the more important poisonous plants, with especial reference to the conditions which exist in Montana. The discussion is partly based on Bulletin 26 of the Division of Botany of this Department (see p. 283).

Tetanus treated by the antitetanus serum, DABERT (*Jour. Méd. Vét. et Zootech., 5. ser., 5 (1901), Jan., pp. 22, 23*).—Brief notes on the symptoms of disease and the successful use of antitetanus serum in one case of tetanus in the horse.

Contagious diseases of animals, H. MITCHELL (*New Jersey State Bd. Agr. Rpt. 1899–1900, pp. 119–122*).—This article contains a brief account of an outbreak of anthrax, together with a tabulated statement showing the extent of other contagious diseases.

Report of the board of agriculture as cattle commissioners, C. J. BELL (*Vermont State Bd. Agr. Rpt. 1900, pp. 117–135*).—A copy is given of the regulations of the board with regard to inspection and quarantine of cattle and other animals. Brief notes are given on tuberculin tests as carried out under the direction of the board and upon glanders in horses. The nodular disease of sheep caused by the presence of *Œsophagostoma columbianum* in the walls of the intestines, is reported as having prevailed to some extent.

Actinomycosis in animals, R. HARTL (*Berlin. Thierärztl. Wchnschr., 1901, No. 1, pp. 1–6, figs. 2*).—This article contains a detailed description of the clinical symptoms and post-mortem findings of cases of actinomycosis in horses, cats, and dogs. In horses the disease assumes a form which resembles farcy, and has been mistaken for the latter. Ulcers with a persistent discharge are formed in the skin. In one case the whole abdominal wall was changed into a hard, fibrous mass containing numerous small ulcers. The author made numerous cultures of the organism obtained from these cases, the greater proportion of such cultures being made in agar-agar and sugar bouillon. Considerable variation was noted in different forms of the micro-organisms thus obtained, and it is suggested that the relationship of the different forms of the disease may ultimately be more clearly defined than at the present.

Bovine tuberculosis in Wisconsin, H. L. RUSSELL and E. G. HASTINGS (*Wisconsin Sta. Bul. 84, pp. 16, figs. 4*).—About 1,200 animals in suspected herds and 1,000 in unsuspected herds in Wisconsin were tested with tuberculin. The percentage of reacting animals varied from 2.2 to 95 per cent in different herds. The average percentage of tuberculous animals in the State is considered rather small. A statistical account is given of the percentage of tuberculous animals in other States, and brief notes are presented on the geographical distribution of tuberculosis in Wisconsin, the spread of the disease from herd to herd, its introduction through tuberculous animals, the advisability of State quarantine, mode of dissemination within a herd, and methods of treating reacting animals and controlling the disease.

Report of tuberculosis commission (*New Jersey State Bd. Agr. Rpt. 1899–1900, pp. 111–116*).—Brief recommendations regarding sanitary measures to be adopted in preventing the spread of tuberculosis among cattle and the transmission of the disease from cattle to man.

The suppression of bovine tuberculosis, A. PETERS (*Rhode Island State Bd. Agr. Rpt. 1900, pp. 200–215*).—A discussion of the views which are held at present with regard to the infectiousness of the flesh and milk of tuberculous animals and the control of the disease by means of government regulations.

Blackleg, D. HUTCHEON (*Agr. Jour. Cape Good Hope, 18 (1901), No. 2, pp. 67–73*).—The symptoms and post-mortem conditions of this disease are described. Brief notes are given on hygienic measures to be adopted for preventing outbreaks of the disease, and directions are given for using blackleg vaccine.

The significance of the fungiform papillæ in the diagnosis of foot-and-mouth disease, H. LEUTSCH (*Ztschr. Fleisch. u. Milchhyg., 11 (1901), No. 5, pp. 142, 143, fig. 1*).—From an anatomical study of the tongue in cases of this disease, it was found that the epithelium becomes elevated, so that the fungiform papillæ appear to be sunken in small depressions. This character is considered of diagnostic value for foot-and-mouth disease.

Study of a case of pneumonia of calf, F. D. CHESTER (*Delaware Sta. Rpt. 1900, pp. 46–52, figs. 2*).—A report is made on a case of pneumonia in a calf, with a detailed statement of post-mortem findings and cultural and pathogenic properties of the organism which was isolated from diseased tissue. This organism was found upon inoculation to be pathogenic to guinea pigs and rabbits. A guinea pig and a calf were inoculated by inhalation of a fine mist containing the organism.

Differential diagnosis of contagious pleuro-pneumonia, F. HAUPTMANN (*Berlin Thierärztl. Wchnschr., 1901, No. 5, pp. 65–67*).—The author describes from cases which occurred in his practice the detailed pathological changes which are considered to be characteristic in diagnosing this disease.

Pneumonia and inoculation against this disease, REINLÄNDER (*Ztschr. Veterinärk., 13 (1901), No. 2, pp. 53–62*).—The author describes the symptoms of this disease and the circumstances of a severe outbreak which occurred in army horses. A number of experiments were tried in protective inoculation, without very promising results. The author concludes that the inoculation method thus far employed will probably not yield favorable results until the organism of the disease has been isolated and studied.

Stoppage of the milk duct in the teat and its treatment, M. STREBEL (*Schweiz. Arch. Thierh., 43 (1901), No. 1, pp. 12–18*).—This condition may be congenital or may be due to mechanical injuries. When the duct is closed by thin membranes, it may be safely opened by the use of the probe. The author discusses the conditions which determine the most practical treatment to be adopted in different cases.

Experimental transmission of Texas fever, LIGNIÈRES (*Rec. Méd. Vét., Paris, 8. ser., 7 (1900), No. 23, pp. 118–180*).—The author conducted extensive experiments with Texas fever in Argentina. It was found impossible to inoculate experimentally the horse, ass, sheep, pig, dog, cat, rat, mouse, and domestic fowl. A number of forms of the disease were noted in cattle inoculated experimentally, and the peculiar features of clinical symptoms and pathological lesions in these forms are described in detail. In this connection the author made numerous counts of blood corpuscles and recorded the variations in number of red blood corpuscles and in the body temperature during the progress of the disease. The tick which is instrumental in transmitting Texas fever in Argentina is called *Rhipicephalus annulatus microplus*. The author describes minutely the external form and anatomy of this tick in its different stages. Experiments were made in producing Texas fever experimentally by infestation with ticks taken from diseased animals. In one case the disease was thus produced by ticks from an animal which was apparently healthy. The author discusses the various objections which have been raised against the theory concerning the agency of ticks in spreading Texas fever.

Experiments conducted for the purpose of determining whether Texas fever could be transmitted through the agency of certain flies gave negative results in all cases. The author describes the geographical distribution of the disease in Argentina, and discusses in a brief section the importance of the disease to the cattle industry. Since Texas fever is most commonly confounded with anthrax, a parallel table is given showing the characteristic symptoms of the 2 diseases. Experiments in the use of quinin in treating Texas fever showed that this substance is without true curative value for this disease.

The author reviews the literature concerning the methods of destroying the cattle ticks and methods of producing immunity in susceptible animals. A number of experiments in blood inoculation for the purpose of producing immunity gave good results. The author concludes that the disease is transmitted only by the agency of ticks, and that preventive vaccination may be successfully carried out, although little hope is to be entertained of curing actual cases by serum inoculations. A bibliography of the subject is added.

Horse sickness of South Africa, E. NOCARD (*Rec. Méd. Vét., Paris, 8. ser., 8 (1901), No 2, pp. 37–51, fig. 1*).—The author discusses the serious outbreaks of this disease among horses at the beginning of the South African war. Charts are given showing details of the clinical history of a number of cases. The organism of the disease has not been isolated, but it is believed by the author to be a protozoan parasite, which is probably transmitted by means of some insect, possibly the mosquito.

Malignant œdema in the horse, E. ZSCHOKKE (*Schweiz. Arch. Thierh., 43 (1901), No. 1, pp. 20–24*).—In one case the disease developed in consequence of stepping on a nail. The wound was treated with lysol, but 9 days afterward the disease appeared. The symptoms and the course of the disease are described in this and several other cases.

Sheep pox, E. PERRONCITO (*Gior. R. Soc. Accad. Vet. Ital., 50 (1901), No. 3, pp. 64, 65*).—Brief notes on the history and unusual severity of an outbreak of this disease during the past year. The author discusses the methods which have thus far been adopted for preventing the spread of the disease.

Dourine, J. DE DOES (*Veeartsenijk. Bladen v. Nederl.-Indië, 13 (1900), No. 2, pp. 104–164.*)—This disease prevailed to an unusual extent during the past season in Soemedang. The author discusses in detail the history of a large number of cases. The pathogenic organism was not isolated.

Hog-cholera remedy, C. L. PENNY (*Delaware Sta. Rpt. 1900, pp. 96–98*).—An analysis was made of a proprietary preparation sold as a "preventive and cure for hog cholera," and the results are compared with a formula recommended by the Bureau of Animal Industry of this Department. It is thought that the compounder meant to follow the formula of the Department and the author questions whether a remedy prepared in this way should be sold under a proprietary name.

In this connection an examination was made of 41 samples of antimony sulphid sold by retail druggists in Delaware and other States. The results showed that 33 samples were entirely free from antimony in any form.

Rabies: Its cause, frequency, and treatment, D. E. SALMON (*U. S. Dept. Agr. Yearbook 1900, pp. 211–246*).—A discussion of the cause, nature, distribution, and means of treating this disease, with historical notes on the success which has been obtained along this line in other countries.

Diseases of poultry, A. G. GILBERT (*Canada Expt. Farms Rpts. 1900, p. 259*).—In cases of outbreaks of infectious diseases the author recommends thorough disinfection of the premises. For the destruction of lice a fluid preparation containing 4 oz. of corrosive sublimate and 4 oz. of common salt was found efficient. These substances should be dissolved in from 2 to 4 qts. of water, and all parts of poultry houses should be thoroughly sprayed. This treatment may be followed by whitewashing.

Asthenia or going-light of fowls, F. D. CHESTER (*Delaware Sta. Rpt. 1900, pp. 52–60, fig. 1*).—From cases of this disease the author isolated 2 organisms, one of which was the coli bacillus and the other similar to *Bacillus vulgaris*. Detailed statements are given concerning the morphological and cultural characters of the organism, and a table is presented comparing the organism with *Bacterium astheniæ*, as described by Dawson.

When fed to young chickens in ordinary food, this organism produced a rapidly fatal disease. Asthenia occurs more frequently in young chickens than in older ones. Apparently the organism is not pathogenic for old fowls, except to a limited extent. It is considered merely a virulent form of the coli bacillus.

Entero-hepatitis or blackhead of fowls, F. D. CHESTER and A. ROBIN (*Delaware Sta. Rpt. 1900, pp. 60–66, figs. 3*).—This disease, which has been known as occurring in turkeys, is now reported as attacking chickens. A detailed report is given on the technical methods employed in preparing and studying pathological tissue. In affected livers certain bodies were seen in some of the cells, which are suspected of being young stages of the parasitic organism which causes the disease.

Notes on parasites, 55-57, C. W. STILES and A. HASSALL (*U. S. Dept. Agr., Bureau of Animal Industry Circ. 34, pp. 4*).—The authors describe a pupa-like stage of *Ornithodoros megnini* and discuss the synonymy of *Boophilus australis* and *B. bovis*. *Strongylus contortus* and *Cysticercus tenuicollis* are reported as having been found in a specimen of mule deer which died at the National Zoological Park.

On disinfection, W. L. MACKENZIE (*Vet. Jour., 52 (1901), No. 308, pp. 100–108*).—The author discusses the practical value for disinfecting purposes of light, fresh air, sulphurus acid, corrosive sublimate, chlorid of lime, lysol, carbolic acid, and formaldehyde.

Stable disinfection, F. P. GORHAM (*Rhode Island State Bd. Agr. Rpt. 1900, pp. 315–322*).—The author gives a brief account of tuberculosis, glanders, and other diseases, with notes on disinfection of stables after outbreaks of these diseases by means of formalin, carbolic acid, carbol-sulphuric acid, creolin, and chlorid of lime.

The laws of the Grand Duchy of Hessen relating to indemnities for animals affected with anthrax, blackleg, and hog cholera, LORENZ (*Ztschr. Thiermed., 5 (1901), No. 1, pp. 12–63*).—This article contains copies of regulations relating to the subject, an elaborate discussion by the author on the sanitary measures to be adopted in outbreaks of these diseases, and on the methods of preventive inoculation which promise to yield the best results.

AGRICULTURAL ENGINEERING.

The carrying capacities of irrigation canals, S. FORTIER (*Utah Sta. Bul. 71, pp. 55, figs. 42*).—This is a report of 64 experiments made during the summer of 1897 on irrigation channels varying in size from small ditches carrying a few miner's inches to large canals carrying as high as 225 second-feet, and including nearly every form of ditch common to western America.

"The object sought was to ascertain as accurately as possible the existing conditions of ditches and canals that had been in operation for a number of years. In order to obtain the volume which flowed in any particular ditch and compare it with some well-known empirical formula, such as Kutter's or Chezy's, it was necessary to ascertain the slope of the surface of the water, the sectional area of the water, the mean velocity, and the ratio between the water area and the wetted perimeter."

Other objects which the author had in view was to ascertain the form which channels assume when acted upon by water and the atmosphere and to determine the values of the coefficient of roughness (n) under different conditions.

The discharge was measured either by a current meter or by a Cippoletti trapezoidal weir, special precautions being taken to secure the conditions necessary for accurate measurements. The current meter measurements recorded are in every case the mean of from 3 to 6 readings. The average cross sections were obtained "by platting in different colors on a large scale the three or more cross sections taken in the field. A new perimeter was then adopted which represented the average of all those platted. Its length was found by a pair of dividers and the area of the average section by a planimeter.

"The slope of a canal represented by the fall of a given portion, usually from 50 to 300 ft., divided by the distance, was determined by a new Buff and Berger 18 in. level and a leveling rod reading to thousandths of a foot.

"The method followed in determining the slope was to drive small finishing wire nails into the tops of submerged oak stakes at each end of the section to be tested. It was not always possible to have the top of the nail coincide exactly with the surface of the water, but this difference introduced no error in the results, provided the heads of both nails occupied the same relative position to the surface of the water. In the case of pulsations or slight waves caused by winds, the tops of both nails were even with the highest or lowest water surfaces."

From the data reported the author draws the following conclusions:

"(1) Sections of canals in earth, although carefully built of a trapezoidal form, with the bottom width horizontal, soon change to segments resembling those of an ellipse.

"(2) In all large or medium sized canals in earth, berms are necessary in order to prevent a portion of the excavated material from rolling into the canal.

"(3) The carrying capacity of new irrigation canals and ditches during the first season of their operation are less than in subsequent seasons, providing the same conditions are maintained.

"(4) The coefficient of friction in canals well lined with sediment in good order and long in use is less than has been usually supposed.

"(5) The frictional resistance of coarse materials, such as gravel, pebbles, or cobble rock, depends to a large extent on whether such material is well packed or loose.

"(6) That a rough channel exerts a greater influence in retarding the flow of a small ditch than the same degree of roughness exerts on the large canal or river.

"(7) In the past, canal builders have to a great extent overlooked the injurious effects of the growth of aquatic plants.

"(8) The effect of water plants in checking the flow and lessening the capacity of irrigation canals may be much greater than a rough uneven channel.

"(9) In parts of the arid West where such vegetation grows abundantly the canals should be built in such a way as to prevent its growth, or, if this is impracticable, to facilitate its removal."

"On account of the dissimilarity between the physical conditions of the channel from which the present values of (n) have been derived and the ditches and canals of irrigated America, the writer has attempted to assign values for (n) which would be more in accordance with the conditions which now exist in the Rocky Mountain States. Future experiments in which the details are more accurately conducted may, however, modify the values of (n) as here given." The proposed values for the coefficient of friction (n) for different kinds of irrigation ditches and canals are as follows:

"n=.0175 for canals in earth in excellent condition, well coated with sediment, regular in cross section and free from vegetation, loose pebbles, and cobble rock.

"n=.020 for canals in earth in good condition, lined with well-packed gravel partly covered with sediment and free from vegetation.

"n=.0225 for canals in earth in fair condition, the wetted surface being lined with sediment with an occasional patch of low-water plants, or composed of loose gravel without vegetation.

"n=.0250 for canals in earth in average condition having few sharp bends and being fairly uniform in cross section; the water slopes and bottom being lined with sediment and low water plants, or composed of loose gravel and fragments of rock less than 2 inches in diameter and free from vegetation.

"n=.0275 for canals in earth below the average in grade, alignment and cross section; having indentations on the sides, the edges in places partially filled with earth and gravel, and the lining composed of coarse gravel and cobble rock unpacked. This value would also apply to a smooth, regular surface if the channel were partially filled with aquatic plants.

"n=.0300 for canals in earth in rather bad condition having the bed partially covered with débris; or having comparatively smooth sides and bottom with bunches of grass and weeds projecting into the water and more or less aquatic plants growing in the channel.

"n=.0350 for small ditches having a small uneven bed and for canals in earth in fairly good condition but partially filled with aquatic plants.

"n=.040 for canals in earth whose channels are about half full of aquatic vegetation.

"n=.050 for canals in earth whose channels are about two-thirds full of aquatic vegetation."

Practical irrigation, C. T. Johnston and J. D. Stannard (*U. S. Dept. Agr. Yearbook 1900, pp. 491–512, figs. 9*).—This article explains methods of laying out and constructing small ditches with varying grades and cross sections, the laying out of field laterals, methods of applying water to crops, when to irrigate, and cost of building and maintaining a ditch.

A study of the practice of irrigation on the plain of Urgel, Spain, P. Philippar (*Ann. Agron., 27 (1901), No. 5, pp. 220–237, fig. 1*).—This article describes quite fully the system of water management and methods of irrigation practiced in this region, and discusses the results obtained.

The Chapman subirrigation plant (*California Cult., 16 (1901), No. 20, p. 305, fig. 1*).—A brief description.

Tenth Biennial Report of the State Engineer to the Governor of Colorado, 1899 and 1900 (*Colorado State Eng. Rpt. 1899 and 1900, pp. 396, pls. 11*).—This is an account of operations during the 2 years ended November 30, 1900, and includes a list of the irrigation officers with recommendations regarding the improvement of the irrigation system of the State; reports on the internal improvements made; an abstract of supreme court decisions relating to irrigation; reports of superintendents of irrigation and water commissioners; ditch and reservoir filings; seepage measurements and ditch ratings; and gagings of streams with comparative tables of discharge.

Agricultural machinery at the Paris Exposition of 1900, G. Coupan (*Bul. Soc. Agr. France, n. ser., 32 (1900), Dec. 15, pp. 469–479, figs. 5; 33 (1901), Jan. 1, pp. 43–49, figs. 4; Jan. 15, pp. 97–106, figs. 11; Feb. 1, pp. 165–176, figs. 5; Feb. 15, pp. 280–286, figs. 4; Mar. 1, pp. 362–370, figs. 5*).—Brief notes are given on plows, cultivators, scarifiers, pulverizers, rollers, harrows, mechanical diggers, fertilizer distributers, seed drills and planters, hoes, pumps, hydraulic rams and other water lifts, agricultural artillery, harvesting machines of all kinds, threshing machines, and presses, mills, and other machines for preparing crops for handling and use.

Results of tests of alcohol motors in Germany, E. Leplae (*Les résultats des essais de moteurs à alcool en Allemagne. Brecht: L. Braeckmans, 1901, pp. 17*).

The selection of materials for macadam roads, L. W. Page (*U. S. Dept. Agr. Yearbook 1900, pp. 349–356*).—This article discusses the importance of the physical properties of rock in road building and of a record of traffic for proposed roads and methods of measuring traffic, the adaptation of material to different kinds of traffic, and methods of determining the value of rocks for road building. Attention is called to the establishment of a road material laboratory in the Division of Chemistry of this Department and the plan and purpose of the work to be undertaken is explained.

Mountain roads, J. W. Abbott (*U. S. Dept. Agr. Yearbook 1900, pp. 183–198, pls. 3*).—The construction and maintenance of such roads are discussed in a popular manner.

Construction and care of earth roads, I. O. Baker (*Illinois Sta. Bul. 65, pp. 73–93, fig. 1*).—This bulletin is "addressed to the farmers chiefly," and deals with the subject under three main heads—construction, maintenance, and administration.

Good dirt roads for Mississippi, J. W. Fox and W. L. Hutchinson (*Mississippi Sta. Bul. 67, pp. 16, figs. 6*).—The road laws of Mississippi are briefly summarized and the system of road maintenance of the State is discussed. Methods of building and maintaining dirt roads are briefly explained.

STATISTICS—MISCELLANEOUS.

Twelfth Annual Report of Delaware Station, 1900 (*Delaware Sta. Rpt. 1900, pp. 259*).—This includes a financial statement for the fiscal year ended June 30, 1900, the organization list of the station, and reports of the heads of departments, including a number of articles abstracted elsewhere, and a reprint of Bulletin 51 of the station on pedigreed sorghum as a source of cane sugar (E. S. R., 13, p. 42).

Thirteenth Annual Report of Louisiana Stations, 1900 (*Louisiana Stas. Rpt. 1900, pp. 22*).—An account is given of the work at the Sugar Station at Audubon Park, the State Station at Baton Rouge, and the North Louisiana Station at Calhoun. The report also contains the organization lists of the stations and a financial statement for the fiscal year ended June 30, 1900.

The Upper Peninsula Experiment Station, C. D. Smith (*Michigan Sta. Bul. 186, pp. 4–8*).—This contains the act of the State legislature establishing the Upper Peninsula Experiment Station, a description of the station farm, including an analysis of the underlying rock, and a brief outline of the work already accomplished.

Bulletins of Alabama Station (*Index to Vol. VIII, Buls. 108–112, pp. 191–201*).

Finances—meteorology—index (*Maine Sta. Bul. 69, pp. 191–228+8*).—This contains a list of acknowledgments, meteorological observations noted elsewhere, a financial statement for the fiscal year ended June 30, 1900, an index to the annual reports for 1897 to 1900, the organization list of the station, and brief notes on the aim and work of the station by the director.

Experimental work in agriculture, C. Schreiber (*Rev. Gén. Agron.* [*Louvain*], *10* (*1901*) *No. 1, pp. 21–29*).—This article discusses the work of the experiment stations, the experimental fields, and the fields of demonstration as they exist in Belgium.

Yearbook of the Department of Agriculture, 1900 (*U. S. Dept. Agr. Yearbook, 1900, pp. 888, pls. 87, figs. 88*).—This includes a general report by the Secretary on the operations of the Department during the year, 30 semipopular articles on miscellaneous subjects noted elsewhere, a brief biographical sketch of William Saunders, and an appendix containing the usual summary of useful information on various subjects of interest to farmers. A new feature of the appendix is the publication of requirements for admission to the agricultural departments of the land-grant colleges, and the cost of attendance.

Crop Reporter (*U. S. Dept. Agr., Division of Statistics Crop Reporter, Vol. 3, Nos. 1–3, pp. 8 each*).—These numbers contain statistical data on the condition of crops in the different States and Territories on May 1, June 1, and July 1, 1901, and a number of articles on miscellaneous subjects, including the following: Production of oats and barley in Russia since 1883, agricultural organizations in France, the cotton crop of India, the wheat crop of India in 1901, the intercontinental wheat trade, principal grain crops of Austria in 1900, principal food crops of Bulgaria in 1898 and 1899, the corn crop of Mexico, the crop reporting service of the Division of Statistics of the Department of Agriculture, the farmers' interest in foreign crop reports, and production of maize and millet in Russia since 1883.

The cotton crop of 1899–1900, J. L. Watkins (*U. S. Dept. Agr., Division of Statistics Bul. 19, pp. 46*).—This bulletin is the customary annual report presenting statistical data on the cotton crop of the different States and Territories as shown by the movement of the crop from the plantation to points of export or consumption. In addition, statistical information is given on the growth of cotton spinning in the South, the sea island cotton crop of 1899–1900, the value of the cotton crop of 1899–1900, the cost of picking cotton, exports and imports of cotton, consumption of American cotton by foreign countries, the world's cotton spindles and their consumption, the cotton production and acreage since 1894, exports of cotton from Brazilian ports, movement of cotton from Asiatic to European Russia, the Mexican crop and world's cotton crops since 1865. The total crop for the year is estimated at 9,935,990 commercial bales, valued at $329,269,332. Of this, the sea island crop amounted to 98,338 bales, valued at $5,578,536.

Foreign imports of American tobacco (*Spec. [U. S.] Consular Rpts., 20 (1900), pt. 1, pp. 71–133*).—A series of reports on the tobacco imports of all the important countries of the world.

Influence of rye on the price of wheat, E. T. PETERS (*U. S. Dept. Agr. Yearbook 1900, pp. 167–182*).—In this article the price of wheat in its relation to the world's supply of breadstuffs, the world's wheat crop, and especially the world's rye production are discussed.

Our foreign trade in agricultural products, 1891–1900, F. H. HITCHCOCK (*U. S. Dept. Agr., Section of Foreign Markets Bul. 23, pp. 61*).—A detailed statistical review of the foreign trade of the United States for the 10 fiscal years 1891–1900. In 1900 the value of the leading agricultural exports amounted to $844,616,530, the principal articles being breadstuffs, cotton, meat products, live animals, tobacco, oil cake and oil-cake meal, vegetable oils, fruits and nuts, dairy products, and seeds. The value of the leading agricultural imports amounted to $420,139,288, the principal articles being sugar, hides and skins, coffee, silk, vegetable fibers, wool, fruits and nuts, tobacco, tea, wines, vegetable oils, and cocoa.

Our trade with Scandinavia, 1890–1900, F. H. HITCHCOCK (*U. S. Dept. Agr., Section of Foreign Markets Bul. 22, pp. 124*).—This is a statistical review of the trade of the United States with Denmark, Sweden, and Norway during the fiscal years 1890–1900. The exports to these three countries increased in valuation from $9,000,000 in 1890 to $29,000,000 in 1900. The imports were valued at $4,000,000 in 1890 and $5,000,000 in 1900.

Agricultural imports and exports, 1896–1900, F. H. HITCHCOCK (*U. S. Dept. Agr , Section of Foreign Markets Circ. 23, pp. 16*).—Statistical tables showing the character, quantity, and value of the agricultural imports and exports of the United States during each of the five fiscal years, 1896–1900.

Agricultural returns for Great Britain, 1900 (*London: Wyman & Sons, 1901, pp. XLIX + 259*).—This report shows the acreage and produce of crops, prices of corn, and number of live stock with agricultural statistics for the United Kingdom, British possessions and foreign countries.

The course of prices of farm implements and machinery for a series of years, G. K. HOLMES (*U. S. Dept. Agr., Division of Statistics Bul. 18, pp. 31*).—The prices of farm implements and machinery for 1860, 1880, 1890, 1895, and 1900 on about July 1 for each of these years were obtained from manufacturers and the figures are here presented in tables. The magnitude of the industry of manufacturing agricultural implements and some of the economic results of machinery produced in the cultivation and harvesting of corn and wheat and the making of hay are pointed out. The change in price of different implements and machines is briefly discussed.

Agriculture in the Twelfth Census, LEG. POWERS (*Amer. Mo. Rev. of Reviews, 23 (1901), No. 134, pp. 321–323*).—A statistical summary dealing mainly with the number of farms in the United States in 1900 and their value.

Notes on the agriculture of Réunion, F. STUHLMANN (*Beihefte Tropenpflanzer, 2 (1901), No. 1, pp. 29, figs. 3*).

Visit to Great Britain and France, W. SAUNDERS (*Canada Expt. Farms Rpts. 1900, pp. 44–66, pl. 1*).—Notes on a trip made by the author, with a paper read before the British Association on the results of experimental work in agriculture in Canada under government organization.

Free delivery of rural mails, C. H. GREATHOUSE (*U. S. Dept. Agr. Yearbook 1900, pp. 513–528, pls. 4, maps 2*).—The author reviews the growth of the rural free delivery of mails in the United States, discusses the advantages and disadvantages of the system, quotes the opinions of a number of farmers as to rural free delivery, and gives directions as to the method of procedure in starting new routes.

Agricultural education in France, C. B. Smith (*U. S. Dept. Agr. Yearbook 1900, pp. 115–130*).—A paper on this subject in which are popularly discussed the French national department of agriculture, national schools of agriculture, practical agricultural schools, farm schools, agriculture as taught in the public schools, departmental and special professors of agriculture and their functions, and agricultural experiment stations and laboratories of France.

"France has, in all, 12 institutions for teaching agriculture of the first and second degrees, 43 for teaching the third degrees, 34 for pure practice of apprenticeship, 3,362 fields of demonstration, 77 establishments for analysis and agricultural research, and 214 departmental and special professors of agriculture, who give instruction yearly to 300,000 adult farmers and conduct agricultural classes in the normal schools for men and in the rural primary schools."

NOTES.

Alabama College and Station.—E. M. Wilcox, Ph. D., formerly of the Oklahoma College and Station, has been appointed professor of biology and horticulture in the college and biologist of the station, vice F. S. Earle, who, as previously noted, has gone to the New York Botanic Gardens. G. F. Freeman has been appointed secretary of the station. H. Harold Hume and H. A. Houghton have severed their connection with the institution.

Alabama Tuskegee Station.—The station is preparing a set of nature-study leaflets, to be placed in the hands of school-teachers. These teachers will be urged to conduct a child's garden in connection with their schools, and to teach something of nature study in a practical way. Farmers' leaflets, written in plain and simple language and dealing with the various phases of farm work, are being issued. The institute keeps in touch with its constituents by means of farmers' conferences held monthly in different localities, delegates from these conferences being sent to the monthly meetings which are held at the institute.

Arizona Station.—John J. Thornber, A. M., has assumed the duties of botanist of the station, filling the vacancy caused by the resignation of David Griffiths, now of the Bureau of Plant Industry of this Department. Mr. Thornber will be chiefly occupied with the study of grazing conditions in the southwest, especially with reference to the administration and reclamation of worn-out ranges. He has been occupied for the past four years with the study of similar problems in Nebraska.

California University and Station.—A. M. dal Piaz, assistant in viticulture, has resigned, and E. H. Twight, a graduate of the Viticultural College of Montpellier, France, has been appointed in his place. A. R. Ward, D. V. M., formerly of Cornell University and Station, has been appointed veterinarian of the station. A dairy school has been established in connection with the college of agriculture. J. H. Barber, foreman of the Paso Robles Station, has been transferred to the station at Jackson, while Foreman J. W. Neal of the latter goes to the Paso Robles Station.

Colorado Station.—An insectary is being built for the entomological section of the station. The governing board has decided to reconvey to the State 160 acres of land, formerly used as a portion of the Rockyford Substation. This reduces the substation to an area of 40 acres, most of which will be leased.

Connecticut Storrs College and Station.—President G. W. Flint and four members of the college faculty have been relieved. H. W. Conn, of Wesleyan University, has been appointed lecturer on agricultural bacteriology in the college, and placed in charge of the dairy experimentation of the station. The latter will be carried on in part at Storrs and in part at the biological laboratory of Wesleyan University.

Delaware College and Station.—C. P. Close, formerly of the Utah College and Station, has been appointed horticulturist to succeed G. Harold Powell. The latter has become assistant pomologist in this Department, vice W. A. Taylor, who has been promoted to have charge of the field experiments in pomology.

Georgia Station.—S. H. Fulton, of South Haven, Mich., has accepted the appointment as biologist and horticulturist of the station, vice A. L. Quaintance. C. L. Willoughby, of the Missouri Station, has been elected dairyman of the station, vice H. J. Wing, who retires December 1, 1901.

Idaho University and Station.—Charles A. Peters, Ph. D. (Yale), has been appointed station chemist and professor of chemistry in the university, to succeed S. Avery, who resigned at the close of the academic year to return to the University of Nebraska. Charles N. Little, Ph. D. (Yale), has been appointed professor of civil engineering in the university and irrigation engineer at the station. A new piggery, to be used in experimental work, has been erected at the college farm, at a cost of $325.

Illinois College and Station.—J. H. Skinner, formerly of Purdue University, has been appointed instructor in animal husbandry in the college and assistant in animal husbandry at the station. A. V. Stubenrauch, formerly assistant at the California Station, has been appointed assistant in horticulture at the station and instructor in horticulture in the college. A. C. Beal, a graduate of the University of Illinois, has been appointed assistant in horticulture in the college. C. F. Hottes, formerly assistant in botany in the university and for the past three years a student at the University of Bonn, Germany, has been appointed assistant in botany at the station and instructor in botany in the college. Heinrich Hasselbring, formerly assistant in horticulture at the New York State Station, has been appointed assistant in vegetable pathology at the station. H. E. Ward, formerly instructor in soil physics in the university, has been made instructor in bacteriology in the college and chief assistant in soil bacteriology in the station. Wm. H. Knox, formerly of the South Dakota College and Station, has been appointed instructor in soil physics in the college and chief assistant in soil physics at the station. Coates P. Bull, a graduate of the Minnesota Agricultural College, has been appointed instructor in farm crops in the college and assistant in farm crops at the station. His special investigation work will be in plant breeding. R. S. Woodrow has been appointed field assistant in sugar-beet investigations. J. H. Pettit, formerly of Cornell University, has been appointed assistant in chemistry at the station. E. M. East, a graduate of the university, has also been appointed assistant in chemistry at the station. A. J. Glover, formerly employed by the State Dairy and Food Commission of Minnesota, has been appointed chief assistant in dairy husbandry.

Purdue University and Station.—The horticultural department of the station has been strengthened by the promotion of William Stuart, who has served for some years as assistant botanist, to the position of associate station horticulturist. Professor Troop, as horticulturist, will give his attention more particularly to the fruits proper, while Mr. Stuart will develop the gardening side of the horticultural work. A limited amount of vegetable gardening will be conducted under glass, in addition to field gardening, and the station will also promote the general gardening interests of Indiana. F. S. Johnston, assistant agriculturist in the New Hampshire College and Station, has been appointed associate professor of agriculture in the university and assistant agriculturist of the station. Herman Dorner, B. S., has been appointed assistant botanist. H. E. Van Norman, who for some years has served as farm superintendent and assistant in dairying at the university, has been promoted to the position of instructor in dairying in the university and dairyman of the station. R. C. Obrecht, B. S. Agr., a graduate of the Iowa Agricultural College, 1901, has been appointed assistant in animal industry in the university and farm superintendent of the station. A. N. Hume, a graduate of the school of agriculture of the university, 1899–1900, has been appointed half-time assistant in the agricultural department of the station. On September 1 the station adopted the scheme of placing weather signals on the rural mail delivery wagons going out from Lafayette. These signals are enlarged reproductions of the weather flags, about 20 by 13½ inches, made of tin and painted. They are affixed to each side of the wagon by means of an iron frame, accommodating two flags on each side. Five wagons carry these flags, and a set is also exposed on the front of the experiment-station building. A key to the flags has been sent each person along the several rural routes.

IOWA COLLEGE AND STATION.—E. C. Myers, B. S. Agr., has been appointed instructor in agricultural chemistry in the college, and C. E. Gray, B. S. Agr., has been appointed assistant chemist of the station. Joseph E. Guthrie succeeds Wm. T. Shaw as assistant entomologist of the station. F. W. Faurot, assistant botantist, J. C. Brown, assistant chemist, and W. D. Hunter, assistant entomologist, have severed their connection with the station. The latter has become assistant in the Division of Entomology of this Department.

KANSAS COLLEGE AND STATION.—The board of regents has divided the farm department into the agricultural department and the department of dairy husbandry. H. M. Cottrell remains in charge of the agricultural department, and D. H. Otis, who has been assistant in dairying for some years, is placed in charge of the department of dairy husbandry. He becomes at the same time professor of dairying in the college. Dr. N. S. Mayo, recently of the Storrs Agricultural College, has been elected professor of veterinary science in the college and veterinarian of the station, a position formerly held by him. F. C. Weber, B. S., a recent graduate of the Ohio State University, has been elected assistant chemist, vice R. W. Clothier, resigned. J. M. Westgate, assistant botanist, resigned his position August 1 to take a course of study.

MAINE UNIVERSITY.—A. W. Harris has resigned the presidency of the university to accept the position of director of the Jacob Tome Institute, at Port Deposit, Md.

MARYLAND COLLEGE AND STATION.—J. B. S. Norton, M. S., has been appointed botanist and pathologist in the college and station, which makes him ex-officio State pathologist. Professor Norton is a graduate of the Kansas Agricultural College and has spent several years at the Missouri Botanical Gardens. F. H. Blodgett, B. S., of Rutgers College, New Jersey, has been appointed his assistant.

MISSOURI STATION.—J. C. Whitten, horticulturist, has been granted leave of absence for 16 months to study horticultural methods in Europe. W. L. Howard, B. S., a graduate of the University of Missouri, 1901, has been appointed assistant in horticulture, to succeed N. O. Booth, who has resigned to accept the position of assistant horticulturist at the New York State Station. F. B. Mumford, professor of agriculture, has returned from a 16 months' study of live-stock husbandry in Europe and resumed his duties. Plans for the dairy building, and for a live stock judging pavilion and veterinary laboratories have been approved, and work on these buildings will be begun at once.

MISSOURI STATE FRUIT STATION.—C. B. McAfee, of Springfield, has been appointed a member of the board of trustees at the station in place of M. T. Davis, resigned. The experiment-station building, to be used for offices and laboratories, has been completed.

NEBRASKA STATION.—Henry B. Slade, A. B., has been appointed assistant station chemist in place of R. W. Thatcher, who, as previously noted, has gone to the Washington Station.

NEW HAMPSHIRE COLLEGE AND STATION.—W. D. Gibbs, professor of agronomy in the Ohio State University, has been elected professor of agriculture and director of the station, and will enter upon his new duties January 1, 1902. He succeeds C. W. Burkett, who, as noted below, has gone to North Carolina. Marion Imes, assistant in veterinary science and dairying, has resigned to accept a position in the Bureau of Animal Industry of this Department. H. P. Richardson, assistant in agriculture and farm superintendent, has resigned to accept the position of poultryman in the North Carolina Station. Temporary arrangements have been made for carrying on the work of the agricultural department, and the college year has begun with an increased number of students in the courses of agriculture, horticulture, and forestry.

New Mexico College and Station.—Pending the election of a successor to President F. W. Sanders, Francis E. Lester, registrar of the institution, is executive officer in charge of the college. The station is investigating the best methods of irrigating from wells, and is collecting data from persons who have had experience with this system. J. J. Vernon and J. D. Tinsley have made a tour of investigation in the Pecos Valley, in southeastern New Mexico, to study the stock interests and the soil and irrigation conditions in that valley, in the course of which considerable data and information of value to the station in its work were obtained. During the past summer E. O. Wooton was engaged in investigating the timber and grazing interests of southeastern New Mexico, under the direction of the Bureau of Forestry of this Department.

New York Cornell Station.—O. F. Henziker has been appointed bacteriologist of the station, vice A. R. Ward, who, as noted above, has gone to the California Station.

New York State Station.—H. J. Eustace, a graduate of Michigan Agricultural College, 1901, has been chosen student assistant in botany. Edwin B. Hart has resumed his duties as assistant chemist, after a year's leave of absence spent in study in Germany. J. Arthur LeClerc, assistant chemist, has been granted one year's leave, also for the purpose of study in Europ.an universities. Amasa D. Cook has resigned his position as assistant chemist, to complete a course of post-graduate study at Cornell University. The director's residence is rapidly approaching completion.

North Carolina College and Station.—Charles W. Burkett, formerly of the New Hampshire College and Station, has been elected professor of agriculture in the college and agriculturist of the station, vice B. Irby. Tait Butler, formerly of the Kansas College and Station, has been elected professor of animal industry in the college and veterinarian of the station. F. L. Stevens, Ph. D. (University of Chicago), has been elected botanist of the station. W. F. Massey has resigned his connection with the college and now devotes all his time to station work in horticulture. In addition to the work already in progress, an experiment in the winter growing of lettuce under glass, with a view to determining the best varieties, as well as fertilizer requirements and methods of preventing rust, has been started. An experiment has been planned with beef cattle, and a number of thoroughbred animals will be added to the station herd, with a view to improving the cattle of the section and showing what can be done with stock in connection with cotton farming. The station will erect a special barn for these animals, and will make experiments in feeding grasses and forage plants a prominent feature of the work. The State department of agriculture has conducted, under the direction of the State chemist, considerable experimental work during the past two years. This work has been confined mainly to surveying, classifying, and mapping the soils of the State, and to conducting on some of the typical soils fertilizer, variety, culture, and new-crop tests. In this connection the department has secured two farms on type areas of the coastal plain section of the State.

Oklahoma College and Station.—The vacancy caused by the resignation of E. M. Wilcox, who has gone to Alabama, has been filled by the appointment of Walter R. Shaw, Ph. D., as botanist and entomologist in the college and station. Work has commenced on the new buildings for the college and station. An addition to the library building, to contain quarters for the departments of botany and entomology and domestic economy, and an auditorium, an engineering building, and a barn comprise the chief improvements, the cost of which will be $54,000.

Oregon College and Station.—F. M. McElfresh has resigned his position as assistant in zoology and entomology, and William T. Shaw, recently of the Iowa College and Station, has been elected to fill the vacancy as biologist in the college.

Porto Rico Station.—At the recent meeting of the American Association for the Advancement of Science L. M. Underwood read a paper before the botanical section on "The location of a tropical research station in Porto Rico," in the course of which he advocated the location of the agricultural experiment station of Porto Rico where it would also be available as a station for general botanical research, and suggested the eastern half of the island, especially the region between Arecibo and Utnado, as presenting the most favorable conditions for agricultural experiments and for botanical research, combined with accessibility. His suggestion, as far as it related to the establishment of a botanical laboratory for research in connection with the proposed experiment station, was embodied in a resolution which was adopted by the section. Thus far the station has not been permanently located, as the island has been looked to to provide the necessary land, and for various reasons none of the tracts yet offered has been accepted. Some preliminary experiments have been undertaken on land which has been leased at Rio Piedras, near San Juan, and temporary stables will be erected. The experiments here will consist largely in the growing of annual crops and vegetables, together with the propagation, grafting, and assembling of nursery stock that will be needed when permanent lands can be secured. Work has already been commenced in the interior on the improvement of the coffee by selection of seed and by propagating in seed beds prepared for the purpose. As soon as the present crop is gathered an effort will be made to improve an old grove by thinning, pruning, reducing the shade, cultivation, and whatever practical methods give promise of good results. James Mackinlay, of New York, has been appointed assistant agriculturist to the station, and O. W. Barrett, of Vermont, entomologist and botanist.

Rhode Island College and Station.—B. L. Hartwell, first assistant chemist, has been granted leave of absence for the purpose of taking a course in chemistry at the University of Pennsylvania. G. F. Parmenter, assistant chemist, has resigned to accept a position as instructor in chemistry at Brown University. Martha Austin, assistant chemist, and Thos. H. Taylor, jr., poultryman, have also resigned. The work of investigation in connection with poultry has been assigned to Cooper Curtice, biologist of the station. The station is now conducting experiments for the purpose of ascertaining the best and most economical means of rearing incubator chicks. Experimental work is also in progress in connection with fowl cholera, goose cholera, and blackhead of turkeys. An old building is being remodeled to suit the requirements of the work in connection with the rearing of incubator chicks. The entire poultry plant of the station and college has been moved from land leased by the college to a location on the college farm. The agricultural instruction of the college is now in charge of F. W. Card, assisted by J. A. Tillinghast. The latter has general supervision of the college farm and continues in charge of the details in the field experiments.

South Carolina College and Station.—D. H. Henry, B. S., has been appointed assistant chemist of the station. A new incubator and brooder house is being built, and a dry house for evaporating sweet potatoes and a laboratory for teaching soil physics, in connection with the agricultural lecture room, are being equipped. The farmers of the State manifested increased interest in farmers' institutes during the past summer. The field institutes were more largely attended, and the college institute had an attendance of nearly 500 representative farmers from every part of the State. Letters requesting information have doubled in number during the past year.

Tennessee Station.—S. E. Barnes, a graduate of the Iowa Agricultural College, has been elected dairyman, vice George A. Flickinger, resigned. Provision has been made for a working farm foreman, so that John R. Fain, who is at present farm manager, may have more time to devote to experimental work, especially in the line of animal husbandry. The unprecedented flood which swept over the university farm in September practically destroyed one or two of the more important feeding experiments contemplated for the fall and winter.

UTAH STATION.—W. D. Beers, B. S., has been appointed assistant in irrigation engineering. J. A. Wright, secretary of the State board of horticulture, has been placed in charge of the horticultural work of the station, vice C. P. Close, who, as noted above, has gone to the Delaware College and Station. Mr. Wright has had charge of the Southern Utah Experiment Station at St. George. This station was established by the State legislature two years ago, and an appropriation of $6,000 made for its maintenance for the biennial term. It is under the control of the State board of horticulture. It has a tract of about 40 acres of land and a house for the foreman. The purpose is to devote it quite largely to the study of problems in fruit culture.

VERMONT STATION.—E. S. Gregg has been appointed dairyman of the station, vice G. W. Strong.

WEST VIRGINIA UNIVERSITY AND STATION.—K. C. Davis, Ph. D., a graduate of Kansas Agricultural College and Cornell University, and instructor in botany in the Minnesota State Normal School, has been elected professor of horticulture in the university and horticulturist of the station, vice L. C. Corbett, who has become horticulturist in this Department in charge of the Arlington experimental farm.

WISCONSIN UNIVERSITY AND STATION.—F. H. King, in charge of the department of agricultural physics of the university, has resigned to assume charge of the work in soil climatology in the Bureau of Soils of this Department. A. R. Whitson, for some time past assistant professor in agricultural physics, has been placed in charge of the department vacated by Professor King. E. G. Hastings, assistant bacteriologist of the station, has been granted leave of absence for a year's study in Europe, and John F. Nicholson has been appointed in his place.

MEETING OF THE AMERICAN POMOLOGICAL SOCIETY.—The thirty-seventh biennial meeting of this society was held in Buffalo September 12 and 13, 1901. There were present about 250 delegates, 174 of whom were accredited. These represented 30 States, including Ontario. The exhibits of the society were large and of high quality. Among these was an exhibit of grapes, apples, pears, peaches, and muskmelons, part of which were grown under glass and against walls by a French organization of commercial growers (Syndicat Central des Primeuristes Française). This was made in the nature of a return for the American exhibit in Paris. The fruit was eleven days in transit and much of it was spoiled, particularly the melons and the thin-skinned grapes.

The committee on awards gave out in all 16 silver and 10 bronze Wilder medals, 2 silver and 2 bronze medals being awarded the French exhibitors. The medals were not given out as awards for competitive exhibits, but rather as awards for exhibits of superior merit.

President Charles L. Watrouse, Secretary W. A. Taylor, and Treasurer L. R. Taft were retained as officers of the association.

Following the president's address, in which the progress in pomology for the past half century was reviewed, W. T. Macoun discussed the subject of orchard renovation in the fruit districts of Ontario. At Ottawa drought is not feared, and apple growers keep their orchards in sod and have good success. The experimental orchard at Ottawa is located on sandy land with a cold subsoil not well drained. Red clover is the cover crop used. It is cut from four to six times in a season, each time just before the blossoms appear, and left to lie on the ground. The crop is believed to evaporate a large amount of moisture from the soil, thus aerating it and making it drier and warmer and adding a large amount of humus to it. The oyster-shell bark louse is controlled by spraying the tree with a lime wash made in the proportion of 1 to 2 pounds of slacked lime to a gallon of water and strained.

In Michigan orchards L. R. Taft placed spraying as the first requisite of successful apple growing, manuring second, and cultivation third. Tobacco dust was recommended for the root aphis. The experience of L. C. Corbett in West Virginia was also in favor of this treatment for the root aphis.

Quality and market was the subject of a paper by Charles W. Garfield. It was pointed out that the aim of the grower should be to place on the market fruit of superior quality in the best condition. F. A. Waugh made a distinction between table quality and market quality, stating that for wholesale purposes quantities of fruit of uniform grade were demanded, while table quality was of minor importance; but for the private demand small quantities of fruit having table quality is required. Improvement in the quality of shipping apples would be had with improved methods of marketing.

L. H. Bailey contrasted the pomology of the Atlantic States with that of California. Commercialism in fruit growing increases as we recede westward from the Atlantic coast. The wholesale cultivation of a few varieties for the general market takes the place of the special varieties for special markets. The chances for success in fruit growing are as great in the East as in California. California fruit is increasing in quantity in the East but it will never compete with the special grower in the special markets of the East. Elements of success in fruit growing are (1) faith in the region where you are, (2) tillage, and (3) cooperation in large areas devoted to one particular kind of fruit.

The development and needs of the export fruit trade were discussed by L. A. Woolverton, of Ontario, G. T. Powell and Charles Foster, of New York, and H. E. Dosch, of Oregon. It was shown that strict grading and honest picking are essential, better shipping accommodations are needed, and better methods of refrigeration.

Other papers read and discussed at the meeting were as follows: Some experiments in orchard treatment, F. M. Webster; Fermentation of fruit juices by control methods, W. B. Alwood; Orchards of the Apple-Pie Ridge and river-front regions of West Virginia, L. C. Corbett; Horticultural conditions in Minnesota, S. B. Green; and University extension work in agriculture at Cornell, J. Craig.

The society decided to be represented by delegates to the New York Hybridization and Plant Breeding Conference in 1902.

The National Beekeepers Association met in joint session with the society at one of its evening sessions. Papers were read at this meeting as follows: Bees as fertilizers of flowers, J. Fletcher; Relation of bees to the orchard, M. B. Waite; Spraying fruit trees in bloom, S. A. Beach; and The pomologist and the beekeeper, H. W. Collingwood.

On the whole the meeting was generally considered one of the best ever held; the programme was crowded, and each session well attended.

Miscellaneous.—*Journal d'Agriculture Tropicale* is the title of a new monthly journal published at Paris under the editorship of J. Vilbouchevitch. The first number was issued July 31 of this year. The journal is to be devoted to the agriculture of all of the tropical countries where "the French language is employed in preference to the German, English, or Dutch languages," including the French and Portuguese colonies, Belgian Kongo, Mexico, Brazil, and other Central and South American countries, Cuba, Porto Rico, Egypt, and the island of Mauritius. The first number contains articles on sisal hemp and machines for preparing the fiber from it; the culture of peanuts; good and bad Castilloa; the dwarf mulberry of Tonkin and its value for the production of silkworms; coffee culture in the Transvaal, and bananas; and notes on new books, statistics of sisal hemp and caoutchouc, besides minor articles.

An agricultural-physiological experiment station has been established in connection with the Technical High School at Prague. The station will have a physiological, a phytopathological, and a bacteriological division, with an assistant in charge of each. Each division will be provided with a separate laboratory. Prof. Julius Stoklasa, a member of the faculty of the Technical High School, with whose agricultural investigations the readers of the Record are familiar, will be director of the new station.

A seed-control station, especially for the examination of forest seeds, has been established in connection with the Royal Prussian Forestry Academy at Eberswalde, Germany. The director of the station is Prof. Adam Schwappach.

A dairy station has been established in connection with the Agricultural Institute of Gembloux, with M. Henseval as technical director of the station.

E. Mach, director of the Institut d'Agriculture of San Michele, Tyrol, Austria, died recently at the age of 56. His manual of viticulture and œnology (*Handbuch des Weinbaues und Kellerwirthschaft*) is considered a model work on viticulture.

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EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Assistant Director.*

EDITORIAL DEPARTMENTS.

Chemistry, Dairy Farming, and Dairying—The Editor and H. W. Lawson.
Meteorology, Fertilizers and Soils (including methods of analysis), and Agricultural Engineering—W. H. Beal.
Botany and Diseases of Plants—Walter H. Evans, Ph. D.
Foods and Animal Production—C. F. Langworthy, Ph. D.
Field Crops—J. I. Schulte.
Entomology and Veterinary Science—E. V. Wilcox, Ph. D.
Horticulture—C. B. Smith.
With the cooperation of the scientific divisions of the Department and the Abstract Committee of the Association of Official Agricultural Chemists.

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EXPERIMENT STATION RECORD.

Vol. XIII. No. 4.

The School of Practical Agriculture and Horticulture at Briarcliff Manor, N. Y., was regarded as something of an experiment at the time of its establishment, over a year ago, and its progress has been followed closely by persons interested in the various forms of agricultural education. As stated in its prospectus, "The school was established by the Committee for the Promotion of Agriculture of New York (now merged into the Board of Trustees) to open an independent means of livelihood for young men and women, especially of our cities; to demonstrate that higher value may be obtained from land under intelligent management, and to develop a taste for rural life."

It is situated in one of the most picturesque sections of Westchester County, within 3 miles of the Hudson River, and in immediate proximity to the Briarcliff Farms of over 6,000 acres belonging to Mr. Walter W. Law, a member of the Board of Trustees. On these farms are maintained a herd of 1,045 Jersey cattle, 487 being registered stock. The milk and butter produced are sold in New York City. There are on the farms over 1,500 pigs, 4,000 chickens, and 400 sheep. There are also extensive greenhouses, in which roses, carnations, and other flowers are produced on a large scale. The students of the school thus have exceptional opportunities for observing the operations of stock husbandry, dairying, and horticulture as conducted on a large commercial scale. The school has under its direct control a farm of 65 acres, part of which has been laid out in orchards and gardens, the remainder being devoted to farm crops. A school building and dormitory, with accommodations for about 40 instructors and students, has been erected on this farm. The other buildings are a farmhouse, greenhouse, barn, and poultry houses.

The faculty consists of a director, horticulturist, agriculturist, and instructors in nature study and cold storage.

Both men and women are admitted as students. "Applicants must have a good knowledge of English, give satisfactory references, be over 16 years of age, and in good health."

The course of study extends over two years of forty weeks each, and includes instruction in agriculture, horticulture, cold storage, and in botany, chemistry, geology, physics, agricultural zoology, entomology, meteorology, land surveying and leveling, and bookkeeping, all with special reference to agriculture and horticulture. Instruction, largely in the form of lectures, is given during the forenoon of each school day, and in the afternoon students, both men and women, engage in the operations on the farm under the supervision of their instructors. A foreman, gardener, and small force of laborers are employed, so that the farm operations go on continuously, the students doing such work as they can in the three or four hours a day that they devote to their practical exercises. The school is conducted, as its title indicates, as a practical school, and no attempt is made to furnish a general education, only such branches of science being taught as are necessary to an intelligent understanding of the practical instruction in agriculture and horticulture.

The school is maintained by tuition fees of $100 a year per pupil and a charge for board in the dormitory of $280 a year, together with funds secured by the trustees from private sources.

The present year about thirty-five students are in attendance, almost all of whom come from cities. Their ages range from 16 to 35 years, and most of them have previously had a high-school education or its equivalent, while some have enjoyed college privileges. Among them are some persons of considerable means who are studying agriculture with special reference to investments in land or the management of large estates. The school has been remarkably successful in attracting students, and has already reached the present limit of its accommodations. Plans are therefore being made for securing equipment on a larger scale. The applications for admission show that if the tuition fee and board were not so high, many more students could easily be obtained. It thus seems clear that the school is meeting a real demand for practical instruction in agriculture on an entirely different basis from that given in the agricultural colleges, and that there are a considerable number of young people in our cities who, for one reason or another, would prefer to engage in pursuits of country life, provided they had the training requisite for success in them. This school will not in any way take the place of the agricultural college or of secondary schools of agriculture maintained at public expense and intended for the instruction of boys and girls on farms. Its success is, however, one of many indications that the time is at hand for the broadening of our system of agricultural education to include secondary and special schools of agriculture and horticulture, to meet the varied needs of our youth in both city and country for training which will fit them to meet with success in practical agriculture and horticulture.

At the Briarcliff school, as elsewhere, when attempts have been made to give practical instruction in agriculture and horticulture, difficulty has been experienced in securing teachers having the requisite combination of scientific knowledge and practical skill and experience. The same difficulty presents itself when farm managers are sought among the graduates of our agricultural colleges. This presents one of the problems of higher education in agriculture as yet unsolved. Experience seems to show that the requisite practical skill and art of management required for the successful conduct of actual farm operations can not as a rule be acquired by students during the period of their life spent in school and college. They must obtain this afterwards by actual contact with the practical problems of the farm. The case is analagous to that of students in medicine or pedagogy. Just as the graduates of medical schools ought to have hospital practice before setting out as regular practitioners, and the graduates of normal schools ought to have actual school work under skilled supervision before taking charge of schools for themselves, so the graduates of agricultural colleges ought in some way to have opportunities for engaging in farm practice before they are accredited as qualified to be instructors in agriculture or farm managers. Already there is a considerable demand for well-equipped farm managers, and in the near future there are likely to be more openings for well-trained men as instructors in secondary and practical schools of agriculture. There is, therefore, encouragement for graduates of our agricultural colleges to give special attention to fitting themselves to meet such demands.

Plans are being made to hold a graduate school of agriculture at the Ohio State University in July, 1902. The first session of this school will be held under the auspices of that university, whose board of trustees has assumed financial responsibility for this new enterprise. The Association of American Agricultural Colleges and Experiment Stations at its recent session in Washington approved the proposition to hold such a school, and voted to assume responsibility for it after the first session, thus making it a cooperative enterprise for the colleges and experiment stations represented in the association.

Secretary Wilson has taken great interest in the project, and acting on his advice, the Director of this Office has consented to act as dean of the school at its first session, and other officers of the Department will be on its faculty. It is planned to hold a four weeks' session, during which advanced instruction and laboratory practice will be given in three general lines, agronomy, zootechny, and dairying. This instruction will be along both scientific and practical lines, and will be of a character to meet the requirements of advanced students. The cooperation of the leaders in agricultural education and research in this country is already assured, and there is good promise of an unusually strong faculty. A prospectus will be issued about January 15, 1902. Correspondence regarding the school should be addressed to Prof. T. F. Hunt, Columbus, Ohio.

An act for the establishment of an Insular Bureau of Agriculture was passed by the United States Philippine Commission early in October, and was made a part of the general plan of the provisional government established in the islands by the commission. The Secretary of Agriculture was invited, through the Secretary of War, to nominate a suitable person to take charge of the new bureau and its organization. Prof. F. Lamson-Scribner, for nearly eight years agrostologist of this Department, was nominated to this position, and has been formally appointed by the Philippine Commission. His title will be chief of the Insular Bureau of Agriculture, and his headquarters will be at Manila, where he will go sometime during the winter.

The present deplorable condition of agriculture in the Philippines marks the establishment of this bureau as one of the most important acts of the Philippine Commission. As stated in the annual report of the Secretary of War for the present year—

> The methods of cultivation are primitive and ineffective; the ordinary vegetables, notwithstanding the fertility of the land, are small and poor, and the stock is evidently run out and should be renewed. Many grains which are unknown to the people can undoubtedly be raised. They live chiefly on rice, and raise less than they consume.

In general, the bureau will, in the terms of the act establishing it, "seek to promote the development of the agricultural resources of the archipelago." Among other things, it will take charge of and conduct the model farms and experiment stations which were established in a number of provinces under the Spanish régime. The act provides that its organization shall be framed as nearly as may be after our National Department of Agriculture, with such variations as may be required by the differences in conditions and by the provisions of the act establishing Government laboratories for the Philippine Islands.

Professor Scribner has had wide experience in the field of agricultural botany and vegetable pathology, and is familiar with the various agricultural institutions of the country, both State and national. These qualifications will stand him in good stead in working out the lines of the new bureau, selecting its corps of workers, and effecting its organization. Considering the agricultural importance of the islands and the great opportunities for development along so many different lines, the field for research and economic work is exceedingly attractive, and the Bureau of Agriculture should in time develop into one of the strongest and most useful branches of the insular government.

THE ASH CONSTITUENTS OF PLANTS; THEIR ESTIMATION AND THEIR IMPORTANCE TO AGRICULTURAL CHEMISTRY AND AGRICULTURE.[1]

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Part II.—Importance of Ash Analysis to Plant Physiology and Agricultural Chemistry.

SUMMARY OF THE VARIOUS ASH ANALYSES.

During the course of the century just closed many thousand ash analyses of various products have been made, the reports of which are widely scattered. The compilation of these by E. von Wolff in his book on ash analyses[2] was a noteworthy service and has made them easily accessible. These analyses show that as between different kinds of plants the ash content, both crude and pure ash, varies quite widely, as does also that of the same kind of plants at different stages and when grown in different localities.

The following table shows in a general way the range of ash in the dry substance of the principal categories:

Approximate range in ash content.

	Per cent.	
Cereal grains, kernels	2 – 3.5	
Cereal grains, straw	4.5– 6.5	
Grasses	3 – 9	or more.
Clovers	5 – 9	
Tree leaves	3.5–10	
Wood	0.2– 0.8	
Bark	5 – 7	
Roots and bulbs	3 – 8	or more.

In the case of some plants, as for example, *Elodea canadensis* and Equisetum, these figures are greatly exceeded.

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[1] Continued from p. 220.

[2] Aschen-Analysen von landwirthschaftlichen Producten, Fabrik-Abfällen und wildwachsenden Pflanzen. Berlin, 1871, pt. 1; 1870–1880, pt. 2.

VARIATION OF THE FIGURES.

As illustrating the variation in the composition as well as in the total amounts of the ash, on the basis of Wolff's compilation, the following table is presented:

Variation in reported ash analyses.

	Pure ash.	In 100 parts of ash. Potassium oxid.	Calcium oxid.	Phosphoric acid.	Silica.	Chlorin.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Meadow hay	2.2–11.4	7.6–56.6	6.0–40.1	2.0–21.3	10.4–63.2	0.2–21.4
English rye grass	7.5–15.0	27.1–52.0	3.5–15.2	6.2–16.0	13.9–49.6	1.3–12.4
Red clover in bloom	4.5– 9.2	8.8–52.0	21.9–53.4	4.0–15.0	0.0–20.0	1.2–11.8
Winter wheat	1.6– 2.5	23.2–41.1	0.9– 8.2	39.2–53.7	0.0– 5.9	0.0– 3.5
Maize	1.0– 1.7	24.3–38.1	0.6– 3.8	37.6–53.7	0.0– 5.5	0.0– 4.8
Winter-wheat straw	4.5– 7.0	9.5–27.4	2.7– 8.9	2.2– 8.9	49.6–72.5	0.0– 7.4
Potato tubers	2.2– 5.8	44.0–73.6	0.4– 7.2	8.4–27.1	0.0– 8.1	0.7–12.6
Potato leaves	5.2–12.9	6.4–42.8	16.1–46.7	2.6–12.1	1.9– 9.4	2.8–10.5

Although a part of this variation may be traced to errors in the determination of the ash, the variations aside from this are unusually large, and the averages calculated from these figures can be of little value. In the case of winter-wheat straw, for example, the individual analyses run all the way from one-half the average figure to double that value, as shown by the following:

Variation in composition of ash of winter-wheat straw.

	Average.	Variation.
	Per cent.	*Per cent.*
Total ash	5.37	4.5– 7.0
In 100 parts of ash:		
Potassium oxid	13.65	9.5–27.4
Calcium oxid	5.76	2.7– 8.9
Phosphoric acid	4.81	2.2– 8.9
Silica	67.50	49.6–72.5
Chlorin	1.68	0.0– 7.4

The average is only a very general indication which can only approximate the truth when based on a very large number of determinations on samples of different origin and harvests, in which case the variations offset each other in a large measure.

CAUSES OF VARIATIONS IN THE AMOUNT AND COMPOSITION OF ASH.

Among the factors, aside from individuality, which influence the variation in composition of vegetable materials may be noted the influence of (1) the stage of growth, (2) the soil, (3) the fertilizers, (4) the available moisture, and (5) the thickness of the stand.

INFLUENCE OF THE STAGE OF GROWTH.

It is evident that the percentage of ash in the plant is not uniform during its growth, since the assimilation of the ash elements from the soil and the increase of organic matter in the plant do not always take place at the same rate. When the ash elements are taken up at a more rapid rate than that at which the organic matter is formed from the carbonic acid of the air and the nitrogenous matter of the soil, the older plants will be relatively richer in ash than where the reverse is true. When reserve matter is stored up, as when starch is stored in seed or cellulose is formed in wood, then the organic matter predominates and only a small percentage of ash is present. The same applies to the separate constituents.

Many investigations of the above points have been made, as for example, those of Arendt with oats, of Pierre with wheat, and of Zöller, Rissmüller, Dulk, Ramann, Tucker, and others with the leaves of trees.

Arendt,[1] who analyzed oats at four periods of growth, found that the content of silicic acid in the dry matter increased, up to the third period, from 17.46 to 28.62 per cent. The sulphuric acid was at its maximum in the fourth period, and the phosphoric acid in the third period, the percentage of phosphoric acid in the ash increasing from 8.93 to 11.21 in that period. The largest amounts of both potash and lime were taken up in the first period, the content of 46.94 per cent of potash and 12.24 of lime in this period decreasing in later periods to 34.48 per cent of potash and 11.59 of lime.

Pierre[2] obtained similar results with winter wheat. From May 1 to July 25, for example, the ash content of the dried plants fell from 7.98 to 3.38 per cent; the percentage of potash in the ash fell from 20.46 to 11.72, of lime from 16.28 to 11.87, and of phosphoric acid from 9.12 to 8.08, while the percentage of silicic acid in the ash rose from 32.84 to 54.26.

In beech leaves, according to Dulk,[3] the ash in the dry matter increased during the period from May 26 to November 7 from 4.68 to 6.39 per cent. The percentage of potash and phosphoric acid in the ash decreased as the season progressed, while that of lime and silicic acid increased.

In a similar way Tucker[4] obtained the following results in a study of the leaves of the plane tree:

Analyses of the ash of the leaves of the plane tree.

Date.	Pure ash.	In 100 parts of pure ash.			
		Potassium oxid.	Calcium oxid.	Phosphoric acid.	Silica.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
June 13	6.10	22.40	28.61	15.00	7.40
November 5	12.25	4.36	15.01	2.73	18.40

[1] Landw. Vers. Stat., 1 (1859), p. 65.

[2] Compt. Rend. Acad. Sci. Paris, 68 (1869), p. 1526; Jahresber. Agr. Chem., 1868–69, p. 264. See Wolff's Aschen-Analysen, pt. 2, p. 6.

[3] Landw. Vers. Stat., 18 (1875), p. 192.

[4] Jour. Landw., 48 (1900), p. 50.

In other words, with the advance of the vegetative process there was a great decrease in the potash and phosphoric acid and an increase in lime and silicic acid as well as in the total ash.

According to the researches of Grandeau and Fliche[1] 4 species of trees contained the following percentages of ash at different dates:

Ash content of young and old leaves.

Species.	Young leaves.		Old leaves.	
	Date.	Ash content.	Date.	Ash content.
		Per cent.		*Per cent.*
Black locust	May 2	6.25	Oct. 13	11.74
Birch	Apr. 30	3.84	Oct. 9	4.68
Bird cherry	Apr. 28	7.80	Oct. 2	7.24
Chestnut	May 1	4.60	Oct. 12	4.55

The wood of old trees is usually poorer in ash than that of young trees. For example, the wood of a beech tree[2] 20 years old contained 0.46 per cent of ash, that of one 40 years old, 0.45 per cent; one 50 years old, 0.36 per cent, and one 220 years old, 0.37 per cent. An oak 15 years old contained 0.53 per cent of ash, one 25 years old, 0.41 per cent; one 50 years old, 0.22 per cent, and one 345 years old, 0.22 per cent.

Bretschneider and Matzdorf found the sugar beet to contain on July 20, in an unripe state, 7.31 per cent of ash in the dry matter. With the growth of the beet and the increase of sugar the ash decreased, and by October 16 had fallen to 3.83 per cent.

The older the plant, or its parts, the greater are found to be the variations in the ash constituents, which is an indication that the storage of materials derived from the soil does not take place in the organs of plants at a uniform rate throughout the period of growth. Accordingly the percentage content of such materials as forage plants, for example, may vary considerably with the time of year. These variations may be brought about, on the one hand, by differences in the extent and activity of the roots in taking up plant nutrients, or, on the other hand, by the migration of these materials from the leaves, stems, etc., to other parts of the plant, where they are held in reserve, increasing the valuable constituents of the latter and decreasing those in the leaves, stems, etc. As pointed out by Fittbogen,[3] toward the end of the vegetative period a part of the nutritive material in the roots is conveyed to the portion of the plant above the ground.

INFLUENCE OF THE SOIL UPON THE ASH OF PLANTS.

It is evident that in soils of different composition quite different amounts of ingredients are at the disposal of plants, and it may be

[1] Ann. Chim. et Phys., 5. ser., 8 (1876), pp. 499, 500.

[2] Weber, in Wolff's Aschen-Analysen, pt. 2, p. 69; Forstl. Blätter, 1876, p. 257.

[3] Landw. Vers. Stat., 6 (1864), p. 481.

presumed that under such conditions they will take up different amounts, and accordingly will show varying percentages of these materials in their ash. Plants grown in lime soils contain more lime than those grown in sandy soils originating from sandstone. For example, Wunder[1] reports that turnips grown in a clay soil rich in lime contained 9.28 per cent of lime in the ash, while those grown in a sandy soil poor in lime contained only 5.47 per cent. Grapevine wood from a soil poor in lime and composed of gneiss, schist, and quartz contained. according to Hruschauer,[2] 32.16 per cent of lime and 34.13 per cent of potash in the ash, while that from a lime soil contained 37.16 per cent of lime and 24.93 per cent of potash in the ash.

Emmerling and Wagner[3] report that hay made from peaty meadows poor in fertilizing ingredients contained 26.30 per cent of potash, 6.50 per cent of lime, and 5.11 per cent of phosphoric acid in the ash, while hay from a good marsh soil contained 37.30 per cent of potash, 9.83 per cent of lime, and 7.28 per cent of phosphoric acid in the ash. On the other hand, the ash of the hay from the poor soil contained 41.82 per cent of silicic acid, while that from the other contained only 21.37 per cent.[4]

From an examination of oats grown on different soils Atterberg[5] found a quite variable content of potash, phosphoric acid, lime, etc., in 1,000 parts of the stalk, seed, and leaves.

INFLUENCE OF FERTILIZERS.

The composition of the ash varies especially when the soil is fertilized with varying amounts of the different ash ingredients in available form. Of the very many evidences of this, only a few cases can be cited. The ash of the sugar beet grown with different fertilizers contained, according to Hanamann,[6] the following:

Potash, lime, and phosphoric acid in ash of sugar beets.

	Potash.	Lime.	Phosphoric acid.
	Per cent.	*Per cent.*	*Per cent.*
Without fertilizers	49.22	17.81	5.78
With potash	52.97	12.31	8.41
With phosphoric acid	48.07	12.71	10.38
In other investigations:			
Without fertilizers	48.69	10.18	12.32
With potash	52.24	8.63	13.85
With phosphoric acid	49.77	8.88	16.34

[1] Landw. Vers. Stat., 4 (1862), p. 264.

[2] Wolff's Aschen-Analyse, pt. 1, p. 114; E. Wolff, Chemische Forschungen auf dem Gebiete der Agriculturchemie u. Pflanzenphysiologie, 1847, p. 322.

[3] Centbl. Agr. Chem., 8 (1875), p. 333.

[4] It should be noted that the grass growing on these two soils was not of the same kind.

[5] Jour. Landw., 49 (1901), p. 97.

[6] Landw. Jahrb., 7 (1878), p. 795; 8 (1879), p. 823; Jour. Landw., 1876, p. 41.

According to Wunder,[1] turnips grown in sand with one application of potash, and in a loam soil, contained the following percentages of potash:

Potash in turnips grown in different soils.

	Sand with potash fertilizer.			Loam soil.	
	First year.	Second year.	Third year.	First year.	Second year.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Potash in dry substance	8.15	5.92	4.73	3.95	4.90
Potash in 100 parts of ash	58.29	52.16	43.36	43.12	44.83

Hellriegel[2] found in barley plants grown in water cultures with increasing amounts of potash from 0.35 to 3.96 per cent of potash in the dry matter. E. Wolff[3] found that in oats grown in water cultures of different composition the ash contained from 18 to 54 per cent of potash, 4 to 38 per cent of lime, and 0 to 27 per cent of soda. Nessler[4] found in the ash of the grapevine the following:

Ash constituents in grapevines.

	Potash.	Lime.	Phosphoric acid.
	Per cent.	*Per cent.*	*Per cent.*
Vines not fertilized	16.76	25.66	9.02
Vines fertilized with potash	23.75	23.99	7.34

Nessler[5] states that in general the content of potash as well as of chlorin in the plant is found to be increased by the addition of these elements to the fertilizer. Pfeiffer[6] studied the effect on the chlorin content of potatoes of applying fertilizers containing no chlorids as compared with those containing chlorin, with the following results:

Chlorin in potatoes (air-dry substance).

	Per cent.
Without chlorin fertilizers:	
No potash salts	0.215
Potassium sulphate	.211
With chlorin fertilizers:	
Potassium chlorid	.279
Potassium sulphate and magnesium chlorid	.373
Kainit	.362
Rock salt	.458

Another illustration of the effect of fertilizers on the individual elements of the ash is afforded by the following analyses by Councler[7] of the ash of maple leaves (*Acer negundo*). One series was in water

[1] Land. Vers. Stat., 4 (1862), p. 266. [2] Ibid., 11 (1869), p. 136.
[3] Ibid., 11 (1869), p. 141. [4] Ibid., 16 (1873), p. 186. [5] Ibid., 40 (1892), p. 411.
[6] Ibid., 49 (1898), p. 371. [7] Ibid., 29 (1883), p. 241.

cultures and accordingly supplied with all the elements of plant growth, and the other in the soil. The following shows the composition of the crude ash:

Ash of maple leaves grown in soil and in water cultures.

	Grown in soil.	Grown in water cultures.
	Per cent.	*Per cent.*
Sand and carbon	35.98	9.15
Silica	9.94	3.24
Sulphuric acid	4.06	14.84
Phosphoric acid	1.91	8.90
Alumina	2.23	.00
Ferric oxid	.51	.74
Magnesium oxid	2.62	2.88
Calcium oxid	15.06	12.10
Sodium oxid	.37	.47
Potassium oxid	18.88	36.91
Carbon dioxid, chlorin, and loss	8.74	9.77

In an extended fertilizer experiment, organized by the late Professor Liebscher, with oats on soils from 24 estates von Seelhorst[1] obtained the following results as to the composition of the ash of the part above ground (roots not included):

Phosphoric acid and potash in oat plant (air-dry substance exclusive of roots).

	Potash.	Phosphoric acid.
	Per cent.	*Per cent.*
Not fertilized	2.122	0.588
Fertilized with potash	2.997	.597
Fertilized with phosphoric acid	2.175	.735

Atterberg[2] has made a long series of experiments. He obtained, for example, the following range of potash (in dry matter) in oats grown in sand cultures with increasing amounts of potash: In unripe harvested plants, 0.75 to 2.46 per cent; in ripe straw, 0.41 to 2.76 per cent; and in the ripe grain, 0.76 to 0.80 per cent.

He secured similar results for phosphoric acid, lime, magnesia, and nitrogen content of the plant. With increasing amounts of the respective ingredients, the yield increased and the percentage of the respective ingredients, as a rule.

In the renowned researches of Lawes and Gilbert[3] at Rothamsted the influence of the fertilizers upon the composition of the plant is shown, as in the growth of barley for 30 years with and without an application of potash. With the addition of potassium sulphate the ash of the straw contained from 27.85 to 34.43 per cent of potash, while without the potash fertilizers the straw contained only from 8.70 to 18.44 per cent of potash.

[1] Jour. Landw., 46 (1898), p. 386.

[2] Jour. Landw., 49 (1901), p. 97.

[3] See K. Bieler, Die Rothamsted Versuche. Berlin, 1896, p. 50.

Although the above examples show a marked influence of the fertilizing materials, in or applied to the soil, on the content of these materials in the ash, it should be mentioned that this effect is not always as marked and may disappear entirely or in some cases be quite the reverse of that noted. This may be due to the fact that when an element, as potash, is present in the soil or fertilizer in insufficient amount, the plants develop poorly and give only a very poor yield; while when fertilized with potash a much larger yield is obtained. When the plants grown without potash fertilizer are incinerated, an absolutely smaller amount but a relatively much larger amount of potash may be found in the ash, while the larger yield obtained with potash manuring may show an absolutely larger amount of potash without the percentage of potash being increased. It must be borne in mind that there are always several factors which influence the absolute amounts of plant food taken up by the plant, as well as the percentage composition of the ash. For example, the presence of nitrogen in the fertilizer or the soil has a great influence, since it promotes a vigorous growth, and the increased yield, consisting largely of organic matter, results in a suppression of certain ash elements of the plant (and a preponderance of others). This is shown, for example, in the above-mentioned experiments of von Seelhorst, in which the average percentages of phosphoric acid and potash in the air-dry matter of the oat plant were as follows:

Potash and phosphoric acid in oat plants differently fertilized (von Seelhorst).

Fertilizer applied.	Potash.	Phosphoric acid.
	Per cent.	*Per cent.*
Potash	2.997	0.597
Potash and nitrogen	2.292	.403
Nitrogen	1.536	.413
Without fertilizer	2.122	.588
Phosphoric acid	2.175	.735
Phosphoric acid and nitrogen	1.348	.472

INFLUENCE OF THE THICKNESS OF THE STAND.

It is well known that the growth and development of plants vary greatly with close and thin planting. It is true of plants in general that they develop better when each plant stands by itself than when they are set close together, and it is evident that this is due to the greater area of soil at the disposal of the plant, as well as the increased amount of light and air. When plants have more soil space in which to grow, they naturally have more plant food at their disposal and more moisture, and this condition must influence the amount and the composition of the plant ash. As illustrating the above points, the experiments of von Seelhorst and Panaotovic[1] with spring wheat and oats

[1] Jour. Landw., 47 (1899), p. 379.

may be noted. Pots containing equal amounts of soil, fertilizer, and moisture were planted with 1, 5, and 8 kernels, respectively, with the following results:

Yields of wheat and oats at different thicknesses.

	Number of kernels in pot.		
	1 kernel.	5 kernels.	8 kernels.
	Grams.	*Grams.*	*Grams.*
Spring wheat	43	72.6	77.2
Oats	66.4	80.8	86.6

The yield from the 1 kernel alone was relatively much greater than that from 5 or 8 kernels, and the same was true of the total ash. The percentages of total ash in the grain, and of potash, phosphoric acid, and lime in the ash were as follows:

Ash of wheat and oats grown at different thicknesses.

	Spring wheat.			Oats.		
	1 plant.	5 plants.	8 plants.	1 plant.	5 plants.	8 plants.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Total ash	2.334	2.177	2.034	3.393	3.240	3.382
In the total ash:						
Potash	34.75	29.85	44.59	17.89	12.56	21.05
Phosphoric acid	33.38	32.01	31.27	22.99	20.74	18.59
Lime	7.46	5.33	5.11	7.05	7.03	5.06

It is thus seen that there are great differences in plants grown singly as compared with 5 or 8 grown together in similar pots.

Atterberg[1] made a similar experiment with oats, and found that by thicker sowing and larger yield the percentages of potash and phosphoric acid fluctuated, while that of nitrogen was less than with thinner seeding. The nitrogen content of the straw was as follows: Thin seeding 0.94 per cent, average seeding 0.88 per cent, and thick seeding 0.68 per cent. Beseler and Maercker[2] found that increasing the thickness of the seeding had a similar influence in lessening the nitrogen content of oat grains. It is well known that the sugar content of sugar beets is much influenced by thick and thin planting, and this is also true of the ash constituents.

INFLUENCE OF AVAILABLE MOISTURE ON THE ASH.

In addition to the effect of soil, fertilizer, and thickness of seeding on the composition of the ash of plants, there are other factors at work.

[1] Jour. Landw., 49 (1901), p. 97.

[2] Centbl. Agr. Chem., 13 (1884), p. 453; Ztschr. Landw. Cent. Ver. Sachsen, 1884, Nos. 4, 5.

and among these is the presence of much or little water in the soil. The influence of water has of late been much studied, and in some cases has been found to exceed that of soil, fertilizer, and thickness of seeding.

The life-giving influence of water in the plant world is well known. The enormous irrigation enterprises in the warmer regions carry fertility everywhere, and especially where the soil is naturally rich. The work of Hellriegel[1] is of especial value in studying the importance of this factor in plant production. Fittbogen[2] has also made a careful study of this subject, and more recently A. Mayer, Pagnoul, Remy, and especially von Seelhorst[3] at Göttingen. The latter, with Tucker and Wilms,[4] has made a study of the influence of much and little water in the soil upon the taking up of fertilizing ingredients and the composition of the ash. In general it was shown that when an insufficient amount or "little water" was provided the crops of potatoes, oats, grass, and clover were diminished, and that the yield was materially increased by a medium amount or still more by "much water." In the increased crops grown with much water the percentage of ash in the dry substance was not lessened as compared with that of the crop grown with little water, but, on the contrary, was often somewhat greater, as in the case of the potato; hence it would appear that when plenty of water is present in the soil much more of the ash constituents are taken out by the plant than when there is a deficiency of water.

The percentages of potash, lime, phosphoric acid, sulphuric acid, and chlorin fluctuate with the changes in the amount of water present. This is shown in the case of potato tubers,[5] for example, as follows:

Ash of potato tubers grown with much and little water.

	Pure ash in dry substance.	In the pure ash.				
		Potash.	Lime.	Sulphuric acid.	Phosphoric acid.	Chlorin.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Unfertilized:						
Little water	3.85	59.38	1.19	10.25	15.28	10.79
Much water	4.06	56.16	3.22	9.51	15.52	13.29
Fertilized with potassium sulphate:						
Little water	3.83	61.42	1.97	8.29	14.55	10.84
Much water	4.16	60.21	3.34	8.91	13.89	11.91

There was an increase in the percentages of lime and of chlorin with the use of much water, while the potash decreased somewhat.

[1] Beiträge zu den naturwissenschaftlichen Grundlagen des Ackerbaus mit besonderen Berücksichtigung, u. s. w. Braunsceweig, 1883; Jour. Landw., 31 (1883), p. 376.

[2] Landw. Jahrb., 2 (1873), p. 353.

[3] Jour. Landw., 47 (1899), p. 369.

[4] Ibid., p. 251.

[5] Daszewski and Tollens, Jour. Landw., 48 (1900), p. 223.

Von Seelhorst[1] obtained the following percentages of phosphoric acid and potash in the dry substance of oat kernels:

Phosphoric acid and potash in oats grown with much and little water.

	Phosphoric acid.	Potash.
	Per cent.	*Per cent.*
Unfertilized:		
Little water	0.933	0.482
Much water	1.060	.616
Fertilized with potash and nitrogen:		
Little water	1.083	.462
Much water	1.151	.470

The content of potash and phosphoric acid in the grain was, therefore, considerably increased by the presence of an abundant supply of water.

Recently Langer and von Seelhorst[2] have made experiments of this kind with oats grown in sterilized sand, and Langer and Tollens have made analyses of the resulting crop, with the following results:

Fertilizing ingredients in oat roots.

Fertilizer applied.	Little water.			Much water.		
	Phosphoric acid.	Potash.	Nitrogen.	Phosphoric acid.	Potash.	Nitrogen.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Phosphoric acid	0.251	0.147	0.748	0.165	0.142	0.678
Phosphoric acid and potash			.736	.269	.247	.645
Phosphoric acid and nitrogen	.233	.116	1.138	.276	.163	.896
Phosphoric acid, potash, and nitrogen	.236	.262	1.154	.237	.189	.919

It will be seen that the results vary quite widely with the use of the different fertilizers and amounts of water.

RELATION OF THE ASH OF PLANTS TO THE FERTILIZING INGREDIENTS OF THE SOIL.

In view of the fact that the soil and the fertilizer used influence the amount and composition of the ash of plants, it would seem that an examination of the plants grown on a soil might give an indication of the plant-food constituents of the soil. This point has been studied in a comprehensive manner, first by Heinrich[3] and afterwards by Liebscher, Helmkampf, Atterberg, and others. According to some of these investigations it appears that the fertility of a soil might be measured by growing plants adapted to the particular soil and analyzing the plants, the results indicating a greater or smaller content of assimilable elements in the soil.

After Hellriegel[4] had shown that the potash content of barley straw

[1] Jour. Landw., 46 (1898), pp. 422, 423.

[2] Ibid., 49 (1901), p. 209.

[3] Grundlagen zur Beurtheilung der Ackerkrume, 1882.

[4] Landw. Vers. Stat., 11 (1869), p. 136.

might range from 0.4 to 6 per cent, according to the percentage in the soil, Heinrich used the oat plant in his experiments and analyzed the roots of the crop grown. When he found in the dry roots of oats from 0.08 to 0.1 per cent or less of potash or phosphoric acid and 0.35 or less of lime, he concluded that the soil was deficient in these materials and that the necessity of fertilizing with them was indicated.[1]

Dikow[2] confirmed Heinrich's results in general, although he employed barley and fixed the minimum for phosphoric acid in the roots at 0.13 per cent.

Atterberg[3] made a long series of investigations, among others with the oat plant. He did not analyze the roots, but the straw and the grain. In his sand cultures, in which he applied the phosphoric acid in the form of a phosphate solution containing all the way from 1 to 7 per cent of phosphoric acid, the phosphoric acid in the resulting straw rose proportionately from 0.026 to 0.792 per cent and in the grain from 0.44 to 0.95 per cent. At the same time the total yield increased, but the percentage of nitrogen in the straw diminished. He laid special stress on the determination of the ratio between the nitrogen and phosphoric acid and also the potash. He concluded that in the oat grains the ratio of nitrogen to phosphoric acid should approach as nearly as possible 100 : 55, and in the oat straw the ratio of nitrogen to potash, 100 : 100; that is, the percentage of nitrogen should equal that of potash.

Joulie[4] presented some general deductions to the effect that from plant analyses (wheat) the fertility and fertilizer needs of the soil could be determined upon; and some of Maercker's researches indicate the same conclusion.

Helmkampf[5] made a thorough study of Heinrich's method. He did not deny that the method had value, but considered spring wheat a better plant for experimental work of this kind than the oat plant. He advised, furthermore, that the part of the plant above ground, harvested during the period of bloom, be used for analysis instead of the roots. He did not give any minimum values for the individual elements, although he stated that when there was an increase in the percentage of potash, phosphoric acid, and nitrogen in the dry matter of the crop as a result of the application of these materials to the plat, the need of these materials was indicated.

In a more recent article by Atterberg[6] the minima for oats are given as follows:

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[1] He made the same application in case of nitrogen as in the ash constituents.

[2] Jour. Landw., 39 (1891), p. 134.

[3] Landw. Jahrb., 15 (1886), p. 415; 16 (1887), p. 757; Jour. Landw., 49 (1901), p. 97.

[4] Jour. Agr. [Paris], 1889, I, No. 1058, p. 89.

[5] Jour. Landw., 40 (1892), p. 168.

[6] Ibid., 49 (1901), pp. 165, 172.

Atterberg's minima for oats.

	Ripe kernels.	Whole plant.	Half-ripe plant.
	Per cent.	*Per cent.*	*Per cent.*
Phosphoric acid	0.37	0.21	0.14
Potash	....	.37	.37
Lime	....	.08	.10
Magnesia	....	.10	.08
Nitrogen	....	.80	.68

It is seen from the above that in spite of much research and much discussion the question of judging of the soil by the results of ash analysis of the plant grown therein is not settled. It might be helpful to a further clearing up of the question to grow plants like oats or spring barley on a very poor soil and gradually increase the applications of potash, phosphoric acid, and nitrogen. With very little plant food the plants would make insufficient growth; with somewhat more the growth would be better, and gradually the amounts of fertilizers would be determined with which the plants began to make satisfactory growth. Then analysis of the resulting plants would show certain percentages of potash, phosphoric acid, and nitrogen, and thus the minimum for these elements in the plants would be found. If similar plants grown on the soil to be tested should show a content of potash, phosphoric acid, and nitrogen lower than this minimum the indication would be clear that the soil was deficient in these elements of plant food, and they should be supplied in the fertilizer.

This method of determining the fertilizing elements deficient in the soil by the analysis of the ash of the plants grown therein still requires much investigation. The percentages of potash, phosphoric acid, etc., in the plant ash, as well as the amounts in the dry matter, are, as already described, influenced not only by the plant food contained in the soil, but also by other conditions, as the water content of the soil or the amount of rainfall. Many researches are yet required to make the method practicable and reliable.

Although investigation on the subject of the ash constituents of plants has been very extensive, much still remains to be done and the subject presents an inviting field for thorough and exact research. In the present status of our knowledge such researches are much to be desired.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

Analysis of fertilizers, D. Sidersky (*Analyse des engrais. Paris: Ch. Béranger, 1901, pp. 240, figs. 2*).—This book has been prepared in accordance with the action of the Second International Congress of Applied Chemistry at Paris in 1896, instructing the author to collect the various official methods of analysis of fertilizers in one publication in the French language. It contains the official methods adopted in France, Belgium, Holland, and the Grand Duchy of Luxemburg; Germany and Switzerland; Austria-Hungary; the United States, and Italy. The report of the committee appointed by the Third International Congress at Vienna in 1898 on international methods, which was adopted by the Fourth Congress at Paris in 1900, is also given, with a short account of the Kjeldahl method by Kjeldahl himself.

A contribution to the improvement of the rapid determination of water-soluble phosphoric acid in superphosphates, L. von Széll (*Landw. Vers. Stat., 55 (1901), No. 4–5, pp. 325–346; abs. in Chem. Ztg., 25 (1901), No. 52, p. 199*).—This is an account of an investigation on 7 different kinds of superphosphate of the influence on the accuracy of the determination of soluble phosphoric acid of (1) lack of uniformity in the sample, (2) different methods of extraction, (3) imperfect filtration, and (4) errors in the precipitation and subsequent operations of the determination. The results show that large errors may be introduced into the determination by lack of attention to any of the points named. As a result of his work, the author proposes the following method: Grind 20 gm. of the sample, which has been passed through a 3 mm. sieve, with water in a porcelain or glass mortar until it forms a thick broth. Gradually add more water and decant the solution into a liter shaking flask. After extracting in this way 4 or 5 times wash the insoluble residue into the flask. Fill the flask nearly to the mark and shake for ¼ to ½ hour in a shaking apparatus, complete the volume to the mark, and filter through double filter papers. If a shaking apparatus is not available allow the solution to stand 1 to 2 hours, with frequent shaking. To 50 cc. of the clear filtrate add, with vigorous stirring, just enough citrate solution (300 gm. citric acid, 1 liter of 24 per cent ammonia, and 3 liters of water) to dissolve the precipitate formed on the first addition of the citrate, then add an additional quantity of the solution equal to one-tenth the amount so used to clear up the solution. Precipitate the phosphoric acid by adding, with constant stirring, the required amount of magnesia mixture, prepared by dissolving 55 gm. of magnesium chlorid and 70 gm. of ammonium chlorid in 650 cc. of water, making the volume to 1 liter with 0.96 sp. gr. ammonia, allowing to stand 24 hours, and filtering. Twenty-five cubic centimeters of magnesia mixture is usually sufficient for the precipitation. After standing 6 to 12 hours, or after ¼ to ½ hour's mechanical stirring and 2 hours' standing, collect the precipitate on a filter, wash with 2½ per cent ammonia until free from chlorids, dry the precipitate at 100 to 120° C., char over a low flame, then ignite strongly for ½ hour, and weigh.

On the adaptability of the molybdic method to the determination of citric-acid soluble phosphoric acid in Thomas slag, O. Foerster (*Chem. Ztg., 25 (1901), No. 39, p. 421*).—To reduce the precipitation of silicic acid as much as possible the author recommends that in the precipitation with molybdic solution the beakers be allowed to stand 10 to 15 minutes in a water bath which is not higher than 80° C. at the beginning and is allowed to cool after the beakers are placed in it.

Estimation of phosphates in potable waters, A. G. WOODMAN and L. L. CAYVAN (*Jour. Amer. Chem. Soc., 23 (1901), No. 2, pp. 96–107, figs. 2*).—The ordinary colorimetric methods are criticised and the following modification is recommended: Mix 50 cc. of the sample with 3 cc. of nitric acid (sp. gr. 1.07), evaporate to dryness on a water bath, and dry the residue in a water oven for 2 hours to render silica insoluble. Dissolve in 50 cc. of water, and without filtering introduce into tube for colorimetric determination. Tubes of hard white glass 2.5 cm. in diameter and 24 cm. long to the 100 cc. mark are recommended. To the solution in these tubes add 4 cc. of ammonium molybdate solution (50 gm. per liter) and 2 cc. of nitric acid (sp. gr. 1.07), and after 3 minutes compare the color with that obtained by the use of standard solutions of sodium phosphate.

On the determination of dry matter in soil samples, H. PUCHNER (*Landw. Vers. Stat., 55 (1901), No. 4–5, pp. 309–324*).—Determinations of moisture in a large number of different kinds of soils, using various kinds of apparatus and methods, are reported. From the results obtained the conclusion is drawn that it is impossible to accurately determine moisture in soils by means of the ordinary methods of drying at 105° C. The precautions which the author suggests in order to secure accuracy are (1) cooling the dried sample only in a closed desiccator before weighing; (2) the use of a well-ventilated drying oven, so that the heated gases are rapidly removed; (3) the introduction of the sample into the drying bath only after the temperature has been raised to 105°, and (4) maintaining the temperature uniformly at 105°. The apparatus which the author considers most nearly satisfying these conditions are those of Soxhlet[1] and Ulsch.[2] It is suggested that electrical heating might be applied to this purpose with advantage.

Calcium carbonate in soils, and a new apparatus for the determination of the same by practical agriculturists, M. PASSON (*Deut. Landw. Presse, 28 (1901), No. 42, pp. 367, 368, fig. 1*).—The importance and function of active lime compounds (carbonates) in soils are discussed, and a modification of Gerlach's simplified Scheibler apparatus for the rapid determination of carbonates in soils is described. This apparatus consists of two parts, a generator and a measuring tube. The generator consists of a wide-necked glass flask, closed with a rubber stopper, through which passes the small neck of a pear-shaped flask, which reaches down into the larger flask and carries the hydrochloric acid used in driving off the carbonic acid from the soil. This smaller flask has a hole in its side through which the acid is introduced. The measuring tube is U-shaped, about 2 cm. in diameter, and 20 cm. high. The right arm is funnel-shaped at the top and has a side tube with stopcock near the bottom. The left arm carries a scale covering a volume of 4.65 cm., graduated to read to tenths of a per cent of calcium carbonate. This tube is connected with the generator by means of a rubber tube. In operation, the tube is filled with water to the zero mark of the scale. The small pear-shaped flask of the generator is filled about three-fourths full with dilute hydrochloric acid through the hole in its side. About 20 gm. of the soil to be tested is placed in the larger flask of the generator. The parts of the apparatus are then connected, and the generation of the carbon dioxid from the soil is begun by tilting the digestion flask so that the acid runs out of the hole in the side of the small flask upon the soil. The gas passes over into the measuring tube, displacing the water in the left arm and causing it to rise in the right. By means of the stopcock the level of the water is maintained at the same height in both arms of the tube. When no further gas is evolved by vigorous shaking of the generator, the

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[1] Ztschr. Angew. Chem., 1891, p. 363.
[2] Chem. Ztg., 19 (1895), No. 51, p. 1183.

percentage of calcium carbonate is read from the scale. If 0.4 or more of calcium carbonate is thus found in the soil, application of lime is considered unnecessary.

The determination of lime in soil samples, E. HOTTER (*Ztschr. Landw. Versuchw. Oesterr., 4 (1901), No. 5, pp. 632–636; abs. in Chem. Ztg., 25 (1901), No. 58, Repert., p. 208*).—The method proposed by the author for the determination of available lime (in form of carbonate) in soils is as follows: Digest 20 gm. of the dry soil, which has been ground to pass a 15 mm. sieve, with 50 cc. of 20 per cent acetic acid for one-half hour in a boiling water bath, make the volume to 1 liter, shake thoroughly, and allow to stand for 12 hours for the solution to become clear. To 200 cc. of this solution add ammonium oxalate in excess to precipitate lime. Collect the precipitate on a filter, wash with cold water, and heat gently at first and then strongly ignite, cool, and weigh the CaO obtained. The ignited precipitate is generally colored gray or brown by manganese oxid, but the amount of this substance is usually negligible. It may be removed, however, by dissolving in dilute nitric acid, filtering, and reprecipitating the lime. Twenty comparisons of this method with the gravimetric method based upon the determination of carbon dioxid are reported. The results by the new method are as a rule higher than those given by the gravimetric method.

The complete analysis of feeding materials, C. A. BROWNE, JR., and C. P. BEISTLE (*Jour. Amer. Chem. Soc., 23 (1901), No. 4, pp. 229–236*).—A sample of distillery waste or mash analyzed by the usual method at the Pennsylvania Station showed a nitrogen-free extract content of 42.93 per cent. Of this about 25 per cent was pentosans, leaving some 15 per cent of material unaccounted for. In analyzing the latter substance by the Sherman method (E. S. R., 8, p. 951) the sum of all the ingredients in the feeding stuff was found to be 96.01, leaving a residuum of about 4 per cent. In order to determine the composition of this residuum a second series of samples was carried through as in the first case, except that the pentosans in the residues were estimated after each stage of the process. From these results it appears that several per cent of a material of a pentose nature found its way into the alcoholic or aqueous extracts, which because of its copper-reducing power would affect the sugar and dextrin determinations. As no copper-reducing bodies were removed by the alcohol, it seems that these pentoses were removed by the water. The copper-reducing power of the aqueous extract the writers believe to be due to bodies of a pentose nature, and if such be the case a serious error exists in the usual process of determining dextrin. Further tests of the results found are presented, and attention is called to the uncertainties in the analytical methods of feeding stuff analysis, as well as to the more or less arbitrary nature of the factors for calculating protein and pentosans.

The hydrochloric-acid-phloroglucin method in the determination of pentosans, E. KROBER (*Jour. Landw., 48 (1901), No. 4, pp. 357–384*).—The author made an extended study for the purpose of testing the method, and in order to determine factors for estimating furfurol and other substances from the phloroglucid obtained. He found that the results are not influenced by allowing the precipitate to stand from 14 to 20 hours. A porcelain Gooch crucible is better adapted to collecting the precipitate, and the wash water should be put through in small portions, attention being paid to the physical condition of the residue, otherwise the filtrate may show no reaction for chlorin while the residue will contain it. Should the precipitate contain chlorin, too high results will be obtained. No practical difference was found in the results when pure phloroglucin and that containing diresorcin was used. Twice as much phloroglucin as is expected of the furfurol should be used. Before adding the phloroglucin to the furfurol solution it should be dissolved in warm diluted hydrochloric acid (specific gravity 1.06). Drying the precipitate 4 hours at a temperature of from 98.5 to 100° C. is recommended. Attention is called to the fact that phloroglucid is very hydroscopic, and the author obtained better and more uniform results by cooling the Gooch crucible in a weighing bottle in the desiccator.

In studying the composition the author came to the conclusion that 1 molecule of furfurol and 1 molecule of phloroglucin unite, 2 molecules of water being eliminated. By using pure furfurol, arabinose, and xylose with the phloroglucin, factors were determined from which a table was worked out for estimating furfurol, arabinose, araban, xylose, xylan, pentose, and pentosan from the phloroglucid obtained in analysis. The table covers amounts from 0.03 and 0.3 grams; higher and lower amounts may be estimated from a formula.

The determination of pentosans, G. S. Fraps (*Amer. Chem. Jour., 25 (1901), No. 6, pp. 501–508*).—It is generally assumed that when pentosans are distilled with hydrochloric acid of 1.06 sp. gr. furfurol is the only product obtained in the distillate, precipitable by phloroglucol. The author in his work found that if the proper precautions were not taken insoluble fatty acids and an amorphous black precipitate (formed upon the distillate simply standing) were usually present, as well as a substance or substances, termed furaloid, which is precipitated by phloroglucol and destroyed, partially or wholly, by second distillation. These furaloid-yielding bodies seem to be widely distributed in nature, as all materials tested contained them in percentage varying from 6.9 to 22.6. They are hydrolized by boiling with 1.25 per cent sulphuric acid, at the same time being almost, if not entirely, destroyed. In the sample of timothy-hay excrement examined they were more highly digested than total pentosans.

As the possibility of the formation of these furaloids from true pentosans (anhydrids of pentose sugars) by distillation with hydrochloric acid was found, from results obtained on xylose, to be highly improbable, it is evident that their presence in crude furfurol affects the determination of pentoses. The author questions the expediency of determining pentosans and furaloid-yielding substances separately until more is known about pentosans.—C. B. WILLIAMS.

The nature of pentosoids and their determination, G. S. Fraps (*North Carolina Sta. Bul. 178, pp. 59–74*).—The author summarizes existing knowledge relating to pentosoids, and reports his investigation on their properties and their determination, which is described above from another source.

Determination of organic nitrogen by the methods of Kjeldahl and Will and Varrentrap, A. Van Engelen (*Rev. Internat. Falsif., 14 (1901), pp. 14–18; abs. in Jour. Chem. Soc. [London], 80 (1901), No. 463, II, p. 343*).—The Kjeldahl method and its various modifications are briefly reviewed and experiments with pear leaves and cotton-seed meal are reported, which show that the highest percentages of nitrogen were obtained by closely following Kjeldahl's original directions, namely, digesting for 2 to 3 hours with sulphuric acid and adding potassium permanganate. For occasional determinations of nitrogen the Will and Varrentrap combustion method is considered more convenient. The author uses an iron combustion tube.

Research work in plant ash determinations conducted in connection with the Association of Official Agricultural Chemists, A. E. Shuttleworth (*Ontario Agr. Col. and Expt. Farm Rpt. 1900, pp. 22–25*).—Two series of ash determinations comparing the official method with the author's method (E. S. R., 11, p. 304) made by C. C. Moore of the Bureau of Chemistry of this Department, G. S. Fraps of the North Carolina College of Agriculture and Mechanic Arts, and W. P. Gamble of the Ontario Agricultural College, are reported in tabular form and discussed. The author believes that volatilization and fusion in the preparation of ash are two important sources of error, and that by his method the use of calcium acetate overcomes the difficulty of fusion and the use of a closed platinum apparatus prevents volatilization.

Household tests for the detection of oleomargarine and renovated butter, G. E. Patrick (*U. S. Dept. Agr., Farmers' Bul. 131, pp. 11*).—Notes are given on renovated or process butter and on its method of manufacture, and two tests, the boiling test and the Waterhouse test, for distinguishing genuine butter from renovated butter or oleomargarine are described in a popular manner.

Volumetric estimation of boric acid, H. Lührig (*Pharm. Centralhalle, 42 (1901), pp. 50–56; abs. in Jour. Chem. Soc. [London], 80 (1901), No. 462, II, p. 280*).—The author indorses the accuracy of Jörgensen's method, which he deems superior to Gladding's process, it being more rapid and less complicated. When testing meat for boric acid, he recommends moistening the sample with strong sodium hydroxid, evaporating to dryness with constant stirring, adding a little sodium carbonate, and then burning the dry mass to ash.

Determination of the hardness of water, M. Pleissner (*Pharm. Centralhalle, 42 (1901), pp. 145–147; abs. in Chem. Centbl., 1901, I, No. 14, p. 796*).

Determination of the addition of water to wine, A. Gautier, A. Chassevant, and M. de la Source (*Jour. Pharm. et Chim., 6. ser., 13 (1901), No. 1, pp. 14–18*).—The addition of water to wine is said to be the most common adulteration of that product and the most difficult to determine. In order to detect the addition of water, it is necessary to find the amount of alcohol, extract, tartar, and especially of the alcohol-acid. A table is presented showing the average results in the analyses of a large number of wines. Attention is called to the relation existing in pure wines between the alcohol and the acid, and the means for employing these factors in determining the purity of the wine.

BOTANY.

The effect of small quantities of toxic substances upon the higher plants, H. Coupin (*Compt. Rend. Acad. Sci. Paris, 132 (1901), No. 10, pp. 645–647*).—A report is given of experiments conducted with wheat germinated in distilled water, after which it is placed in dilute solutions of a number of salts. After germination and root development had well started, the seedlings were placed in the solutions and the effect of the different solutions ascertained by the retardation of further growth. It was found that no growth took place in 15 days in solutions of the following dilution:

The toxic effect of dilute solutions on wheat seedlings.

Substance.	Strength of solution.	Substance.	Strength of solution.
Copper sulphate	1 : 700,000,000	Barium chlorid	1 : 10,000
Mercury bichlorid	1 : 30,000,000	Calcium iodid	1 : 10,000
Cadmium chlorid	1 : 10,000,000	Strontium nitrate	1 : 6,000
Silver sulphate	1 : 2,000,000	Lithium nitrate	1 : 5,000
Silver nitrate	1 : 1,000,000	Barium nitrate	1 : 4,200
Palladium chlorid	1 : 500,000	Lithium sulphate	1 : 4,000
Lead nitrate	1 : 100,000	Sodium acetate	1 : 2,000
Aluminium sulphate	1 : 50,000	Magnesium acetate	1 : 2,000
Zinc sulphate	1 : 40,000	Sodium borate	1 : 1,600
Potassium permanganate	1 : 15,000	Barium acetate	1 : 1,000
Manganese nitrate	1 : 13,000	Manganese chlorid	1 : 1,000
Lithium chlorid	1 : 12,000	Calcium bromid	1 : 400
Aluminium chlorid	1 : 10,000	Calcium chlorid	1 : 260
Magnesium iodid	1 : 10,000		

The figures given in the above table show that the effect of these toxic substances upon the higher plants is identical with that found for some of the lower fungi, and that injurious effects may be exerted by such dilute solutions as to be impossible of detection by ordinary methods.

On the absorption of metallic poisons by plants, H. Devaux (*Compt. Rend. Acad. Sci. Paris, 132 (1901), No. 11, pp. 717–719*).—A report is given of experiments with salts of copper and lead upon Spirogyra and the petioles of *Aralia sieboldii* and the small roots of *Mibora verna*. The author found that all the plants were poisoned by solutions of copper and salt diluted as much as 10 million times. The metallic salt is not fixed equally in all parts of the cell. At first it is found only in the membrane, afterwards in the nucleus and nucleolus, and at length in the protoplasm. At the termination of the experiment the metals were found in all parts of the cell.

Native and introduced forage plants, J. H. Shepard, D. A. Saunders, and W. H. Knox (*South Dakota Sta. Bul. 69, pp. 54, figs. 10, pls. 3*).—This bulletin, in continuation of work previously reported (E. S. R., 6, p. 403), gives the description, geographical distribution within the State, and chemical analysis of the following grasses and forage plants: Weak spear grass (*Poa debilis*), grove meadow grass (*P. alsodes*), teff (*Eragrostis abyssinnica*), slender fescue (*Festuca octoflora*), western cord grass, slender cord grass (*Spartina gracilis*), Kalm's brome grass (*Bromus kalmii*), California brome grass (*Bromus carinatus linearis*), field brome (*Bromus arvensis*), short awned brome (*Bromus breviaristatus*), downy brome grass (*Bromus tectorum*), giant brome (*Bromus maximus*), western needle grass (*Stipa comata*), Seneca grass, holy grass (*Savastana odorata*), Minnesota muhlenbergia (*Muhlenbergia ambigua*), Montana reed grass (*Calamagrostis montanensis*), foxtail or pigeon grass (*Setaria viridis* and *S. glauca*), Japanese millet (*Panicum crus-galli gigantea*), Tambov millet (*Panicum miliaceum*), black Voronezh millet (*Panicum miliaceum*), slender wheat grass (*Agropyron tenerum*), spelt (*Triticum dicoccum*), hairy wheat (*Triticum villosum*), little barley (*Hordeum pusillum*), smooth wild rye, American rye grass (*Elymus sibericus*), bottle-brush grass (*Asperella hystrix*), sedge (*Carex lupuliformis*), early sedge (*Carex pennsylvanica*), loose flowered sedge (*Carex laxiflora*), wild buckwheat or black bindweed (*Polygonum convolvulus*), bushy knotweed (*Polygonum ramosissimum*), Australian saltbush (*Atriplex semibaccata*), mealy or gray saltbush (*Atriplex halimoides*), slender saltbush (*Atriplex leptocarpa*), wild mustard (*Brassica arvensis*), spurry or sand weed (*Spergula arvensis*), bitter vetch (*Lathyrus sativa*), serradella (*Ornithopus sativus*), yellow lupine (*Lupinus luteus*), Egyptian clover or Alexandrian clover (*Trifolium alexandrinum*), bur or spotted clover (*Medicago maculata*), beggar weed (*Desmodium tortuosum*), modiola (*Modiola decumbens*), and hairy vetch or sand vetch (*Vicia villosa*).

The autumnal translocation of material in the hop plant, C. Fruwirth and W. Zielstorff (*Landw. Vers. Stat., 55 (1901), No. 1–2, pp. 9–18*).—This is a report on a study of the hop plant to determine the translocation of matter at the end of the growing season. The plants which entered into the experiment were protected against such external influences as might have caused a loss of substance. The vines of some of the plants were removed at the time of harvesting, while those of others were left until October when the different parts were analyzed. From the results obtained the authors draw the conclusion that the diminution of nitrogen and phosphoric acid in the leaves and vines of the hop plant in the fall may be interpreted as a translocation of these substances from the leaves and vines to the remaining parts of the plants.

On the nitrogenous products of seed and seedlings of white lupines, N. J. Wassilieff (*Landw. Vers. Stat., 55 (1901), No. 1–2, pp. 45–77; Ann. Agron., 27 (1901), No. 2, pp. 81–90*).—A study was made of seeds and seedlings of the white lupine to test the hypothesis of Schulze that in the decomposition of albumen during germination there are afforded certain products, notably amido acids and hexose bases, by the decomposition of albuminoid bodies. A great portion of these products are transformed for the utilization of the plant. This transformation gives rise to asparagin and glutamin. A number of experiments were conducted in which the white lupine was used, and comparisons made with the yellow and blue lupines in which the nitrogen content of the seeds and seedlings was investigated at regular periods. The author's experiments show that the hypothesis of Schulze accords with his investigations. Asparagin is formed in the seedling to the exclusion of other products, and in the leaves asparagin is utilized for the synthetic formation of albumen.

The reserve carbohydrates of the bulb of the hyacinth, J. PARKIN (*Ann. Bot., 14 (1900), No. 53, pp. 155–157*).—Various authors have reported that the reserve carbohydrates in the bulbs of hyacinths, lilies, tulips, etc., consist of dextrin inulin, and other carbohydrates. The author has made a study of hyacinth bulbs and has found that the reserve material consists of a form of inulin. Inulin is said to include those carbohydrates which are levorotatory and which, when treated with an acid, hydrolyse to fructose. The polariscope method of distinguishing between dextrin and inulin is considered by the author the most satisfactory means of recognizing these substances. Based upon his investigations, the author states that the inulin of plants can be arranged into 3 classes, as follows:

"That found in the Compositæ and allied orders, which is precipitated in the tissues by alcohol in the form of the well-known spherocrystals, and which is practically insoluble in cold water, requiring a temperature of 50 to 55° F. for its solution.

"That characteristic of many monocotyledons, e. g. Scilla, Yucca, Phleum, and the plant now before us; it is precipitated in an amorphous form, in the tissues, as a thick lining to the inside of the cell wall and is readily soluble in cold water.

"That found in the bulb scales of species of Galanthus and Leucojum, which is precipitated in the tissues in an amorphous form, and which requires a temperature as high as 80° for its solution."

Experimental investigations on the origin of species, H. DE VRIES (*Rev. Gén. Bot., 13 (1901), No. 145, pp. 5–17, figs. 10*).—The results are given of a number of experiments made by the author, in which advantage was taken of the individual variation of plants to produce new species. The principal part of the paper is taken up with a discussion of the species of Œnothera which were produced from *Œ. lamarkiana.* The species to which names have been given are apparently quite unlike the parent plant, and in some cases possess characters of an apparently new type. Ordinarily they all reproduce themselves without any reversion to the characters of the original species. Of the 4 species which have been developed in this way, but one possesses characters which would in any way associate it with the original, and it might be regarded simply as a white variety. The new characters appeared without any attempt on the part of the investigator to control them, and possessed none of the individual characteristics of the mother plant. The changed characteristics can not be entirely attributed to individual variability.

The course of the hyphal filaments of Tilletia in the body of the wheat plant, H. L. BOLLEY (*Proc. Soc. Prom. Agr. Sci., 1900, pp. 147, 148*).—Attention is called to an error of the author, which was published in North Dakota Station Bulletin 27 (E. S. R., 9, p. 143). In reporting the results of studying the development of the hyphæ of Tilletia he was led into the error of mistaking the dried contents of the mesophyll cells of diseased wheat straws for the knotted filaments of the fungus.

Individual prepotency in plants of the same breeding, W. W. TRACY (*Proc. Soc. Prom. Agr. Sci., 1900, pp. 57–59*).—A brief account is given of breeding experiments in which it was desired to establish a forcing radish with a distinctly oval shaped root. The experiments were conducted for 3 years, the methods of selection being described in some detail. Wide variation in the progeny of some of the selected roots was noted and in general there was less departure from the desired type where there was a general selection of roots than where a single individual was taken as a type.

The botanic garden as an aid to agriculture, W. TRELEASE (*Proc. Soc. Prom. Agr. Sci., 1900, pp. 103–110*).—In this article the value of botanic gardens as adjuncts to agricultural education is pointed out, and various ways in which their efficiency can be increased are described.

The value of willows in retaining the banks of streams, W. W. Rowlee (*Proc. Soc. Prom. Agr. Sci., 1900, pp. 145, 146*).—Attention is called to the natural affinity of willows for stream banks and some of their peculiar habits of growth are described. Their shade is never intense and their root systems are deep in the soil, whereby they form dense masses at the water's edge, protecting the soil from washing, and retaining the embankments. Another advantage possessed by willows is the rapidity of their growth. Among the best species for planting are *Salix alba* and some of its varieties.

ZOOLOGY.

Notes on the food of birds, T. D. A. Cockerell (*New Mexico Sta. Bul. 37, pp. 35–52*).—The economic relation of birds to agriculture is discussed in a general way, and many special instances of the harmful or beneficial action of birds are cited. Notes are given on the feeding habits of a number of birds in New Mexico, including woodpeckers, sparrow hawk, Cooper's hawk, road runner, California cuckoo, belted kingfisher, shrike, band-tailed pigeon, poor-will, and evening grosbeak. The woodpeckers as a whole are believed to be useful and deserving of protection. The only species of woodpeckers which is considered injurious to any serious extent in New Mexico is *Sphyrapicus varius nuchalis*. All other species of woodpeckers are considered as doing far more good than harm in orchards or any other cultivated crops. An examination of the stomach contents of the sparrow hawk showed that the food of this bird was largely of an insect nature, and that the bird is, therefore, to be reckoned as beneficial. Cooper's hawk is condemned on account of its habit of feeding on small birds and poultry.

The birds of Colorado, W. W. Cooke (*Colorado Sta. Bul. 56, pp. 179–239*).—This contains corrections to Bulletins 37 and 44 of the station (E. S. R., 9, p. 209; 10, p. 521) and additional notes on the birds of Colorado.

The food of the toad, H. Garman (*Kentucky Sta. Bul. 91, pp. 60–68, fig. 1*).—A study was made of the feeding habits of toads in Kentucky, and the various insects and other food materials which were found are classified in detail. The insects found in the toad's stomach in the order of frequency of their occurrence were as follows: Ants, beetles, bugs, moths and caterpillars, crickets, flies, springtails, and thrips. Many of the most destructive insect pests were found to be eaten extensively by toads, and among such pests the following may be mentioned: Chinch bug, plant lice, leaf hoppers, Colorado potato beetle, corn-root worm, cabbage flea-beetle, strawberry-root borer, wireworm, and cricket. The toad is considered a very useful help to the farmer in the destruction of injurious insects. Brief notes are also given on the feeding habits of *Rana pipiens* and *R. clamitans*.

Zoological yearbook for 1900, P. Mayer (*Zoologischer Jahresbericht für 1900. Berlin: R. Friedländer & Son, 1901, pp. 488*).—This report contains detailed lists of biological references to the literature on all the groups of animals. A brief summary is given of the more important contributions on all subjects.

METEOROLOGY—CLIMATOLOGY.

Forests and snow, L. G. Carpenter (*Colorado Sta. Bul. 55, pp. 12, pls. 18, figs. 7*).—This bulletin attempts to bring out some of the relations of forests to water supply which have become evident in the study of one of the typical irrigation streams of Colorado, viz., the Cache la Poudre River. It contains a number of reproductions of photographs taken during June, 1899, showing the snow cover under different forest conditions at the headwaters of this stream at elevations of 9,000 ft. and over. The rainfall conditions of the State and their effect on stream flow, the effect of forest growth in conserving moisture and preventing irregular flow, and the effect of the sun and wind in melting snow are briefly explained, observations on these subjects being summarized as follows:

"(1) The mountain streams in the early irrigation season are largely supplied by melting snow.

"(2) There is a marked diurnal fluctuation, greater with high water than with low, due to the daily variations in the rate of melting.

"(3) The stream at high water may be one-half greater than at low water on the same day.

"(4) Cloudy weather in the mountains, protecting the snow from the radiation of the sun, causes the fluctuation to disappear and the flow to decrease.

"(5) This decrease is so great that the cloudiness associated with continued rain usually more than counterbalances the gain from the rain.

"(6) The loss of snow by evaporation is considerable, especially when exposed to winds.

"(7) Snow remains in the timber and in protected spots much longer than where exposed.

"(8) This is due not so much to drifting as to shelter from the radiation afforded by the forest cover.

"(9) Hence, the greater amount of forest cover the less violent the daily fluctuation, the more uniform the flow throughout the day and throughout the season, and the later the stream maintains its flow.

"(10) The loss of the forest cover means more violent fluctuation during the day, greater difficulty in regulating the headgates and keeping a uniform flow in ditches, and hence an additional difficulty in the economic distribution of water. Also the water runs off sooner, hence the stream drops earlier in the summer, and on account of the lessening of the springs, the smaller is the winter flow.

"(11) The preservation of the forest is an absolute necessity for the interest of irrigated agriculture."

Meteorological observations, J. E. Ostrander and C. L. Rice (*Massachusetts Sta. Met. Buls. 148, 149, 150, pp. 4 each*).—Summaries of observations on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during April, May, and June. The data are briefly discussed in general notes on the weather of each month.

Report of department of meteorology and meteorological summary, C. H. Pettee (*New Hampshire Sta. Bul. 79, pp. 33, 34, 38*).—A brief report is given of the operations of this department of the station during the year, accompanied by a monthly and an annual summary of observations on temperature, precipitation, snowfall, cloudiness, and direction of wind during the fiscal year ended June 30, 1900, with averages for each month from July 1, 1895, to June 30, 1900, inclusive. The annual summary of these observations is as follows: Temperature (degrees F.)—1899-1900, 45.5; 1895-1900, 45.7; precipitation (in.)—1899-1900, 43.59; 1895-1900, 45.5; snowfall (in.)—1899-1900, 50.5; 1895-1900, 62.1; number of days on which there was 0.01 in. precipitation—1899-1900, 77; 1895-1900, 98; prevailing direction of wind—1899-1900, northwest; clear days—1899-1900, 181. The principal meteorological characteristics of the year were lack of moisture during the growing season and an abnormally light snowfall. The precipitation was normal, but one-third of it was concentrated in 30 consecutive days, covering most of February and a part of March.

Summaries of temperature, rainfall, and sunshine, E. F. Ladd (*North Dakota Sta. Rpt. 1900, pp. 14-19*).—Tables give the maxima, minima, and mean monthly temperatures at Fargo, N. Dak., for the year 1900; a monthly record of sunshine during 1899 and 1900; total annual rainfall for the period 1892-1900; calculated and recorded daily temperatures during April-September, 1900; and mean hourly temperatures April-September, 1899.

Report of rainfall and temperatures for the year 1900 (*Ontario Agr. Col. and*

Expt. Farm Rpt. 1900, p. 7).—Tables give monthly and annual summaries of observations on temperature, rainfall, and snowfall for 1900, and maximum and minimum temperatures for 1899 and 1900.

Meteorological chart of the Great Lakes, A. J. Henry and N. B. Conger (*U. S. Dept. Agr., Weather Bureau, Meteorological Chart of the Great Lakes, 1901, No. 1, pp. 28, figs. 2, charts 4*).—This is a summary of data relating to summer storms; ice during winter of 1900 and 1901; opening of general navigation, season of 1901; fog from April 16 to May 15, 1901; wrecks and casualties from April 16 to May 31, 1901; precipitation and water levels on the Great Lakes; Weather Bureau office at Sault Ste. Marie; fog distribution on the Great Lakes.

Meteorological reports for East Africa, 1900 (*Shamba* [*Zanzibar*], *1901, No. 23, pp. 3, 4*).—Tables give (1) monthly and annual summaries of rainfall at 11 places during 1899; (2) maximum and minimum temperatures at 6 places during 1900; (3) summaries for January, February, and March, 1901, of observations at Zanzibar and Vunga on atmospheric pressure, humidity, temperature, rainfall, and wind movement; and (4) monthly and annual summaries of rainfall at Zanzibar during 19 years, 1874–1901.

Meteorological observations at Manila (*Bul. Mens. Obs. Manila, 35* (*1899*), *Apr., May, and June, pp. 57–110, charts 3*).

Climatology of the Philippine Islands (*Climatologia de Filipinas. Washington: Government Printing Office, 1900, pp. 265, pls. 64, figs. 2*).—An excerpt from a large treatise on the Philippine Archipelago published in the English and Spanish languages.

Rainfall and the temperature of the soil, A. Tolsky (*Zhur. Opuitn. Agron., 1* (*1900*), *pt. 3, pp. 266, 267*).—In a study of the relations between the amounts of rainfall and the temperatures of the soil at the Institute of Forestry at St. Petersburg in the years 1893–1897, the author found, in accordance with other observers, that the influence of rains on the distribution of heat in the soil is indirect, the precipitation increasing the humidity of the soil and thus improving its heat conductivity. Hence it frequently happens that the mean and maximum temperatures of the soil increase, especially when the latter is covered with grass.—P. FIREMAN.

The chief meteorological factors of fertility according to observations on the "Alexeevskiye" estate of P. I. Levitzki, Government Tula, A. Levitzki (*Zhur. Opuitn. Agron., 1* (*1900*), *pt. 2, pp. 147–171*).—On the basis of 14 years' observations the author finds that the size of the crops of winter rye, potatoes, and oats, depends with great certainty and regularity upon the rainfall in certain months.—P. FIREMAN.

Origin of atmospheric hydrogen, A. Gautier (*Bul. Soc. Chim. Paris, 3. ser., 25* (*1901*), *No. 5, pp. 231–235*).—Investigations are reported which lead to the conclusion that the hydrogen of the air is of volcanic origin, being produced by the action of igneous rocks on aqueous vapor.

Combustible gases of the atmosphere—atmospheric hydrogen, A. Gautier (*Ann. Chim. et Phys., 7. ser., 22* (*1901*), *Jan., pp. 5–110*).—A detailed account of the author's investigations on this subject dealing with methods used; comparative studies of the air of towns, of the country, of the sea, and of the upper atmosphere; nature of the combustible gases of the air of towns, woods, etc.; origin of these gases, especially the hydrogen (see above). The author concludes from the long series of investigations of air freed from suspended matter, here reported, that there exists normally in pure air about 20 parts of free hydrogen to 100,000 parts of air, as well as a certain amount of hydrocarbons due to exhalations from the soil, from plants, fermentations, manufactories, etc. They, however, appear to diminish as the air becomes purer. They are found in comparatively large quantities in the air of towns, to a less extent in that of the country, in very small amounts in the air of rocky plateaus and the peaks of high mountains, and are entirely absent from the pure air derived from the high regions of the atmosphere.

The character and proportions of the combustible gases found in the air are indicated by the following analysis of the air at Paris, which may be taken as representative of the air of large cities in general: One hundred liters of the air of Paris at 0° and 760 mm. pressure contain free hydrogen, 19.4 cc.; methane, 12.1 cc.; benzin ($C^6 H^6$) or similar hydrocarbons, 1.7 cc.; carbon monoxid, with traces of hydrocarbons of the Cn H2n-2 and Cn H2n groups, 0.2 cc.

Atmospheric dust observed at Tunis March 10, 1901, E. BERTAINCHAUD (*Compt. Rend. Acad. Sci. Paris, 132 (1901), No. 18, pp. 1153-1155*).—The dust was essentially siliceous.

Electro-sonorous method of combating hail, G. M. SLANOÏÉWITCH (*Compt. Rend. Acad. Sci. Paris, 133 (1901), No. 7, pp. 373, 374*).—The author proposes to send up in a kite or captive balloon an electric vibrator to agitate the air in the storm center and thus more effectually accomplish the result of dissipating the storm than could be done by explosives, especially if the storm center is at a considerable elevation, as is frequently the case with the more violent kinds.

The Tolmar experiments with explosives to control the weather, A. HERTZOG (*Fühling's Landw. Ztg., 50 (1901), No. 15, pp. 542-545*).—This is a brief account of attempts to dissipate storms by means of cannonading, pointing out the desirability of a more thorough investigation of the principles upon which the method rests and of its effectiveness in practice.

WATER—SOILS.

Artesian wells in North and South Dakota, W. UPHAM (*Bul. Minnesota Acad. Nat. Sci., 3 (1901), No. 3, pp. 370-379*).—Data relating to location, depth, source, and pressure of water, etc., are given for a number of wells deriving water from the Dakota sandstone, with some discussion of the character of the waters.

The geology of the artesian basin of South Dakota, D. S. McCASLIN (*Bul. Minnesota Acad. Nat. Sci., 3 (1901), No. 3, pp. 380-388*).

Drainage water and salt morasses of the Odessa sewage fields, T. SELIWANOFF (*Landw. Vers. Stat., 55 (1901), No. 6, pp. 475-478*).—A short account of observations on the soil of fields used for sewage disposal by irrigation which had become impregnated with chlorin to an injurious extent. This condition was corrected by improved drainage.

Researches on moorland waters. II, On the origin of the combined chlorin, W. ACKROYD (*Jour. Chem. Soc. [London], 79 (1901), No. 463, pp. 673, 674*).—Weekly determinations of chlorin in the water of a reservoir at Widdop in Yorkshire, November 12 to December 31, 1900, and January 7 to February 18, 1901, and in the rainfall during the same period are reported. The conclusion was reached that the combined chlorin in the reservoir water was wholly derived from the rain. For previous paper on acidity of moorland waters see E. S. R., 11, p. 312.

The systematic investigation of soils, B. W. KILGORE (*Bul. North Carolina State Bd. Agr., 22 (1901), No. 5, pp. 38-46*).—This is the annual address of the presiding officer of the North Carolina section of American Chemical Society and gives a general discussion of this subject.

Some experiments in soil temperatures as affected by color and the moisture content of the soil, J. B. REYNOLDS (*Ontario Agr. Col. and Expt. Farm Rpt. 1900, pp. 7, 8, pl. 1*).—An account is given of observations on 6 kinds of soil: (1) Pure black humus or vegetable matter; (2) a potting soil containing about 65 per cent of rotted sod, 20 per cent barnyard manure, and 15 per cent sand; (3) clay loam; (4) heavy clay; (5) coarse sand, and (6) fine sand, almost white. "Two sets of these samples were used, one set being kept dry and the other wet. The experiments were conducted outside, where the soils were exposed to the full influence of the sun and wind. Temperatures were observed every hour from 8 a. m. to 8 p. m." From the data obtained, curves are platted which show the rise and fall of temperature. The humus, as a rule, reached a higher temperature than any other soil, the dark potting soil standing next, followed by the open clay, heavy clay, and fine white sand. The differences in the temperature are ascribed to variations in the color, the darker samples being warmer than the lighter. It was also observed that the humus remained steadily warmer than the other soils, thus proving an exception to the rule that a soil which warms rapidly is likely to part with the heat readily.

On the relations of the soil solutions to the phosphates used as fertilizers, T. Schloesing (*Ann. Sci. Agron., 1901, I, No. 3, pp. 406–424*).—This article records observations on the solubility of tricalcium phosphate in solutions of carbon dioxid of different strengths saturated with calcium bicarbonate and free from this substance, and in water free from carbon dioxid. The methods of preparing the tricalcium phosphate and the solution of carbon dioxid and calcium bicarbonate are described, as well as those used in determining the solubility of the phosphate in the various solutions. The results reported show that the phosphate dissolved in the carbon dioxid solutions in proportion to their strength, but that it was not sensibly soluble in such solutions when saturated with calcium carbonate. The bearing of these facts on the behavior in the soil of soluble phosphates applied as fertilizers and on the formation of phosphate deposits is discussed.

Sources of the constituents of Minnesota soils, C. W. Hall (*Bul. Minnesota Acad. Nat. Sci., 3 (1901), No. 3, pp. 388–406*).—This article discusses the formation of soils and the various agents which have taken part in it, and the chemical composition of Minnesota soils and of the rocks from which they have been derived based upon analyses compiled from various sources.

"The rocks of Minnesota are classified under 5 groups: (1) Acid crystallines, (2) basic crystallines, (3) sandstones and quartzites, (4) calcareous shales, and (5) the carbonates. Among these, granitic rocks and basic eruptive, which occupy large areas beneath the drift in the northern and western portions of the State, furnish many important food elements, particularly alkalis and alkaline earths.

"The sandstones and quartzites among the most barren soil producers have mingled with other substances their beneficent uses. The calcareous and siliceous shales spring from widely divergent geologic periods and bring to the making of soils somewhat different physical and chemical factors. Their influence is wholesome and strengthening. Finally the carbonates come before the eye in this chemical review. They yield, for soil making, carbonic acid, lime, magnesia, and small quantities of other compounds. When the condition of a soil is reached, but a small percentage of these rocks is left, but this is a substantial part and enters into the constitution of the best soils of the State. They appear in full force in the southeastern corner of the State where stands a portion of that old glacial island, a tract over which the ice did not flow during the period when all the rest of the State was buried deep beneath the glacier."

Solubility of gypsum in aqueous solutions of sodium chlorid, F. K. Cameron and F. D. Gardner (*Proc. Soc. Prom. Agr. Sci., 1900, pp. 160, 161*).—A brief note on some studies on this subject made in the Division of Soils of this Department.

Report of the Valuiki Agricultural Experiment Station (Government of Samara), 1895-96, V. S. Bogdan (*St. Petersburg: Department of Agriculture, 1900, pp. 126; abs. in Selsk. Khoz. i Lyesor., 199 (1900), Oct., pp. 235–237*).—Among the articles of interest in this report is one discussing the reclamation of alkali soils by proper management of the rainfall and the culture of plants which take up large amounts of alkali in their growth, and another on the influence of the character of the soil on the composition of the wheat grain. Experiments showed that with the increase of the salt content of alkali soils the nitrogen and ash contents of the wheat grains increased, but the absolute weight of the grain diminished. According to the author this explains the good quality of the wheat, especially with regard to high protein content, from the east and southeast of Russia, where the soils are rich in soluble salts, including nitrates.—P. FIREMAN.

Formation of sodium carbonate or black alkali by plants, F. K. CAMERON and F. D. GARDNER (*Proc. Soc. Prom. Agr. Sci., 1900, pp. 162, 163*).—A brief note on chemical examinations of the water extract of the stems, leaves, etc., and the ash of two plants capable of withstanding relatively large amounts of alkali in the soil—creosote bush (*Covillea tridentata*), and greasewood (*Sarcobatus vermiculatus*). It was found in case of the first that while the plant contained chlorin, it was not present in the form of sodium chlorid, but probably in organic combination. The amount of sodium present was decidedly in excess of that required to neutralize the chlorin found.

[It was found that the greasewood] "contained considerable amounts of chlorids and sulphates, and that practically all of these acids were present in the plant in the form of the sodium salts as such, the plant being in this respect in marked contrast to the *Covillea tridentata* previously examined. A striking feature was the much greater percentage of ash obtained from the leaves and blossoms than from the stems, and the markedly larger percentage of alkali salts in the ash of the former. Another interesting point is that the leachings of the air-dried leaves and blossoms were shown to contain about three times as much sodium as would be necessary to balance the hydrochloric and sulphuric acids in the plant. It is, therefore, probably present very largely in organic combination and upon the decay of the plant tissues would be expected to yield large amounts of sodium carbonate."

A study of the agricultural value of the soils of Madagascar, A. MÜNTZ and E. ROUSSEAUX (*Ann. Sci. Agron., 1901, I, Nos. 1, pp. 1–98, 152–160, map 1; 2, pp. 161–253, 296–320; 3, pp. 321–398*).

The soils of the colony of the Cavaignac, Algeria, J. DUGAST (*Ann. Sci. Agron., 1901, I, No. 3, pp. 425–452, pls. 3*).—Partial mechanical and chemical analyses of 18 samples are reported. The soils are stated to be in general well supplied with nitrogen (0.063 to 0.168 per cent) and phosphoric acid (0.073 to 0.221 per cent), and to be rich in potash (0.5 to 1.228 per cent), but difficult to cultivate, being compact and impermeable. They contain a large amount of tenacious clay (32.45 to 54.77 per cent), fine calcareous sand (4.2 to 16.9 per cent) and fine siliceous sand (15.42 to 40.08 per cent), which causes them to become sticky when wet and hard when dry. The lime varies in the analyses reported from 2.826 to 13.272 per cent.

FERTILIZERS.

Influence of systems of fertilizing upon the amount and quality of the humus of the soil, W. FREAR and E. H. HESS (*Proc. Soc. Prom. Agr. Sci., 1900, pp. 60–69*).—The importance and functions of humus in the soil are briefly discussed and an account is given of chemical examinations of soils from plats at the Pennsylvania Station which have been used since 1881 for fertilizer experiments as follows: (1) Cropping without manure, (2) manured with stable manure and lime, (3) treated with lime alone, (4) treated with crushed limestone, (5) receiving complete mineral fertilizer containing nitrate of soda, and (6) receiving complete mineral fertilizer containing sulphate of ammonia. The chemical examinations made involved determination (1) of loss on ignition, (2) organic carbon, and (3) active humus; besides hygroscopic moisture, nitrogen, and hydrogen. The results reported show that continuous cultivation on the limestone clay soils used in these experiments has not greatly diminished the amount of humus. The greatest increase in humus was found in case of the manuring with yard manure and lime, although the amount of humus was but slightly smaller in case of complete mineral fertilizer, a larger amount of nitrogen being found in the case of complete mineral fertilizer containing sulphate of ammonia than in case of that containing nitrate of soda. An examination with litmus paper showed that the limed soil was strongly alkaline, that receiving mineral fertilizer containing nitrate of soda slightly acid, and that receiving mineral fertilizer containing sulphate of ammonia strongly acid. The unmanured soil contained three-fourths of its organic matter in active form, i. e., soluble in 4 per cent ammonia water according to the Official-Grandeau method. The largest amount of active humus was found in the plat receiving mineral fertilizer containing sulphate of ammonia. The plat receiving manure and lime contained both absolutely and relatively less active humus than the unmanured plat. The supply of nitrogen was greatest in the plat receiving manure and lime. The use of lime alone apparently "rapidly diminishes humus of all kinds and results in a marked loss of nitrogen."

Experiments on the relative fertilizing value of ammonia salts, P. WAGNER (*Mitt. Deut. Landw. Gesell., 16 (1901), Nos. 10, pp. 55, 56; 11, pp. 57–60*).—Plat experiments are reported in which as a result of 36 tests with rye, oats, and barley 100 kg. of nitrate of soda produced 421 kg. of grain and 617 kg. of straw, while a corresponding amount of ammonium sulphate produced 280 kg. of grain and 402 kg. of straw. If the effect of the nitrate be taken as 100 that of the sulphate would be 67 in case of the grain and 65 in case of straw. In 9 tests with fodder beets, sugar beets, and potatoes 100 kg. of nitrate produced 34.3 of roots while the sulphate produced 16.6, the relative effect being 100:48. The difference in effect was much more marked in case of root crops than in case of grains. The yield was decidedly increased by divided applications in case of the root crops, but was not materially affected in case of the grains. The seasons of 1899 and 1900, during which the experiments were made, were not favorable to rapid nitrification and so to the quick action of ammonium sulphate. The soils used in the experiments were variable in physical character but no differences due to this fact were apparent. As regards the influence of the proportion of lime in the soil the results are inconclusive.

Investigations on the fertilizing action of the phosphoric acid of bone meal, O. KELLNER and O. BÖTTCHER (*Deut. Landw. Presse, 28 (1901), Nos. 23, pp. 194, 195, figs. 6; 24, p. 204*).—This is a continuation of experiments previously reported (E. S. R., 12, p. 323). Mustard was grown in pots containing 3.5 kg. of fine sandy loam containing in dry matter 22.4 per cent of humus and 14.3 per cent of lime. Superphosphate, Thomas slag, and steamed bone meal were used as in previous experiments, except that to one series of pots 15 gm. and to another series 30 gm. each of calcium carbonate were applied. The relative effect of the different methods of fertilizing was as follows:

Relative effect of different phosphates, with and without lime, on mustard.

	Without lime.	With 15 gm. lime.	With 30 gm. lime.
Superphosphate	100	77.7	75.5
Thomas slag	100	81.7	81.5
Bone meal	100	72.6	50.0

These figures show a decided decrease in yield when lime was applied. It is claimed that this effect of liming is not confined to the phosphoric acid of the fertilizers applied, but extends to that of the soil. These conclusions are in direct contradiction to those of Dafert and Reitmair (E. S. R., 12, p. 839), which, it is claimed, are based on unreliable data.

The most profitable amount of fertilizer to apply, M. FISCHER (*Fühling's Landw. Ztg., 50 (1901), Nos. 7, pp. 264–270; 8, pp. 295–301*).—Plat experiments with rye and oats to which different fertilizers were applied in various ways and amounts are reported. The experiments were mainly a comparison of sulphate of ammonia and nitrate of soda applied in different ways (all in one application or fractionally). In general it was found that winter grain was less benefited by the fertilizers than summer, the former producing a better crop without fertilizers than the latter. Both for winter and summer fertilizing it is best to use a combination of sulphate of ammonia and nitrate of soda. The results obtained in the use of fertilizers on one grain are not considered applicable to another.

The uses and abuses of fertilizer formulas, S. M. TRACY (*Proc. Soc. Prom. Agr. Sci., 1900, pp. 164–168*).—The unreliability of the fertilizer formulas commonly recommended and of the need of care in preparing formulas for fertilizers for special purposes are pointed out.

The manurial value of ashes, mucks, seaweed, and bone, C. D. WOODS (*Maine Sta. Bul. 74, pp. 65–88*).—A popular discussion of the fertilizing value of these materials, accompanied by compilations of analyses of wood ashes, mucks, and seaweeds.

Seaweed as a fertilizer, F. W. MOORE (*New Hampshire Sta. Bul. 79, p. 9*).—Analyses of 1 sample each of kelp and mixed seaweed from the coast of New Hampshire are reported.

The composition of the sewage of the town of Odessa, T. SELIWANOFF, CHONIA, MOTSCHAU, and BOUDAREW (*Landw. Vers. Stat., 55 (1901), No. 6, pp. 463–474*).—The results reported show great daily, and even hourly, variation in the composition of the sewage, especially in the insoluble matter. The sewage of this town was apparently more concentrated than that of other large cities of the world.

Report on official inspection of commercial fertilizers and agricultural chemicals during the season of 1900, C. A. GOESSMANN ET AL. (*Massachusetts Sta. Rpt. 1900, pp. 55–63*).—This report includes a comparison of the quality of the fertilizers examined during 1899 and 1900; the trade values of the fertilizing ingredients in fertilizing materials during the same years, with an explanation of the use of these data in calculating the approximate value of a fertilizer; a table showing the average composition of fertilizers examined during 1900; and a list of brands of fertilizers licensed by manufacturers and dealers under the provisions of the State law during the year. Except in case of fertilizers containing only 2 essential constituents the goods examined during 1900 were decidedly superior to those inspected during the previous year.

Report on general work in the chemical laboratory, C. A. GOESSMANN (*Massachusetts Sta. Rpt. 1900, pp. 64–70*).—This includes a list of miscellaneous materials sent to the station and examined during the year; notes on wood ashes, comparing the quality of samples examined during 1899 and 1900; a brief discussion of the agricultural value of sewage sludge, with analyses of 8 samples of the material; and notes on phosphatic slag as a source of phosphoric acid for manurial purposes, accompanied by analyses of 9 samples of slag examined at the station.

Analyses of commercial fertilizers, M. B. HARDIN (*South Carolina Sta. Bul. 60, pp. 24*).—This bulletin contains the analyses of 186 samples of fertilizers collected during the season of 1900–1901, with a discussion of the composition and valuation of fertilizers and the laws and regulations governing the sale of commercial fertilizers in South Carolina.

The world's production of phosphates, MAIZIÈRES (*L'Engrais, 16 (1901), No. 28, pp. 662–664*).

FIELD CROPS.

Report of the agriculturist, W. P. BROOKS and H. M. THOMSON (*Massachusetts Sta. Rpt. 1900, pp. 91–123*).—The experiments here reported include fertilizer, soil, and variety tests with different field and garden crops, and are in continuation of work previously reported (E. S. R., 12, p. 226).

Experiments to determine the relative value of fertilizers supplying nitrogen were begun in 1890 and the crops grown, given in their order, were oats, rye, soy beans, oats, soy beans, oats, soy beans, oats, oats, clover, and potatoes. The relative efficiency of the different materials was found to be as follows: Nitrate of soda 100, barnyard manure 90, sulphate of ammonia 89, dried blood 86, and the plats without nitrogen 68. Owing to the humus and mineral substances furnished by barnyard manure in addition to nitrogen, the author considers its efficiency really higher than the availability of nitrogen alone would show. The results further showed that the efficiency of sulphate of ammonia is largely increased when the soil is well supplied with lime.

Plowing under the stubble and roots of soy beans and clover was found to be very advantageous to subsequent crops. The plats on which this test was made had received no nitrogen in the fertilizer for 16 seasons, still after this long period potatoes on clover sod gave a crop equal to 95.3 per cent of the yield on plats which had yearly been given a fair amount of fertilizer containing nitrogen. This season the nitrogen plats yielded 219.3 bu. of potatoes per acre, or an increase of 10.3 bu. as compared with the no-nitrogen plats.

Comparative tests with muriate and high-grade sulphate of potash have been in progress since 1892. Both salts were applied yearly at the rate of 400 lbs. per acre, but this season only 250 lbs. were used. Considering the results for the entire period, clover, cabbage, and soy beans generally gave the best returns on the sulphate plats, while corn, grasses, oats, barley, vetches, and sugar beets gave equally good yields on the muriate plats. The sulphate plats produced the best quality of potatoes and sugar beets. Considering all the crops except the clover, the efficiency of the muriate was 98.1 per cent of that of the sulphate, and taking into consideration only those crops which showed a preference for the sulphate, its efficiency was 88.6 per cent of that of the sulphate. The conclusion of the authors favors the use of the sulphate at present prices. The results with early and late garden crops were also in favor of the use of sulphate of potash, especially in the case of early crops.

The series of experiments with nitrate of soda, dried blood, and sulphate of ammonia in progress since 1891, showed that up to 1898 nitrate of soda was with one exception the most efficient source of nitrogen. During the period of these tests only commercial fertilizers were applied.

From 1890 to 1893 inclusive, dissolved boneblack, ground South Carolina rock, ground Florida rock, Mona guano, and phosphatic slag were compared on the basis of their money value, i. e., the cost of quantities applied being the same in all cases. The soil had been liberally supplied with nitrogen and potash since the beginning of the experiment, but no phosphate has been applied since 1893. The results for the entire period indicate that the liberal use of natural phosphates produces profitable crops and that in a long series of years their substitution, at least in part, for the higher priced dissolved phosphates may prove economical. None of these natural phosphates seemed suitable for cruciferous crops. There was practically no difference in the economic results from South Carolina rock, Mona guano, and phosphatic slag. The quantity of Florida phosphate used contained more phosphoric acid than any of the others but it becomes soluble very slowly. For ordinary farm and garden crops the use of the natural phosphates in connection with a moderate quantity of one of the dissolved phosphates is recommended. A comparison of phosphates on the basis of an equal application of phosphoric acid, in progress for three years, showed that phosphatic slag furnished phosphoric acid in a very available form, yielding about as much as dissolved boneblack; that the phosphoric acid of Florida soft phosphate was rendered available with great slowness; and that steamed bone meal appeared inferior in availability to raw bone meal.

The results for the twelfth season of a soil test with grass are reported, in which the same fertilizers or combinations were applied to the same plats continuously.

Nitrate of soda alone or in combination gave a large increase. "It is especially noteworthy that nitrate of soda alone, applied to a plat which has now received no other fertilizer for 12 years, gives a crop of hay amounting to almost $1\frac{1}{4}$ tons. This plat last year gave a crop of corn at the rate of something less than 14 bu. per acre. The plat to which nitrate of potash alone has been applied during the past 12 years gave us last year a yield of corn at the rate of nearly 50 bu. per acre. The hay crop this year is 1,140 lbs."

A soil test with onions was continued this season with the same fertilizer applications used the previous year, i. e., different combinations of nitrate of soda, dissolved boneblack, and muriate of potash at the rate of 320, 640, and 320 lbs. per acre, respectively (E. S. R., 12, p. 22). This year the limed portion of the plat, which yearly received the mixture of all three fertilizers, yielded nearly 500 bu. per acre of well-cured onions, while the unlimed portion produced only 136.9 bu. Good crops were obtained only on those plats which received annual applications of potash. The limed portion of the plats yearly manured with muriate of potash alone produced 383 bu. per acre, as compared with 311 bu. for nitrate of soda and potash, and 380 bu. for dissolved boneblack and potash. The effects of potash far exceeded those of either of the other elements. The results further show that the use of muriate of potash makes the employment of lime absolutely necessary. Applications of muriate of potash and nitrate of soda without lime proved injurious. The use of dissolved boneblack greatly promoted the perfect ripening of the crop, and corrected in a large measure the injurious effects following the use of muriate of potash. This is considered due largely to the considerable quantities of sulphate of lime or land plaster contained in all dissolved phosphates. Practical advice on fertilizers for onions based on the results obtained are given.

A special corn fertilizer was compared with an application richer in potash. The fertilizer applied furnished the same amount of plant food as an application of 1,800 lbs. per acre, containing an average of 2.37 per cent of nitrogen, 10 per cent of phosphoric acid, and 4.3 per cent of potash. The other applications contained slightly more nitrogen, much less phosphoric acid, and considerably more potash. All plats received in addition a ton of lime per acre. The yield with the special fertilizer was 77.50 bu. of shelled corn per acre and 6,270 lbs. of stover, and with the fertilizer richer in potash, 73.75 bu. of corn and 6,280 lbs. of stover. This series of experiments, carried on for 10 years, has shown that corn can be successfully grown on fertilizers alone. The average financial results of a comparison of barnyard manure alone and with potash for corn were in favor of barnyard manure and potash.

The results of experiments with soy beans and cowpeas for green manuring showed that the Medium Green soy bean produced 5,386 lbs. of dry matter and 167.3 lbs. of nitrogen per acre, the Wonderful cowpea 3,622 lbs. of dry matter and 80.4 lbs. of nitrogen, and the Black cowpea 3,389 lbs. of dry matter and 62.1 lbs. of nitrogen. The work was conducted on a medium loam soil retentive of moisture and during a season of sufficient rainfall.

The use of 150 lbs. per acre of nitrate of soda on meadows, applied July 1, after the first crop of hay had been made, gave in one case an apparent increase of 816 lbs. of rowen per acre, and in another 600 lbs. The experiment is not considered conclusive as regards the most profitable quantity of nitrate of soda to be used. A similar experiment in progress since 1893 consisted in applying 1 ton of wood ashes, 600 lbs. of ground bone and 200 lbs. of muriate of potash, and 8 tons of barnyard manure per acre in rotation on grass land. This year this system was modified by adding 64 lbs. of nitrate of soda to the application of wood ashes and 83 lbs. to the application of bone and potash. The plat fertilized with wood ashes and nitrate of soda produced the best yields, followed by the plat which had received ground bone, potash, and nitrate of soda. The average yield of hay and rowen for the 3 plats was 6,510 lbs. per acre. Since the beginning of the test the plats receiving barnyard manure have averaged 6,817 lbs. per acre, the plats receiving bone and potash 6,626 lbs., and those receiving wood ashes, 6,371 lbs.

The Woburn Pot-culture Station, J. A. VOELCKER (*Jour. Roy. Agr. Soc. England, 3. ser., 11 (1900), pt. 4, pp. 553–604, figs. 17*).—This article deals with the inception and general arrangement of the Pot-culture Station at Woburn, and further discusses in detail the work of the station during 1898 and 1899. The experiments discussed are grouped under two heads, namely, the Hills experiments, consisting of a study of different chemical substances in their relation to plant growth when applied to the soil, and miscellaneous pot-culture experiments bearing on different agricultural questions.

The Hills experiments.—These are named for E. H. Hills, who bequeathed a considerable sum to the Royal Agricultural Society of England for the purpose of carrying out investigations on the value of "tertiary ash," under which term he included compounds of fluorin, manganese, iodin, bromin, titanium, and lithia. The first year the experiments were made with calcium fluorid, calcium oxid, manganese oxid, sodium iodid, sodium bromid, sodium chlorid, titanium oxid, ferric oxid, lithium chlorid, and calcium chlorid applied at the rate of 5 cwt. per acre. The selected crops—wheat, barley, mustard, peas, and red clover—were grown in pots. The experiments with wheat showed that sodium iodid applied at the rate of 5 cwt. per acre kills the plant. Sodium bromid seemed to do no harm at first, but later on weakened the plant and reduced the yield. It also seemed to check the growth of the roots and to cause the root stocks to send out fresh roots. Lithium chlorid also had a retarding influence in the beginning, but subsequently the plants grew and matured fairly well. The sodium chlorid pot gave practically the same results as the unmanured pot. Sodium iodid and lithium chlorid retarded germination and lowered the proportion of germinating seed.

The pots to which sodium iodid had been applied gave off a decided iodin odor, and the soil in them was rendered impervious to water. The effects on barley were much the same as on wheat. Sodium iodid, applied at the rate of 2 cwt. per acre, seemed to have no injurious effects on either wheat or barley. Sodium iodid and lithium chlorid prevented the growth of mustard, lithium chlorid being the more effectual. Sodium bromid at first showed no injurious effects on the mustard plant, but in the end affected it quite seriously. The sodium chlorid and sodium bromid injured peas eventually, although they at first seemed harmless. Sodium iodid and lithium chlorid prevented the pea seed from germinating properly, but when applied at the rate of 2 cwt. per acre, these substances effected a small improvement. The experiments with red clover were the same as with the other crops, with the exception that sodium iodid and lithium chlorid were applied at the rate of 2 cwt. per acre. Results of the experiments with clover for this and the following season were not conclusive, and the statements made regarding the outcome of the test were that lithium chlorid prevented the proper growth of the red clover, while sodium iodid and sodium bromid did not this season have the injurious effects noted with the cereal crops. The second year the plan of the experiments was somewhat changed, the investigation being limited to tests with sodium iodid and sodium bromid applied in different quantities and at different times. It is concluded from the experiments made during the 2 years that sodium iodid and sodium bromid, even at the rate of ½ cwt. per acre, are injurious to wheat, whether applied at the time of sowing or later on, and that they apparently check root development. Soaking the seed in a 1 per cent solution of either salt exercised a good influence on the wheat plant and increased the yield. The tests with barley gave much the same results, with the exception that the effect of sodium bromid was not so marked, and the results with clover were practically the same as those with barley. The results of a test with mangel-wurzels added to the experiments this year show that sodium iodid at the rate of 1 cwt. per acre, applied either at the time of sowing or as a top-dressing, was decidedly injurious and that sodium bromid used at the rate of either 1 or 2 cwt. per acre was also injurious, but when applied as a top-dressing did not injure the crop any more than the same amount of sodium chlorid applied in the same way.

Miscellaneous pot-culture experiments.—This work consisted of experiments with wheat and barley on thick and thin sowing, and the use of large and small seed, a study of hard and soft wheat, an investigation on wheat smut, and several fertilizer tests. The results of thick and thin seeding are presented in the following table:

Results of pot experiments on thick vs. thin sowing of wheat.

Number of seeds sown per pot.	Rate per acre.	Weight of grain.	Weight of straw.	Yield per plant.	
				Grain.	Straw.
	Pecks.	*Grams.*	*Grams.*	*Grams.*	*Grams.*
5	2.7	5.6	11.3	1.11	2.27
10	5.5	5.9	11.4	.59	1.14
15	8.3	4.9	10.6	.34	.73
20	12.0	4.8	11.2	.24	.57

On May 4 the average number of shoots per plant was 6.1 for the thin seeding, and 3.5 for thick seeding; and on June 6 there were 7 and 2.6 shoots per plant, respectively. With barley thick seeding did quite as well as thin seeding. The experiments with small and large seed showed practically no difference in the results, and this was the case with wheat as well as barley.

The test of hard and soft wheat indicated that soft wheat does not necessarily produce starchy grain, or hard wheat glutinous grain, and that there are other determining factors with a more powerful influence in this direction than the seed sown. The dry grain from hard wheat was found to contain 2.57 per cent of nitrogen and the grain from soft wheat 1.94 per cent.

The results further indicate that heavy soils produce a more glutinous wheat than light sandy soil. In these tests soft wheat was sown on heavy soil but the produce was entirely hard wheat.

The investigation on wheat smut consisted of a comparative test of the ordinary smut remedies. Nitrate of soda containing 2.15 per cent of potassium perchlorate, applied at the rate of 1 cwt. per acre, had no injurious effect on barley as compared with nitrate of soda free from perchlorates. The use of "Martellin," a silicate of potassium fertilizer, had no beneficial effect on red clover.

Report of the agriculturist, R. S. Shaw (*Montana Sta. Bul. 28, pp. 10–13*).—Yields of wheat, oats, and barley grown under the Campbell system and under general methods of culture are given. The author concludes that "the Campbell system will not compete with methods of irrigation, though it may hold an important place in crop producing in arid regions where water is not available." Yields of wheat, oats, barley, clover, peas, and sugar beets grown in rotation experiments are also given. Results of feeding experiments with steers, sheep, and pigs reported in Bulletin 27 of the station (E. S. R., 13, pp. 270, 271, 273) are briefly summarized.

Grain and forage crops, J. H. Shepperd and A. M. Ten Eyck (*North Dakota Sta. Rpt. 1900, pp. 59–97*).—The work here reported, covering the seasons of 1899 and 1900, is largely in continuation of experiments described in a previous bulletin (E. S. R., 11, p. 331). The results obtained are shown in tables and briefly discussed.

Wheat.—Sixty-three varieties of wheat were grown in 1899 and 51 in 1900. In 1899, 15 varieties yielded over 24 bu. per acre. The leading sorts were: Pererodka U. S. No. 2954, and Kubanka U. S. No. 2953, yielding 34.9 and 30.1 bu. per acre, respectively. Bolton Blue Stem, Experiment Station Fife, Red Fife and Glyndon (774) yielded on the average for 6 successive years, 24.2, 23.5, 22.8 and 22.8 bu. per acre, respectively. Many of the wheats tested were originated by the station or imported varieties from Russia. A few of the new varieties are described. The results for 1900 were not considered conclusive and are not reported. The average results from 23 tests with home-grown seed and with wheat originally from this station but grown at the Minnesota Station from 1 to 9 years, showed a gain of 2.44 bu. per acre in favor of the home-grown seed. Five and a half pecks of seed wheat per acre gave the best average results for 7 trials, including the last 2 seasons. The yields as compared with the rate of seeding were not very uniform.

Oats.—Twenty-five varieties of oats, of which 8 had been tested for 6 years or more, were grown during the 2 seasons. In 1899 only 3 varieties were injured by rust, namely, Black Beauty, Tobolsk, and Swedish Select. Archangel also rusted but to a less degree. In 1900, weather conditions interfered with the successful growth of the crop. Tartarian, American White Banner, Race Horse, Black Beauty, Archangel, White Russian and Lincoln produced the largest average yields for 6 years tests.

Barley.—In both seasons 25 varieties of barley were grown in the field trials. Success, Culver, French Chevalier, Minnesota No. 105, Manshury, Sisolsk, 2-rowed Manshury and Odessa, in the order mentioned, gave the largest average results for the two seasons, the yields ranging from 31 to 37½ bu. per acre. The best returns from varieties grown for 3 successive years were obtained from French Chevalier, Culver, Manshury, Odessa, Salzer Silver King, and Bernard, in the order given. The average yields varied from 34.4 to 39.4 bu. per acre. In 1900 the late-maturing varieties gave enough heavier yield to affect the average for 3 years to such an extent that they ranked highest.

Spelt.—Of 4 varieties of spelt grown in 1899 the 2 best yielding varieties, Common and Yaroslaf Spelt, were given a further trial the following year. The Common yielded 32.69 bu. per acre, while the Yaroslaf, a Russian variety, yielded 28.56 bu. per acre. In 1899 the yield had been 69.1 and 74.1 bu. per acre, respectively. A comparison of the average yield for 3 years of the best producing varieties of barley and oats, with the highest yielding spelt, shows an advantage of 45 lbs. over oats and 73 lbs. over barley in favor of the splet.

Millet.—A number of varieties of millet have been grown by the station for several years. The highest average yield of seed per acre for the 2 seasons, 43.9 bu., was produced by the German millet. When grown from North Dakota seed this millet gave 1½ tons less fodder per acre, but about a ton more grain than when grown from southern seed. The millet also produced more grain per acre than either oats or barley.

Flax.—Four varieties, Riga Fibre, Common, Russian, and Odessa were on trial in 1900. The Russian yielded the most seed, 16 bu. per acre, and the Riga Fibre produced the heaviest yield of straw, 1,683 lbs. per acre. These 2 varieties also matured earlier than the other sorts. The Riga Fibre flax produces more straw and less seed than seed flax varieties. A 3 years' trial of growing flax and wheat together is reported and the results are compared with the yields obtained when the crops were grown separately. The financial results were only very slightly in favor of the unmixed grain. Wheat grown with flax was poorer in quality than wheat grown alone, while flax grown alone was poorer in quality than when mixed with wheat. The results of other tests indicate that flax should be sown about the time the wheat is coming up instead of sowing the mixed seed. Sowing 4 pecks of wheat and 2 pecks of flax per acre gave the largest yield. Different amounts of seed were sown per acre to study the effect on the yield and quality of straw, fiber, and seed, but the results were not conclusive. Sowing from 2 to 4 pecks per acre produced the heaviest and longest straw, but more branched and less long straight straw than thicker seeding. In the dry season of 1900 from 4 to 6 pecks per acre produced more profitable yields of seed than thinner sowing.

Buckwheat.—Among 6 varieties tested, 2 introduced Russian varieties, designated as Russian No. 1 and Orenberg No. 6, gave the best results.

Potatoes.—Forty varieties were tested in 1899, and 12 of these had been grown the previous year. Sixteen of the 40 kinds grown in 1899 were planted for trial in 1900. The varieties giving the best average yields for the last 2 seasons were Early Dawn, Thoroughbred, Early Ohio, Burpee Superior, Six Weeks, Freeman, Secretary Wilson, Early Andes, and Carman No. 1. Early Ohio, Early Dawn, and Early Andes are recommended as good early potatoes. The results of experiments on the thickness of planting showed a general decrease in yield as the distance between the hills increased. The seed in this case had been cut from 2 to 3 eyes to the piece and planted about 4 in. deep. Doubling the quantity of seed per hill decreased the yield and proved detrimental to the quality of the tubers. Planting potatoes from 3 to 5 in. deep gave the largest yields but a poorer quality of tubers than deeper planting. Shallow and flat cultivation gave larger yields than deep cultivation and hilling.

Report of the experimentalist, C. A. Zavitz (*Ontario Agr. Col. and Expt. Farm Rpt. 1900, pp. 96–125, figs. 5*).—The work here presented consists largely of variety tests, and is in continuation of experiments conducted in previous years (E. S. R., 12, p. 328). Other work of the experimental department is briefly noted. The results of 10 years' experiments show that Joanette Black oats gave the largest average yield of all varieties tested. Sixty-seven varieties were grown this season, and among them Probsteier, White Siberian, Mennonite, Daubeney, Waterloo, and New Electric, in the order given, produced the largest yields. Vanhouten, Scottish Chief, and Black Irish were the least productive varieties in the test, giving less than one-half the yield of the best yielding sorts. The grain per measured bushel of Whiteside, Early Dawson, Mortgage Lifter, White Dutch, White Superior Scotch, and Washington weighed over 40 lbs., but it was observed that varieties producing heavy grain are usually only moderate yielders, and that the grain is generally thick in the hull. The earliest varieties, Alaska, Daubeney, and Black Mesdag ripened about the 25th of July. Seed of 6 different varieties grown in Missouri, but originally from the Ontario Agricultural College, was compared with seed grown at the college, and the results of this single test showed that the Missouri seed produced the largest yields and the Ontario seed the heaviest grain.

The experiments with barley show that the 6-rowed varieties have given much better results than the 2-rowed varieties. Manshury barley has been compared with the widely cultivated Common 6-rowed barley for 12 years, and the results show an average yield of 66.8 bu. of grain and 1.9 tons of straw per acre for the Manshury and 57.9 bu. of grain and 1.6 tons of straw for the Common 6-rowed. The average weight per bushel of Common 6-rowed was 52.7 lbs., or 1.6 lbs. greater than the weight of the Manshury. Of the 19 varieties tested this season, California Brewing, Four-Rowed Canadian, and Six-Rowed Baxter Improved gave the best yields. The heaviest grain weighed 54.6 lbs. per bushel and was produced by the Oderbrucker variety. The average results for several years show that the best 2-rowed barley yielded about 14 bu. per acre less than the best 6-rowed variety. The 2-rowed varieties giving the best average yields for a period of several successive years were New Zealand, Chevalier, Gold Foil Hansford, French Chevalier, Empress, Two-Rowed Canadian, and Kinna Kulla. Of the varieties tested in 1900 Two-Rowed Canadian, Duckbill, Vermont Champion, and Jaramn Selected Beardless produced the highest yields.

Of 12 varieties of hulless barley grown this year Guy Mayle and Black Hulless were the best grain producers. Purple and Black Hulless yielded the heaviest grain, the weight per measured bushel being 64 and 62¾ lbs., respectively. Hulless barley usually weighs about 60 lbs. per bu.

Twenty-eight varieties of spring wheat were tested this season, and among them Red Fern, Bart Tremenia, Pringle Champion, and Wild Goose, in the order mentioned, gave best returns. Harrison Bearded, Bart Tremenia, Wild Goose, Konisburg, and Blue Democrat produced the heaviest grain per measured bushel. The Wild Goose is the best macaroni wheat grown in Ontario and is largely exported to Italy and France. Other varieties of this class grown at the college, namely, Medeah, Bart Tremenia, Sorentina, and Algiers have each given better results than any of the finer varieties of spring wheat. Most varieties of spring wheat gave better results than Salzer spelt. Of the 33 best varieties of winter wheat grown for 5 years, Dawson Golden Chaff, Egyptian Amber, Imperial Amber, Early Genesee Giant, and Reliable, in the order mentioned, gave the best results, the yields ranging from 50.9 to 56.7 bu. per acre. The lowest average yields for 6 years were produced by Treadwell, Turkey Red, and Velvet Chaff. All the varieties tested yielded over 40 bu. per acre. Large plump seed produced a better yield and a heavier grain than small plump, shrunken, and broken seed. The last week of August proved the better time for sowing winter wheat. The results of drilling and broadcasting the same quantity of seed were practically equal. Peas, as a green manure for winter wheat, gave better results than buckwheat, but an application of 20 tons of barnyard manure on a bare summer fallow gave better yields than either. Winter wheat after clover gave better returns than when grown after grass. The largest yields of grain and straw and the heaviest weight per measured bushel were obtained by allowing the grain to ripen fully.

The 4 varieties of spring rye under test yielded from 34.5 to 38.7 bu. per acre in the following order: Dakota Mammoth rye, Prolific spring rye, Common rye, and Colorado Giant rye. Very good results were obtained from winter rye, the two varieties grown, Mammoth and Common, yielding 71.4 and 70 bu. per acre, respectively.

The largest average yields per acre of peas grown for 6 years were obtained from White Wonder, New Zealand Field, Early Britain, Egyptian Mummy, New Zealand Brown, and Tall White Marrowfat. In 7 years' tests the Grass peas produced an average of 2.3 tons of straw and a little over 23 bu. of grain per acre. In a comparative test this season Grass peas gave a better yield than Oddfellow peas. The chick-pea (*Cicer arietinum*) has given good results at the college. The best variety of cowpeas grown was the Italian, which produced 12.3 tons per acre.

Twenty-two varieties of flint corn were tested in 1900, and of these King Philip, Angel of Midnight, Pride of Canada, Salzer South Dakota, Salzer North Dakota, Longfellow, and Genesee Valley, in the order given, produced the largest yields. Of 128 varieties of fodder corn, including dent, flint, and sweet varieties, Mammoth Cuban and Mastodon dent gave excellent satisfaction. Corn planted 2 in. deep gave the greatest total yields per acre. Planting in hills gave better results than planting in drills.

The average results of the experiments with potatoes for several years indicate that Empire State, Pearl of Savoy, American Wonder, Dempsey Seedling, and Rural New Yorker No. 2 are the best general varieties. Daisy, Rose New Invincible, Paris Rose, Irish Cups, Bovee, Six Weeks, White Elephant, and Ohio Junior yielded over 220 bu. per acre this season. Sprinkling cut seed potatoes with gypsum or land plaster increased the yield 16.4 bu. per acre. Cut potatoes planted on the same day they were cut yielded about 18 bu. more per acre than those planted 4, 5, and 6 days after cutting. The results of the distance experiments were in favor of planting 26½ in. apart, with the sets 1 ft. apart in the row. Planting 1 set in each hill gave a better yield than planting 2 or 4 sets per hill.

Hairy vetch produced an average for 4 years of 8.8 tons of green forage per acre. Alfalfa gave three cuttings and yielded 4.6 tons of hay per acre in the present year. The best mixtures of grass and clover for hay were tall oat grass and alfalfa; tall oat grass, orchard grass, mammoth red clover and alfalfa, and alfalfa and timothy. A mixture consisting of 4 lbs. of orchard grass, 4 lbs. meadow fescue, 3 lbs. tall oat grass, 2 lbs. timothy, 2 lbs. meadow foxtail, 5 lbs. alfalfa, 2 lbs. alsike clover, and 1 lb. of trefoil is recommended for permanent pastures. Among a number of grain mixtures grown for the production of grain and straw, Mansbury barley and Daubeney oats, Chevalier barley and Siberian oats, and Kinna Kulla barley and Poland White oats produced the largest yields of grain. In general, the results of experiments in sowing oats, barley, spring wheat, and peas on different dates favor the earlier sowings and tests with selected seed of these same crops show the superiority of large plump grains. Drilling oats, barley, and peas was found preferable to broadcasting.

Farm superintendence, G. E. Day (*Ontario Agr. Col. and Expt. Farm Rpt. 1900, pp. 53–60, figs. 5*).—Brief notes are given on the different field crops grown at the college in 1900 with reference mainly to the amount of land devoted to each crop, the preparation and cultivation of the soil, the result of seeding and the yields obtained. Notes are also given on the live stock, and a financial statement of the farm department for the year is included.

Field experiments with fertilizers on corn, oats, and wheat in 1899 and 1900 (*Ohio Sta. Bul. 124, pp. 103–119*).—The general plan of these experiments and previous results have been noted (E. S. R., 12, p. 127). The changes from the general plan made in 1899 consisted in discontinuing on one plat the use of bran as a carrier of phosphoric acid, doubling the quantity of phosphoric acid and reducing the quantity of nitrogen by one-half on 4 plats and in one instance bringing tankage into comparison with other nitrogen fertilizers. The results are tabulated in detail. It is concluded from the results obtained that the relative behavior of two soils toward phosphoric acid and potash can not be determined by chemical analysis, and that the physical condition of the soil may have a greater influence on its fertility than its chemical composition. For the soils here under test phosphoric acid was found to be the most important element. Without phosphoric acid in the fertilizer application nitrogen and potash were not effective. Next to phosphoric acid, nitrogen was most needed, and it seemed most effective on the soil showing the greatest deficiency in it by chemical analysis. The results, however, indicate that where clover enters into the rotation the quantity of nitrogen which can be economically applied is far below the needs of the soil, as shown by its chemical composition. On the soil at Strongsville, which has accumulated a considerable reserve of nitrogen during a long rest in pasture, 3 per cent of nitrogen in the fertilizer application was not too much, and it is concluded that a still larger quantity might be profitably used on the badly worn soil at Wooster. Potash, although the least important of the 3 necessary elements of plant food, in these tests produced an additional increase in the yields after both nitrogen and phosphoric acid had been applied. The potash content of the 2 soils coming under this observation was practically identical, still, potash in the fertilizer application was much more effective at Wooster than at Strongsville.

Recent experiments with Alinit in the cultivation of oats and barley, A. Damseaux (*Jour. Soc. Roy. Agr. L'Est, Belg., 1900, pp. 111, 112*).

Sludge as a fertilizer for grass, A. E. Shuttleworth (*Ontario Agr. Col. and Expt. Farm Rpt. 1900, pp. 30, 31*).—Dry sludge applied as a top-dressing at the rate of 1,000 lbs. per acre increased the yield of green timothy a little over 4 per cent. Analyses are given of sludge and barnyard manure.

A meadow for hay and pasture, G. Heuzé (*Jour. Agr. Prat., 1901, I, No. 9, p. 286*).—A note on the management of a meadow to be used as a pasture after the first cutting of hay.

Experiments with beans, A. M. Ten Eyck (*North Dakota Sta. Rpt. 1900, pp. 98–101*).—These experiments consisted of distance and variety tests. Drilling beans in rows 2 ft. apart gave the larger yield and an earlier crop than drilling in rows 3 ft. apart. In the variety test the Brown or Swedish bean stood first in yield, Dewey Navy second, and California Wonder third. The Dewey Navy is an early variety and sells well. The Great Northern and Aristook are a little earlier, but are not considered equal to the Dewey Navy on account of being dwarf and light-yielding varieties.

Experiments in corn culture, J. S. NEWMAN (*South Carolina Sta. Bul. 61, pp. 12, pls. 3*).—In this bulletin the reports of experiments on corn culture are prefaced with a brief consideration of the preparation of the soil and the cultivation of the crop. The experiments were conducted on river bottom land and embraced methods of planting and cultivation and fertilizer and variety tests. The effects of different methods of planting and cultivating were not pronounced. The best results in the distance experiments were obtained from plats on which the stalks had each from 4 to 6 sq. ft. of space. In connection with these tests it was observed that planting peas in drills between the rows of corn increased the yield, and that where the peas were sown broadcast the increase in the yield of corn was still greater. The use of commercial fertilizers did not increase the yield sufficiently to cover the cost of the application. Albemarle Prolific gave the best yield of the 7 varieties tested, but it showed the smallest percentage of shelled corn on the weight in the ear.

The culture of maize, C. GINER (*Bol. Agr. Min. é. Ind.* [*Mexico*], *10* (*1900*), *No. 2, pp. 61–93*).—An article treating in general and at some length of the culture of corn and discussing the effect of climate and cultivation on the growth, composition, and value of the plant.

Studies upon flax in 1900, H. L. BOLLEY (*North Dakota Sta. Rpt. 1900, pp. 43–45*).—A study of the uneven ripening of flax was made by sowing seed on different dates at varying depths. Seed from several supposed varieties and several different grades of one variety were used. The conclusion drawn from the results is that an equally maturing crop of flax can be grown from good uniform seed sown at a uniform depth on land of even quality. The date of sowing was not found to be an influential factor. In studying the effect of frost on young plants it was determined that plants killed back to below the 2 seed leaves will not put forth new sprouts, while plants with the seed leaves uninjured branch freely. Germination tests of flax injured by frost before it had matured showed that it had a very low germinating quality.

The removal of the hop vines immediately after the hops had been harvested (*Württemberg Wchnbl. Landw., 1901, No. 4, pp. 42, 43*).—A brief note discussing the advantages and disadvantages of this method.

Culture tests with horse beans on different soils under the same climatic conditions, J. SEISSL and E. GROSS (*Ztschr. Landw. Versuchw. Oesterr.*, *3* (*1900*), *No. 2, pp. 153–164, fig. 1*).—In these experiments the horse beans (*Vicia faba major*) were grown in pots of various kinds of soil from different sections of the country. The amount of plant food withdrawn from the different soils by the plants was calculated. Although no definite conclusions are drawn, the author calls attention to the relation existing between the yield, the assimilation of phosphoric acid by the plants, and the proportion of phosphoric acid to the sesquioxids of iron and ammonium in the soil, a factor acting on the solubility of the phosphoric acid.

Results with variety tests of lupines, EDLER (*Jahrb. Deut. Landw. Gesell.*, *15* (*1900*), *pp. 546–560*).—Cooperative tests with different species and varieties of lupines, begun in 1897, are here described and the results obtained recorded. The results show that varieties of blue lupines yielded much more seed but less straw than varieties of the yellow lupine. Only on poor, dry, sandy soils did the yellow lupines produce more seed than the blue. The yields of seed of the yellow lupine and the black lupine (*Lupinus luteus* and *L. luteus semine nigro*) were equal. The yellow lupine developed slower than the blue, requiring from 2 to 3 days more to come up, a week longer to come into bloom, and about 10 days more to ripen. The yellow lupine is much more sensitive to the lime content of the soil than the blue lupine, and its seed also has a much higher alkaloid content. The albumen content of the seeds of yellow lupines was much greater than that of blue lupines.

Soil inoculation experiments with lupines, C. SCHREIBER (*Rev. Gén. Agron. [Louvain], 9 (1900), No. 7, pp. 302–304*).—The inoculation of a field at the rate of 6,000 kg. per hectare with soil taken from land producing good lupines increased the yield of green plants, including roots, by 22,500 kg. per hectare as compared with soil not inoculated.

Autumn catch crops, P. P. DEHÉRAIN (*Bul. Soc. Nat. Agr. France, 60 (1900), No. 12, pp. 749–751*).—A discussion on the use of white lupines in this connection.

Tillage experiments with potatoes, J. L. STONE (*New York Cornell Sta. Bul. 191, pp. 167–188, fig. 1*).—This bulletin summarizes the reports from farmers who cooperated with the station in cultural experiments with potatoes in 1899 and 1900. The cultural methods recommended by the station were early or twice plowing, thorough fitting, deep planting, prolonged, frequent, level tillage, and spraying with Bordeaux mixture and Paris green. Eighty-five per cent of the reports received from the farmers who gave these methods a trial indicate profitable returns. The results of similar experiments conducted at the station from 1895 to 1899, inclusive, published in former bulletins and previously noted, are reported and briefly discussed.

The work with potatoes during the summer of 1899, H. L. BOLLEY (*North Dakota Sta. Rpt. 1900, pp. 39–43*).—From 4 varieties of potatoes—Sunlit Star, Dakota Seedling, Trumbull, and Early Ohio—the largest and best, nearly round and typical long shaped tubers were selected from the bin and planted. The results obtained confirmed the previous conclusions (E. S. R., 9, p. 942) that for form and quality of tuber the selection must be made in the field from the vine. It was found better, however, to select from the bin the shape desired than to make no selection at all. A comparison of the stem and seed ends of the tubers for seed was only slightly in favor of the seed end. Several experiments to determine the possibility of root fusion are reported, but the results in all cases were negative.

Field experiments with fertilizers on potatoes, 1894 to 1900 (*Ohio Sta. Bul. 125, pp. 121–132, dgms. 2*).—The experiments here considered have been partially reported in a former bulletin (E. S. R., 12, p. 127). They were made at the central station at Wooster and at the substations at Strongsville and Neapolis. The rotation in connection with this experiment was potatoes, wheat, and clover. Superphosphate, muriate of potash, nitrate of soda, and dried blood were applied at different rates, alone, and in different combinations. It is concluded that, after making allowance for irregularities in yields, phosphoric acid is the constituent most needed for potatoes and cereals by the soils at Wooster and Strongsville, while on the thin, sandy soil at Neapolis potash is relatively more effective than phosphoric acid. All tests showed a much greater increase from the use of the combined fertilizer than from any single constituent alone. It is considered that in a general way the results indicate that acid phosphate in moderate quantities can be profitably used in potato growing and that it is also advantageously combined with small quantities of potash and nitrogen fertilizers. In a short rotation like the one used in these experiments, and on soils which produce good crops of clover, the economy of using nitrogen fertilizers on potatoes is questioned. The results also show that it is the soil rather than the crop which determines the fertilizer required.

Report on variety tests with potatoes, F. W. RANE (*New Hampshire Sta. Bul. 79, pp. 10–15*).—The results of varieties of potatoes tested in 1900 are tabulated and each variety is briefly described.

Serradella in Campinas, G. D'UTRA (*Bol. Agr. São Paulo, 1. ser., 1900, No. 7, pp. 474–478*).—A brief description of the culture tests with serradella and a report on analyses of the plant at different periods of growth.

Experimental work with sugar beets during 1900, R. H. FORBES (*Arizona Sta. Bul. 36, pp. 187–205, maps 2*).—This bulletin is a report on cooperative culture experiments with sugar beets under the direction of the station. Each test is discussed separately and the results set forth graphically. In the Upper Gila district where this work was carried on, beet seed may be planted from about February 1 to October 15. Autumn plantings endure the winter if the beets have attained a certain size before the cold weather comes. In one instance a plat seeded September 6, on which the leaves were about 10 in. long, was not seriously injured by cold weather up to January, while a planting made September 15 on the same ground was partly destroyed by frost. On all plats the weight of the beets increased until about the first week in August. The influence of water on tonnage was shown where one-half of a plat received an extra irrigation on August 7, the average weight of the beets being increased 1.1 oz., but the quality of the beets was lowered. The average sugar content of the beets June 5 and 6, was 10.6 per cent; June 20, 11.82 per cent; July 2–6, 12.29 per cent; July 19–21, 12.27 per cent; August 3–13, 13.16 per cent, and August 27–31, 12.58 per cent. A shortage of water seemed to decrease the percentage of sugar. "These facts indicate that drought causes the beets to curtail sugar production in favor of maintenance of structural growth." Early planting is recommended to enable the beets to be comparatively mature before the hottest weather sets in. The purity of the juice was quite variable, increasing from May 23 to June 20, when the beets were growing rapidly, and decreasing after that period when the growth was lower. May 23, the average purity was 71.9, and June 20, 83.1, while the latter part of August it had fallen back to 81.25. The results obtained on a plat grown at the station showed a yield of 4,901 lbs. of total sugar per acre. These beets had been planted December 26 and attained fair size before the arrival of hot weather.

Sugar beets, W. P. Headden (*Colorado Sta. Bul. 63, pp. 31*).—This bulletin is a review of the work with sugar beets carried on at the station up to the present time and reported in the station bulletins. These bulletins have been previously noted.

Experiments with sugar beets, J. D. Towar (*Michigan Sta. Bul. 188, pp. 97–107, fig. 1*).—The experiments reported in this bulletin, including tests of various kinds of soils for sugar beets, an experiment on the time of planting beets, and distance, fertilizer, and variety tests, were conducted in 1900 on soils ranging from sand to loam. The results show that clay loam soils produce the largest tonnage and the highest percentage of sugar. The tests on muck soils indicated the possibility of a high percentage of sugar, but most pure muck soils produce beets so low in sugar content that they can not be profitably worked. This season seed planted between May 10 and 24 gave the most profitable yield, but the author considers any time between the last week in April and the last of May as suitable for planting in that latitude. Planting in rows 21 in. apart increased the yield 5 per cent as compared with planting in rows 18 or 24 in. distant. The results of experiments made to determine whether sugar beets exhaust the soil show that beets after potatoes or beans gave a better yield than beets grown after beets. Fourteen varieties were tested during the season, giving an average yield of 14.08 tons per acre with 13.63 per cent of sugar in the juice and a purity of 81.30. Austrian Special Kleinwanzlebener No. 5 produced the greatest value of crop per acre. Germination and vitality tests of the seeds of these different varieties were made and the results recorded. Austrian Special B. G. V. produced 166 sprouts from 48 seed balls, while Simon Le Grande C No. 27 grew only 126 sprouts from 72 balls, but low germination did not seem to affect the yield, for the best yielding varieties were by no means those which gave the highest percentage of germination.

Fertilizer tests with various applications were begun in 1899 and the fertilizers applied in both seasons were practically the same in quantity and quality. Stable manure applied early in the winter gave the largest yield of beets and the lowest percentage of sugar, but it proved to be the most remunerative fertilizer. When applied the day before plowing the field, the percentage of sugar in the beets was so low that the use of home-mixed fertilizers was more profitable. In no case did the use of incomplete fertilizer applications prove remunerative. Transplanting beets was found to be detrimental in every way. Meteorological conditions of the season are shown in a table.

Sugar-beet experiments for 1900, E. F. LADD (*North Dakota Sta. Rpt. 1900, pp. 20–23*).—This is a report on cooperative culture experiments with sugar beets made throughout the State. The results of analyzing the samples are given in tables. An unfavorable season prevented maturity of the beets, and the results were not satisfactory.

Sugar-beet investigations in Ohio in 1900, A. D. SELBY and J. W. AMES (*Ohio Sta. Bul. 126, pp. 133–174, figs. 8*).—This bulletin is a report on the cooperative culture tests with sugar beets throughout the State in 1900. The results of germination tests of the beet seeds used in these experiments and the meteorological data for the year and for previous seasons are reported. Seed was sent to 203 farmers in 60 different counties of the State, and of these 109 returned samples for analyses. A total of 303 samples was analyzed by the station, and the results are set forth in tables. The results for the entire State show an average of 10.9 per cent of sugar in the beets and a purity of 77.1. Dividing the State into different sections, the results for the northern section show an average of 11.3 per cent of sugar in the beets, with a purity of 77.8; for the middle section, 10.7 per cent of sugar and 77.4 purity; and for the southern section, 8.1 per cent of sugar and 67.5 purity. The bulletin further discusses the industry within the State, gives a concise description of the factory processes, and notes the advantages of certain cultural practices. The most important diseases of the sugar beet are discussed and remedial measures suggested.

Sugar-beet experiment, A. E. SHUTTLEWORTH (*Ontario Agr. Col. and Expt. Farm Rpt. 1900, pp. 25–29*).—This article describes the experimental culture of sugar beets by farmers in 3 different localities in Ontario and reports the results obtained from these tests and reviews briefly previous experiments in this same line. In each of the 3 localities samples were taken on different dates, and it was found that there was very little increase in the size of the beets between September 25 and November 6, but the purity gradually improved. The weight of the beets in all the samples varied from 15.7 to 20.8 oz., the sugar in the juice from 13.7 to 15.3 per cent, and the purity from 81.9 to 86.8.

Sugar-beet experiments in Ontario in 1900, A. E. SHUTTLEWORTH (*Ontario Agr. Col. Bul. 113, pp. 43, figs. 9, map 1*).—This bulletin contains the report of cooperative culture tests with sugar beets conducted at 3 different centers: Aylmer, Welland, and Newmarket. The results of the analyses of different samples are recorded in tables. Directions for the cultivation of sugar beets in Ontario are given and a discussion of the cost and profit of sugar-beet culture is taken from other sources. Most of the samples analyzed showed the required sugar content for factory purposes and a correspondingly high coefficient of purity.

Nitrogenous fertilizers in the culture of sugar beets (*Sucr. Indig. et Coloniale, 57 (1901), No. 6, pp. 167–171*).—A brief account is given of experiments in the department of Aisne which showed that mixtures of nitrate of soda, sulphate of ammonia, and dried blood gave better results as regards yield and quality of beets than nitrate of soda alone.

The sugar industry in the island of Guadeloupe (*Sucr. Indig. et Coloniale., 57 (1901), No. 9, pp. 272, 273*).—A description of the sugar-cane crop and the campaign of 1900.

Brief notes on the culture of tobacco (*Tabac, 21 (1901), No. 369, pp. 2, 3*).

Notes on the culture of tobacco and its preparation, M. M. GARCIA (*Bol. Agr. Min. e. Ind. [Mexico], 10 (1900), No. 2, pp. 3–60*).—An article treating at some length the culture of tobacco in Mexico.

The drying of tobacco. I, Total weight and loss of weight, E. C. J. MOHR (*Meded. 's Lands Plantentuin, 1900, No. 41, pp. 49*).—The author studied in detail the process of drying tobacco, and determined some of the conditions that influence the quality of the dried leaf. Three stages in the drying process are distinguished: The first stage from the time the tobacco is hung until the cells of the leaf blade are dead; the second until the leaf blade is dry, covering about two days; and the third stage is characterized by the death and drying of the midrib. At its close the leaves are taken down and carried to the fermenting barn.

Before the death of the cells the passage of the cell contents is controlled by the living protoplasm, but after the death of the cell, the contents can pass freely from place to place as long as there is sufficient moisture to permit of chemical activity.

Evaporation goes on much more rapidly after the death of the cells than before, but as all the cells do not die at the same time the effect of this is not noticeable. The chemical changes which take place during the drying result in a decrease in dry matter. This is especially true during the first stage, while during the last stage there may be a slight increase of dry matter due, the author thinks, to oxidation.

The quality of the finished product depends largely upon the length of time the different stages are allowed to continue. If the drying is unduly hastened the leaf blade becomes too dry by the time the midrib is dry enough, and the danger is that the leaf will not ferment properly. As a result of this study of fresh tobacco the author finds that on properly grown plants the top leaves are heavier than the lower ones and contain a relatively larger amount of dry matter. The cells and air spaces are larger in the lower leaves, and the leaves dry more rapidly and burn better. In the upper leaves the unit of surface (1 sq. cm.) is heavier than in the lower leaves, due to the greater amount of solid matter in the cells of the upper leaves. It was also found that the green leaf was influenced by the time of day the tobacco was cut and by the weather conditions some hours or even some days before harvest. The riper the leaves were, the shorter the time needed for drying.

During harvest careful attention must be given to wet leaves, the bruising of leaves, and the sweating. Wet leaves or wet places on the leaves tend to discolor the tobacco and to make it dry unevenly. Bruising affords a point of entrance for molds.

During sweating an increase in temperature lowers the vitality of the cells, thus hastening death and the completion of the first stage in drying.

The influence of light, air, moisture, and heat are briefly discussed. In urging the necessity for ventilation the author points out that in the process of drying the air of the barn must be changed at least 500 times in order to carry off all the moisture from the leaves.—H. M. PIETERS.

Work with wheat in 1900, H. L. Bolley (*North Dakota Sta. Rpt. 1900, pp. 28–32*).—The work of wheat selection which has been in progress for several years was continued this season. Large and small grains from each of a number of selected heads were sown and the resulting plants compared. In the majority of cases, the greatest length of straw was in favor of the large seed. The total weight of straw and grain produced by 102 stools from large grains was 1,417 gm. and by the same number of stools grown from small grains, 1.328 gm. In a second test 800 of the largest, plumpest, and finest colored grains and the same number of the smallest possible grains which were plump, hard, and of similar fine quality were selected from a graded sample of Scotch Fife wheat and grown for comparison. The results showed a gain of over 10 per cent in the total weight of straw and grain in favor of the large seed. The large grains also produced heavier heads. In a third experiment, heads of wheat were harvested at different stages of maturity and cured in a dry room, the grain being left in the straw until it was sown. After a germination test, which showed perfect germination for all the samples, the seeds of the different lots were sown for comparison. The most rapid growth was made by the young plants from the most immature seed and the sprouts were longer than those from the mature grain, but these were 3 to 4 times as strong in diameter. Owing to unforeseen advantages of some of the plats, no conclusions could be drawn from the results.

Wheat studies, E. F. LADD (*North Dakota Sta. Rpt. 1900, pp. 13, 14*).—Wheats were studied to determine the percentage of nitrogen in individual heads and the heads from individual stools. It was found that individual heads ranged from 13.56 to 18.25 per cent in proteid content, and the average for the stools from 14.74 to 17.09 per cent.

Improving wheat (*Bol. Soc. Agr. Mexicana, 25 (1901), No. 11, pp. 216–218*).—A consideration of the methods of improving wheat.

Some important questions in plant breeding, W. EDLER (*Vrtljschr. Bayer. Landw. Rath., 5 (1900), No. 4, Sup., pp. 619–630*).—An article on the improvement of potatoes, beets, rye, and oats.

Silo temperatures taken by electricity, H. H. LAMSON (*New Hampshire Sta. Bul. 79, pp. 29–33, fig. 1*).—The temperature of silage was determined at different depths of the silo on a series of dates from September 9 to February 17, by means of the electrical apparatus designed by the Bureau of Soils of this Department. The method of using the apparatus is described and the different temperatures recorded by it are given in a table.

HORTICULTURE.

Vegetables in South Dakota, N. E. HANSEN and W. S. THORNBER (*South Dakota Sta. Bul. 68, pp. 105–158, pls. 12*).—Some results are given of variety and cultural tests of vegetables at the station for the 2 years 1899 and 1900. Of the different crops grown there were 49 varieties of tomatoes, 29 eggplant, 16 peppers, 10 cauliflower, 3 kohl-rabi, kale, 22 sweet corn, 47 cucumbers, 30 beets, Swiss chard, 10 okra, many summer, fall, and winter squashes and pumpkins, 62 bush beans, 28 pole beans, 11 pole and 6 dwarf Lima beans, besides several varieties each of English broad beans, artichokes, chives, dandelions, endives, garden herbs, etc. Illustrations are given of many varieties of the vegetables grown. All of the more tender plants and those requiring a long season for maturing were either started in the greenhouse or under a cold frame.

With tomatoes, plants started in a cold frame compared favorably in yield and earliness with those started in the greenhouse. When grown in a cold frame the seed were planted in bottomless tin cans or like holders, which made transplanting to the field easy. This method is practical only for small areas. Among the heaviest yielding tomatoes for the first half of August in 1899, were Earliest of All, Salzer Earliest of All, Vaughan Earliest of All, and Early Leader. For the whole season Early Leader, The Early Bird, Bright and Early, and Early Ruby were the heaviest yielders. Some experiments are under way at the station in crossing tomatoes to secure a smooth variety which will ripen its main crop in July and August. Red Cherry has been used as a mother, and crossed with Early Ruby, Bond Early Minnesota, and Ponderosa.

Of the varieties of sweet corn tested Early La Crosse, Mexican, Lackey Early, and Telephone are preferred. Of cucumbers Siberian, West India Gherkin, Jersey Extra Early Prolific, and N. K. & Co. were found especially desirable for pickling purposes, while for table use Burpee White Wonder, Green Prolific, Fordhook Improved, White Spine, and Salzer Perfection are recommended. With regard to squashes the most productive of the large fall varieties were Orange Marrow and Boston Marrow, and of the winter sorts Hubbard and Marblehead. Of the small varieties Cocoanut, Henderson Delicata, Perfect Gem, Canada Crookneck, and Der Wing were the most productive in the order mentioned.

"It is sometimes recommended to plant Lima beans with the eye down; some of Burpee's and Henderson's were tested this way, but no difference was observable from those planted in the ordinary way."

Fertilizers for garden and field vegetables, DUBBERS (*Deut. Landw. Presse, 28 (1901), No. 35, p. 305, figs. 4*).—The good results obtained in growing cabbage, celeriac, spinach, pole beans, onions, kohl-rabi, carrots, peas, etc., by combining commercial fertilizers with barnyard manure, are shown by experimental data obtained with these crops.

Seven years of experiments with bush beans, B. D. HALSTED (*Proc. Soc. Prom. Agr. Sci., 1900, pp. 119–129*).—Cultural experiments and experiments in controlling the diseases of bush beans have been carried on since 1894, and are here summarized. Planting at depths of 1 to 1¾ in. gave the best yield. Four and one-half inches distant in the row with Golden Wax sorts has been found better than greater or less distances. The more the beans are crowded, however, the greater the amount of spot diseases. Sprinkling the plants twice daily, from August 30 to October 1, had no appreciable effect upon the foliage or pods. Irrigation nearly doubled the yield of pods but tended to increase the diseases. Mulching was found to be of value only in seasons with less than the normal rainfall. Half-shading prolonged the period of maturity of the first crop and retarded the time of blooming of the second. The pod spot and bacteriosis of beans have been controlled in a large measure by the application of Bordeaux mixture and its various modifications. Beans have yielded on the whole better on old land than on new land, though slightly more subject to diseases. Mulching beans with spotted pods tended slightly to increase the disease. More and larger tubercles have been found on plants grown on old bean lands than where grown on new lands.

The cantaloupe, H. H. GRIFFIN (*Colorado Sta. Bul. 62, pp. 3–7, 16–18, fig. 1*).—Notes are given on the methods followed in growing the Netted Gem muskmelon at Rockyford, Colo. The results of some experimental work along the line of irrigation, fertilizing, and transplanting previously reported (E. S. R., 12, p. 229) are also noted, and additional data given on the proportion of male and female flowers produced on muskmelon vines at different dates during the season.

In the culture of muskmelons in Colorado the first planting is made from May 1 to 10. The land, preferably alfalfa sod, is put into good tilth, and furrows run with a shovel plow 6 to 7 ft. apart. From 10 to 15 seed are then planted 1 in. deep in hills 5 to 6 ft. apart by the sides of the furrows. The author prefers to plant the hills first and irrigate the furrows afterwards, rather than to irrigate first, since the soil is apt to become crusted and dry if it is handled and pressed after irrigation. Cultivation should follow until the vines are 2 to 3 ft. across the hill. "Then the irrigating furrows should be run and cultivation cease, giving such hoeing as will keep down weeds."

Rockyford cantaloupes are characterized by the author as follows: "A pure Rockyford cantaloupe when ripe should have a silver colored netting which is lace-like in appearance. The skin should be green turning to a peculiar gray color when the melon is fit for shipping. The flesh should be green in color, and so sweet and luscious that it may be eaten close to the rind. The melon should have a small seed cavity and the portion of the flesh immediately surrounding it be slightly tinged with yellow. The melon should weigh about 1½ lbs. and be very solid and firm."

A few melons for shipment are picked the first week in August, but the heavy shipping does not commence until about the middle of the month. The melons are crated in 3-tier crates holding 15 perfect melons in each tier. The standard size of this crate, inside measurement, is 22 in. long, 12 in. wide, and 13 in. deep. A 2-layer crate two-thirds the size of the standard and a "pony" crate, holding 45 melons but smaller than the standard, are also in use.

Relative to the signs which indicate the time for picking the Rockyford muskmelon, the author states as follows: "When it is proper time to pick for shipment, the stem slightly parts from the melon. No stem tissue should adhere to the melon, but there should be a smooth surface where the stem was attached. The netting and skin have a peculiar grayish appearance, which is easily distinguished when one becomes accustomed to picking."

In investigating the number of flowers borne by 6 vines from June 27 until July 13, when the vines became so interlapped that the individual vines could not be distinguished, it was found that the average number of male flowers to each hill, for the whole period, was 512, and the female flowers 42. It requires about 6 weeks from the time of setting of the flowers for the fruit to ripen. Twenty ripe melons to each vine is considered a heavy yield.

Among the insect pests of the cantaloupe the flea-beetle, striped cucumber beetle, geometer or measuring worm, and the melon louse are mentioned, and appropriate remedies suggested in each instance.

Tomato report, F. W. RANE (*New Hampshire Sta. Bul. 79, pp. 16–22*).—Tabular data and descriptive notes are given on a test of 29 varieties of tomatoes. Two methods of starting tomato plants have been tested at the station. In one the plants were transplanted into small boxes, so arranged that the bottom could be easily removed and the dirt allowed to slip out, and in the other they were transplanted into 4-in. pots. The author states that the percentage of loss from transplanting was very much less when the pots were used. The pots seemed to induce early maturity and early fruitfulness. "The pot system takes more time and occupies more space, but if this year is a criterion it surely pays."

The kind of soil in which the tomatoes were planted seemed to have an effect on the amount of rot produced. Where the soil was inclined to dry out, the rot was much more prevalent, while on a loamy, moist soil there was very little rot. "Where the soil was the most clayey the rot was the worst."

The development of a tomato hybrid, W. M. MUNSON (*Proc. Soc. Prom. Agr. Sci., 1900, pp. 41–43*).—The currant tomato was crossed on the Lorillard, using the Lorillard as pistillate parent. The first cross produced a plant almost exactly intermediate between the 2 parents. Subsequent selection resulted in enlarging the fruit and improving the quality of the same. The fruit now produced is quite uniform in size and form, a little smaller than Lorillard but superior in quality and earlier, and especially well adapted to forcing. The net weight of the product is slightly less than that of the more commonly forced varieties.

Report of the professor of horticulture, H. L. HUTT (*Ontario Agr. Col. and Expt. Farm Rpt. 1900, pp. 61–68, figs. 4*).—This work covers briefly the results of variety tests with raspberries, blackberries, currants, gooseberries, strawberries, tomatoes, geraniums, coleuses, gladioli, and chrysanthemums. With the tomatoes it is stated that such varieties as Earliest of All, Express, Plentiful, and Atlantic Prize were practically free from rot, while some other varieties, such as Livingstone Favorite, Ignotum, Paragon, and Volunteer, lost from one-third to nearly one-half of the crop from this cause. It is thought that this loss might have been prevented had the plants been sprayed with Bordeaux mixture, but this was not done in order to ascertain the susceptibility of the different varieties to the disease. The varieties standing at the head of the list for total yield of sound ripe fruit were Earliest of All, Plentiful, Express, Atlantic Prize, and Ignotum. The first three yielded about 11 lbs. of ripe fruit per plant.

Out of 230 varieties of geraniums tested for 3 years in succession, the following have been selected as a few of the most desirable for bedding purposes: "*Scarlet*—Aceton, Director Marmy, Garden Director, General Grant, J. J. Harrison, Louis Fages, Marvel, M. A. Boleaus, Marquis de Garland, and W. A. Chalfant; *Crimson*—S. A. Nutt; *Rose*—Fanny Thorpe and La Contable; *Pink*—Eulalie, Madonna, and Mary Hill; *Salmon*—Dr. Verneull, John Good, and Mrs. E. G. Hill; *White*—Alpine Beauty, C. de Harcourt, La Favorite, and Mad. Buchner; *Silver-leaved*—Mad. Saleroi and Mrs. Parker; *Golden-leaved*—Crystal Palace Gem."

Among coleuses the following have been found most desirable: "Alhambra, Beckwith Gem, Chicago Bedder, Charming, Excelsior, Electric Light, Firecress, Firebrand, Golden Bedder, John Good, Pink Gem, Paroquet, and Rob Roy."

Among several hundred gladioli tested for 4 years the following list is given of those which can be expected to bloom from the middle of July to the end of October: "Achanti, Diamant, Deuil de Carnot, Domino Rose, Dr. Bailly, Erie, E. V. Hallock, E. Souchet, Formosa, La Parisienne, La Perle, Massena, Magenta, M. de Vilmorin, Nakomis, Nezidscott, Pacha, P. Hariot, Princeton, and Snow-white."

Of 250 varieties of chrysanthemums under test at the station for several years the following are considered good representatives of the different types and present also a wide range of colors: "*Japanese*—Autumn Glow, Georgina Pitcher, Harry Sunderbruch, Heron's Plume, Maud Dean, Mrs. W. H. Robinson, Mrs. L. Allen, O. P. Basset, Philadelphia, Pitcher and Manda, Queen, Viviand-Morel, W. H. Lincoln, and Waban; *Japanese quilled*—Good Gracious, Helen Bloodgood, Iora, Kentucky, L. B. Bird, and W. H. Rand; *Japanese hairy*—Beauty of Truro, Louis Boehmer, Leocadie Gentils, Mrs. Alpheus Hardy, and R. M. Grey; *Chinese*—Cupid, Ideality, Mrs. L. C. Maderia, Mrs. Col. Goodman, and Major Bonnaffon; *Anemone flowered*—Antonius, Condor, Descartes, Falcion, John Bunyan, Mad. Robert Owen, and Surprise; *Pompons*—Rose Travena, Golden Fleece, Black Douglas; *Single-flowered*—Eucharis and Framfield Beauty."

Report of the South Haven Substation, S. H. FULTON (*Michigan Sta. Bul. 187, pp. 49–94*).—This is the annual report on varieties of orchard and small fruits and nuts under observation at the South Haven Substation, and is similar in character to the previous reports (E. S. R., 12, p. 236). In all, the yield and characteristics of 61 varieties of raspberries, 29 blackberries, 28 currants, 20 gooseberries, 64 cherries, 113 peaches, 47 pears, 9 quinces, 47 plums, 81 grapes, 105 apples, 11 crab apples, and a number of varieties of European and Japanese chestnuts, filberts, and walnuts are tabulated, with additional notes on many of the more important or newer varieties.

Of the raspberries grown Cumberland, Eureka, and Smith Prolific are recommended for general cultivation. Conrath, Diamond, Gregg, Idaho, Kansas, and Smith Giant are also considered reliable sorts. Columbian and Shaffer were the most productive of the purple caps and are the only varieties of this class recommended for profit. Among the red varieties, Cuthbert, Loudon, and Marlboro are considered especially desirable.

Of the blackberries grown Early King was the most productive of the early varieties, Wallace of the mid-season varieties, and Fruitland of the late varieties, though the latter is not as large nor as good a berry as Ohmer, which ripened at the same time.

Chautauqua and Lancashire gave the best results among the English varieties of gooseberries grown. Downing was the most productive of the American kinds.

London Market is considered one of the most profitable market varieties of currants grown at the station. White Dutch was one of the best white varieties on trial. Champion, English, and Wales excelled among the black kinds.

Of the cherries grown Dyehouse, Montmorency, Ostheimer, Richmond, and Weir were among the most productive sour varieties. Montrueil and Magnifique gave the largest yields of the Duke varieties grown. Ida, Mary Kirtland, Napoleon, Tartarian, and Windsor excelled among the sweet varieties. A block of cherry trees left 3 years in sod did not give as good results during the season as trees under cultivation, the yield being less and the fruit smaller.

In experiments with peaches, copper sulphate (1 lb. to 20 gal. of water) applied early in the spring again proved an effectual preventive of leaf curl.

Further experiments in pruning frost-injured trees "confirm the belief that much risk is incurred in cutting the main branches of the tree back to stubs, and at the same time strengthen the opinion that a moderately severe pruning is highly beneficial. Trees given the latter treatment have grown vigorously, developing clean, new, thrifty tops, and this season were covered with healthful, dark-green foliage. For the most part they were loaded with attractive fruit of fine quality. On the other hand, trees which were pruned lightly after the usual plan of heading in and thinning out part of the new growth have grown more slowly, were marked by smaller, less thrifty foliage, bore fruit of smaller size and poorer quality, and this fall contain much more dead wood. But it must be admitted that no manner of pruning will entirely renovate a badly frozen tree. There is hardly a tree above 4 years old on the station grounds that is not rotten in trunk and main branches and is held together only by the new growth which has been made since the freeze. This being the case, the trees broke down badly in winds and under their weight of fruit this season. But trees well cut back, having made a greater development of new wood, were better able to resist influences which tended to break them down, and doubtless their lives will be considerably prolonged."

Results obtained in experiments in thinning favored more severe thinning of peaches than is commonly practiced. A distance of 10 in. between fruits seemed to be none too great in the case of the varieties experimented on. In the experiments with pears early spraying with copper sulphate (1 lb. to 15 gal. of water) proved less efficient in the prevention of scab than late spraying with Bordeaux mixture just as the fruit buds were about to open.

Grapes at the station containing vinifera blood fruited sparsely, mildewed badly, and many were inclined to be tender and weak growers. The varieties best adapted for general cultivation in the climate of the station were Winchell, Diamond, Worden, Niagara, Concord, and Delaware.

Of the foreign chestnuts grown the Paragon was by far the best variety among either the European or Japan kinds. Likewise the Japan walnut (*Juglans seiboldii*), the author states, grows rapidly, and makes a handsome tree for ornamental purposes. The nuts are borne abundantly in large clusters. The quality is good but not high. An English walnut has grown but 5 ft. in height in 11 years, and has as yet shown no signs of fruiting.

Winter irrigation of deciduous orchards, A. J. McClatchie (*Arizona Sta. Bul. 37, pp. 207–240, figs. 9*).—The greater value for orchards in southern Arizona of winter over summer irrigation has been pointed out by the station in earlier reports (E. S. R., 12, p. 1042). Some data have also been given showing the effect of winter irrigation on crop and orchard production, and on the moisture content of the soil throughout the season, to a depth of 34 ft. The work here reported includes the earlier work and some additional data. Some meteorological records are incorporated and a discussion given of the principles involved in winter and summer irrigation. In 1899–1900 irrigation of a portion of a peach and apricot orchard was begun December 16 and continued at intervals until March 5, when 3 ft. of water had been applied. No further water was given for the next 8 months, and only $2\frac{1}{2}$ in. of rainfall, divided among 5 showers, fell during this period. The orchard was plowed each way about 1 ft. deep as soon as it was dry enough in the spring and harrowed thoroughly. After each rainfall it was again harrowed to break up the crust that formed. As in the previous year the orchard thus treated showed no signs of drought and made a vigorous growth throughout the season. Both apricots and peaches matured a heavy crop of fruit of good quality. The season, especially May and June, was the hottest and driest ever known in the vicinity of the station. At the end of it the experimental orchard had a thrifty, vigorous appearance, while many other orchards in the vicinity of the station had died.

The great advantages of winter irrigation for orchards are stated by the author as follows: "During the winter the lower temperatures and the higher relative humidity cause evaporation to be much slower than during the remainder of the year. In applying water, therefore, comparatively little escapes into the atmosphere. The supply of water being greatest at that time of the year makes it possible to apply large amounts at short intervals, thus avoiding the loss that occurs if small amounts are applied at greater intervals. Then, too, the trees are dormant and the roots need little air; hence, no injury is done them by keeping the soil supermoistened, or by letting the surface bake to some extent. Consequently, cultivation after each irrigation is not necessary, much time thus being saved."

In these experiments it was found that root growth took place at depths of 10 to 16 ft. as early as February 20, when above ground there was no indication of growth whatever. Some data were also secured on the evaporation of soil moisture by weeds. A portion of the orchard which had been left uncultivated was overgrown with weeds. An examination showed that the upper 5 ft. of soil in the cultivated portion of the orchard contained about twice as much available moisture as the upper 5 ft. of the soil in which the weeds were growing.

In the irrigation experiments here reported the water content of each foot of soil from the surface down to ground water (34 ft.) was determined in different months from April to October. These data are tabulated and commented upon. The greatest amount of water was used by the trees during spring and early summer. This is the time when water for irrigation is least abundant, and "emphasizes very strongly the importance of filling the subsoil with water during the winter, when the supply is comparatively abundant." The total loss of water during the whole season was about 20 in., of which about 80 per cent was lost during the first 3 months, 16 per cent the next 3, and 4 per cent the last 3 months. The indications seem to be that deciduous orchard fruit trees in Arizona begin using water early in February.

"From this date until about the end of June the amount used evidently gradually increases, and after the latter date evidently gradually diminishes. These facts indicate plainly that much of the water should be applied as soon after the first of January as possible.

"The amount of water needed by a deciduous orchard to keep it in good condition in southern Arizona from March to November is about 21 in., which can be stored in the soil by the application of about 3 ft. during winter."

A crop of clover (*Melilotus indica*) grown in the orchard for green manuring, from December 16 to March 5, withdrew from the soil about 20 in. of water. It is calculated that in order to supply an orchard with sufficient moisture to grow a crop of green manure and to mature a fruit crop about 4 ft. of water will be required in the warm valleys of southern Arizona.

Relative to summer irrigation of orchards the author states as follows: "If about the middle of the summer water is available in abundance, it would probably be wise to give the orchard a thorough irrigation in as short a time as possible, and then follow the irrigation with a thorough plowing, as in the spring after the winter irrigation ceases. But frequent summer irrigations are decidedly not advisable under our conditions, where the soil is fairly deep and retentive of moisture."

Report on horticulture, S. M. EMERY (*Montana Sta. Bul. 28, pp. 6–10*).—Lists are given of the hardy, semihardy, and poor or useless ornamental shrubs, apples (including crabs), pears, cherries, and plums grown at the station. In a study of the relation between the maturity of the terminal buds at the beginning of winter and the hardiness of the variety, there was found to be little or no correspondence between bud maturity and the bark bursting of the stems and twigs. In a test of the Stringfellow system of root pruning, 89 trees of the Wealthy and Alexander apples were pruned back close to the tap root and the stem cut to about 12 in. These stubs were planted in clean, mellow soil with a crowbar, and irrigated twice before July 1. "At that date about 18 per cent of the trees were dead, 56 per cent were in good condition, and the rest weak. The fact that 75 per cent of the dead trees are the Alexander would indicate a marked difference in the ability of the different varieties to withstand this treatment."

Manuring of fruit trees, A. PETTS (*Jour. Hort., 53 (1901), No. 2745, pp. 388, 389*).—The best methods of using potash and liquid manures on fruit trees are noted.

Cold storage for fruit and other productions, F. R. LATCHFORD (*Ontario Fruit Growers' Assoc. Rpt. 1900, pp. 81–89*).—A popular discussion of the subject, in which the value of the Hanrahan system of cold storage is pointed out.

Storage of apples, H. H. LAMSON (*New Hampshire Sta. Bul. 79, pp. 25–29*).—The decay of the Baldwin apple was found to be due chiefly to brown rot and the common mold fungus (*Penicillium glaucum*). While these fungi are widely distributed, it is believed that apples barreled in the orchard will be less likely to be infected than if they are previously stored uncovered in dusty barns or moldy cellars. Heat and moisture are especially favorable to the growth of rot-producing fungi. Hence the value of storing apples in a dry, cool place.

In order to test the value of cold storage for apples, 12 bushel boxes of No. 1 Baldwins were put in cold storage, in Boston, where the temperature averaged about 34° F., and a check kept in the station cellar. The station cellar averaged about 40° until April, then ran up to 45° during the first half of the month and to nearly 50° during the latter half. Part of the stored fruit was wrapped with manila tissue paper in each case. One box was withdrawn from cold storage each month until June, after which date 2 were withdrawn each month until the 12 had been exhausted. The amount of sound and rotten fruit in the boxes for each of the months December 18 to August 4 is shown in tabular form. While in general there was an increase in the number of rotten apples as the season advanced, this increase was not at all uniform, and no explanation of this phenomenon is offered. In all but two instances the wrapped apples kept better than the unwrapped.

Apples in Iowa (*Rpt. Iowa Hort. Soc., 35 (1900), pp. 55–72, maps 12*).—From 150 answers to a circular letter of inquiry the secretary of the society has compiled a list of apples that may be grown with assurance all over the State of Iowa. These are Oldenburg, Yellow Transparent, Longfield, Tetofsky, Red Astrachan, Plumb Cider, Walbridge, Wealthy, Wolf River, and one crab—Whitney No. 20. Of these varieties 6 are summer apples, 3 fall apples, and only 1—the Walbridge—a long keeping winter apple. The areas where these and some other varieties thrive best are mapped out for the State.

Apple districts of West Virginia, L. C. CORBETT (*West Virginia Sta. Bul. 75, pp. 83–178, figs. 13, map 1*).—Preliminary notes are given on the apple orchards and apple crops of West Virginia and on top-grafting old trees. Following the severe freeze of March 29, 1898, an inquiry was made of special correspondents in each county of the State as to the condition of orchards, the purpose being to learn in what districts commercial fruit growing can be engaged in with a fair assurance that the crop will not be injured by any ordinary late spring frost. A map based on these replies is given which shows graphically the various localities where full and where only partial crops were reported. Another map shows graphically the areas in West Virginia reported as suited to apple culture, areas suggested as valuable for this purpose, and the areas where commercial orchards are now growing.

The relative values of 114 varieties of apples and 5 varieties of crab apples, as shown by nearly 2,000 answers to a circular letter of inquiry, for each county of the State, are brought together in a comparative table. Further separate tables are also given for each county of the State showing the varieties of table apples held in highest esteem in the county; the market varieties having the best form, color, and keeping qualities; varieties which keep in pits or cellars in fit condition for the April market; varieties which bear most regularly; varieties most exempt from or most affected by scab, etc. Under each county some notes are also appended on the adaptability of the county for fruit growing.

Apple culture and district lists of apples suitable for Ontario and Quebec, with descriptions of varieties, W. T. Macoun (*Canada Cent. Expt. Farm Bul. 37, pp. 74, figs. 12, map 1*).—A popular exposition of apple culture and orchard management in Canada, based largely on experimental work which has been carried on since 1887 at the Central Experimental Farm. The provinces of Ontario and Quebec are divided into 13 districts, according to climatic and orchard conditions, and lists given of varieties of apples best suited to each of these districts. The whole problem of apple growing in Canada is discussed, thoroughly reviewed, and descriptions given of all the varieties best suited to the different localities. A fruit map showing the approximate boundaries of the different apple districts accompanies the bulletin.

Experiments in fruit growing at the Central Experimental Farm, W. T. Macoun (*Ontario Fruit Growers' Assoc. Rpt. 1900, pp. 15–22*).—An outline of the work being done at the station, with brief notes on some of the results obtained with varieties. Fall planting has not given satisfactory results in Ottawa with apples and should not be practiced. Where trees are planted in the fall they seem to dry out and are easily injured by frost. They are also liable to be heaved. The varieties of apples best suited for growing in such districts as Ottawa are, for summer, Yellow Transparent and Duchess; for autumn, Wealthy; very early winter, McIntosh Red and Fameuse, where it can be grown with natural protection. For late winter Scott Winter, Geno, Pewaukee, and Salome are recommended. Other varieties that are perfectly hardy are Lawver, Golden Russet, and Ben Davis.

Report of the fruit experiment stations in Ontario, L. Woolverton et al. (*Ontario Fruit Expt. Stas. Rpt. 1900, pp. 79, figs. 49*).—This report is similar in character to those of previous years (E. S. R., 12, p. 1044). Additional illustrations and descriptions for the purpose of identification are given of 4 varieties of apples, 19 currants, and 1 each of peaches, blackberries, and grapes grown in Ontario. A catalogue showing the characteristics of varieties of orchard and small fruits is included for the use of planters.

Notes from the plum orchard, E. A. Popenoe and A. Dickens (*Kansas Sta. Bul. 101, pp. 117–143, pls. 26, figs. 2, charts 2*).—These are largely notes on the different varieties of European, Japanese, and native plums grown at the station, with illustrations of the more prominent varieties, nursery notes on the growth of certain varieties, and a chart showing the period of blooming and ripening of 34 varieties of plums. The experience and observations of the station warrant the recommendation of clean culture for plums and of keeping the ground shallow-cultivated or disked. Where the orchards are so located as to be exposed to winds or danger from washing they should be seeded to rye or oats, preferably oats, in August. It is claimed that the proper and persistent use of Bordeaux mixture will practically control the fungus diseases of the plum.

Figs in pots, J. Hudson (*Jour. Roy. Hort. Soc.* [*London*], *25* (*1901*), *No. 3, pp. 231–234*).—This is a popular discussion of the early and late forcing and potting of figs, specific directions being given for the care of the trees, top-dressing, watering, etc. The varieties recommended for pot culture are as follows: For early forcing, St. John or Pingo-de-Mel, followed by Brown Turkey and White Marseilles; for the main crop the last two may be grown, and also Bourjassotte, Grise, and Violette Sepor; for late forcing Negro Largo is considered one of the very best, and can be relied upon until the end of October. Following this is Nebian or Grosse Verte, which is best during September and October. The latest fig of all is D'Agen, which will last up to Christmas day. Other good varieties are White Ischia, desirable as an autumn fig, Angelique, and Black Douro.

Report on the export of tender fruits, L. Woolverton (*Ontario Fruit Growers' Assoc. Rpt. 1900, pp. 43–52*).—This is a detailed financial and critical report on the results of a number of experimental shipments of fresh fruits to England. The experience of the season indicates that with proper methods of cold storage on shipboard pears, summer apples, and even peaches may be shipped to England in perfect condition. The market for grapes will, in a large measure, need to be created, since at present there seems to be no marked demand for these fruits.

Coffee culture in Queensland, H. Newport (*Queensland Agr. Jour., 8 (1901), No. 6, pp. 437-440, pl. 1*).—This article, the ninth of a series of articles on this subject, discusses the treatment of young plants in the field.

Cacao shade (*Trinidad Bot. Dept. Bul. Misc. Inform., 1901, No. 27, pp. 330-333*).—An analysis of the flowers of the leguminous coffee shade tree known as Bois Immortel (*Erythrina umbrosa*) showed the high nitrogen content of 6 per cent, and therefore considerable manurial value. Some data are given which go to show that 250 cacao trees give a yield of about 500 lbs. of cured cacao per acre, containing 2½ per cent of nitrogen, and will therefore remove 12½ lbs. of nitrogen from the soil annually. Fifty Immortel trees, on the other hand, furnish 500 lbs. of dry flowers, which, at the low estimate of a nitrogen content of 4 per cent, return to the soil 20 lbs. of nitrogen per acre, or 7½ lbs. more than the crop of cacao removed. The flowers, however, lose their nitrogen rapidly. The analysis showed that while fresh flowers contain 6.32 per cent of nitrogen, those 2 days old contain but 5.16 per cent and those 5 days old but 4.14 per cent. The flowers bloom only in the dry season, and therefore, unless showers come opportunely to wash the nitrogen into the ground, much will be lost. The Immortel is a West India tree, reaching sometimes 60 ft. in height.

Oswego strawberries. An account of experiment with fertilizers, and records of strawberry growing, in the Oswego district, L. H. Bailey (*New York Cornell Sta. Bul. 189, pp. 119-140, figs. 4*).—Fertilizer experiments have been carried on in Oswego for a period of 3 years in cooperation with the strawberry growers, and the results obtained are here reported and commented upon. The methods of strawberry culture followed by Oswego growers are briefly outlined and a short history given of the development of the industry in Oswego, together with some statistics of shipments to the larger markets in different years.

The fertilizers used have been the sulphate and muriate of potash, dissolved rock, ashes, and nitrate of soda. These have been used singly and combined, and in smaller and larger amounts. "The fertilizers were applied to young plantations in spring after the first tillage and before the plants bloomed, a year in advance of the recorded crop. The materials were scattered alongside the row, within a few inches of the plants, and were cultivated in." The soils upon which the tests were conducted have varied from gravelly loam through meadow land to black muck.

Some contradictory data were secured on the different farms and plats, but on the whole there was considerable uniformity of results. The fertilized plats yielded on an average 5,197 qts. per acre, or about 2,000 qts. above the average. The potash and phosphatic fertilizers were much more effective than nitrogenous fertilizers, especially on lands well supplied with humus, like muck soils. The fruits grown with these fertilizers were better colored, better flavored, and firmer. The nitrogenous fertilizers, including heavy applications of barnyard manure, gave too much growth of vine, and the fruit was softer and of inferior quality. It is suggested that in these experiments the good tillage given probably supplied sufficient nitrogen in most instances.

"As to methods of planting, it may be said that the old method has been discarded—planting in rows 3 to 3½ ft. apart and the plants from 12 to 15 in. apart in rows, keeping off the runners until late in July and then allowing the runners to grow and root at will, making a matted row. In this old system many plants are almost on top of others, the roots barely in the ground, and they suffer in a season of drought. The rows are so wide that to pick fruit in the center it is almost necessary to crush fruits on the outside of the row. This system gives few large first-class fruits. The up-to-date grower starts with the assumption that the largest and highest colored fruits are found on plants along the outside of the rows, and therefore he plans to have as many outside rows as possible. This he accomplishes by having his rows closer together and much narrower. The rows are made from 30 to 36 in. apart and the plants from 18 to 24 or even 30 in. apart in the rows, much depending on the capability of the variety as a plant maker. If the plants used for a new bed are strong and start into growth vigorously the first runners are used, as it has been found that under most conditions the plants about 12 months old yield the greatest number of fine fruits. These first runners are usually 'bedded in,' i. e., planted by hand, training them along the wide way of the rows, using from 4 to 8 of the first runners and cutting off those growing later. This method of planting allows cultivation both ways until the runners start, retaining moisture and saving labor in hoeing."

The cost of growing strawberries in Oswego is estimated at $77 per acre. The bulk of the crop is shipped to New York, Boston, and Philadelphia. In 1898 about 52,263 crates were shipped and in 1900 40,284 crates. The total crop in the Oswego district in 1900 was nearly 2,000,000 qts.

Practical guide to viticulture, J. PECH (*Guide pratique du viticulteur. Montpellier: Coulet & Sons, 1901*).—This is a viticultural calendar dealing with the different kinds of work which occur each month of the year in the vineyard and cellar. It is essentially a practical manual for this work.

Grapes, C. W. MATHEWS (*Kentucky Sta. Bul. 92, pp. 71–97, figs. 7*).—Detailed popular directions for the planting, pruning, training, cultivation, and fertilizing of grapes, with notes on the insects and diseases affecting them. Eighty-seven varieties of grapes are being grown in the station vineyard. These are briefly described and their suitableness for Kentucky planting is pointed out. Of the black varieties, Moore Early, Worden, and Concord are considered best; of red varieties, Delaware, Wyoming, Brighton, and Catawba; and of white varieties, Martha and Niagara. A supplementary list of very promising recent introductions is as follows: *Black*—Aminia, Herbert, Campbell, Carman, Standard, Ozark; *Red*—Alice, Brilliant, Jefferson, Lindley, Mrs. Munson; *White*—Gold Coin, Eclipse, Geneva, Colerain, Duchess, Noah.

On the influence of early and late pruning on the productiveness of vineyards, C. MAYER (*Agr. Jour. Cape Good Hope, 18 (1901), No. 6, pp. 367, 368*).—The brief data here given show that vines pruned in the spring were somewhat more productive than when fall pruned, while the leaves were still on.

The economical manuring of vines, H. LAGATU (*Prog. Agr. et Vit. (Éd. L'Est), 22 (1901), Nos. 1, pp. 10–16; 2, pp. 41–47; 3, pp. 72–78; 4, pp. 115–118; 5, pp. 134–138; 6, pp. 170–175; 7, pp. 206–212; 9, pp. 265–269; 10, pp. 298–304; 11, pp. 328–335; 13, pp. 388–395; 14, pp. 435–441; 15, pp. 472–477; 17, pp. 525–530; 18, pp. 546–550; 19, pp. 573–579*).—A comprehensive article on the nature of all the more usual fertilizers, and the manner of compounding and using them in vineyards on different soils, especially those of different lime content, and in years of different rainfall.

Grafting walnuts and hickories (*Amer. Gard., 22 (1901), No. 331, pp. 307, 308, fig. 1*).—The work of the U. S. Department of Agriculture in grafting walnuts and hickories is briefly described. The success in grafting these nuts has been greatly insured by the use of an incubator box. The scions are securely tied to the stocks with a waxed cord, and are either wrapped in bundles with moss around them or packed in layers in a box with clean sphagnum and kept at a temperature ranging from 75 to 80° F. At the end of about three weeks callusing has progressed sufficiently so that the grafts may be removed. After their removal the stocks with shortened tap roots are potted, where possible, in 6-in. pots to encourage the production of roots. When a few leaves have been formed, the potted plants are gradually hardened off and eventually put in a frame, where they pass their first year. Thus far about 75 per cent of the scions have united with the stocks.

Notes on perfumery plants and on the development of this industry in New Caledonia, E. Heckel (*Rev. Cult. Coloniales, 8 (1901), No. 76, pp. 257–265*).—The adaptability of New Caledonia to the perfumery industry is pointed out and a list given of the perfumery plants grown in New Caledonia.

Plants for perfumery and essence, J. Chapelle (*Rev. Gén. Agron. [Louvain], 10 (1901), Nos. 3, pp. 107–118; 4, pp. 163–168*).—A discussion is given of the perfumery and essence industry of Southern France. The culture of the various plants used in the industry are noted and statistics given on the importance of the industry. The regions about Nice, Grosse, and Cannes constitute the center of the industry. There is grown and treated annually about 2,500,000 kg. of orange blossoms, 3,000,000 kg. of roses, 200,000 kg. of jasmine, 150,000 kg. each of violets, acacia (*Acacia farnesiana*), and tuberoses; besides several thousand kilograms of geranium, mint, balm-mint, jonquils, mignonette, verbena, lavender, thyme, rosemary, etc.

The propagation, culture, and use of poinsettia (Euphorbia pulcherrima), N. Schneider (*Rev. Hort., 73 (1901), No. 9, pp. 221–223*).—Details are given for the outdoor and greenhouse culture of this ornamental shrub, with directions for its floral arrangement.

The groups of dahlias (*Amer. Gard., 22 (1901), No. 329, p. 270*).—Herein are considered a number of cactus varieties, decorative cactus varieties, pompon varieties, single varieties, show varieties, and fancy varieties, all briefly described as regards coloring.

Report on cactus dahlias, 1900 (*Jour. Roy. Hort. Soc. [London], 25 (1901), No. 3, pp. 390–401, fig. 1*).—An account is here given of the growth and care of 146 stocks of cactus and decorative cactus dahlias.

Lilies of Japan (*Yokohama: Yokohama Nursery Co., 1899, pp. 39, pls. 38*).—Large colored plates are given showing the flowers, stalks, and leaves of 38 Japanese lilies.

Narcissi in New Zealand, J. G. W. Ellis (*Jour. Roy. Hort. Soc. [London], 25 (1901), No. 3, pp. 337–340*).—New Zealand seems especially well adapted to the culture of Narcissi. Some notes on the methods of cultivation are given, together with lists of some of the more important varieties grown there.

Own root roses, A. Herrington (*Garden, 59 (1901), No. 1534, pp. 253, 254*).—The author has secured good results with tea roses on their own roots in New Jersey, where roses on brier roots were stunted in growth by the heat of summer and practically failed of autumnal bloom. These roses on their own roots flowered freely from June to November on a light hot soil that was paralyzing to the same roses on brier roots. A protection of oak leaves suffices for the plants in winter, and when cut back to within 2 in. of the ground each spring, they make a strong, vigorous growth and give a continuous bloom.

Violets, J. Bradley (*Florists' Exchange, 13 (1901), No. 14, pp. 388, 389*).—Cultural notes for outdoors and in frames with suggestions regarding the control of insects and diseases affecting violets.

The Aspleniums (spleenworts), C. T. Druery (*Garden, 59 (1901), No. 1537, pp. 318, 319*).—Cultural notes are given and descriptions of the maiden-hair (*Asplenium trichomanes*), black maiden-hair (*A. adinatum nigrum*), sea (*A. marinum*), and scaly (*A. ceterach*) spleenworts. The habitat of the varieties, finder and raiser of the same, etc., are also noted.

The heating and ventilating of hothouses, A. D. Mackenzie (*Jour. Roy. Hort. Soc. [London], 25 (1901), No. 3, pp. 323–327, figs. 4*).—Some of the more elementary principles in the hot-water heating of forcing houses are discussed.

Horticultural progress during the nineteenth century, J. Clayton (*Jour. Roy. Hort. Soc. [London], 25 (1901), No. 3, pp. 328–336*).—The author popularly summa rizes the century's advance in the improvement of garden vegetables, fruit, flowers, and glass houses. The increase in gardening literature and societies is also noted.

The century book of gardening; a comprehensive work for every lover of the garden, E. T. Cook (*New York: Charles Scribner's Sons, 1900, pp. XIII+610*).

SEEDS—WEEDS.

Influence of chemical solutions upon the germination of seeds, G. E. Stone and R. E. Smith (*Massachusetts Sta. Rpt. 1900, pp. 74–83*).—The authors have been studying for some time the effect of various chemical and physical agencies upon the germination of seed, the object being to determine to what degree seeds could be accelerated in their germination, and also to what extent their germinating capacity could be increased. In the present report the effect of treating seeds with solutions which are known to exist in many seeds, such as diastase, pepsin, trypsin, asparagin, and leucin, was tested. Strengths of these different ferments or enzyms, varying from 0.1 to 2 per cent, were tested upon a number of seeds. The seeds were first soaked for about 12 hours in the solutions, after which they were rinsed and placed in germinating chambers. With the seeds treated with asparagin solutions, the average increased germinations were obtained as follows: Alfalfa, 10.6 per cent; rape, 20.8 per cent; Canada field peas showed no improvement, both normal and treated seed germinating 100 per cent; buckwheat, 10.6 per cent gain; serradella, 19.8 per cent gain. In the experiments with leucin solutions the following average gains were noted: For treated buckwheat seed, 9.2 per cent; alfalfa, 7 per cent. Experiments with pepsin solutions gave 13.3 per cent increase for treated crimson clover seed, and 15.6 per cent for cucumber seed. In the experiments made with diastase solutions, black barley seed treated gave an increased germination of 7 per cent, and upland rice 11.5 per cent. In a number of the experiments the authors experienced considerable trouble from the presence of various molds. This was particularly true in experiments in which the seeds were treated with diastase solutions. The results obtained are briefly commented upon, and the conclusion reached that the study of the effects of amids and ferments and other accelerating factors upon seeds offers a promising field for further investigation.

The effect of age and length of sprouts upon the vitality of seeds, J. H. Shepperd and E. G. Schollander (*North Dakota Sta. Rpt. 1900, pp. 101–113*).—Tabulated results of these experiments here presented show that of 1-year-old wheat the vitality varied from 73 to 100 per cent, being in the majority of cases over 90 per cent. Of a sample of 2-year-old goose wheat 97 per cent germinated. Two samples of wheat taken from sheaves saved from the crop of 1895 gave 98 and 100 per cent of sprouted kernels. Of a sample of 8-year-old wheat only 3 per cent germinated. Buckwheat 7 years old showed a germination of 84 per cent. Tests were made with sprouted wheat from the crop of 1900 and in every case the sprouted seed was weakened, but the authors conclude from the results that seeding 5 per cent heavier with the wheat tested would have given a normal stand. An experiment to determine what length of sprouts wheat may have and regerminate was made with sprouted kernels of Minnesota No. 163 wheat. The grains were sprouted and allowed to grow for different lengths of time, making the first sprouts 7 days older than the last. After sprouting the kernels were taken from the germinator and thoroughly dried. The radicles and plumule were measured and the grains again placed in the germinator. The results indicate that sprouted wheat will regerminate and form healthy sprouts until the stem or plumule is $\frac{3}{4}$ in. long and that an average of 80 per cent will regerminate if the length of the stem or plumule does not exceed $\frac{1}{2}$ in. Stock and bin-burned wheat gave an average germination of 62.4 per cent, or too low for seeding purposes. Corn 6 years old which had remained upon the cob until tested required

7 days to complete its germination, when 77 per cent had sprouted. From results with oats it is concluded that old oats carried over one season in good condition are comparatively safe for seed. Eight-year-old oats taken from the sheaf at the time of testing gave a germination of 87 per cent. Other germination tests with 1-year-old barley, spelt, and flax are reported.

Studies upon weeds in 1900, H. L. Bolley (*North Dakota Sta. Rpt. 1900, pp. 48–56*).—In 1899 favorable results were reported (E. S. R., 12, p. 248) on the use of commercial copper sulphate at the rate of 1 lb. to 4 gal. of water, when sprayed upon weeds. The season when this investigation was conducted was one in which the plants were making rapid growth, and mustard, tall ragweed, and others were quickly destroyed. In 1900 an effort was made to repeat on an extensive scale the investigations of the previous year. In general the results obtained were discouraging, although it was shown that further investigation would be needed before definite statements could be made regarding the destruction of weeds by herbicides. During the dry windy weather all the plants became very resistant, and only when thoroughly wet while quite young did the treatment prove beneficial in destroying the weeds. The recommendations of the author are that if both grain and weeds are rapidly growing they can be successfully destroyed by the use of sodium arsenite or copper sulphate, the latter being most reliable. In selecting nozzles for this use, those should be employed which throw fine drops of the herbicide rather than misty sprays. The author recommends spraying just after a rain, and unless the plants are in a succulent rapidly-growing condition no treatment is advised.

Further observations are reported on the life of weed seeds in the soils of the vicinity of the station, the investigation being continued from the report of the previous year (E. S. R., 12, p. 248). The experiments on the depth of planting show that shepherd's purse does not send up plants from a depth of more than 1 in., French weed from more than 2 in.; mustard and pigeon grass send up most of their plants where the seed has been covered to a depth of 1 in., and tall ragweed did best from a depth of 2 in., although some late plants appeared when the seed was covered 4 in. deep. When covered to a depth of 4 in. all the weed seeds experimented with, except wild oats and tall ragweed, were killed.

Work is being continued on the extension of the herbarium, and a preliminary list of the seed plants of the State has been issued as Bulletin 46 (E. S. R., 13, p. 21). Observations upon the growth of red clover seed are briefly reported, from which the author believes that the presence of bumblebees or other large insects to carry the pollen is not essential, but that the plant is practically fertilized by pollen carried by the wind.

Weed notes, W. Lochhead (*Ontario Agr. Col. and Expt. Farm Rpt. 1900, pp. 17, 18, fig. 1*).—Brief descriptions are given of a tumbleweed (*Amarantus albus*) and pigeon weed (*Lithospermum arvense*), and suggestions given for the possible eradication of these pests.

Romulea rosea, R. Helms (*Agr. Gaz. New South Wales, 12 (1901), No. 2, pp. 232–236, pl. 1*).—A description is given of this liliaceous plant, which threatens to become an exceedingly troublesome weed in New South Wales and other parts of Australia. The plant is a very aggressive one, spreading rapidly by the multiplication of its bulbs as well as the abundant development of seed. It soon forms solid masses, crowding out other species. It appears to be entirely shunned by domestic animals, whether from toughness of foliage or unpalatability is not stated. Various means of suppression are suggested, which contemplate the cutting of the plants to prevent seed formation, rooting them up and burning, or cultivation of hoed crops.

Russian thistle in Massachusetts, G. E. Stone and R. E. Smith (*Massachusetts Sta. Rpt. 1900, p. 73*).—The authors briefly report the occurrence of the Russian thistle in the State. This weed was first reported August 22, 1897, since which time the plants have shown a slight tendency to spread.

The weedy plants of Iowa, L. H. Pammel (*Proc. Soc. Prom. Agr. Sci., 1900, pp. 173–177*).—Notes are given on the geographic distribution of a number of weeds throughout the State, and attention called to the very slow distribution of some species as compared with the rapid spread of others.

The use of chemical substances for the destruction of weeds among growing cereals, C. Dusserre (*Chron. Agr. Canton Vaud, 14 (1901), No. 9, pp. 253–256, fig. 1*).—The author comments upon the use of solutions of copper sulphate, iron sulphate, and sodium nitrate for the destruction of wild mustard, charlock, and wild radishes, and claims that experiments show that the quantity of liquid employed should be greater than that generally recommended. Where 2 to 5 per cent solutions of copper sulphate, or 10 to 20 per cent sodium nitrate, are employed, the amount of liquid, the author claims, should be from 800 to 1,000 liters per hectare, a quantity more than double that usually recommended. For the application of the herbicide the author recommends power sprayers, and one which has proved very efficient is figured and described.

A new method of cleaning roads and walks (*Gard. Chron., 3. ser., 29 (1901), No. 753, p. 358*).—A brief note is given on a machine for the destruction of weeds in drives and walks in which the direct heat of burning fuel is brought to bear on the surface of the walk, charring and killing all weeds, grasses, and fallen seeds. The machine consists mainly of an inclosed fire box for holding coke in a state of combustion and a drum containing a fan for creating a draft. The machine may be drawn about the grounds, allowing it to stand still for a few seconds. It is said to be very efficient, and to do away with the expensive work of hoeing drives, paths, etc., or the use of arsenical poisons, hot water, salt, etc.

DISEASES OF PLANTS.

Twenty years' progress in plant pathology, B. T. Galloway (*Proc. Soc. Prom. Agr. Sci., 1900, pp. 96–102*).—While the subject of plant pathology has had its students for a century, the real development of the subject has taken place in the last 20 years. The author reviews the work of some of the pioneers on the subject, and devotes special attention to the organization and development of the study of plant pathology in this country. The progress is said to have been made in two distinct epochs; the first was concerned with the development of fungicides and means for their application for the prevention of diseases, while the second is represented by more careful research work into the life histories of the fungi and study of the normal and pathological conditions of the plants.

Flax wilt, H. L. Bolley (*North Dakota Sta. Rpt. 1900, pp. 45–48*).—A preliminary report is given of observations made upon a disease of flax, which for want of a better name the author has designated as "flax wilt." Little attention seems to have been paid to this disease in this country, although it appears to have been observed in Europe. It has been repeatedly observed that after flax has grown for a number of years upon the same land, the crop becomes very much lessened in yield. This has been attributed to impoverishment of land, but soil analyses show that this can not be the fact. The investigations of the author indicate that the disease is due to a parasitic fungus which lives in the soil and in the old decaying flax stubble. It may be transmitted to a new field by the transfer of dirt from an infected one, or by infusions made from diseased plants. Investigations made in a number of fields seem to indicate that the disease may be communicated through seed flax. The fungus appears to attack the roots of the plants most strongly at a depth of soil corresponding to the bottom of the furrow. An examination shows that the parasite fills the vessels and tissues of the roots with its filaments, cutting off the water supply and bringing about a typical wilt. A number of experiments have been inaugurated, and investigations are still in progress, the results of which are promised in a future bulletin.

Experiments on the bacterial diseases of potatoes, H. JENSEN (*Centbl. Bakt. u. Par., 2. Abt., 6 (1900), No. 20, pp. 641–648*).—Preliminary notes are given by the author upon investigations of potato diseases which have been considered as of probable bacterial origin. The first disease described is that sometimes known as brown spot. In the tubers reddish brown spots are noticed. They are of different sizes, irregularly distributed, and are bounded by cells of cork tissue. The protoplasm of the cells is massed together, and the intercellular spaces filled with a brownish substance. Thus far examinations have failed to show any connection between the spots and external conditions, and neither bacteria nor fungi have been recognized as the cause of the disease. All inoculation experiments have proved failures.

The second disease described is the bacteriosis of the potato stem. In investigating the so-called "black shank" of potato plants, the author found the diseased portions filled with various organisms, but his preliminary investigations seemed to indicate that a micrococcus was the primary cause of the trouble. Inoculation experiments showed that the disease could be readily produced and was easily transmitted. The organism was found to secrete ammonia, and through the presence of this substance it gains entrance to the host; otherwise the micrococcus appears to be a saprophyte.

Notes are given on the predisposition of potatoes to the disease, in which the varying susceptibility of different varieties is shown.

The author has investigated the statement of Wehmer (E. S. R., 10, p. 972) that bacteria are of secondary importance in the wet rot of potatoes, with the result that he differs from that author and affirms that bacteria are able to produce the disease.

Experiments with fungicides upon potatoes in 1900, C. D. WOODS (*Maine Sta. Bul. 73, pp. 49–57*).—The author reports a series of experiments to demonstrate the value of Bordeaux mixture when applied on a large scale, and also as a comparison between freshly prepared Bordeaux mixture and some of the ready-prepared fungicides on the market. The plats were given 4 sprayings with a freshly prepared Bordeaux mixture, consisting of 5 lbs. copper sulphate, 5 lbs. fresh lime, and 50 gal. of water, and comparisons made with Boxal, Adler's Bordeaux, and Blanchard's Lion brand Bordeaux mixture. In comparing the efficiency of the different mixtures, Adler's ready-made Bordeaux was found to be as efficient as that freshly prepared, while the other two kinds were slightly less so. Where small quantities of the fungicides are to be used the author believes that the ready-made or stock solutions are to be preferred to those which are made by the user.

The applications of the fungicides were made at a cost of about \$2.50 per acre for the 4 sprayings. When the potatoes were dug the crop was estimated, at the current market rate, to be worth \$106.40 per acre for the sprayed plats, as compared with \$62.60 for the unsprayed plats, giving a net return of about \$40 per acre.

How to fight potato enemies, C. D. WOODS (*Maine Sta. Bul. 73, pp. 58–64*).—The author popularly describes the principal fungus diseases and insect enemies to which the potato crop is subject, and gives suggestions for the prevention of their injuries. Formulas and directions for preparation are given for the more important fungicides and insecticides, and the different forms of apparatus recommended are described.

Experiments with potato scab, H. GARMAN (*Kentucky Sta. Bul. 91, pp. 56–59*).—The author gives a record of experiments made in the season of 1900 for the prevention of potato scab, comparisons being made between seed potatoes treated with corrosive sublimate and those soaked in various strengths of solution of formaldehyde. The seed tubers used were badly scabbed, and while the disease did not do as much harm as was expected from the condition of the seed potatoes a noticeable difference in the prevalence and extent of disease was observed in favor of the potatoes from treated seed. The lots from seed treated with formaldehyde averaged about as free from scab as those treated with corrosive sublimate.

Notes on the sugar-cane disease of the West Indies, W. T. THISELTON-DYER (*Ann. Bot., 14 (1900), No. 56, pp. 609-616*).—The author reviews the different phases of the life history of the fungus causing the more destructive cane diseases in the West Indies. Two forms are recognized as especially destructive, the rind disease and root rot. The first affects the canes, and its presence is indicated by dark red or brown marks toward the middle or base of the cane. These red splotches spread rapidly, and later black specks make their appearance on the cane between the joints, and finally the cane shrivels and dries up. The fungus bursts through the epidermis in the form of black filaments, an inch an a half or less in length. The fungus causing this disease has been given various names, *Trichosphæria sacchari* being the name adopted by the author. This fungus has been described as having several distinct phases. The root disease is characterized by the dwarfed appearance of the canes. The plant puts out fresh basal shoots, but ultimately the growth is arrested and no cane formed. If the plants be dug up the roots are nearly all dead, and those still living are marked with small red spots. Investigations are reported which show that the root disease and rind disease are really due to the same cause, and the fungus described under the name of *Colletotrichum falcatum* is really a phase of the polymorphic fungus causing the two diseases. A healthy seedling sugar cane was inoculated with spores taken from diseased roots, and at the end of 20 days developed the rind disease phase of the fungus. From this fact it is urged that great precaution should be taken to avoid planting tops which are possibly affected by the rind disease.

Concerning the mosaic disease of tobacco, IWANOSKI (*Centbl. Bakt. u. Par., 2. Abt., 7 (1901), No. 4, p. 148*).—A preliminary note is given on investigations by the author which led him to believe that the mosaic disease of tobacco is of bacterial origin. He claims to have isolated a small short bacillus which occurs in great numbers in the palisade parenchyma, which he believes is the specific cause of the disease. His complete investigations are to be published later.

Investigations on the stinking smut of wheat, H. L. BOLLEY (*North Dakota Sta. Rpt. 1900, pp. 32-38*).—In continuation of investigations previously reported (E. S. R., 12, p. 255), the author studied the influence of various factors on the stinking smut (*Tilletia fœtens*) of wheat. The question of the wintering of smut in the ground was studied by means of plats on which a large crop of smutty grain was raised in 1899. Part of the grain was removed in the usual manner, and on the other half of the plats the grain was allowed to fall to the ground without being harvested. Prior to seeding, the ground was plowed or disked and seed treated in various ways were sown. From the results of his experiments it seems apparent that little difference in the amount of smut was observed in the portions of the plats where the grain had been removed or where it had been plowed under, and there was a small amount of smut developed on all the plats. Investigations showed that there was an abundance of spores in the soil where the grain had been allowed to stand, and it was demonstrated that the smut spores retained their vitality for at least 2 years in wheat stored in the ordinary manner.

The influence of smut upon the doughing of flour and bread making was investigated, known amounts of smut being added to the flour before making the bread. The results show that flour containing smut spores did not act differently from that containing no smut. The smut spores retained their normal color, and there was no evidence of its being disseminated to the starch or bread. The only effect of smut spores in flour and bread is due to the color which they impart in mass.

The effects of soil and weather conditions were also investigated, the season being one of almost complete drought. As previously reported (E. S. R., 11, p. 361), it was again demonstrated that the greatest amount of smut was produced when the soil conditions were best for the growth of wheat from the seed. It was shown that soil which was very wet, although it did not check the development of a reasonable crop of wheat, was unfavorable to the development of smut.

The effect of different depths of seeding in dry soil was studied, the seed being sown at depths of 1, 2, 3, and 4 in. Where the seed had previously been treated with formaldehyde no smut was developed in any case. The most smut was developed where the seed was planted the deepest, an explanation of which is believed to be that the deep planting seems to secure the best conditions for the smut development as well as retarding the growth of the wheat during the period when it is susceptible to the attack of the fungus. Where the seed bed is well prepared and the grain covered to a uniform depth, not to exceed 2 in., the most desirable conditions for growth of wheat and minimum production of smut are found.

Canteloupe wilt, H. H. Griffin (*Colorado Sta. Bul. 62, pp. 7–15*).—For a number of years a blight of cantaloupes due to *Macrosporium cucumerium* has been under investigation at the station. The fungus produces small brown spots upon the leaves in the center of the hill. These spots gradually enlarge until they attain a diameter of half an inch or more, enveloping the leaf and causing its destruction. In 1899 experiments for the control of the disease were attempted in which vines were sprayed with Bordeaux mixture, and the results obtained were considered very satisfactory. The season of 1900 was dry and hot, hence unfavorable to the spread of the disease. Experiments with Bordeaux mixture were conducted in a number of places, and the results obtained were considered highly satisfactory. The average cost for spraying is stated at $4.47 per acre for 3 applications. The fungicide seemed to not only protect the vines from disease but to prolong the growing season, and as a result the cantaloupes were ripened at a considerably longer period instead of matured practically at one time.

In 1899 there appeared to be no evidence of the disease in any other locality than that of Rockyford, but in 1900 it was found in nearly all parts of the valley. The formula for Bordeaux mixture which the author recommends is 4 lbs. copper sulphate, 4 lbs. fresh lime, and 40 gals. of water. A stronger solution could be used, but good results have been obtained from that recommended.

Bacillus carotovorus, the cause of the white rot of carrots, L. R. Jones (*Centbl. Bakt. u. Par., 2. Abt., 7 (1901), Nos. 1, pp. 12–21; 2, pp. 61–68*).—The author's attention was directed to this disease of carrots in Vermont in December, 1898, when he received at the experiment station diseased specimens, together with a statement that the disease had been known for two or more years. Among the carrots harvested in 1897, at the time of harvesting, was found here and there a single diseased root. After the roots were stored in the cellar a development of the disease took place so rapidly as to destroy in the autumn and early winter almost the entire harvest. Carrots were planted in 1898 upon a field which had been fertilized with manure from animals fed with carrots, and the crop of 1898 was almost entirely destroyed by the disease. In nearly every case the disease appears as a white rot, usually attacking the crown and penetrating the root rapidly. The diseased tissue is ordinarily white, but sometimes brownish, and between the sound and diseased portions of the root a sharply drawn line intervenes. A microscopic examination failed to show the presence of any fungus, but the tissues were swarming with bacteria. Plate cultures from diseased tissue showed in a short time an abundance of the organism, which when inoculated from bouillon cultures upon carrots quickly produced the rot. The bacteria occur in the intercellular spaces and through their action dissolve the middle lamella. The destruction of this intercellular substance is very similar to that of an enzym-like cytase, but this part of the investigations has not been completed. Inoculation experiments with a great variety of plants showed the organism was capable of producing the white rot upon a number of plants in no way related to the carrot. Roots of white beets, ruta-baga, radish, parsnip, salsify, onion bulbs, young leafstalks of celery, leaves and flower stalks of hyacinth, cabbage, and green tomatoes were all more or less successfully inoculated, the characteristics of the disease being produced in a comparatively short time. In a number of instances it was found necessary to keep the inoculation material moist, as the wilting or drying of the material checked the development of the disease. The experiments in the inoculation of oranges, bananas, apples, pears, potatoes, sweet potatoes, and garden beets gave negative results; and similar results were obtained where the roots and leaves of young plants of carrot and parsnip and the stems and petioles of tomato were inoculated The methods of inoculation and the characteristics of the destruction by the organism are described. The cause of the disease is said to be a new species of bacillus, to which the name *Bacillus carotovorus* is given. In old cultures the bacillus exhibits rounded ends, but in young cultures frequently long filaments are produced. In size the individual organism varies from 1.5 to 5μ in length, and from 0.7 to 0.8μ in diameter. It stains fairly readily, and so far as known does not produce capsules. Physiological action of the organism in various culture media is described at considerable length.

As possible means for the prevention of this disease, the author recommends rotation of crops in which the soil which has become contaminated may be kept for some years in cereals, grass, potatoes, beans, or similar crops. In no case should manure from animals fed diseased carrots or should compost from garden refuse be applied to soil if the presence of the disease is suspected. When roots are to be stored they should be thoroughly dried, and as sunlight exerts a very destructive influence upon the bacteria in cultures, it is believed that spreading the roots for 2 hours in bright sunlight would destroy the organisms present in the roots. In stored roots the disease may be prevented by keeping the root cellar at a uniformly low temperature.

Cucumber diseases, H. Garman (*Kentucky Sta. Bul. 91, pp. 50–56, fig. 1*).—Descriptive notes and directions for the prevention are given in the following diseases of cucumbers, cantaloupe, and other cucurbitaceous plants: Cucumber mildew, melon and cucumber anthracnose, cucumber-leaf spot, cucumber spot, cantaloupe-leaf spot, damping off, timber rot and leaf glaze, cucumber wilt, watermelon wilt, and cucumber dodder.

Aster diseases; nematode worms; and cucumber mildew, G. E. Stone and R. E. Smith (*Massachusetts Sta. Rpt. 1900, pp. 71–73*).—The authors report extensive experiments with China asters, in which experiments were conducted with some 15,000 plants to test the effect of fertilizers, varieties, time of planting, etc., on diseases. The China aster is said to be affected by a number of serious troubles, the most prominent of which appears not to be due to any organism, but rather the result of a disturbance in the assimilative functions of the plant. The conditions which bring about this disturbance, so far as their experiments show, are not yet understood.

A peculiar disease of potted cuttings of perennial phlox was noticed during the winter which proved to be caused by a species of nematodes. This nematode, unlike the ones occurring on the roots of many plants, attacks the stem of the plant, causing an abnormal enlargement, while the leaves are stunted or in some cases reduced to mere rudiments, and the plant generally dies. The species appears to be undescribed, and this is the only reported occurrence, so far as the authors know, in the State.

During the past year the presence of the cucumber mildew (*Plasmopara cubensis*) is reported as occurring on greenhouse cucumbers in 2 distinct and remote localities. This appears to be the first time it has been observed in Massachusetts since 1889 (E. S. R., 3, p. 160).

Notes on plant diseases, W. Lochhead (*Ontario Agr. Col. and Expt. Farm Rpt. 1900, pp. 15, 16, 18–21, figs. 3*).—A brief description is given of the celery blight (*Cercospora apii*). For its prevention the author recommends spraying the plants at intervals of 2 weeks with ammoniacal copper carbonate solution. The occurrence of asparagus rust (*Puccinia asparagi*) is noted. So far as the author's observations go, this disease was first reported in Ontario in 1899. During the season covered by the report it had spread and caused considerable injury. The different phases in the life cycle of the fungus are briefly described, and as possible methods of combating the rust the author suggests the burning of all diseased plants in the fall, besides spraying the beds with Bordeaux mixture several times after the market season is over. A brief account is given of a disease of balsam trees due to *Trimmatostroma abietina*. An account of this disease has been previously noted (E. S. R., 13, p. 63).

Spraying in bloom, S. A. BEACH and L. H. BAILEY (*New York State Sta. Bul. 196, pp. 399–460, pls. 3, figs. 6*).—The practice of spraying fruit trees in bloom, as begun a few years ago, has led to considerable controversy as to the effect of such treatment upon the yield of fruit, as well as the injury to bees. As a result of the agitation a law was passed by the legislature of the State of New York prohibiting the application of poisons to fruit trees while in blossom. The effect of such treatments upon the production of fruit has been investigated at both the New York State Station and the New York Cornell Station. During the year 1900 extensive field experiments were conducted by the Cornell Station on spraying fruit trees in bloom, which showed no decisive results. The season was one of heavy crop and little disease, and good or fair crops followed all treatments. There was no apparent injury to blossoms on trees sprayed when in full bloom.

The effect of spray mixtures on pollen and blossoms was studied by the State station both in the laboratory and in the orchard. In the laboratory, pollen grains were put into cultures which contained insecticides or fungicides, and the germination and growth compared with others placed in culture media without any fungicide or insecticide. "From these investigations it appears that if before pollination occurs the stigmatic surface of the pistil should be covered either with Bordeaux mixture alone or with arsenical poison alone, of the strength commonly used in spraying orchards, there would be no germination of any pollen which might afterwards reach the stigmatic surface, and so fertilization would be prevented and no fruit would be formed. Even the presence of lime alone, of the strength commonly used in spray mixtures, prevented the germination of pollen. Bordeaux mixture was diluted in aqueous sugar solution to 500 parts, 200 parts, 100 parts, 50 parts, 2 parts, and 1 part in 10,000 of culture media into which various kinds of pollen were introduced. Even when diluted to 50 parts in 10,000 it prevented germination to large extent, and where germination did occur the growth which followed was decidedly slow and the pollen tubes were dwarfed. When diluted to 100 parts, 200 parts, or 500 parts either no germination or practically none was found."

The effect of spray mixtures on the apple blossoms was examined, trees being sprayed in bloom and observations made at different times until the fruit had become as large as cherries. In the tests where the trees were sprayed repeatedly, so as to hit as many as possible of the new blossoms which opened from day to day, but few blossoms survived the treatment and but little fruit was set, showing that spray mixtures prevent the setting of fruit when applied to blossoms soon after they open. If the tree should have a scant amount of blossoms, serious loss might follow from such treatments. In some cases the spray mixture had a decided corrosive effect on the tissues of the stamens and pistils. In other cases pistils which showed the presence of spray mixture on the stigmatic surfaces awaited fertilization for several days, but eventually withered and died. It appeared that in these cases the spray mixture inhibited the process of fertilization. Blossoms which had been opened several days before being sprayed seemed to have reached a stage where the treatment did not check fertilization, and the fruit was set as abundantly as upon those trees which were not sprayed. The effect of spraying in bloom upon the yield was investigated with a number of varieties of apples. In the case of Hubbardston the loss per tree from spraying in bloom was 0.9 bu. of marketable fruit; with Oldenburg and Baldwin the loss was 0.4 bu.; with Tompkins King, 1½ bu.; and with Rhode Island Greening, 1¼ bu. In some cases the spraying in bloom thinned the fruit and the thinning done seemed to produce results somewhat similar to those produced when the young fruit is thinned by hand, that is, the total yield is slightly decreased, but the amount of marketable fruit is not in any way diminished. Other experiments gave contradictory results, and further tests are needed to establish a safe general conclusion on this point.

Fruit setting of sprayed blossoms, F. H. HALL, S. A. BEACH, and L. H. BAILEY (*New York State Sta. Bul. 196, popular ed., pp. 15, pl. 1, figs. 6*).—A popular summary of the above bulletin.

An experience with pear blight, D. R. PEASE (*Rural New Yorker, 60 (1901), No. 2671, pp. 245, 246*).—The author recounts his experience in attempting to combat the bacterial blight of pears and quinces. Various methods were unsuccessfully tried, but beginning with 1898 sulphur and a wash of lime and sulphur were thoroughly applied to the bark of the trees while in the dormant condition, or sprayed upon the trees when the life began to make its first appearance. The author believes that this application, made just before the blossoms appeared, prevented the appearance of blight in his pear orchard during the season of 1900. A considerable difference in susceptibility to disease was noted for different varieties of pears and quinces. Among the pears the most seriously injured were the Louise Bonne and Bartlett. Seckel was very little affected. The Orange quince trees were nearly all destroyed, while Rea was but slightly damaged.

Concerning apricot diseases, R. FARNETI (*Atti Inst. Bot. Univ. Pavia, 2. ser., 7 (1900), pp. 9; abs. in Bot. Centbl., 85 (1901), No. 12, pp. 405, 406*).—Descriptions are given of 3 new species of fungi which have been observed on the ripe or ripening fruit of the apricot. The first, to which the name *Stigmina briosiana* is given, produces small spots 1 to 2 mm. in diameter upon the fruit. The flesh of the spot dries and the fruit becomes bitter. The other fungi observed on the plant, which are concerned to some extent in causing a rot, are *Phyllosticta armenicula* and *Phoma myxæ*.

Chlorosis of fruit trees in calcareous soils, H. DAUTHENAY (*Rev. Hort., 73 (1901), No. 2, pp. 50, 51*).—The occurrence of chlorosis on fruit trees in calcareous soils is said to be quite common wherever for any reason the nutritive elements of the soil become unassimilable to the tree. The use of sulphate of iron for preventing this disease gives partial relief and, according to the author, it acts upon the lime, changing its form. This treatment alone is not sufficient, but should be supplemented by the use of proper fertilizers.

The deterioration of passion vines and fruit, W. J. ALLEN (*Agr. Gaz. New South Wales, 12 (1901), No. 2, pp. 248–250, pls. 2*).—This fruit, which is cultivated to a considerable extent in Australia, is subject to a disease which during the past season has occasioned considerable loss. The disease is characterized by a thickening and hardening of the rind, and only a small portion of the fruit develops properly, most fruits being undersized, contorted, and with little or no pulp. The disease seems to make its appearance soon after the fruit has set, and the vines appear stunted, their leaves being greatly reduced in size. Various causes are attributed as possible agents for the production of this disease, among them improper fertilizers, insufficient moisture, irrational planting, and fungus disease. Examinations of stalks and leaves of diseased plants have shown the presence of an undetermined fungus, but whether it is the primary cause of the disease or not remains to be ascertained.

Some experiments in combating grape mildew, B. CHAUZIT (*Rev. Vit., 15 (1901), No. 382, pp. 419, 420*).—During the preceding season experiments were conducted at the departmental experimental fields of Nimes for the prevention of the downy mildew of the grape. Different lots were sprayed with Bordeaux mixture of different strengths, Burgundy mixture, solutions containing cadmium, zinc, etc., as well as applications of different forms of powders. The results obtained by experiments showed that in combating this disease some form of copper, preferably the Bordeaux mixture, gave the best results.

Concerning the conidial form of the black rot fungus, G. DELACROIX (*Compt. Rend. Acad. Sci. Paris, 132 (1901), No. 13, pp. 863, 864*).—A brief account is given of the conidial form of the black rot fungus which has been found in a few localities in France. This conidial form has been observed frequently in the United States, being most abundant during very rainy seasons.

ENTOMOLOGY.

Report of injurious insects and common farm pests during the year 1900, with methods of prevention and remedy, ELEANOR A. ORMEROD (*London: Simpkin, Marshall, Hamilton, Kent & Co., 1901, pp. 111, figs. 27*).—This report is the twenty-fourth of a series made by the author, and it is indicated that the publication of these reports will not be continued. *Laverna atra*, known as the pith moth (pp. 1–8), caused injuries to apple trees by tunneling into the stems just beneath the apple blossoms. The only effective preventive measure so far known consists in cutting or breaking off the infested shoots and burning them. The habits and life history of the insect are described in detail so far as known. It is not known where the eggs are deposited. Detailed notes are given on the life history and habits of 2 ash-bark beetles (*Hylesinus fraxini* and *H. crenatus*) (pp. 9–21). In combating the first species it is recommended that felled timber and dead or dying branches should be removed. The best time for doing this is in the month of June. In cases of standing ash trees which are pierced by the insects for the purpose of securing winter shelter, it is recommended that the bark be peeled off over the places where the beetles are hibernating. The second species may be treated in the same manner, with the exception that the removal of newly felled ash trunks will be of little avail, since this species infests standing trees.

Notes are given on the appearance, life history, and habits of *Bruchus rufimanus*, *B. pisorum*, *B. tristis*, *B. brachialis*, and *B. rufipes* (pp. 21–31). Descriptive notes are given for the purpose of distinguishing the different species. For treating infested seed the author recommends the usual remedies, and also the treatment of bean seed with blue vitriol. *Tylenchus devastatrix* (pp. 32–37) is reported as causing considerable injury to field beans by infesting the stems. The plants become irregularly branched and distorted. In preventing injury from these worms it is recommended that care should be exercised not to plant a susceptible crop immediately following a crop which has been badly infested. Plowing is effective if the surface be turned completely under. It is also recommended that the stubble of infested crops should be burned and that application of sulphate of potash alone or with a mixture of sulphate of ammonia be given to the soil. Experiments with gas lime showed that this was without effect in controlling the eel worm.

Hylemyia coarctata (pp. 38–43) is reported as causing considerable injury to wheat. Notes are given on the life history of the insect so far as known, and on its method of attack.

Phytoptus ribis (pp. 43–48) has continued its injurious attacks during the season. A large number of remedies have been tried, most of which are unsuccessful. The need of further experiments with hydrocyanic-acid gas is urged. It is suggested that where black currants are grown together in large areas a satisfactory way of checking the spread of the pest consists in breaking off and destroying the galls. *Pulvinaria ribesiæ* (pp. 48–52) is sometimes injurious to currants. The scale is described and notes given on its life history. In preventing the attacks of this insect, it is suggested that the currants should not be grown in an overcrowded condition. Application of soft soap and kerosene oil are reported ineffective. Economic and biological notes are given on *Plusia gamma* (pp. 53–58). The species is reported as injurious to mustard and potatoes. Arsenical poisons are recommended in destroying this insect. The pear-leaf blister mite (pp. 59–62) is described and brief notes given on its life history, habits, and means of prevention. *Diplosis pyrivora* (pp. 63–69) is spreading and becoming more injurious. In combating this species the infested pears which have fallen should be collected and destroyed. The trees may be shaken for the purpose of removing other infested fruit which does not fall. It is also recommended that cloths be spread under the trees and kept smeared with tar or other substance, which will prevent the escape of larvæ which fall or emerge from infested fruit.

Notes are given on the habits, life history, and remedies for *Scolytus pruni* (pp. 69–72), *Penthina variegana* (pp. 73–78), *Archerontia atropos* (pp. 82–84), *Lampronia rubiella* (pp. 85–88), and *Œstrus ovis* (pp. 89–94).

A planarian worm (*Bipalium kewense*) is reported as having been found in a number of greenhouses. The species is somewhat beneficial from its habit of feeding upon earthworms, and thus checking a too great prevalence of the latter in greenhouses. Short biological and economic notes are also given on *Psylla mali*, currant sawfly, *Mamestra brassicæ*, and *Retinia buoliana*.

Report on injurious insects and plant diseases in 1900, W. M. Schöyen (*Beretning om Skadeinsekter og Plantesygdomme i 1900. Christiania, 1901, pp. 34, figs. 21*).—In this report the author gives economic and biological notes on a number of injurious insects and fungus diseases affecting cereals, grasses, potatoes, cabbage, turnips, peas, beans, fruit trees, small fruits, shade trees, evergreen trees, and ornamental plants. Among the injurious insects which are discussed mention may be made of *Charæas graminis*, wireworms, cabbage-root maggot, *Silpha opaca*, destructive pea aphis, apple maggot, codling moth, *Cheimatobia brumata*, *Phyllobius argentatus*, *Hyponomeuta varabilis*, *Eriocampa adumbrata*, pear-leaf blister mite, currant sawfly, *Cossus ligniperda*, *Lasiocampa pini*, and earwigs. Notes are also given on the cereal rusts, *Glœosporium lindemuthianum*, apple scab, gooseberry rust, and *Æcidium strobilinum*.

Notes on insects, W. Lochhead (*Ontario Agr. Col. and Expt. Farm Rpt. 1900, pp. 13–15, figs. 2*).—The buffalo carpet beetle is reported as having occurred in unusual numbers during the season. In combating this insect it is recommended that the beetles be prevented from entering houses by the use of window screens during the month of May, when the beetles are flying most actively. Infested carpets may be treated with gasoline along the borders, and the same treatment should be applied to the floors under the borders of the carpet.

The codling moth occurred in about the usual numbers. Legislation has been adopted permitting municipalities to enforce the application of bands to apple trees from the first week in June. It is urged, however, that this method is successful only when the bands are carefully examined at frequent intervals.

Many complaints are reported concerning the ravages of the Hessian fly. It is recommended that narrow strips of wheat be sown 4 or 5 weeks earlier than the main crop in order to entice the insects to lay their eggs. This wheat may then be plowed under so as to destroy the eggs.

Report of the entomologists, C. H. and H. T. Fernald (*Massachusetts Sta. Rpt. 1900, pp. 84–88*).—The San José scale is reported as having been received from 37 towns in the State, and it is believed that there are other unreported localities of infestation. Brief notes are given on periodical cicada, birch Bucculatrix, Marguerite fly, greenhouse Aleurodes, fall cankerworm, and pea louse.

Insects injurious to grain, G. d'Utra (*Bol. Agr. São Paulo, 2. ser., 1901, No. 1, pp. 1–21*).—Descriptive, economic, and biological notes on *Calandra oryzæ*, *C. granaria*, *Cathartus gemellatus*, *Tribolium ferrugineum*, *Ephestia kuehniella*, *Tinea granella*, and *Silvanus surinanensis*.

The principal insect enemies of growing wheat, C. L. Marlatt (*U. S. Dept. Agr., Farmers' Bul. 132, pp. 40, figs. 25*).—The chief insect enemies of wheat, in the order of their importance, are considered to be chinch bug, Hessian fly, wheat midge, and grain-plant louse. The wheat-straw worms, wheat-bulb worms, army worms, cutworms, and sawflies are of secondary importance, while a large variety of insects are occasionally found upon wheat. In this bulletin especial attention is devoted to the 4 insects mentioned as being of chief importance, and also to *Isosoma tritici*, *I. grande*, *Meromyza americana*, *Leucania unipuncta*, *Laphygma frugiperda*, *Cephus pygmæus*, *C. occidentalis*, and *Pachynematus extensicornis*.

The mites of sugar cane in Java, L. Zehntner (*Meded. Proefstat. Suikerriet West Java, No. 51, pp. 17, pls. 2; reprint from Arch. Java Suikerind., 1901, No. 5*).—A detailed description is given of *Tetranychus exsiccator* in all its stages, together with an account of its injuries and natural enemies. Besides several species of ladybirds which prey upon the mite, the author gives an account of *Diplosis acarivora*, which is described as a new species and as parasitic upon the mite. When the mite occurs in large numbers, it is recommended that infested plants be sprayed with petroleum emulsion.

Enemies of cucumbers and related plants, H. Garman (*Kentucky Sta. Bul. 91, pp. 3–48, figs. 14*).—Considerable work was done on the life history of the striped cucumber beetle. The beetle was found to hibernate in the adult condition, and individuals were found in the spring as early as April 12. During the latter half of July adults began to appear from the earliest eggs which were laid by the spring brood. Some of these beetles may possibly lay eggs for a second brood which matures in the fall, but it is not believed that there are over 3 or 4 broods during a season. According to the author's observations, the life history of the species occupies from 26 to 33 days. Notes are given on the food plants of the beetle. It is stated that the beetles begin to lay their eggs by the middle of June, and that the young larvæ begin to hatch about the second half of June. The average duration of larval life was found to be about 19 days. As remedial treatment for this insect the author recommends burning all leaves and rubbish, dusting plants with insect powder, spraying with Bordeaux mixture, and the use of various forms of covers. Plaster and lime were found to be ineffective. A detailed description of the species is given in all its stages, together with notes on the literature of the beetle.

Brief notes are given on the life history and habits of the spotted cucumber beetle.

The northern squash beetle (*Epilachna borealis*) is reported as causing local and periodical depredations on the cucumbers and related plants. Egg laying begins in the second half of June, and the larvæ hatch within about 10 days. For combating this species the author recommends hand picking and spraying with Paris green to which lime has been added.

As remedies for the melon aphis (*Aphis gossypii*), tobacco decoction, kerosene emulsion, fumigation with bisulphid of carbon, hydrocyanic-acid gas, and tobacco extracts are recommended. The author devised 2 forms of fumigators especially for the purpose of fumigating with tobacco extracts. One fumigator consists of a can with a tin cylinder 8 in. long and 4 in. in diameter soldered to one side. The cylinder is furnished with an opening covered with a screw cap on the upper side, into which nicotine preparations may be poured. The can is without bottom and is placed over the plant to be treated. Heat is then applied by a burner to the under side of the cylinder. The second form of fumigator consists of a wooden box, tightly calked, inverted over the plant to be treated, and a tin pail connected with the box by a tin tube 1 in. in diameter. The nicotine is placed in the pail and the heat applied to the bottom of the pail by means of a burner. Notes are given on the food plants, life history, and enemies of the melon louse.

Brief biological and economic notes are presented on *Anasa tristis*, *A. armigera*, *Leptoglossus oppositus*, *L. phyllopus*, squash borer, pickle worm, melon worm, *Cyrtoneura cæsia*, *Thrips tabaci*, and *Armadillidium vulgare*. In greenhouses attacked by the cucumber thrips the author recommends fumigation with tobacco extract and syringing plants with the same insecticide. In the field infested plants may be sprayed with tobacco extract, kerosene emulsion, or fumigated in the manner recommended for melon aphis. Experiments with Armadillidium, or greenhouse pillbug, showed that this pest possesses great resisting power to ordinary insecticides, and that tobacco decoctions and kerosene emulsions are not effective against it. In infested soil the author recommends the use of bisulphid of carbon.

Further experiments against the peach-tree borer, M. V. SLINGERLAND (*New York Cornell Sta. Bul. 192, pp. 191–196, figs. 5*).—Good results were obtained by J. M. Stedman in the use of wire-cage protectors for keeping the borer away from peach trees. As these results were different from those obtained by the author in previous experiments, the value of such protectors was again tested by further experiments. The author concludes from his experiments that the wire cage successfully used by Stedman offers "no protection against the peach-tree borer." The gas-tar treatment, which in experiments conducted by Stedman killed nearly all the trees upon which it was used, is recommended by the author as a harmless and effective remedy. Wooden wrappers, advised by Stedman and recommended for use on a large scale, are considered by the author to be no more effective than cheaper tarred paper wrappers.

San José scale investigations. I, The development of the female, V. H. LOWE and P. J. PARROTT (*New York State Sta. Bul. 193, pp. 351–368, pls. 6*).—Experiments with larvæ for the purpose of determining the duration of the period of activity were conducted in a temperature of from 70 to 76° F. None of the larvæ settled down before 12½ hours, and the average length of the period of activity was 27.7 hours. As a rule, the young larvæ remained inactive for from ½ hour to 4 hours. Observations on the rate of travel of young larvæ at a temperature of 74° F. showed that they may move 10½ ft. in a period of 6 hours. On fruit the greater number of larvæ seek the blossom end or stem end, preferring the part of the apple which is in the shade. The young remain in large numbers around the adult females. The average mortality among the larvæ of the San José scale was 39.8 per cent.

The duration of the period of growth was found to be, on an average, 49.5 days, and during this time 4 stages of growth were noted in the formation of the scale. In the first stage the body of the insect becomes covered with a secretion of white filaments, in the second stage a denser layer of waxy threads is noted among the loose threads of the first stage, while the third stage is characterized by the dull black color of the scale. The fourth stage is that of the mature insect. The first molt occurred on an average 20.7 days after birth and the second molt 29¼ days.

The effect of temperature on the development of larvæ was carefully studied by the author. At a temperature of 35° F. the larvæ settled down almost immediately and attempted to secrete scales. Some of them succeeded in this, but all the larvæ died before reaching the hibernating stage. At a temperature of 45° F. the larvæ were unable to reach the hibernating stage, but after resisting this temperature for 6 weeks continued to develop to that stage if transferred to a room with higher temperature. At a temperature of 58° F. the larvæ reached the normal hibernating stage and in one instance developed completely.

Observations were made on the means of local distribution of the San José scale, and it was found that active larvæ on leaves which were picked from the tree and allowed to be carried away by the wind were dislodged only with considerable difficulty, and it is believed that larvæ may be transported to some distance by this means. Larvæ were found clinging to grasshoppers, aphis lions, flies, and *Euphoria inda*, and may therefore be transported from tree to tree on such insects.

In studying the different stages of the San José scale the author made use of two devices for confining the scale to limited areas. Bands of cotton wool tied about small nursery trees or on the limbs of large trees at intervals of 1 to 2 in. served to confine the scales within these boundaries. Another means of accomplishing this was found in the use of metal rings, or curtain rings, set in the bark and covered with microscopic cover glasses held in place with paraffin.

San José scale investigations, II, V. H. Lowe (*New York State Sta. Bul. 194, pp. 369–384*).—The experiments reported in this bulletin were undertaken for the purpose of determining the effects of winter applications of kerosene on nursery trees and bearing trees, the percentage of oil necessary to kill scales in winter, and the effect of summer applications on healthy trees. Two series of experiments were made on nursery trees, the first lot of trees being sprayed once on November 22 and the second lot twice on November 22 and March 27. The trees were apple, pear, peach, plum, and quince, 144 in all. The peach and plum trees were found to be quite sensitive, peaches being killed with a 20 per cent mixture, and plums seriously injured with a 40 per cent mixture. Pears and apples were not injured with 1 application of the 40 per cent mixture, and the apples were not affected by 2 applications of this strength, although pears were slightly affected. Similar experiments were made on bearing trees, with the result that no injury was noted on pears, except where pure kerosene was used. Plums were not injured by 1 application of the 40 per cent mixture, but were badly affected by the pure kerosene. In experiments to determine the percentage of oil necessary to kill the San José scale it was found that the scales were not destroyed by the 20 per cent mixture of kerosene, but were killed in all cases where the 40 per cent mixture was used. In testing the effect of summer applications of kerosene, 2 grades of oil were used, 100° and 150°. The 100° oil injured the foliage of apple and pear trees in all cases, even when used in the 15 per cent mixture, when applied during May and June. The 150° oil, on the other hand, did not injure the trees except when used pure. It is concluded that kerosene may be used in winter on apple and pear trees in a 40 per cent mixture or at a sufficient strength to kill the scales without injuring the trees, but its use is impracticable on peach trees and is somewhat injurious to plums.

Brief notes are given on the method of fumigation by hydrocyanic-acid gas, and spraying with crude petroleum, and whale-oil soap.

Controlling San José scale, F. H. Hall, V. H. Lowe, and P. J. Parrott (*New York State Sta. Buls. 193 and 194, popular ed., pp. 11, pls. 2*).—This is a popular summary of Bulletins 193 and 194 of the station (see above).

Observations on Coccidæ, R. Newstead (*Ent. Mo. Mag., 2. ser., 12* (*1901*), *No. 136, pp. 81–86, figs. 5*).—The author gives descriptive and biological notes on the species of Aspidiotus, Lichtensia, Diaspis, Fiorinia, Antonina, and Dactylopius.

Classification of Parlatoria, G. Leonardi (*Riv. Patol. Veg., 8* (*1900*), *No. 7–12, pp. 203–209*).—Brief notes on the anatomy of this genus of scale insects, together with an analytical table for the determination of species.

The injurious scale insects and mealy bugs of the British Isles, R. Newstead (*Jour. Roy. Hort. Soc.* [*London*], *23* (*1900*), *No. 3, pp. 219–262, figs. 22*).—The author gives a general account of the life history, habits, and methods of combating a large number of scale insects injurious to fruit, shade trees, and other plants. A chapter is devoted to remedies and methods of prevention, in which, besides a general discussion of the subject, special recommendations are given concerning the value and methods of making kerosene emulsion, fir-tree oil, soft-soap solution, lime wash, caustic-soda wash, clay and sulphur, etc.

Woolly aphis and mistletoe, F. Peneveyre (*Chron. Agr. Canton Vaud, 14* (*1901*), *No. 5, pp. 147–150*).—The remedies which are recommended against the woolly aphis include the following formulas: Soap, 1 kg.; petroleum, 900 gm.; amyl alcohol, 500 gm.; water, 3 liters. Soap, 150 gm.; water, 1 liter; petroleum, 1,800 gm.; pure petroleum.

The damage caused by Porthesia chrysorrhœa, L. J. Lambillion (*Bul. Agr.*

[*Brussels*], *17* (*1901*), *No. 1, pp. 42–45*).—The author gives an account of the fruit trees and shade trees which are most seriously attacked by this insect, together with notes on its distribution. The damage caused by the species is said to be 10 times as great as that of the gypsy moth.

The Rutherglen bug, Nysius vinitor (*Agr. Gaz. New South Wales, 12* (*1901*), *No. 2, p. 247*).—This insect appeared in great numbers in a cherry orchard and caused an unusual amount of damage. In combating the pest experiments were tried with a fumigating tent and hydrocyanic-acid gas. This method proved very effective and it is believed that the insects would be destroyed by using a diluted formula.

Some insects injurious to small fruits, MARY E. MURTFELDT (*Missouri State Hort. Soc. Rpt. 1900, pp. 315–324*).—Brief notes on insects which are injurious to strawberries, raspberries, and other small fruits.

Disease of the black currant caused by the gall mite, Phytoptus ribis, J. H. WILSON (*Jour. Roy. Hort. Soc.* [*London*], *23* (*1900*), *No. 3, pp. 346–349, fig. 1*).—Brief biological and descriptive notes are given on this mite. The removal and destruction of infested buds is regarded as only a temporary check and too expensive for application on a large scale. Spraying with insecticides is practically useless when the mites are protected within the bud scale. The only reliable method for extermination of the pest is found in the complete destruction of infested plants and the application of gas lime or slaked lime to the ground after the removal of the bushes.

Three unusual strawberry pests and a greenhouse pest, M. V. SLINGERLAND (*New York Cornell Sta. Bul. 190, pp. 143–164, figs. 15*).—The author's attention was called to an attack of *Cacœcia obsoletana* on strawberry fields at Westfield, N. Y. Specimens of the moth were collected and placed in breeding cages in which strawberry plants were set. The eggs were laid on the glass sides of the cages. The duration of the egg stage was found to be 10 days. The caterpillars fed chiefly on the underside of the leaves and after a few days began to roll the leaves together by means of silken threads. There are probably 3 broods of the caterpillars during the growing season, in May, July, and September. A parasite identified as *Rhysallus atriceps* was bred from a number of caterpillars. In one strawberry field an experiment was tried in spraying with Paris green at the rate of 1 lb. to 150 gal. of water, without the addition of lime. The leaves and young fruits were injured by the Paris green and only a few caterpillars were destroyed. It is recommended that where spraying is adopted, applications should be made before the blossoms open, and if another spraying is required it should be done after the fruit is picked. Arsenate of lead is recommended as more suitable than Paris green for this purpose. Mowing over the strawberry patch after the fruit is picked, and burning the leaves, is recommended as still more effective than spraying.

At Leechburg, Pa., 2 species of ground beetles (*Harpalus caliginosus* and *H. pennsylvanicus*), are reported as injuring ripe strawberries by eating the seeds and incidentally damaging the pulp to a greater or less extent. The beetles apparently attack the fruit for the purpose of getting the seeds, but when the fruit is scarce they feed upon the pulp, especially of very ripe berries. By raking off the mulch and placing a few boards between the rows, the beetles may be enticed under such protection and thus found and destroyed. They are attracted to lights and it is suggested that they may be successfully combated by means of lantern traps. The beetles may be attracted to similar traps by means of meat baits.

Biological and economic notes are given on the white fly of the strawberry belonging to the genus Aleurodes. The life cycle of these insects occupies from 4 to 5 weeks, and there are 3 or more broods during the growing season. The insects congregate mostly on the underside of the leaves, from which they suck the sap. They may be combated by a spray of kerosene emulsion, mechanical mixture of kerosene and water, or whale-oil soap, directed so as to strike the lower side of the leaves.

The greenhouse leaf tier (*Phlyctænia rubigalis*) is reported as injurious to all sorts of greenhouse plants. The caterpillars feed preferably on the underside of the leaves, eating out patches of the leaf tissues and leaving the thin skin on the upper side. The caterpillars require about 20 days in attaining their complete growth and undergo 3 molts during that time. The life cycle is passed through in from 44 to 50 days, and there may be 7 or 8 generations every year in greenhouses. This insect is easily transported on greenhouse plants in the egg state or as young caterpillars, and such plants should be examined before being set out in the greenhouse. The moths are somewhat attracted to lights, and lantern traps are recommended in combating them. Fumigation with tobacco was found ineffective. A greenhouse containing 8,000 cubic feet of space was fumigated with hydrocyanic-acid gas at the rate of 1 oz. of cyanid to each 400 ft. of space for about ½ hour. Live moths of the leaf tier kept in a wire cage were not killed by this treatment, and none of the caterpillars or pupæ was affected by it, although considerable damage was done to roses, carnations, and other plants. Further experiments with this gas indicated that the greenhouse leaf tier can not be destroyed without using the gas in a strength which is injurious to the plants. The most practical and thorough method of combating this insect is considered to be hand picking.

The phylloxera of the vine, F. T. Bioletti (*California Sta. Bul. 131, pp. 16, figs. 4*).—A brief historical review is given of the gradual distribution of phylloxera in European countries and its subsequent reimportation into California. The insect has recently appeared in several important crop-growing districts of California, which were previously regarded as exempt from its attacks. The author therefore prepared notes on the life history and habits of the phylloxera, together with a discussion of the various remedies which have been found most effective in combating the pests. Of these remedies special mention is made of carbon bisulphid, submersion, planting in sand, disinfection of cuttings, and the use of resistant vines.

Combating phylloxera in Roumania, G. N. Nicoleano (*La lutte contre le phylloxéra en Roumanie. Bucharest: Government, 1900, pp. 173, figs. 15, map 1*).—The author gives an account of the present centers of infection by this insect, experiments in treatment with bisulphid of carbon, the spread of the insect, and of the reconstruction of vineyards by the use of American vines and by other methods.

Catching the moths of Tortrix ambiguella, J. Dufour et al. (*Chron. Agr. Canton Vaud, 14 (1901), No. 8, pp. 229–237*).—This article contains an account of a method adopted for capturing moths of injurious grape caterpillars by means of a racket covered with adhesive substances. These instruments may be successfully manipulated by small children which are employed for this purpose in vineyards. The use of this method has given such promising results that it is strongly recommended.

Report on methods of combating Tortrix ambiguella in spring and summer, J. Laborde (*Bul. Min. Agr. (France), 20 (1901), No. 1, pp. 112–124*).—The author reports a large series of experiments with remedies for destroying this insect, and also *Eudemis botrana*. Remedies were tested on all stages of the insect. For destruction of the eggs, sulphuric acid, *eau de javelle*, soap and turpentine, and soap and petroleum were tested; on the larvæ, soap and nicotine, soap, nicotine and sulphate of copper, oleic acid, petroleum, bisulphid of carbon and acetic acid, and also various arsenical poisons. The conclusion is drawn from the author's experiments that attention may be most advantageously directed in the winter against the chrysalis and in the spring against the larvæ of the first generation.

Larkspur and geraniums for grasshoppers, C. Ledwidge (*Agr. Gaz. New South Wales, 12 (1901), No. 2, pp. 317, 318*).—Brief observations are given on the poisonous effects of larkspur and red geraniums on grasshoppers. It was noted that grasshoppers died very quickly after eating these plants, but it is not believed that large swarms of grasshoppers could be checked by this means.

Spray calendar (*New York Cornell Sta. Bul. 188, pp. 107–116*).—A brief discussion is given of the means for preventing attacks of fungi and insects, and suggestions are made for the protection, by spraying, of different fruits, vegetables, and ornamental plants. Formulas and directions for preparation are given for the more important fungicides and insecticides.

The general treatment of insect pests, H. Maxwell-Lefroy (*Imp. Dept. Agr. West Indies, Pamphlet No. 5, 1901, pp. 29*).—A brief discussion of injurious insects, giving general classification and an account of remedies and spraying apparatus which have been found effective. Brief notes are also given on beneficial insects, means of introduction of insect pests, and directions for collecting and forwarding specimens.

The resistance of the larval mosquito to cold, M. J. Wright (*British Med. Jour., 1901, No. 2102, Epit., pp. 882, 883*).—The observations reported in this article were made on several species of Anopheles and Culex. At a temperature sufficiently low to freeze a crust of ice on pools, the author observed mosquito larvæ in active movement in such pools. In some cases the adult mosquitoes were emerging from the nymph condition. Mosquito larvæ kept in bowls and subjected to low temperature remained alive and active until the water was frozen into a solid mass. After thawing out, some of them recovered their activity. The author believes that mosquitoes pass the winter chiefly in the larval stage.

A preliminary note on the hibernation of mosquitoes, H. E. Annett and J. E. Dutton (*British Med. Jour., 1901, No. 2104, Epit., p. 1013*).—This paper contains a discussion of the question in what stage mosquitoes pass the winter. It appears that in England species of Culex and Anopheles winter over in both the adult and the larval stages. Experiments indicate that when mosquitoes are kept in a dry cage they die within a few days, while they may be kept alive for months in a damp, cold atmosphere.

The life history of the warble flies, E. E. Austen (*Ent. Mo. Mag., 2. ser., 12 (1901), No. 136, pp. 92–95*).—This article contains a discussion of the literature on *Hypoderma bovis* and *H. lineatum*. The evidence for the supposed entrance of *H. bovis* into the mouth and subsequent penetration through the tissues to a position under the skin is considered unsatisfactory.

Report of the lecturer on apiculture, H. R. Rowson (*Ontario Agr. Col. and Expt. Farm Rpt. 1900, pp. 136, 137*).—An experiment was conducted for the purpose of determining an economic method for using unfinished sections. Some of the supers containing unfinished sections were left on the hives, and other supers with unfinished sections were placed in front of the hives in such a way that the bees could easily remove the honey from them without danger of interference from bees belonging to other colonies. The honey from the unfinished sections outside the hives was rapidly removed and served to complete the unfinished sections within the hives. The result was satisfactory, since no robbing was observed and the sections were not stained by the bees.

It was found by experiment that protection could be afforded in the spring to colonies of bees which have been maintained in cellars during the winter by placing supers on the hives and putting the hives in chaff cushions. It was found that the heat was thus well retained in the cushion, and as a result the cluster of bees did not become contracted and the queen was able to lay eggs over a greater area of comb.

The heat of beehives and the results of varying it, Sylviac (*L'Apiculteur, n. ser., 44 (1901), No. 2, pp. 75–78*).—The author discusses this problem in a general way, and indicates the methods for determining the temperature of the inside of the hives and for determining any movements of the bees and the amount of food consumed.

The Freiburg investigations of eggs of bees, F. Dickel and A. Weismann (*Anat. Anzeiger, 19 (1901), No. 3–4, pp. 104–111*).—This discussion is controversial in nature and concerns the general problem of the influence of fertilization and heredity upon the development of the different members of bee colonies.

Notes on foul brood of bees, E. Ruffy (*Rev. Internat. Apicult., 23 (1901), No. 3, pp. 60–61*).—A brief discussion of practical methods for preventing the spread of this disease.

FOODS—NUTRITION.

The composition of jellies and jams, L. M. Tolman, L. S. Munson, and W. D. Bigelow (*Jour. Amer. Chem. Soc., 23 (1901), No. 5, pp. 347–353*).—As preliminary to the examination of a large number of commercial fruit preserves, a number of samples of fruits and of jellies and jams made from them were analyzed. The fruits examined include the apple, crab apple, pear, peach, plum, grape, orange, pineapple, huckleberry, and blackberry. Determinations were made of the solids, ash, proteids, and sugars. Total solids were determined by drying from 5 to 10 gm. in a large flat-bottomed platinum dish at 100° for from 10 to 12 hours. The solids were charred, the mass collected on a filter, exhausted with water, incinerated, and weighed. Acid was determined with decinormal potassium hydroxid, using phenolphthalein as an indicator, the results being reported in terms of sulphuric acid. Nitrogen was determined by the Gunning method. Reducing sugars were estimated by the Allihn method and cane sugar calculated by the Clerget formula, the polarization being made with a Schmidt and Haensch instrument.

The results of these examinations are tabulated. It is stated that the fruits selected, especially the apples and grapes, "were not in all cases of typical composition."

Cane sugar was found in all the fruits examined except blackberry. In the orange, peach, and pineapple it was in excess of the reducing sugar. The polarization of the Damson plum indicated an excess of dextrose over levulose. The extent of inversion in comparing jams and jellies varied with the amount of free organic acid and length of time the product was heated. There were, however, some marked exceptions to this rule. The jams and marmalades, except the crab apple products, showed a higher inversion than the corresponding jellies, because of the fact that they were heated for a longer time.

The presence of tin in canned foods, J. K. Caldwell and A. E. Parkes (*British Food Jour., 3 (1901), No. 29, pp. 146, 147*).—The authors report the presence of tin in all samples of canned fruit and vegetables which they examined. In estimating the tin, 100 gm. of the can's contents was evaporated to dryness and the residue gently charred. The residue was ground and twice extracted with warm dilute hydrochloric acid. It was then treated with sulphureted hydrogen, the tin being recovered as stannic oxid. The amount of tin in the canned vegetables—tomatoes and beans—was 0.168 grain per pound. In the fruits—pears, peaches, apricots, and pineapples—it ranged from 0.112 to 0.885 grain per pound. The length of time the articles had been canned was not known. In 2 of the samples very slight traces of lead were found.

Maple sirup from defoliated trees, F. W. Morse (*New Hampshire Sta. Bul. 79, p. 10*).—As shown by analyses, the sirup from the last run of sap from maple trees which had been stripped of their leaves the previous summer by the forest tent caterpillar did not differ materially in composition from other "last run" maple sirup. In appearance it was dark colored and clear.

Concerning the fineness of division and solution of food when chewed, J. U. Gaudenz (*Arch. Hyg., 39 (1901), No. 3, pp. 230–257, dgm. 1*).—Experiments which the author reports covered a number of common foods, including apples, bread, radishes, sandwiches, eggs, cheese, meat, macaroni, potatoes, etc. Conclusions are drawn regarding the quantity ordinarily taken at a bite and the size of particles after chewing food for a longer or shorter time. Results showing the size of the chewed particles and the amount of the different foods dissolved by the saliva are reported in detail. The author believes that a bite of normal size is sufficiently chewed in half a minute, so that there is a desire to swallow it. In general, vegetable foods were better divided by chewing than animal foods. According to these investigations, the saliva in a very short time (half a minute) dissolved the common starchy food such as macaroni and potatoes. As was to be expected, animal foods, such as egg white and meat, were not dissolved by saliva. The results are discussed at some length.

The effect of severe and prolonged muscular work on food consumption, digestion, and metabolism, W. O. Atwater and H. C. Sherman (*U. S. Dept. Agr., Office of Experiment Stations Bul. 98, pp. 1–56, fig. 1*).—A 6-day bicycle race afforded the authors an opportunity to study the food consumption by 3 of the principal contestants, as well as the digestibility of the food and the metabolism of nitrogen, the investigation being made with the view to determine the effects on these factors of severe and prolonged muscular work. The average amounts of food consumed per man per day follow:

Average daily food consumption of bicycle racers performing severe muscular work.

	Protein.	Fat.	Carbohydrates.	Fuel value.	Nutritive ratio.
	Grams.	*Grams.*	*Grams.*	*Calories.*	*1:*
Miller, during 6-day race	169	181	585	4,770	5.9
Pilkington, during 3 days of the 6-day race	211	178	509	4,610	4.3
Albert, during 6-day race	179	198	859	6,095	7.3
Albert, during preliminary period	169	153	375	3,650	4.2

The following conclusions were drawn regarding the food consumed, digestibility of the food, and the metabolism of nitrogen:

"(1) Trained athletes undergoing unusually severe exertion demand a largely increased supply of easily digested food of such kinds as 'agree' with the subject, and that the availability of such food is not greatly affected by the loss of sleep and almost continuous muscular exertion; (2) under such circumstances the metabolism of nitrogen as well as that of energy is increased, body protein being drawn upon unless the food is very abundant; and (3) trained athletes appear to be able to lose relatively large amounts of body nitrogen without any apparent ill effects.

"It is conceivable that equally severe and prolonged exertion might perhaps be undergone without increased metabolism of nitrogen, provided the supply of fuel material was very abundant. This question, however, can be settled only by experiments in which the diet is under control."

The mechanical work and efficiency of bicyclers, R. C. Carpenter (*U. S. Dept. Agr., Office of Experiment Stations Bul. 98, pp. 57–67, figs. 2*).—From the data recorded in the investigations noted above, and a number of special determinations, the author discusses the amount of work performed by 2 of the bicycle racers, its mechanical equivalent, and the apparent efficiency of the racers. As pointed out, the external resistance may be summarized under 2 general heads—that of the air and that of the bicycle.

"The total work done by Miller is computed to have been over 15,000,000 foot-pounds, or 7,500 foot-tons, on the first day, and 5,500,000 foot-pounds, or 2,750 foot-tons, on the last day of the race. . . . The average heat equivalent of the work done in the 6 days amounted to 3,102 calories. At the same time the food consumed furnished 4,957 calories, making an apparent efficiency of over 60 per cent. . . . If we assume that the equivalent exposure of the bicycle rider was 4 sq. ft., . . . the total work done each day ranged from nearly 20,000,000 to nearly 7,000,000 foot-pounds, and the corresponding heat equivalent from 6,381 to 2,256 calories, averaging 3,994 calories.

"The amount of work done by Albert was slightly less than that by Miller, ranging from 12,000,000 to 4,000,000 foot-pounds per day, with a corresponding range in heat equivalent from 3,938 to 1,334 calories. The average heat equivalent of the work done per day during the 6 days is 2,760 calories, and the average energy in the food as found by actual determination of the heat of combustion is 6,307 calories, making an apparent efficiency of nearly 45 per cent. . . .

"If the equivalent exposure of the rider is assumed as equal to 4 sq. ft., the total amount of work done each day varied from nearly 16,000,000 to a little over 5,000,000 foot-pounds, with a corresponding range in heat equivalent from 5,088 to 1,686 calories, with an average for the 6 days of 3,547 calories."

It is pointed out that in each case there is some uncertainty regarding the energy of the food consumed, since a greater or less amount of body fat was also consumed, the energy of which should be taken into account in estimating the total income. This would diminish somewhat the apparent efficiency.

"Under the conditions of the race the amount of energy exerted can be considered about the limit of human strength and endurance. This is reasonably many times greater than would be exerted by the ordinary laborer working under the routine of his usual occupation."

On the influence of food consumed upon metabolism, G. Koraen (*Skand. Arch. Physiol., 11 (1900), No. 3-4, pp. 176-197*).—The respiratory quotient and the hourly excretion of nitrogen were studied under different dietary conditions, the author being the subject. A number of his conclusions follow: When some 66 gm. of fat is consumed the total metabolism is not increased. When some 165 gm. of cane sugar is consumed it is increased somewhat, and markedly increased when 52 gm. of protein is consumed. A marked increase is also observed when a mixed diet which is rather difficult of digestion is consumed. When fasting, the hourly excretion of nitrogen is 0.414 gm.; that of carbon, 6.05 gm., with a possible error of $\pm$ 0.19 gm. These values are equivalent to 72.1 calories, with a possible error of $\pm$ 2.3 calories.

Respiration experiments with a corpulent subject when work was performed and the moisture content of the air varied, A. Broden and H. Wolpert (*Arch. Hyg., 39 (1901), No. 3, pp. 298-311*).—In these experiments the respiratory quotient was determined. The large amount of water in the respiratory products explains the great thirst experienced by corpulent persons. The experiments are discussed in considerable detail, especially with reference to the performance of work by corpulent and thin persons in the tropics.

Contribution to the subject of gastric juice and the composition of its enzyms, M. Nencki and N. Sieber (*Ztschr. Physiol. Chem., 32 (1901), No. 3-4, pp. 291-319*).—Experiments are reported and discussed.

Concerning the theory of digestion of protein, W. W. Sawjalow (*Arch. Physiol. [Pflüger], 85 (1901), No. 4-6, pp. 171-225*).—A chemical study of the digestibility of proteids with an extended discussion.

Contribution to the physiology of digestion. III, A substance increasing the flow of digestive juice, C. Radzikowski (*Arch. Physiol. [Pflüger], 84 (1901), No. 11-12, pp. 513-526*).—Studies on the effect of alcohol on peptic digestion.

Contribution to the physiology of digestion. IV, Two pepsin-forming bodies, F. R. Mark-Schnorf (*Arch. Physiol. [Pflüger], 85 (1901), No. 1-3, pp. 143-148*).—Experiments with a dog are reported which led to the conclusion that white, so-called pure dextrin neither causes a secretion of digestive juice nor formation of pepsin. Inulin and glycogen, even when chemically pure, cause the formation of pepsin without causing a secretion of digestive juice.

ANIMAL PRODUCTION.

The composition, digestibility, and feeding value of barnyard millet (Panicum crus-galli) J. B. LINDSEY (*Massachusetts Sta. Rpt. 1900, pp. 33–44*).—Proximate and ash analyses are reported of the millet plant at different stages of growth, millet seed, millet silage, millet and soy-bean silage, corn and soy-bean silage, as well as the coefficients of digestibility (obtained in experiments with sheep) of green millet, millet hay, millet and soy-bean silage, and corn and soy-bean silage. The coefficients of digestibility follow:

Coefficients of digestibility of millet, millet hay, etc.

	Dry matter.	Protein.	Fat.	Nitrogen-free extract.	Crude fiber.	Ash.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Green millet, early to late bloom	71	69	63	72	73	64
Millet hay, full bloom	56.5	47.5	48	53.5	62	43.5
Millet and soy-bean silage (2:1)	59	57	72	59	69	....
Corn and soy-bean silage (2:1)	69	65	82	75	65	....

The feeding value of millet is discussed at some length. The author's conclusions follow:

"Barnyard millet is a warm-weather plant, similar in this respect to Indian corn. As harvested in early blossom, the fodder contains less nitrogen-free extract matter, more fiber or woody matter, and rather more ash than corn fodder. The seed resembles the cereals (especially oats) in composition. It contains considerable more fiber, rather more ash, and 5 to 6 per cent less extract matter than maize.

"Barnyard millet, grown on naturally moist and fertile land, will probably yield as much dry matter per acre as corn. It has less nutritive value than the corn, the principal reason for this being that the corn can partially mature its grain and still be readily eaten by animals, while the millet must be cut when in blossom to secure it in the most desirable condition for feeding.

"It is not suitable for hay, and, while it makes a fairly satisfactory silage, it is inferior to maize as a silage crop. It furnishes a desirable green feed, especially during the month of August, and it is for this purpose that it can be most satisfactorily utilized. The millet can be used for silage in place of corn whenever it is not convenient or possible to grow the latter."

Dried distillery grains, J. B. LINDSEY (*Massachusetts Sta. Rpt. 1900, pp. 44–50*).—Distillery grains are divided into 3 classes, those obtained in the manufacture of (1) alcohol and spirits, (2) Bourbon whisky, and (3) rye whisky. Statistics are given of the total American output of dried distillery grains and of the amount exported. The composition of a number of sorts is also given, as well as the results of digestion experiments with sheep. The average coefficients of digestibility of distillery grains of the better sort were: Dry matter, 81; protein, 74; fat, 94; and nitrogen-free extract, 32. The value of distiller's grains for milch cows is briefly spoken of.

Chemical composition and feeding value of the germ and dry residue of barley used in the manufacture of Italian beer, P. SCARAFIA (*Staz. Sper. Agr. Ital., 34 (1901), No. 4, pp. 321–337*).—Proximate and ash analyses are reported, as well as artificial digestion experiments.

Parsons Six-Dollar Feed, J. B. LINDSEY (*Massachusetts Sta. Rpt. 1900, pp. 53, 54*).—An analysis is reported of this feeding stuff, which is said to consist principally of the hulls of different grains and other low-grade material from grain mills and elevators.

Beet pulp, A. E. SHUTTLEWORTH (*Ontario Agr. Col. and Expt. Farm Rpt. 1900, pp. 29, 30*).—The author quotes the composition of the beet pulp and discusses its feeding value.

Composition of sunflower seeds, F. W. MORSE (*New Hampshire Sta. Bul. 79, pp. 7, 8*).—The specific gravity of sunflower seeds, relative amounts of meats and hulls, as well as the composition of both black and striped whole seeds, meats, and hulls are reported.

Composition of some poultry foods, F. W. MORSE (*New Hampshire Sta. Bul. 79, pp. 8, 9*).—Analyses of meat and bone meal, beef scraps, ground dried fish, broken crackers, middlings, and several commercial poultry feeds are reported.

The composition of purslane (Portulaca oleracea), J. B. LINDSEY (*Massachusetts Sta. Rpt. 1900, pp. 52, 53*).—The composition of purslane is reported and the uses of the plant briefly discussed.

Grape prunings as a feeding stuff for farm animals, F. GUERRIERI (*Staz. Sper. Agr. Ital., 34 (1901), No. 4, pp. 338–346*).—The author reports proximate and ash analyses of grape prunings, hay, and straw.

Breadnut (*Bul. Bot. Dept. Jamaica, n. ser., 8 (1901), No. 3, p. 42*).—It is stated that the fruit or "nut" of the breadnut (*Brosimum alicastrum*) is largely used for feeding cattle, as are also the leaves, which constitute a valuable fodder for horses and cattle. The tree also yields excellent timber.

The respiratory quotient and overfeeding of fat, M. BLEIBTREU (*Arch. Physiol. [Pflüger], 85 (1901), No. 7–8, pp. 345–400, figs. 2, pl. 1*).—With a view to obtaining data on the different sorts of animal fats, experiments were made with geese. They were overfed with ground rye mush, to which, in some cases, sugar was added. A respiration apparatus, which is described, was used to determine the respiratory quotient in connection with these investigations. The author sums up the results as follows: When full-grown lean geese are fed much more than they require of a ration rich in carbohydrates, the respiratory quotient becomes much greater than normal. The high value is caused by an increase in the amount of carbon dioxid excreted and not by a decrease in the amount of oxygen consumed. A respiratory quotient exceeding the unit value, namely, that corresponding to the combustion of body substance, shows that the transformation of carbohydrates into fat in the animal body is accompanied by a cleavage of carbon dioxid. Even when the process of digestion is most active the geese overfed with rye did not excrete any inflammable gases so far as could be determined. The milk-white color of blood serum which has often been observed in overfed geese is due to an emulsion of fat in which the drops are very minute. This condition disappears if the animal fasts for a few days, and does not occur if the animal is fed fat-free food rich in carbohydrates. It is probable, therefore, that the fat in the serum is derived from fat in the food consumed and not from newly formed body fat.

Further experiments on the resorption of artificially colored fat, E. PFLÜGER (*Arch. Physiol. [Pflüger], 85 (1901), No. 1–3, pp. 1–64*).—Additional experiments are reported and the recent work on the subject of the resorption of colored fat is critically reviewed.

Remarks on Dr. L. Holfbauer's article concerning the resorption of artificially colored fat, S. EXNER (*Arch. Physiol. [Pflüger], 84 (1901), No. 11–12, pp. 628–635, fig. 1*).—A controversial article.

The resorption of fat and soap in the large and the small intestine, H. J. HAMBURGER (*Proc. Sec. Sci. Koninkl. Akad. Wetensch. Amsterdam, 1900, II, pp. 287–298*).—Experiments with a dog are reported.

A note on the question of the digestibility of cellulose in the intestines, E. MÜLLER (*Arch. Physiol. [Pflüger], 83 (1901), No. 10–12, pp. 619–627*).—Experiments were made with the enzym of the *hepato pancreas* of a carp and also with a goat having 2 fistulas. According to the author the tests showed that with the goat sugar is not formed as an intermediate product when cellulose is rendered soluble in the intestine.

Corn vs. peas for fattening steers, G. E. DAY (*Ontario Agr. Col. and Expt. Farm Rpt. 1900, p. 46*).—The comparative value of peas and corn as part of a ration was studied. Six steers fed corn, barley, and oats (1:1:1) for 36 days and then corn and oats (3:1) for 151 days, gained 341.5 lbs., consuming 4.73 lbs. of grain per pound of gain. Five steers fed peas, barley, and oats (1:1:1) for 36 days and then peas and oats (3:1) for 151 days, gained 348.6 lbs., consuming 4.64 lbs. of grain per pound of gain.

The meal mixture containing peas gave slightly larger gains than that containing corn; but when the relative cost per ton of corn and peas was taken into account the corn mixture gave decidedly cheaper gains. In this one test the pea mixture was not worth quite 50 cts. per ton more than the corn mixture, whereas the actual cost of the pea mixture was between $2 and $3 per ton more than the corn mixture.

Heavy, medium, and light rations for fattening steers, G. E. DAY (*Ontario Agr. Col. and Expt. Farm Rpt. 1900, pp. 45, 46*).—Using 3 lots of 4 steers each, the comparative value of heavy, medium, and light grain rations was tested, in continuation of previous work (E. S. R., 12, p. 372), the feeding test proper covering 187 days. The average amount of grain consumed per 100 lbs. live weight by the steers receiving a heavy ration was 0.85 lb. per day; of those receiving a medium ration, 0.66 lb.; and of those receiving a light ration, 0.51 lb. The average daily gain per steer in the 3 lots was 1.80, 1.87, and 1.87 lbs., respectively, the cost of food per pound of gain being 7.67, 6.97, and 6.36 cts. From this and earlier tests a number of conclusions are drawn:

"In the average of 4 trials, a comparatively heavy meal ration gave slightly larger but more expensive gains than those obtained with lighter rations.

"In the average of 4 trials, the most economical gains were obtained by commencing with about one-third of a pound of meal per day per 100 lbs. live weight of the animals, and gradually increasing, the rate of increase being such that on the average of the whole feeding period the steers received ½ lb. of meal per day per 100 lbs. of their live weight. A finished steer is fed at a loss; therefore, in economical feeding, an effort must be made not to have the animals finished for any considerable time before they can be disposed of.

"The method of feeding recommended is suitable for somewhat long feeding periods. Shorter feeding periods would call for a more rapid increase in the meal ration."

Experiments in breeding fat lambs (*Jour. Bd. Agr. [London], 7 (1901), No. 4, pp. 482, 483*).—A test of the comparative merits of crosses of "Lleyn" ewes with Shropshire, Oxford, Suffolk, and Border Leicester rams showed that from the standpoint of early maturity of the lambs the best results were obtained with the Suffolk and Border Leicester crosses.

Digestion of oat and pea bran by sheep, A. E. SHUTTLEWORTH (*Ontario Agr. Col. and Expt. Farm Rpt. 1900, pp. 32–34*).—Two sorts of oat dust and pea bran were analyzed and their digestibility determined with 3 sheep. The average coefficients of digestibility of the 2 materials follow:

Coefficients of digestibility of oat dust and pea bran—Experiments with sheep.

	Organic matter.	Protein.	Fat.	Nitrogen-free extract.	Crude fiber.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Oat dust; average of 6 determinations	60.86	68.15	79.01	69.51	33.48
Pea bran; average of 5 determinations	70.78	67.53	78.40	76.77	68.98

Digestion experiments with sheep, J. B. LINDSEY (*Massachusetts Sta. Rpt. 1900, pp. 50-51*).—The digestibility of a number of feeding stuffs was tested with sheep. These include hay (largely June grasses), meadow fescue, Kentucky tall oat grass, distillery grains (5 sorts), oat feed, rye feed, Cleveland flax meal, and Parsons's Six-Dollar feed. A number of the coefficients of digestibility follow:

Digestibility of a number of feeding stuffs by sheep.

Kind of feed stuff.	Dry matter.	Protein.	Fat.	Nitrogen-free extract.	Fiber.	Ash.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Hay, largely June grass in bloom (*Poa pratensis*)	59	61	47	62	57	48
Meadow fescue, full bloom (*Festuca elatior pratensis*)	61	52	54	59	67	46
Kentucky blue grass, full bloom (*Poa pratensis*)	56	57	42	53	63	42
Tall oat grass, late bloom (*Arrhenatherum elatius*)	55	51	56	58	55	41
Oat feed (large amount hulls)	34	62	92	33	27	13
Rye feed	82	80	90	88	(?)	35
Chop feed	80	67	82	84	82	....
Cleveland flax meal	87	83	76	94	(?)	21
Parsons's Six-Dollar feed	56	57	81	64	47	12

Experiments with pure-bred swine, G. E. DAY (*Ontario Agr. Col. and Expt. Farm Rpt. 1900, pp. 47, 48, figs. 2*).—Continuing previous work (E. S. R., 12, p. 374), the relative gains made by different breeds of pigs was tested. Three animals in each lot were fed corn and 3 barley. The test covered some 4 months. The greatest gain, 0.93 lb. per pig per day, was made by the Yorkshire, and the least, 6.42 lbs., by the Tamworths. The Berkshires required the least meal per pound of gain, namely, 4.09 lbs., being followed by the other breeds in the order mentioned: Yorkshire, Duroc Jersey, Chester White, Tamworth, and Poland China, the latter requiring 4.74 lbs. The pigs were sold for export, their suitability for this purpose being judged by an expert. The Yorkshires were reported as the most suitable for the purpose.

Corn vs. barley for feeding hogs, G. E. DAY (*Ontario Agr. Col. and Expt. Farm Rpt. 1900, pp. 48, 49*).—The comparative merits of corn and barley in the above test are discussed at some length. Each of these grains was fed with wheat middlings, at first in the proportion of 3:1, and later 1:1 and 1:3. Owing to the fact that 3 each of the Chester Whites and Tamworths were not in good condition, the results obtained with these breeds are not included. In 140 days the average daily gain by 12 pigs on corn and middlings was 0.817 lb., the meal consumed per pound of gain being 0.432 lb. The average daily gain per pig of 12 pigs fed on barley and middlings for the same period was 0.841 lb., and the meal consumed per pound of gain was 0.43 lb.

"In this experiment, therefore, the mixture of barley and middlings gave slightly better results in producing gain in weight than the mixture of corn and middlings. The difference, however, is very small, and the two foods might almost be pronounced equal in feeding value so far as this experiment goes."

Experiments with grade swine, G. E. DAY (*Ontario Agr. Col. and Expt. Farm Rpt. 1900, p. 50*).—The comparative value of barley alone and in combination was tested with 5 lots of 5 pigs each, the special object being to determine the effect of barley upon the firmness of bacon. The test covered 120 days. On barley alone the average daily gain per pig was 0.789 lb., and the meal consumed per pound of gain, 4.58 lbs. On barley and corn (1:1), the corresponding amounts were 0.762 and 4.78 lbs.; and on barley and oats (1:1), 0.645 and 5.26 lbs. On barley and cooked mangel-wurzels (1:1) the daily gain per pig was 0.850, the meal and roots consumed per pound of gain being 3.97 and 3.61 lbs., respectively. On barley and raw mangel-wurzels the average daily gain was 0.807 and the meal and roots consumed per pound of gain 4.23 and 3.74 lbs., respectively.

"Barley alone gave larger gains than when combined with either oats or corn.

"Barley and roots gave larger gains than barley alone.

"Cooked roots gave much better results than raw roots, but it is very probable that the individuality of the animals had more to do with causing this difference than the cooking of the roots.

"In the case of cooked roots, 1 lb. of grain proved equivalent to 5.9 lbs. of roots. This is not nearly so high a value as many people place upon roots for feeding hogs; but it corresponds very closely with the results of extensive Danish experiments.

"A short experiment conducted under my direction by Mr. A. H. Crerar as a basis for his third year thesis, indicated that a pound of mixed grain is equivalent to 5.78 lbs. of raw roots. This is almost identical with the relation between cooked roots and barley stated above, and indicates that the comparison of cooked and raw roots is scarcely reliable.

"Further experiments with roots are in progress, and it is too soon to draw conclusions."

Wet vs. dry meal, G. E. Day (*Ontario Agr. and Expt. Farm Rpt. 1900, pp. 50, 51*).—A comparison was made of the relative merits of wet and dry meal as a feed for pigs with 2 lots of 4 animals each. In 7 weeks lot 1 fed wet wheat and barley meal made an average daily gain per pig of 0.957 lb. and consumed 4.89 lbs. of meal per pound of gain. On the same grains dry there was an average daily gain per pig of 1.037 lbs., the grain consumed per pound of gain being 4.52 lbs.

Influence of food upon firmness of bacon, G. E. Day (*Ontario Agr. Col. and Expt. Farm Rpt. 1900, pp. 52, 53*).—Using the data obtained in the feeding experiments reported above, the author discusses the influence of food upon the firmness of bacon. The principal deductions follow:

"Hogs which have had plenty of exercise and a mixed diet, or that have received a reasonable allowance of dairy by-products and a mixed grain ration, until they are over 100 lbs. live weight, can be finished on corn without injury to the quality of bacon.

"Close confinement in pens from birth to time of marketing has a tendency to injure the quality of bacon, though the effect is not always well marked. The rational use of dairy by-products tends to produce bacon of excellent quality and seems to compensate largely for lack of exercise.

"Unthrifty, unfinished hogs, or those which have been kept on a mere maintenance ration to keep them from becoming too heavy while holding for a rise in prices or other reason, have a marked tendency to softness. Exclusive corn feeding during a somewhat extended period has given very unsatisfactory gains and has produced bacon of very soft, undesirable quality. The mixing of middlings with corn to the extent of two-thirds of the ration at the commencement and one-third at the close of the feeding period has not been successful in counteracting the bad effects of corn, the bacon thus produced being soft and generally undesirable. Barley, to the extent of at least half the ration, seems so have an influence in mitigating the effect of corn, but further investigation is necessary along this line. Barley, either alone or in conjunction with oats or middlings, has produced bacon of first-class quality. Peas appear to have an influence similar to barley. So far as our work has gone, roots have had no injurious effect upon the firmness of bacon, but they are being made the subject of further investigation."

Poultry experiments, W. P. Brooks and H. M. Thomson (*Massachusetts Sta. Rpt. 1900, pp. 123–129*).—With a view to testing the comparative merits of feeding a mash to poultry in the morning and in the evening, tests were made in both winter and summer with Plymouth Rocks. Two lots, each containing 20 pullets and 2 cocks, were used in each trial. In addition to the mash the fowls were fed meat scraps, and in the winter cabbage and clover also. In the winter test the fowls fed a mash in the morning laid 793 eggs in 6 months; those fed a mash in the evening laid 758 eggs.

In the summer test the fowls fed a mash in the morning laid 583 eggs in 5 months; those fed a mash in the evening, 570 eggs. The weights of the poultry at the beginning and end of the test are reported.

"It will be seen that neither in the winter nor summer experiment was there any very considerable difference in the number of eggs produced. It is, however, possibly significant, and this fact is made evident by the tables showing monthly egg yields, that during the period of shortest days the fowls receiving the evening mash laid less eggs than the others.

"The most striking result of the experiments is the great difference in the relative amounts of droppings voided during the night by the fowls under the two systems of feeding. It was noticed from the beginning, and the same remained true throughout the entire period, that the amount of droppings voided during the night by the fowls receiving the evening mash was very much greater than the amount voided by the other lot of fowls. . . .

"[This] furnishes conclusive evidence that the digestive process in the case of a soft food like a mash is very rapid. The fact that digestion among birds is relatively much more rapid than with most classes of animals has been already many times pointed out. . . .

"Our experiments indicate that the ordinary domestic fowl, as might have been supposed would be the case, is also able to digest soft foods with a degree of rapidity which seems astonishing. There has long been a general impression, and the usual practice in feeding fowls is evidence of this, that it is better to give the more solid food at night, especially during the winter, since it will 'stay by' the fowls better. Our experiments indicate that this impression is well founded and that the usual practice is correct, although they can not be considered to prove it, because, of course, it may be that a period of comparative rest for the digestive organs during the night is better than the condition of more continuous work for these organs which would follow the use of solid food at night.

"We have not obtained a sufficient difference in egg-production to be considered significant, but it is believed that the experiment, so far as it goes, indicates that it is better that the mash should be fed in the morning."

Report of the manager of the poultry department, W. R. GRAHAM (*Ontario Agr. Col. and Expt. Farm Rpt. 1900, pp. 126–135, fig. 1*).—The rations fed and eggs produced by the station poultry during the year are discussed, as well as the proportion of eggs hatched by incubators and by hens. Brief statements are also made concerning raising broilers and ducks, and 3 feeding experiments are reported in detail.

In the first test rations consisting of ground barley, corn, oats, and buckwheat meal, alone and in combination, were compared on 8 lots of 12 chickens each, the grain in some cases being finely ground and in others coarsely ground. In 3 weeks the greatest gain, 12 lbs., was made by lot 4 on a ration of finely ground oats, corn meal, and pea meal (2 : 1 : 1), the cost of food per pound of gain being 5.15 cts. The smallest gain, 5 lbs., was made by lots 5 and 8, the rations consisting, respectively, of finely ground corn and ordinary ground oats. In these cases the cost of food per pound of gain was 8.2 and 8.3 cts., respectively.

In the second test the comparative merits of pure-bred and scrub stock were studied with 8 lots, each consisting of 6 pure-bred chickens and 6 scrubs. For 2 weeks they were fed a ration made up of barley, oats, corn, and buckwheat, alone and in combination, and coarsely and finely ground. In every case milk was fed, and in one case, lot 8, potatoes were fed in addition. For the remainder of the test they were fed, by means of a cramming machine, a ration of finely ground oats and ground buckwheat (2 : 1), mixed with twice their weight of skim milk. In each instance the greater gains were made by the pure-bred stock, the differences in their favor ranging from 5 to 8.8 lbs. Furthermore, the gain was more cheaply made by the pure-bred stock. Considering the lots as a whole, the greatest gain, 48 lbs., was made by lot 3, fed coarsely ground corn, ground buckwheat, and finely ground oats (2 : 2 : 1), and the smallest gain, 28 lbs., by lot 2, on a ration consisting of finely ground oats, coarsely ground corn meal, and ground wheat (2 : 2 : 1). As regards financial returns the gains were made most cheaply by lot 1 on a ration of ground barley, finely ground oats, and coarsely ground corn (2 : 2 : 1), the cost being 3.88 cts. per pound. Gains were made least cheaply by lot 2, the cost being 5.8 cts. per pound.

The comparative merits of cramming and natural feeding was tested with 2 lots of about 25 chickens each. Both lots were fed grain and milk. In 10 days the chickens fed from a trough consumed 40 lbs. of grain and an equal amount of milk. They gained 5 lbs., the cost of a pound of gain being 10.2 cts. In the same time the chickens fed by the cramming machine consumed 50 lbs. of grain and 100 lbs. of milk and made a total gain of 7.5 lbs., the cost per pound of gain being 9.33 cts. On an average it was found that the machine-fed chickens were each about a half pound heavier than the others and sold for about 0.75 ct. per pound more.

Egg preservation.—During the year a number of methods of preserving eggs were tested. When preserved in a solution of water glass made in the proportion of 1 part sodium silicate to 5 of water, the eggs were of fairly good flavor and all well preserved. In a solution made in the proportion of 1 part of water glass to 8 of water, the eggs kept nearly as well as in the stronger solution. This is regarded as a good preservative when it is desired to keep summer eggs for winter use. When a solution consisting of 1 part of water glass to 10 of water was used the eggs did not keep as well. A second test was made with a solution of 1 part water glass to 8 of water, "but in place of allowing the eggs to remain in the liquid, they were removed after having been in it for a week, except the last lot which was put into the solution. This lot was allowed to remain the remainder of the season.

"(*a*) The eggs, after being in the solution for a week, were removed and placed in an ordinary egg case in the cellar. They were all good when tested, but had evaporated considerably and were lacking in flavor.

"(*b*) These were the second lot of eggs to be placed in the liquid. They were handled similarly to those in *a*, and were of about equal quality.

"(*c*) These eggs were allowed to remain in the liquid. They were well preserved, all being good."

As a whole these eggs did not keep quite as well as those which remained in the 1 : 8 solution, but were superior to those kept in the weaker solution.

Eggs were also preserved in a solution of limewater and salt and in dry lime and dry salt. The first of these methods gave fairly satisfactory results; the last 2 were unsatisfactory.

Capons and caponizing, O. M. WATSON (*South Carolina Sta. Bul. 62, pp. 10, pls. 2*).—The superior market value of capons is pointed out, and the method of caponizing described. According to the author, "capons are very useful in taking care of broods of young chickens. They take them without any trouble, and care for them just as well and we think better than a hen."

DAIRY FARMING—DAIRYING.

Report of the professor of dairying, H. H. DEAN (*Ontario Agr. Col. and Expt. Farm Rpt. 1900, pp. 37–44*).—An account is given of the different lines of investigation conducted during the year.

Milk was pasteurized at temperatures ranging from 140 to 200° F. and compared for butter-making purposes with milk heated at 90 to 100° F. before separation. Some of the results are as follows:

"The cream from the milk separated at the higher temperatures contained a higher percentage of fat, was less in bulk, churned in less time, and produced slightly more butter. . . . The creaming quality of the milk by the gravity process decreased with an increased temperature before setting. . . . The keeping quality of the butter, and also of the skim milk, was much improved by heating the whole milk to the higher temperature before separating. . . . The moisture content of the pasteurized butter was 10.77 per cent, 1 per cent less than that of butter made from unpasteurized milk."

The effect of various methods of handling butter upon the moisture content was studied, some of the results being inconclusive. Butter salted at the rate of $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, and 1 oz. of salt per pound of butter contained, respectively, 11.29, 10.47, 9.80, and 9.47 per cent of moisture, while unsalted butter contained 12.38 per cent. Butter worked with 20 revolutions of the worker contained 12.34 per cent of moisture, while that worked with 30 revolutions contained 9.43 per cent.

The overrun or excess of butter over fat in milk averaged 12.6 per cent during August with milk testing 3.4 to 3.8 per cent of fat, and 13.1 per cent during September with milk testing 3.6 to 3.9 per cent of fat.

Results of experiments in washing curd are summarized as follows: "Washing curds after milling tends to improve the flavor of cheese, especially of cheese made from curds bad in flavor. Cheese made from washed curds had a tendency to be open. There was little difference in the general quality of the cheese made from washed and unwashed curds when the milk was in good condition. Washing curds tends to reduce the yield of cheese. The average loss in our experiments was 1.12 lbs. of cured cheese per 1,000 lbs. of milk. There was not much difference in the results from washing with water at temperatures ranging from 90 to 110°. The average loss of cheese was somewhat less from washing with water at 90°, but the quality of the cheese was better with water at 110°."

Experiments in curing cheese at different temperatures gave results similar to those obtained in earlier work along this line (E. S. R., 12, p. 385). Cheese cured at 60 to 65° lost about 0.5 per cent less in weight than cheese cured at 70° and was of better quality. There was apparently no advantage in placing cheese in a warm room for one week and then removing to a cool room to finish the curing process.

Methods of caring for milk used in cheese making were investigated. Aeration was of no advantage. Where no means of cooling were employed, milk kept better over night in small than in large cans. A comparison was made of adding culture to milk at night and in the morning. When the milk was cooled to 46°, adding culture in the evening decidedly improved the quality of the cheese. Milk cooled to 48° over night and to which no culture was added produced cheese of very poor quality. Several different cultures were tested.

Rations containing, respectively, apples, apple pomace, rape, and turnip tops, with and without the addition of a material known as "Virginia cattle food" and sold for "purifying" milk, were fed to different lots of cows and butter and cheese were made from their milk. The results indicated that "the addition of 'Virginia cattle food' to the ration of rape and turnip tops improved to some extent the flavor of both cheese and butter, but in the case of apples and apple pomace no improvement was discernible."

Data are given regarding the composition of colostrum milk from 3 cows. The content of fat and total solids varied greatly. "Colostrum milk does not become normal, in many cases, so soon as is usually supposed. It is probable that instead of the eighth or ninth milking being fit for table use, in the case of some cows it is the twenty-first milking before it is normal."

Two tests were made of a substitute for cream as a food for calves. The results indicated that bran and oats fed dry were better and cheaper substitutes for cream than the one tested.

A tabulated record is given of 23 cows for the year, with a summary of the principal data. The average yield of milk was 7,179 lbs. and the average fat content 3.87 per cent.

Effect of feed on the composition of milk, butter fat, and on the consistency or body of butter, J. B. LINDSEY ET AL. (*Massachusetts Sta. Rpt. 1900, pp. 14–33*).—This is a summarized account of experiments relative to the effect of food on the quality of milk and butter, conducted at the station during a period of 6 years. The conditions of the different experiments are noted and some of the results are given in tables. Full data for the work, however, are to be published later. The effect of different quantities of protein on the composition of milk was studied in earlier work (E. S. R., 11, p. 577). The effect of fat on the composition of milk was studied in 3 experiments, 2 of which were considered as preliminary. In the third experiment, made with 10 cows and covering 16 weeks, a ration furnishing 0.5 lb. of digestible fat was compared with a ration furnishing 1.75 lbs. The effect of this ration on the composition of the butter fat and on the character of the butter was also noted. Experiments IV and V were made with 12 cows and lasted 5 weeks. Experiment VI was made with 10 cows and lasted 12 weeks. In the 3 experiments rations containing Cleveland flax meal, Chicago gluten meal, King gluten meal, and cotton-seed meal, respectively, were compared with a grain ration adopted as a standard, the effect of the different concentrated feeds on the butter fat and butter being studied. The following deductions are made from the results of the experiments:

"(1) Different amounts of protein do not seem to have any influence on the composition of the milk.

"(2) Linseed oil in flax-seed meal, when fed in considerable quantities (1.4 lbs. digestible oil daily), increased the fat percentage and 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 the fat.

"(3) In general, feeds containing much oil have a tendency to slightly increase the fat content of milk when first fed. The fat percentage gradually returns to normal.

"(4) It is not practicable to feed large amounts of oil to cows, as it has a tendency to derange the digestive and milk-secreting organs.

"(5) Linseed oil effected 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 iodin coefficient.

"(6) All oils do not produce the same effects on butter fat.

"(7) The melting point of butter fat is not always indicative of the firmness or body of butter.

"(8) An excess of linseed oil produced a soft, salvy butter, with an inferior flavor.

"(9) Linseed and corn gluten meals, with a minimum percentage of oil (3 per cent), produced a normal butter fat. The corn gluten meal produced butter with a desirable flavor and of good body.

"(10) King gluten meal (corn gluten meal with 13 per cent oil) increased the iodin coefficient of the butter fat several degrees above standard ration butter fat, and slightly depressed the melting point of the fat. This effect was probably due to the corn oil. The same meal produced butter of a very desirable flavor and body. [The author notes, however, that the body of the butter might have been considered by some as lacking in firmness.]

"(11) Cotton-seed meal produced butter fat quite similar in composition to that produced by the standard ration. The butter produced by this meal was rather crumbly when hard, and slightly salvy to the taste."

The college herd, C. W. BURKETT (*New Hampshire Sta. Bul. 79, pp. 23, 24*).—A tabulated summary of the herd record from November 1, 1899, to October 31, 1900. "The herd has been equivalent to 349 milch cows and 64 dry cows for one month, and has produced 171,883 lbs. of milk and 10,219 lbs. of butter. There has been an average of 29 cows in milk for each month, producing an average of 495 lbs. of milk and 28.6 lbs. of butter per cow, or an average yearly yield of 5,940 lbs. of milk and 343.2 lbs. of butter."

The milk supply of Copenhagen, F. C. HARRISON (*Ontario Agr. Col. and Expt. Farm Rpt. 1900, pp. 74-77, fig. 1*).—An account is given of the operations of the company supplying milk to Copenhagen. The filtering apparatus in use is illustrated.

A biological study of pasteurized and unpasteurized milk, E. W. HAMMOND (*Ontario Agr. Col. and Expt. Farm Rpt. 1900, pp. 77-81*).—Results of a study of the bacterial content of unpasteurized milk and milk pasteurized at different temperatures are summarized in tables. Different species of germs were isolated and inoculated into sterile milk and into guinea pigs or rabbits, the results of the inoculation being noted in each case. The author's conclusions are as follows:

"When the milk was run through the pasteurizing machine at low temperature, the effectiveness of germ destruction varied greatly. When the temperature was raised to 160° F., the effect was excellent. The number of germs was reduced, and those of a disease-producing variety were all killed. . . . Previous tests prove that continuous pasteurization has been made at too low temperatures to insure the getting rid of the germs which cause bad effects. Heating milk to a temperature of 160° F. insures the death of *Bacillus tuberculosis* in 15 minutes, reduces the number of other bacteria, and does not give a permanent cooked taste."

A study of the causes of the variation in the composition of butter, J. J. L. VAN RYN (*Landw. Vers. Stat., 55 (1901), No. 4-5, pp. 347-378*).—Owing to the controversy over the purity of certain Netherland butters during the past year, the author sought to determine those factors influencing the variations in their composition. In a long series of trials the breed, age, and time of calving of the cows were noted, and the soil, food, and method of feeding. Tables of analysis are shown, giving the refraction, specific gravity, volatile, soluble, and insoluble fatty acids and saponification and iodin numbers.

As the variations in the butter are more pronounced in the autumn the analyses were made during the last 4 months of the year. The greatest variation occurred in the volatile fatty acids; the numbers averaged by months as follows: September, 24.8; October, 23.7; November, 25.2; and December, 26.6.

Out of 428 samples, 2.3 per cent of the volatile-acid figures ranged between 17 and 21, and 6.5 per cent between 21 and 21.9.

The iodin number did not vary with the volatile fatty acid number, and there appeared to be no constant relation between the two numbers. With an increase in the volatile-acid number there was a fall in the refractometer figure.

The influence of the various factors noted upon the composition of the butter is discussed, the work of other authorities is quoted, and the influence of stall feeding is especially pointed out. In conclusion, the author states that the composition of the butter is determined by outside influences, and that care should be exercised in pronouncing a given sample adulterated.

The manipulation of sour and thickened whole milk and the partial removal of the milk foam, HAMILTON (*Molk. Ztg., 15 (1901), No. 21, pp. 361, 362, fig. 1*).—The author describes a method for neutralizing sour coagulated milk, thereby permitting the manufacture of a good article of butter. The solution for this purpose is made up of slaked lime and soda, full directions being given for its preparation. About 11 per cent of soda is added to water and enough of the lime so that a clear solution may be obtained. The amount of the solution used depends upon the acidity of the milk and the alkalinity of the soda solution. To facilitate the operation where the milk is much thickened, it is forced through a strainer and sweet milk is added. The method of adding the solution to the milk is figured and described. The milk is thoroughly stirred during the addition, litmus paper being used as an indicator.

The addition of this solution to milk that is to be sold as such is not advised, it being clearly an adulteration. With butter it is different, as the soda solution and the acid form salts that are easily eliminated from the product in butter making, passing into the buttermilk and leaving no undesirable taste in the butter. Furthermore, they do not form products any more harmful than the ordinary salt employed. In neutralizing such milk certain undesirable flavors are eliminated. Neutralized milk may be pasteurized, thereby destroying many bacteria that have an undesirable influence, and the cream inoculated with pure cultures. The neutralized milk is easily and thoroughly creamed after heating to 45° C. When the milk contains free acid, much foam is formed in separating. This is obviated by the neutralizing. The curds from neutralized milk may be made into cheese and ripened in the ordinary manner.

Influence of the addition of boric acid, borax, and sodium sulphite upon the coagulation of milk, L. Lange (*Arch. Hyg., 40 (1901), No. 2, pp. 181–186*).—The author made a study of the spontaneous coagulation and the coagulation by rennet of milk to which had been added boric acid, borax, and sodium sulphite. The varying amounts of the preservatives were added to 10 cc. of the milk and the coagulation carried out in sterilized tubes at room temperature.

The addition of boric acid to the milk gave the following results with spontaneous coagulation:

	Days.
Control coagulated in	2½
With ⅛ per cent boric acid in	3
With ¼ per cent boric acid in	4
With ½ per cent boric acid in	5½
With 1 per cent boric acid in	7
With 2 per cent boric acid	Did not coagulate.
With 4 per cent boric acid	Did not coagulate.

The time required for coagulating the milk after the addition of 0.1 cc. of a 1 per cent rennet solution is shown in the following table. The first column shows the result soon after the addition of the boric acid, and the second column 2 days later.

Coagulaion of preserved milk by rennet.

Strength of preservative.	Fresh milk.	Milk preserved two days.
	Seconds.	*Seconds.*
No preservative	165	80
⅛ per cent boric acid	125	345
¼ per cent boric acid	100	255
½ per cent boric acid	70	240
1 per cent boric acid	45	150
2 per cent boric acid	30	125
4 per cent boric acid	(a)	....

a Did not coagulate.

It will be observed that in spontaneous coagulation the process was hindered, and with above 2 per cent of boric acid no coagulation took place. With the rennet extract the time of coagulation was shortened by the use of up to 2 per cent, while with 4 per cent, as with spontaneous coagulation, no action of the rennet was possible. It would appear that the boric acid in small amounts had a deterrent effect upon the bacteria concerned in the natural coagulation of milk, while up to 2 per cent it had no unfavorable effect upon the unorganized ferment of the rennet.

With borax the results were not so striking. There was with the increased addition of this substance a slight retardation of the rennet coagulation.

The addition of from ⅛ to 1 per cent of sodium sulphite exercised no essential influence upon the coagulation of rennet; nor was the natural coagulation apparently affected by it.

The action of certain proteolytic enzyms in the ripening of cheese, O. Jensen (*Ann. Agr. Suisse, 2 (1901), No. 3, pp. 95–100*).—In the continuation of his work on the ripening of cheese (E. S. R., 12, p. 682) the author made a study of the influence of the enzyms galactase, pepsin, and trypsin in Emmenthaler cheese. Ten liters of milk was used in the manufacture of each cheese, and with the samples indicated it was heated to 90° C. and rapidly cooled to 35° C.

The cheeses were examined after 4 months, the results being reported in tables showing the soluble nitrogen, the nitrogen of decomposition of albuminoid bodies in percentages of total nitrogen, the acidity, milk sugar, taste, and the result of a bacteriological examination.

In the experiment with galactase 200 cc. of the enzym obtained by the method of Babcock and Russell was added to the milk for each cheese, together with the rennet and a small amount of calcium chlorid. The results are shown in the following table:

Influence of galactase in ripening cheese.

	In total nitrogen.		Acidity.	Bacteriological examination.
	Soluble nitrogen.	Nitrogen of decomposition.		
	Per cent.	*Per cent.*		
A. Control made from heated milk with artificial rennet.	4.95	0.83	0.3	Only *Bacillus mesentericus*, 200,000 per gm.
B. Made from heated milk with artificial rennet and galactase.	7.25	1.48	1.3	*Bact. lact. acidi*, *B.* ∝, and some colonies of *B. mesentericus*.
C. Control made from milk not heated and with natural rennet.	17.52	3.59	1.2	*Bact. lact. acidi* and *B.* ∝.
D. Made from heated milk with natural rennet and the addition of galactase.	4.07	2.44	1.3	Do.

A second series of experiments was carried out with pepsin, using 25 gm. of a commercial preparation per 100 liters of milk. The examination of the cheeses was made after 4 months, as in the previous case. The results are shown in the following table:

Influence of pepsin in ripening cheese.

	In total nitrogen.		Acidity.	Bacteriological examination.
	Soluble nitrogen.	Nitrogen of decomposition.		
	Per cent.	*Per cent.*		
E. Control made from heated milk and natural rennet.	13.18	3.55	1.2	*Bact. lact. acidi.*
F. Made from heated milk with natural rennet and the addition of pepsin.	12.71	1.93	0.8	Do.
G. Control made from heated milk with artificial rennet and the addition of lactic ferments.	4.96	2.40	1.5	*Bact. lact. acidi* and *B.* ∝.
H. Made from heated milk with artificial rennet and the addition of lactic ferments and of pepsin.	8.57	1.56	1.2	Do.

A later series of experiments was carried out using 25 gm. of a commercial preparation of trypsin per 100 liters of milk. The action upon cheese made from milk not heated was very pronounced. The results are shown in the following table:

Influence of trypsin in ripening cheese.

	In total nitrogen.		Acidity.	Bacteriological examination.
	Soluble nitrogen.	Nitrogen of decomposition.		
	Per cent.	*Per cent.*		
Control	18.62	8.60	1.3	*Bact. lact. acidi*, *B.* ∝, and *B.* ε.
With the addition of trypsin	44.69	13.94	1.8	Do.

In another experiment in which 1 gm. of trypsin was used in 100 liters of milk the cheese made did not exhibit any difference from the control. It appears that so small an amount of trypsin in the cheese is without influence in the ripening, while 25 gm. per 100 liters, as in the previous experiment, is too much, causing a bitter taste.

It was found that with cheese heated only slightly the addition of pepsin hastened the ripening, as pointed out by Babcock and Russell. The following table shows the results after 4 months with skim-milk cheese heated to only 38° C.:

Influence of pepsin in ripening cheese.

	In total nitrogen.	
	Soluble nitrogen.	Nitrogen of decomposition.
	Per cent.	*Per cent.*
Control	37.29	2.41
With the addition of pepsin	48.57	2.85

A number of speculations are made, but the results are not of sufficient number or uniformity to draw definite conclusions. The most marked indication is that of the much more intense action of trypsin over that of galactase and pepsin.

Assistance offered to cheese factories and creameries in Ontario, F. C. Harrison (*Ontario Agr. Col. and Expt. Farm Rpt. 1900, pp. 70–72*).—Brief notes are given on a number of troubles in cheese factories and creameries due to bacterial infection, and assistance in investigating any such troubles in the Province is offered by the bacteriological department.

VETERINARY SCIENCE AND PRACTICE.

The lymph after intravenous injection of tetanus toxin and tetanus antitoxin, F. Ransom (*Ztschr. Physiol. Chem., 29 (1900), No. 4–5, pp. 349–372*).—The chief object of the author's investigation was to determine the agency of lymph in distributing tetanus toxin and tetanus antitoxin throughout the organism. As experimental animals dogs were chosen, since the thoracic duct could be readily exposed in these animals and the lymph allowed to flow out into receptacles through a canula. Before being operated upon the dogs were treated with morphin and anæsthetized. They were kept in this condition during the experimental period. The lymph was received in glass vessels from the thoracic duct, and the length of time after inoculation was noted. The blood which was studied was taken from the femoral artery. For determining the strength of toxin and antitoxin as found in the lymph or blood, inoculation tests were made with mice. The results of the author's experiments may be summarized as follows: After the tetanus toxin is injected into the blood circulation, a considerable portion of it rapidly passes into the lymph. If the blood and lymph systems are left intact, the toxin is found equally distributed in the blood and lymph 26 hours after injection. If the thoracic duct is opened shortly before the intravenous injection, the toxin content of the blood remains considerably greater than that of the lymph for 6 hours after injection. After injection of tetanus antitoxin (horse serum) into the blood, this substance rapidly finds its way into the lymph. If the thoracic duct is opened, the blood contains more antitoxin than the lymph for a period of at least 6 hours. If the thoracic duct is intact, the antitoxin does not become equally distributed in the blood and lymph after a period of 68 hours, the blood containing during this time considerably more antitoxin than the lymph. No noteworthy changes take place in the toxin or antitoxin while remaining in the blood or in the lymph. The tetanus toxin in the blood circulation behaves like normal inorganic constituents of the blood in so far as it rapidly diffuses itself throughout the organism. The tetanus antitoxin, on the other hand, behaves more nearly like the proteid materials of the blood.

Demonstration of the tetanus bacillus in decomposing bodies of animals killed by tetanus inoculation, W. Rohardt (*Hyg. Rundschau, 10 (1900), No. 8, pp. 376–381*).—The author inoculated guinea pigs and mice with soil containing tetanus spores. After the death of the experimental animals the bodies were placed in dry glass vessels and maintained at a temperature of 5° C. The results of microscopic investigation of these bodies at varying periods after death are stated in a tabular form. In a majority of cases tetanus bacilli were demonstrable either at the point of inoculation or in other tissues of the body. The pin-shaped bacilli were found for a period of 5 weeks after the death of the animals.

Annual report of the Board of Cattle Commissioners, A. Peters, L. F. Herrick, and C. A. Dennen (*Massachusetts State Bd. Cattle Com. Rpt. 1900, pp. 90*).—The chief source of expense was found in the payment of indemnities for tuberculous cattle. The management of the disease by the cattle commissioners falls under the heads of quarantine regulations and testing the entire herd at the request of the owners. A detailed discussion is given of obstacles met with in enforcing the regulations concerning the tuberculin test in interstate cattle traffic. It is stated that numerous specific cases of dishonesty in this matter were determined, and that such behavior on the part of cattle dealers and veterinarians renders the proper enforcement of quarantine laws very difficult. Tables are given showing the results of tuberculin tests on various herds. The statistics of the inspection of cattle and horses are also given.

In 3 cases of glanders guinea pigs which were inoculated with the nasal discharge developed glanders, although no lesions could be found upon post-mortem examination of the horses. It appears, therefore, that the nasal discharge may be virulent before internal lesions are developed.

During 1900 a disease resembling blackleg caused the death of a number of young cattle in different parts of Worcester County. Descriptive notes are given of post-mortem findings of a number of cases and upon cultures of material obtained from the organs of diseased animals. No cases of Texas fever were noted during the year. A few outbreaks of rabies were reported, and 11 outbreaks of hog cholera.

Bovine tuberculosis, H. H. Lamson (*New Hampshire Sta. Bul. 78, pp. 162–178, fig. 1*).—Brief popular notes are presented on the cause, methods, and sources of infection, methods of transmission, diagnosis, and pathological lesions of this disease. When the tuberculin test was applied to the college herd, numbering 55, 8 of the cattle, or 14½ per cent, reacted. Four months later 2 new cases were detected by the same means, and after another 9 months 1 other case was found. All the animals which reacted were found at the autopsy to have well-developed tubercular lesions. Tables are given showing the results of the tuberculin tests in detail.

Several experiments were conducted for the purpose of testing the milk of tuberculous cows by inoculation into guinea pigs. The guinea pigs upon which these experiments were conducted failed in every case to develop tuberculosis. Calves which were fed for 3 months with the milk of tuberculous cows showed no evidence of the disease and did not respond to tuberculin. Microscopic examinations of numerous samples of milk from condemned cows did not disclose the presence of the tubercle bacillus.

The dissemination of tubercle bacilli of cows in coughing a possible source of contagion, M. P. Ravenel (*Jour. Comp. Med. and Vet. Arch., 22 (1901), No. 1, pp. 15–18*).—For the purpose of determining the extent to which tubercle bacilli are present in the sputum of tuberculous cattle, the author constructed a nosebag, near the bottom of which was placed a shelf of soft pine wood, which was sterilized by steam each time before using. This nosebag was then adjusted to the head of tuberculous cattle. By means of this procedure the tubercle bacilli were found to be present in the bronchial secretions of every cow upon which experiments were made. It became apparent during these experiments that cows in coughing atomized their sputum and projected it into the air in small particles, which may float for a considerable period of time. The danger of human infection by means of this atomized sputum is practically confined to such persons as are in constant contact with the animals.

Guinea pigs which were inoculated with material collected from nosebags subsequently developed generalized tuberculosis in 50 per cent of the cases. Guinea pigs which were directly exposed to the breath of tuberculous cows did not become infected.

The repression of tuberculosis of cattle by sanitation, L. Pearson (*Pennsylvania Dept. Agr. Bul. 74, pp. 23*).—Experiments were conducted for the purpose of determining the effect of good and bad stable conditions on the spread and development of tuberculosis. For the experiment 2 herds of 6 cows each were selected. There were 4 healthy and 2 tuberculous cows in each herd. One stable contained 8,970 cubic feet of space and was furnished with smooth walls and fixings which could be kept scrupulously clean. The other stable contained about 3,000 cubic feet of space and dust was allowed to collect in various places in the stable during the experiment. The smaller stable was not carefully cleaned and the cows in this stable were not separated by partitions between their heads. In both stables the animals were arranged so that each healthy cow stood next to a tuberculous animal. The fodder of the 2 lots of cattle was the same during the experiment, and the cows were confined all the time except for a short period once a week, when they were led out to be weighed. The larger stable was kept as clean as possible during the entire experiment. The stalls were cleaned 3 times per day and the partitions and mangers washed with a disinfectant once a day. The floors, walls, ceilings, windows, manger, etc., were scrubbed with water and soap once a week. A bucket was reserved for the use of each cow during the entire experiment.

All of the tuberculous animals gained somewhat in weight during the first part of the experiment. This was probably due to their being dried off as soon as possible and being better fed. In order that the exposure of the healthy cows in the large, light, and well-ventilated stable and in the smaller, dark, and poorly ventilated stable might be the same, the tuberculous cows were transferred from one stable to the other every 10 days. The curious fact was developed from these experiments that the cows in the dark stable gained more in weight during the experiment than those in the light stable.

On the eighty-second day after the beginning of the experiment one of the healthy cows in the light stable and two of the healthy cows in the dark stable reacted to tuberculin. A second test, made 15 months after the beginning of the experiment, showed that 2 of the originally healthy cows in the light stable and all of the originally healthy cows in the dark stable were tuberculous. In the dark stable, which was not furnished with partitions between the heads of the cattle, the tubercle bacilli may easily have been transmitted from tuberculous to healthy cows by contact. Such means of transmission was impossible, however, in the light stable, and it is assumed that infection took place in this stable in the 2 cows which finally became tuberculous by inhaling tubercle bacilli which had been expelled into the air by the coughing of the tuberculous cows.

Treatment of tuberculosis by means of strychnin, V. Galtier (*Jour. Méd. Vét. et Zootech., 5. ser., 5 (1901), Jan., pp. 1–8*).—The author conducted experiments for the treatment of tuberculosis by means of Fowler's solution of arsenic and solutions of strychnin. The experiments were made upon goats, asses, pigs, calves, and rabbits. The experimental animals were infected by feeding with tuberculous material or by intravenous injections. The check animals were infected in the same manner. The results of these experiments may be summarized as follows: The treatment of tuberculosis by the simultaneous use of Fowler's solution and a solution of strychnin indicated some action of these substances in checking the progress of the disease. The experimental animals remained in a better condition of health than the check animals and it was determined that the progress of the disease was much hindered, and that the lesions showed a tendency to disappear. The same treatment adopted for the purpose of prevention increased the resisting power of animals to the disease, prevented the generalization of infection, and brought about a cicatrization or extinction of already-existing lesions. During these experiments it was found that a solution of strychnin given in suitable doses in the food or water, or in subcutaneous injections, had no injurious effects upon the experimental animals. The ass and pig showed an especial resisting power to relatively large doses of strychnin. The guinea pig was much more resistant than rabbits. It is concluded that strychnin in suitable doses may be advantageously administered either alone or associated with arsenic in the treatment of tuberculosis.

Government regulations to be adopted for the eradication of tuberculosis in domestic animals, KÜHNAU (*Berlin. Thierärztl. Wchnschr., 1901, No. 7, pp. 113–120*).—For the government regulation of this disease the author recommends periodical milk inspection, compulsory reporting of tuberculosis of the udder, and destruction and indemnity for such cows, pasteurization of dairy products, control of the manufacture and distribution of tuberculin, and prevention of importation of tuberculous cattle and untreated milk.

The struggle against bovine tuberculosis, B. BANG (*Ontario Agr. Col. and Expt. Farm Rpt. 1900, pp. 81–95*).—A translation by F. C. Harrison of certain portions of Professor Bang's writings on tuberculosis.

A new method of tubercle-toxin treatment, G. LANDMANN (*Hyg. Rundschau, 10 (1900), No. 8, pp. 361–376*).—The author experimented with a compound which he calls tuberkulol. The method of preparation is as follows: Bouillon cultures of tubercle bacilli which have been brought to a high degree of virulence by repeated passages through animals, are filtered, and then the fat is extracted and the bacilli are pulverized. They are then extracted by the fractional method in physiological salt solution, beginning with a temperature of 40° C. and ending with a temperature of 100°.

Numerous experiments were made with this substance on animals and on tuber culous human patients. From these experiments the author concludes that tube kulol is much more active than any similar product produced, and that healthy animals can be immunized by injections of this substance, so that they are protected against subsequent infection from tuberculosis. Satisfactory results were also obtained from hypodermic injections of tuberkulol in tuberculous human patients.

Culture of tubercle bacillus, C. FRAENKEL (*Hyg. Rundschau, 10 (1900), No. 13, pp. 617–630*).—The author records the results of experiments in making cultures of the tubercle bacillus upon a great variety of different media of different reaction, concentration, and chemical composition.

Pathogenesis and therapy of milk fever, C. HEMPRICH (*Berlin. Thierärztl. Wchnschr., 1901, No. 6, pp. 90, 91*).—According to the author, milk fever is caused by a process of autointoxication, which is due to the production of "milk radicals." These milk radicals appear in abundance at the beginning of the process of milk secretion and antagonize the action of the liver. It is not determined whether the milk radicals are derived from the sugar, fat, or casein of the milk. In the treatment of milk fever, the object should be to check the milk secretion until the liver can metamorphose the abundant milk radicals. The author used a modification of the Schmidt treatment, as follows: 0.2 parts pure iodin, 10 parts potassic iodid, and 2,000 parts water.

Lysol in milk fever, F. C. Mason (*Veterinarian, 74 (1901), No. 878, pp. 78, 79*).—The author tested lysol in the treatment of 3 cases of milk fever, with results which indicate that this substance is as effective as chinosol and rather more so than potassium iodid. The udder was cleaned externally, milked out as dry as possible, and then received an injection of a half pint of ½ per cent solution of lysol in each quarter. Treacle was given at the same time as a drench, in doses of 2 lbs. The drench and injection were repeated if necessary, and the cows were not given anything to eat until they manifested a desire for feed.

Preventive inoculation against foot-and-mouth disease, with especial reference to the practical use of preventive serum in hogs and sheep, Loeffler and Uhlenhuth (*Centbl. Bakt. u. Par., 1. Abt., 29 (1901), No. 1, pp. 19–25*).—The authors claim that a protective serum has been obtained which produces complete immunity in hogs and sheep. The serum was found to have similar action in cattle. In one case, where the disease broke out in a herd of 416 sheep, 28 sheep which appeared to be healthy were inoculated 2 days after the appearance of the disease in the herd. Of these sheep 7 were attacked by the disease within 2 days after inoculation, and the author believes that they were already infected before receiving the serum. The other 21 remained healthy, although all the animals which were not inoculated became infected. Similar results were obtained in other outbreaks of the disease in both sheep and hogs. During the author's experiments it became apparent that the organism of foot-and-mouth disease was so small that it readily passed through filters which were fine enough to stop ordinary bacteria. It is necessary to bear this fact in mind in order to obtain a safe and reliable protective serum.

The control of swine plague by inoculation with Höchst serum, Gaertner (*Berlin. Thierärztl. Wchnschr., 1901, No. 10, pp. 165–169*).—The author made experiments with serum manufactured in Höchst in 3 outbreaks of swine plague. Detailed notes are given on post-mortem findings on a number of animals which died of the disease, and it is stated that the differential diagnosis between this and hog cholera was comparatively easy in these outbreaks. During experiments, inoculations with the serum were made in a large number of animals of different ages, and in many cases a cure was effected in animals which seemed to be in the last stages of the disease. The results were not strictly uniform, but the author believes that the disease can be cured in a large proportion of cases by the use of this serum. It is recommended that pigs be inoculated at a young age, in order to prevent the development of the disease among them.

The bacteriology of hog cholera, G. McCarthy (*Bul. North Carolina State Bd. Agr., 22 (1901), No. 2, pp. 23, 24*).—Brief statistical notes on the prevalence of the disease, and a statement of the effectiveness of serum treatment.

Serotherapy and serovaccination in hog cholera, Coremans (*Ann. Méd. Vét., 50 (1901), No. 1, pp. 14–22*).—A general discussion of the problem connected with the treatment of hog cholera. The author made experiments on the preventive and curative properties of serum. The duration of immunity was about 5 months after the first vaccination, and 1 year after the second.

Hog-cholera serum from cows, T. Kitt (*Monatsh. Prakt. Thierh., 12 (1901), No. 5, pp. 193–199, fig. 1*).—Repeated inoculations of virulent cultures in large doses finally produced fatal endocarditis in the cow and hog-cholera bacilli were found in large numbers in the cardiac lesions. After the cow had received 380 cc. of pure cultures, the serum showed a slight retarding effect on the progress of hog-cholera infection in mice. Later a strong serum was obtained fully as effective as that prepared from the horse.

Bacterium coli as the cause of an infectious disease of horses in west Prussia, Piorkowski and Jess (*Berlin. Thierärztl. Wchnschr., 1901, No. 4, pp. 45–

48).—Several serious outbreaks of this disease occurred and were investigated by the authors. The first symptoms were fever, followed by colicky attacks. Some of the horses died within 2 hours. A post-mortem examination disclosed perforating ulcers of the intestines and inflammation of the cœcum. One attack of the disease did not confer immunity to further attacks. The period of incubation was apparently from 8 to 14 days. From affected organs of horses the authors isolated *B. coli* in great quantities and found that it possessed an especially high virulence. An attempt to inoculate a horse by means of feeding this culture was without results. Intravenous injection, however, of the organism caused the death of the experimental animal. In case of further outbreaks of this disease the authors recommend an immediate and complete change of diet.

On the question whether bacteria can penetrate through the wall of the healthy alimentary tract, A. Schott (*Centbl. Bakt. u. Par., 1. Abt., 29* (*1900*), *Nos. 6, pp. 239–255; 7, pp. 291–297*).—This article contains an extended discussion of the literature of the subject in connection with a bibliography. The evidence thus far brought together does not support the belief that pathogenic or nonpathogenic bacteria can penetrate through the wall of the normal intestines.

AGRICULTURAL ENGINEERING.

A text-book of the physics of agriculture, F. H. King (*Madison, Wis.: Author, 1901, 2. ed., pp. XVI+604, figs. 276*).—In this book, as Professor King states, "the aim has been to present to the student who expects to be a farmer some of the fundamental principles he must understand to become successful." The author states that it is his purpose to present these principles from the physical rather than the chemical or biological standpoint, and from that of the general student and farmer rather than from that of more technical scientific agriculture. Nevertheless the book will be found to be a notable contribution to the literature of scientific agriculture in a field which has not heretofore received the attention its importance demands. The introduction deals briefly with certain general physical principles, laws, and factors, a knowledge of which is necessary to an understanding of their subsequent practical application. Other chapters deal with the nature, origin, and waste of soils; chemical and mineral nature of soils; soluble salts in soils; physical nature of soils; soil moisture; physics of plant breathing and root action; movements of soil moisture; conservation of soil moisture; relation of air to soils; soil temperature; objects, methods, and implements of tillage (especially the plow); ground water, farm wells, and drainage; principles of rural architecture, including strength of materials (posts, barn frames, etc.), warmth, light, and ventilation, principles of construction, construction of silos; farm mechanics, including principles of draft, construction and maintenance of country roads, farm motors (animal power, steam and gasoline engines, and windmills); farm machinery (general principles, belting, farm pumps, hydraulic rams); principles of weather-forecasting, including discussions of the atmosphere and its movements, and weather changes.

Cold-storage experiments, J. B. Reynolds (*Ontario Agr. Col. and Expt. Farm Rpt. 1900, pp. 3–7, figs. 3*).—Observations are reported on the amount of ice consumed by absorption through the walls of a refrigerator constructed on the plan recommended by the Dominion government. The refrigerator used had a door at the top opening into an ice-box and another in front opening into the cooling chamber. Three galvanized-iron tubes extended from the ice-box to a trough at the bottom of the cooling chamber. These served to carry off the water from the ice-box and were filled with a mixture of ice and salt in place of the ice in the box when it was desired to reduce the temperature of the refrigerator to a lower degree than could be obtained with the ice alone. A record was kept of the temperature inside and outside of the refrigerator during 20 days. From these data the factor for radiation was calculated to be 4.25, "that is, 4.25 units of heat were absorbed through 1 sq. ft. of wall, floor, or ceiling in 24 hours for each degree of difference in temperature between the outside and inside air." Observations were also made with what is termed the Hanrahan system, the essential feature of which is that the ice house is in connection with the refrigerator, so that there is a complete circuit of air. "The air of the refrigerator, having been warmed by the products stored therein, ascends a flue between the two parts of the building and at the top of the flue passes over into the ice house, where it is cooled and gradually falls to the floor. The ice rests on large slats at the floor and the air is drawn below the ice between these slats toward the refrigerator, and thus the circuit is completed." Observations during 22 days on a cold-storage system of this character, the ice house being $12 \times 12 \times 20$ and the refrigerator $12 \times 10 \times 7$, showed that the average temperature outside of the refrigerator was 68.5°; inside, 43.3°; of the dead-air space, 56.4°. It is thus clear that in order that this system may be effective and economical of ice, it is essential that the insulation should be as perfect as possible.

The quantity of water used in irrigation and the seepage loss from canals, S. Fortier (*Montana Sta. Bul. 29, pp. 44, pls. 10*).—This is an account of investigations made during 1900 in cooperation with this Office under supervision of Elwood Mead, expert in charge of irrigation investigations. Records are given of observations on the amount of water actually used in different cases in the Gallatin and Bitter Root valleys and in Yellowstone County, and on the duty of water in Middle Creek Canal. A study of the losses due to seepage and evaporation on 5 canals and their relation to the duty of water is also reported. "In addition to these investigations it was thought desirable to institute a second series of experiments for the purpose of determining the proper amount of water to apply to growing crops and the proper time to irrigate. It is intended that this series will extend through a period of at least 5 years, during which time the staple crops of Montana can be experimented on with the object of finding out how much water is necessary to produce the most valuable yields and the right time to apply it." The results with oats in 1900 are reported, but on account of the unusually dry season no conclusions are drawn.

A loss from evaporation and seepage of as much as 34.7 per cent of the total supply of water in a canal is reported and the conditions affecting seepage are discussed.

STATISTICS—MISCELLANEOUS.

Sixteenth Annual Report of Maine Station, 1900 (*Maine Sta. Rpt. 1900, pp. 228*).—This is made up of reprints of Bulletins 59–69 of the station on the following subjects: Feeding-stuff inspection (E. S. R., 12, p. 377), fertilizer inspection (E. S. R., 12, p. 324), notes on insects and plants (E. S. R., 12, pp. 312, 367), the Maine Experiment Station (E. S. R., 12, p. 599), feeding-stuff inspection (E. S. R., 12, p. 587), poultry experiments in 1899 (E. S. R., 12, pp. 585, 586), coffee substitutes (E. S. R., 12, p. 586), nut oils (E. S. R., 12, p. 516), testing grass seed (E. S. R., 12, p. 565), potato pomace (E. S. R., 12, p. 587), fertilizer inspection (E. S. R., 12, p. 737), digestion experiments with sheep (E. S. R., 12, p. 873), experiments with insecticides upon potatoes (E. S. R., 12, p. 863), and finances—meteorology—index (E. S. R., 13, p. 290).

Thirteenth Annual Report of Massachusetts Station, 1900 (*Massachusetts Sta. Rpt. 1900, pp. 132*).—This contains a brief summary of station work during the year, including a list of the officers of the station and a list of station publications now available for distribution; a financial statement for the fiscal year ended June 30, 1900; and reports of the chemists, botanists, entomologists, meteorologist, and agriculturist, outlining the work in their respective departments and giving accounts of investigations noted elsewhere.

Seventh Annual Report of Montana Station, 1900 (*Montana Sta. Bul. 28, pp. 24*).—Reports of the director and heads of departments review at some length the different lines of station work during the year. The organization list of the station, a financial statement for the fiscal year ended June 30, 1900, a list of exchanges, and a subject list of station bulletins are included. The reports of the horticulturist and agriculturist are noted elsewhere.

Twelfth Annual Report of New Hampshire Station, 1900 (*New Hampshire Sta. Bul. 79, pp. 38*).—This includes a financial statement for the fiscal year ended June 30, 1900, reports of the vice-director and heads of departments, parts of which are noted elsewhere, for the year ended October 31, 1900, and a list of station publications available for distribution.

Director's report for 1900, W. H. Jordan (*New York State Sta. Bul. 195, pp. 383–398*).—The different lines of station work, with the results obtained, are reviewed at some length. Notes are also given on the station staff, institute and inspection work, cooperative experiments, etc. A list of bulletins published in 1900 is appended.

Eleventh Annual Report of North Dakota Station, 1900 (*North Dakota Sta. Rpt. 1900, pp. 119*).—A brief report on station work by the director, departmental reports, parts of which are abstracted elsewhere, and a financial statement for the fiscal year ended June 30, 1900. Included in the report of the chemist and not noted elsewhere in this issue are analyses of 3 samples of commercial fertilizers, 14 samples of clays and cements, and 2 samples of lime rock.

Statistics of the land-grant colleges and agricultural experiment stations in the United States for the year ended June 30, 1900 (*U. S. Dept. Agr., Office of Experiment Stations Bul. 97, pp. 37*).—A summary of this has already appeared (E. S. R., 13, p. 101).

Proceedings of the fourteenth annual convention of the Association of American Agricultural Colleges and Experiment Stations, A. C. True, W. H. Beal, and H. H. Goodell (*U. S. Dept. Agr., Office of Experiment Stations Bul. 99, pp. 192, pls. 3*).—This is a detailed account of the proceedings of the New Haven convention (E. S. R., 12, p. 404).

Proceedings of the twenty-first annual meeting of the Society for the Promotion of Agricultural Science (*Proc. Soc. Prom. Agr. Sci., 1900, pp. 183*).—Articles published in the proceedings and not noted elsewhere in this issue are as follows: Syllabus for a short course on grasses and other forage plants, by W. J. Beal; University extension methods for the promotion of agricultural knowledge, by I. P. Roberts; Egyptian agricultural institutions, by D. G. Fairchild; Sub-Arctic agriculture, by C. C. Georgeson; The application of agricultural chemistry to the farm, by J. B. Weems; How to teach agricultural chemistry to best combine the science of chemistry with the application of it to the affairs of farm life, by E. B. Voorhees; The course in cryptogamic botany, by L. H. Pammel. The information contained in the following articles has been noted from other sources: The work of the society in agricultural education, by W. J. Beal (E. S. R., 12, p. 599); The chemical functions of certain soil bacteria, by F. D. Chester (E. S. R., 12, p. 729); Meteorological influences on the development of the Hessian fly, by F. M. Webster (E. S. R., 11, p. 476); Some new facts regarding the destructive green pea louse, by W. G. Johnson (E. S. R., 12, p. 861); Effects of artificial foundations on the building of honey comb, by C. P. Gillette (E. S. R., 12, p. 658); and Influence of wheat farming on soil fertility, by H. Snyder (E. S. R., 9, p. 641).

Fifth report of committee on methods of teaching agriculture (*U. S. Dept. Agr., Office of Experiment Stations Circ. 45, pp. 8*).—This report was submitted by the committee at the New Haven convention of the Association of American Agricultural Colleges and Experiment Stations, 1900. The report contains syllabi of courses in agrotechny, rural engineering, and rural economics.

NOTES.

Alaska Stations.—Isaac Jones, who has had charge of the station at Rampart for the past year, has resigned. On his way out from the interior Mr. Jones went over the trail from Eagle to Valdez with a view to obtaining definite information concerning the agricultural prospects in the Upper Tanana and Copper River valleys. The trip from Eagle to Valdez occupied 18 days. He reports that the outlook is very promising, that there are large tracts of agricultural land in that region, that grass is abundant in many places, and that the limited attempts thus far made by prospectors at gardening and grain growing have been very successful. It is hoped that funds may be provided to establish a station somewhere in that region. During the past season a comfortable two-story log house has been completed at Kenai, which will serve as office and dwelling for the superintendent in charge at that place. Two acres of land have been cleared there, in addition to that previously cleared. The work there has been mostly with grain crops, grown on a larger scale than at the other places where tested. At Sitka a four-room cottage and a good-sized barn have been completed. Small plats of grain and a great variety of vegetables, grown with a number of different fertilizers on new and old land, have constituted the principal experimental work. The past season has been unusually dry, both at Sitka and Kenai, so much so as to interfere somewhat with the experiments. It has, however, been favorable to hay making, which this year has presented no difficulties.

C. C. Georgeson, the special agent in charge of the Alaska stations, has returned to Washington, D. C., for the winter.

Florida College and Station.—Work on the new science hall, which was provided for by the last legislature, is progressing rapidly. The building is Spanish in design. It consists of a main building, three stories in height, and two wings at the rear, two stories in height, with a loggia on the first and second floors on the court side. It is expected to cost between $45,000 and $50,000.

Purdue University.—The university has received a donation of $60,000 from Mrs. Eliza Fowler, of Lafayette, Ind., for the erection and equipment of an assembly hall.

Iowa College and Station.—The contract has been let for a new laboratory building for the department of horticulture. The building will be 35 by 50 feet, two stories in height, and built of pressed brick, and will contain a large laboratory room accommodating 30 students, in which practice will be given in grafting, budding, making cuttings, potting plants, and all the practical indoor work of the horticulturist. It will also contain a large fruit room, to be used for instruction purposes, connected with two refrigerators, one for experimental work in cold storage and the other for preserving fresh fruits for study and comparison of varieties. On the second floor a photographic room, dark room, and museum are provided. In the basement are storage rooms for bulbs, grafts, and nursery stock. It is expected that the building will be one of the most complete of its kind in the country. The estimated cost is $6,000, exclusive of heating and plumbing.

Kansas College.—Possession of the Fort Hays Reservation, which was transferred by act of Congress to the State of Kansas for the use of the State Agricultural College and State Normal School, has been delayed by a controversy between the State and settlers on the reservation; but a recent decision of the courts was in favor of the State. The reservation embraces about 7,000 acres of fine prairie land lying directly south of Hays City. The plan of the agricultural college is to convert its share of the land into a model experiment farm of several thousand acres to be used for the purpose of testing drought-resisting crops, such as alfalfa, Kafir corn, soy beans, the various grasses, etc., and the comparison of methods of tillage and treatment. An appropriation of $3,000 a year for this work was made by the last State legislature. In connection with its short courses this winter, the college will offer a course in practical poultry management, to be given in February.

Nebraska University and Station.—A. T. Wiancko, B. S. A., a graduate of the Ontario Agricultural College, and recently experimentalist with the Standard Cattle Company, Ames, Nebr., has been appointed instructor in agriculture in the university and assistant agriculturist of the station.

New Mexico College and Station.—Luther Foster, recently agriculturist of the Wyoming College and Station, has been elected president of the New Mexico College and director of the station. He will enter upon his new duties at once.

North Carolina College.—Watauga Hall, occupied partly as a dormitory, and as dining room and kitchen for the whole college, was destroyed by fire the night of November 29 in the midst of a furious wind. The loss is estimated at about $10,000; the insurance is $600. About 50 students occupying the building lost all of their effects, several of them barely escaping with their lives. Temporary kitchen and dining room arrangements were quickly provided, and college exercises were but slightly interrupted. Plans for rebuilding on a better and larger scale are being considered.

Texas College and Station.—President L. L. Foster, of the Agricultural and Mechanical College of Texas, died at his home at Bryan, December 2, 1901. The board of directors met November 6 at Fort Worth for the purpose of locating the new State experiment station provided for by the recent legislature, for which $10,000 was appropriated. Over 100 delegates were present at the meeting, representing 20 different localities. After a full hearing had been given to all the localities concerned, the board decided that the station should be located in either Smith or Henderson County (east Texas). A special committee was appointed, consisting of 3 members, to decide upon the exact location.

Utah College and Station.—The new cattle and sheep barns are about completed. A soil physics laboratory and an agricultural museum have been started, and a number of improvements and additions to equipment in the dairy department have been made.

A New Experiment Station.—The Epitomist Experiment Station, maintained by the publication known as *The Agricultural Epitomist*, has been established at Spencer, Ind. Operations will be begun on a systematic basis in 1902. The farm of 590 acres includes a variety of land, furnishing an opportunity for experimenting in drainage and irrigation. An orchard and vineyard have been planted and some work commenced in growing corn and potatoes. The station has a poultry department consisting of an incubator cellar, brooder house, poultry houses and yard, and about 800 birds, including different varieties of chickens, Pekin ducks, and Toulouse geese. It also has a few Angora goats, flocks of Shropshire and of Highland blackface sheep, about 20 steers, and 3 litters of pigs. While it is to be presumed that the farm will be operated more or less on a commercial basis, the effort of those having it in charge will be "to help advance and improve agriculture in all its branches."

Personal Mention.—The presentation of a medal to M. Berthelot, the eminent chemist, in the large amphitheater of the Sorbonne, in commemoration of his services to science, occurred November 24. Berthelot's activity during more than half a century has covered nearly every branch of chemistry, and has included a number of important contributions to agriculture. His latest publication, Les carbures d'hydrogène, is a work in three large volumes, comprising an account of his labors on these compounds during the last half century. Some of the other important lines of Berthelot's work have been his researches on the synthesis of natural fats, his discovery of polyhedric alcohols, his investigations on explosives, on the fixation of nitrogen by plants, and in the domain of thermochemistry. The calorimeter bomb, which is coming into considerable use in the study of the fuel value or heats of combustion of foods and feeding stuffs, is a product of his labors in the latter direction.

Dr. Charles P. Strong, assistant surgeon in the Army, has been appointed director of the Government biological laboratory recently established in Manila. His work will be mainly along lines relating to animal pathology.

Prof. A. E. Shuttleworth, formerly chemist of the Ontario Agricultural College and Experimental Farm at Guelph, Canada, has resigned from that institution to accept the position of superintendent and chemist for a Sugar Beet Company, in Ontario, Canada. His assistant, R. Harcourt, has been appointed to fill the vacancy.

Clarence T. Johnston, assistant in irrigation investigations in this Department, will spend the winter in Egypt studying irrigation works and practice in that country. Mr. Johnston will go directly to Cairo, where he will meet the English irrigation officers and make plans for his tour, possibly joining one of the field parties. He will go up the Nile about 500 miles above Cairo, and will inspect the canal systems, levees, dams, etc., including the famous Assuan Dam across the Nile, which is approaching completion. Special attention will be given to pumping machinery, tools used in irrigation work, the maintenance of canals and levees, and similar engineering features. Mr. Johnston will arrive about the time that the Corvee or forced labor enters upon its work of repairing the canals and putting the levees in shape for the season. He will return, probably, some time in February via northern Italy, southern France, and Spain, taking in the irrigated sections of those countries.

Regierungsrath Freiherr Dr. von Tubeuf has been appointed director of the biological section of the royal board of health at Berlin, in place of Dr. B. Frank, deceased.

Prof. Dr. W. Palladin, formerly of the University of Warsaw, has become extraordinary professor of vegetable anatomy and physiology at the University of St. Petersburg.

Dr. E. Eidam, director of the Agricultural-Botanical Experiment and Seed Control Station at Breslau, has retired and has been succeeded by Dr. W. Remer as director, with J. Schleussner as assistant.

B. Minari, agricultural chemist of the soil survey of the Imperial Department of Agriculture and Commerce at Tokyo, Japan, has recently visited this country and gone over the soil work which is being carried on by this Department and a number of the experiment stations. Mr. Minari states that the soil survey of Japan, which was started several years ago, is being actively prosecuted and will eventually cover the whole country.

Miscellaneous.—An office of agricultural information (*office de renseignements agricoles*) has recently been established under the ministry of agriculture of France. It takes the place of the former bureau of agricultural statistics and food products. The object of the office is to collect statistical information in regard to agriculture and agricultural products in France and foreign countries, the market conditions, general agricultural conditions, imports, public sales, agricultural labor, and similar lines; to make practical studies on such subjects as the methods of packing and preserving, transportation, etc., of agricultural products; the conditions of buying and selling, business customs, etc., in France and foreign countries; to prepare monographs on agricultural topics; to collect technical and commercial information of interest to professors of agriculture; and to publish in abstract and otherwise the results of scientific investigations in agriculture in France and foreign countries, and the proceedings of agricultural societies, agricultural syndicates, and similar bodies. The force of the new office has been organized and the work planned, and methods of gathering and publishing data are outlined in a circular addressed to the prefects of departments and to the special and departmental professors of agriculture in France.

The new library and class-room buildings of the Ontario Agricultural College, the gift of W. E. H. Massey, are approaching completion. Mr. Massey has done much to stimulate interest in agricultural investigation, and especially on the animal husbandry side, having given liberal prizes for judging contests at the college in the past. It is with regret that we note his death at this time, on the eve of the completion of the building which his liberality made possible.

A new magazine, entitled *Country Life in America*, has recently appeared, under the editorship of Prof. L. H. Bailey. The purpose of this publication is to represent the present growing interest in country life, from both the ideal and practical standpoints. It will pay especial attention to horticultural matters, but items of current interest and progress along agricultural lines will be noted.

According to a note in *Science* the first number of a journal devoted to biological chemistry, entitled *Beiträge zur chemischen Physiologie und Pathologie: Zeitschrift für die gesammte Biochemie*, and edited by Dr. Franz Hofmeister, professor of physiological chemistry at Strasburg, has recently appeared.

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EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Assistant Director.*

EDITORIAL DEPARTMENTS.

Chemistry, Dairy Farming, and Dairying—The Editor and H. W. Lawson.
Meteorology, Fertilizers and Soils (including methods of analysis), and Agricultural Engineering—W. H. Beal.
Botany and Diseases of Plants—Walter H. Evans, Ph. D.
Foods and Animal Production—C. F. Langworthy, Ph. D.
Field Crops—J. I. Schulte.
Entomology and Veterinary Science—E. V. Wilcox, Ph. D.
Horticulture—C. B. Smith.
With the cooperation of the scientific divisions of the Department and the Abstract Committee of the Association of Official Agricultural Chemists.

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EXPERIMENT STATION RECORD.

Vol. XIII. No. 5.

Less than a year and a half ago the death was noted of Sir John Bennett Lawes, of Rothamsted fame. We are now called upon to record the death of his lifelong coadjutor and friend, Sir Joseph Henry Gilbert, which occurred December 23, 1901. Thus these two men, so closely associated in their scientific work in life, were not widely separated in death. Their remarkable scientific partnership, extending over more than fifty-five years, has hardly a parallel, and their harmonious labors at Rothamsted in the cause of agricultural science have made a profound and lasting impress on the agriculture of the world. The beginning of their labors well-nigh marks the beginning of the experiment station as an institution devoted to investigation in agricultural science, and within their active lives the science of agricultural chemistry has developed and the experiment station has come to be regarded in all civilized countries as a practically indispensable institution.

Joseph Henry Gilbert was born at Hull in 1817, and was therefore in his eighty-fifth year at the time of his death. After attending the University of Glasgow and University College, London, where he devoted special attention to chemistry, he spent some time in Liebig's laboratory at Giessen, where he obtained his doctorate. Upon returning to England, two or three years were spent in teaching and in studying the chemistry of calico printing, dyeing, etc. Dr. Gilbert became associated with John B. Lawes at Rothamsted in 1843, at first superintending the laboratory investigations and later entering more generally into the field and feeding experiments and other investigations. He continued to occupy the position of director of the Rothamsted laboratory to the time of the death of Sir John Lawes, whom he succeeded as director of the Rothamsted Station.

While the opportunity for conducting the Rothamsted investigations was due to the munificence of Sir John Lawes, a large measure of credit for their scientific character and exactness is due to Dr. Gilbert, who gave to them his undivided attention through a long, active life. Indeed, Sir John, in his generosity of spirit, seemed always anxious that full credit should be given his colleague, and often paid tribute to his scientific insight and systematic methods. His high scientific attainments were recognized by many learned societies in his election to honorary membership and to high office. He was appointed Sibthorpian professor of rural economy in the University of Oxford in 1884, and reappointed for a second period of three years in 1887. He was the recipient of many and varied honors, alone and in conjunction with Sir John, and shared in the honor of the jubilee celebration at Rothamsted in 1893, being elevated to knighthood in that year.

Sir Henry Gilbert visited this country on three occasions. In 1882 and 1884 he traveled extensively in the United States and Canada to study the conditions of agriculture; and his last visit, in 1893, will be remembered with much pleasure by all who met him. The series of lectures delivered by him on that occasion, under the provisions of the Lawes Agricultural Trust, was a most interesting and valuable summary of the agricultural investigations at Rothamsted in certain lines during a period of fifty years. Upon the preparation of these lectures and their subsequent publication as a bulletin of this Office, Sir Henry bestowed a great amount of time and pains, and it was evident that he regarded them as possibly the final summing up of his and Sir John's lifelong labors in some of their most important lines.

Of late, although in quite feeble health, Sir Henry took a deep interest in the lectures of Dr. Bernard Dyer, delivered in this country in 1900, and in the final preparation of these for the press. Indeed, Dr. Dyer, in his introduction to these lectures, states that "a very large share of the credit should go to Sir Henry Gilbert, who has spent infinite pains in aiding and advising me in this work." His natural interest in having the results of the soil work at Rothamsted brought together and adequately presented was quickened by the desire to carry out the oft-expressed wish of Sir John Lawes that this might be done. It is gratifying to know that the proof sheets of these lectures reached him over a month before his death, and were a source of satisfaction to him.

The services of these lifelong collaborators at Rothamsted can hardly be separated or individualized. The qualifications of the one strengthened and supplemented those of the other. The application of the results of their combined labors and the influence of Rothamsted on agricultural investigation in general are world-wide. In the history of agricultural science, as in the current literature, each will be best known by the association of his name with that of the other, and for a long time to come the work of "Lawes and Gilbert" will constitute a basis for practice as well as a starting point for further investigation.

The system of agricultural education in England which is carried on under the county councils has never been clearly understood in this country. This is due to the fact that so little has been published which explains the work as a whole, and to the diverse character of the arrangements made in the different counties. It is perhaps incorrect to speak of the undertaking as a system, since there appears to be an entire lack of system, considering the country as a whole, and no advisory or supervisory relations exist between the county councils and the Boards of Agriculture or Education or other central agency. The funds with which the work is carried on are derived under a local taxation act of 1890 and are for technical education, which in most counties is construed to include agriculture. The county councils, in whose hands the administration of the funds is placed, are to a large extent the executive officers of the counties. Each county has been left to work out its own plan for technical instruction under this act. As the matter was largely an experiment, there was quite naturally a variety of opinion as to the best means of carrying out the purpose of the act, especially in providing instruction in agriculture. This accounts for the variety of arrangements which have been made in different counties, the grade of instruction provided, and its efficiency.

A review of this educational work carried on by the county councils is presented in the Annual Report of the Board of Agriculture on The Distribution of Grants for Agricultural Education and Research, 1900–1901. This summary is based upon the reports of the committees on technical education in the various counties of England and Wales, and shows the provisions which have been made for elementary and higher instruction in agriculture. It will be of considerable interest to those who are following the various forms of agricultural education in other countries, and will prove helpful in giving a clearer idea of the aims and methods of this rather unique system.

It is shown that the amount of money available for technical education in England and Wales under the act of 1890, excluding that which went to urban and metropolitan authorities, was about £500,000, and of this sum it is estimated that approximately £77,000 was used for agricultural instruction. While the proportion devoted to agriculture is not large, it represents in the aggregate nearly $375,000, which is a relatively large sum considering either the area covered (one-fourth larger than New York State) or the rural population.

The facilities provided by different county councils vary greatly in extent and character, but in general it may be said that they include instruction of the various grades, from the college course to the agricultural or farm school, and the most elementary courses of lectures or demonstrations, furnished by migratory schools or lecturers; together with the maintenance of demonstration plats to illustrate the culture or handling of various crops. The facilities for higher agricultural education are furnished by a number of universities and agricultural schools or institutes, which receive grants from the various counties and in return provide a certain number of scholarships for students from those counties. The University College of Wales, at Aberystwyth, for example, receives grants from six different counties. The Midland Dairy Institute is a center for a number of counties, and the Southeastern Agricultural College at Wye is supported jointly by the counties of Surrey and Kent.

In a number of counties agricultural or farm schools have been fitted up especially for this instruction, and in this undertaking adjoining counties have sometimes united. These secondary schools are of different grades, some of them covering the whole range of agriculture, others being devoted to dairying, while still others are farm schools, giving much attention to instruction in the practical operations of farming. Five or six counties have provided dairy schools, and at least four have local county farm schools of different descriptions.

The itinerant or migratory schools are a prominent feature of the elementary work in most of the counties. In conducting these each county has selected a certain number of centers, sometimes only two or three, sometimes as many as thirty or more, where the courses are given. These cover a variety of subjects, and evidently differ considerably in character. They usually comprise from five to ten exercises, but in some cases twenty or more. In most of the counties they include a traveling dairy school, and courses of lectures in agriculture and horticulture. Courses in poultry, bee keeping, farriery, cider making, and veterinary science are also common. These lectures often take the form of practical demonstrations, as in the case of dairying, pruning, and farriery. It is mentioned, for instance, that in Somersetshire the farriery van visited fifteen centers, remaining for periods of from two weeks to two months, and giving instruction to seventy-six pupils in all. A further extension of this instruction in "manual processes" includes plowing, sheep shearing, hedging, thatching, and even basket making, in some counties taking the form of competitions.

The forms of this popular instruction adopted in different counties present almost an endless variety. For example, an excursion to Holland was organized by the technical education committee for Essex farmers, for the purpose of studying agricultural education and the organization and practice of the agricultural industry in that country. In the County of Kent boys' gardens are maintained at twenty centers, the small plats being cultivated by boys admitted as pupils, under the supervision of a local instructor appointed by the committee, and prizes awarded by the county superintendent to the most meritorious. Similar prizes for gardens are awarded at other places. A county council garden is maintained on the Isle of Wight, where agricultural instruction is given daily. In Derbyshire "champion" and "ordinary" garden certificates are awarded on the basis of practical work.

The agricultural experiments carried on under the county councils are of a simple character, and for the most part are made for purposes of demonstration. Where this is the case a considerable number of centers are selected, sometimes as many as 30 or 40 in the county. In other instances grants are made to agricultural colleges or schools for the purpose of conducting more technical experiments

The data given as to the attendance indicate that the migratory schools and practical demonstrations have attracted a considerable number of pupils, and that the scholarships provided in the agricultural schools and college courses have been quite largely taken, particularly those in the secondary schools.

To the funds used for agricultural education by the county councils should be added the grants for agricultural education distributed by the Board of Agriculture. These amounted in England and Wales in 1899–1900 to £7,850, and the beneficiaries included ten institutions of the college or institute grade providing the higher forms of agricultural instruction. These were for the most part institutions which are being utilized by the county councils for the advanced courses. During the year there were upwards of seven hundred students receiving instruction at these agricultural colleges and dairy institutes. Of this number one-half were taking regular courses in general agriculture or special branches, while the remainder were attending the shorter courses, usually in dairying or poultry keeping.

After reviewing the various agencies for agricultural instruction in England, Major Craigie, the author of the report, concludes that although there may be some question as to the symmetry and uniformity of these varied facilities provided by central and local effort, the provision made for agricultural instruction is relatively as extensive as in other countries, considering the proportion of the population directly engaged in agriculture. The most material advance to be hoped for, he believes, is "that greater use may be made of the various existing types of educational facilities by the classes for whose immediate instruction they have been provided."

It will be a matter of surprise to many to know that over $400,000 of public money is expended annually for agricultural instruction in England and Wales. It may, perhaps, be questioned whether the plan of management by the county councils, which are bodies of men with a multitude of other duties of varied character similar to those of the county commissioners or supervisors in some of our States, has resulted in building up as strong institutions of various grades and as symmetrical a system of instruction as would be possible under a central agency. Under the circumstances it was probably the part of wisdom to give prominence to the elementary side of the instruction at the outset.

CONVENTION OF ASSOCIATION OF OFFICIAL AGRICULTURAL CHEMISTS, 1901.

D. W. May,

Office of Experiment Stations.

The eighteenth annual convention of the Association of Official Agricultural Chemists met in the lecture hall of the Columbian University, Washington, D. C., November 14, 15, and 16, 1901. The meetings were presided over by the president, L. L. Van Slyke.

In his address the president reviewed the causes which led to the creation of the association and the lines along which it has advanced. The expansion of the work has been very large, not only in amount but in character. Personal initiative has been the prime factor in advancement. From the consideration of methods of analysis the work has grown more into lines of original investigation. Something must be done tôward identifying the individual compounds, he declared, before effective methods can be provided for their estimation. He believed that the association should encourage research in all lines, with the study of methods as a secondary consideration. He called attention to the need of a much broader preparation for work by agricultural chemists. An analyst, simply, is not fitted for research work. We are being drawn more into the untried fields of life chemistry, and must take up the solution of questions that partake more of the character of advanced science. The time of the association, he believed, should be taken up more with the discussion of lines of investigation and less with methods of analysis. The special investigations of different stations should be subjects for consideration before the association. More concise reports by the referees on methods of analysis were considered advisable, and he counseled care in selecting referees for this work. Reference was made to the death of Dr. John A. Myers, a former president of the association, and the suggestion made that an evening session be held to consider his life work and to adopt suitable resolutions.

In accordance with this suggestion the association met at the Cosmos Club the evening of the first day, and adopted resolutions in recognition of Dr. Myers's services and the esteem in which he was held in the Association.

FERTILIZERS.

Nitrogen.—In the absence of the referee, W. R. Perkins, the report was read by E. B. Ferris. The work during the past year was a continuation of trials of the neutral permanganate (Street) and alkaline permanganate (Jones) methods for determining available organic nitrogen. In submitting the results obtained and the comments of the different analysts, the referee suggested that the time of digesting, in determining total nitrogen, receive the attention of the association, as samples with a high nitrogen content do not give uniform results after digesting three hours. While the results by the neutral permanganate method did not agree perfectly, the method was regarded as of value in distinguishing between the different grades of nitrogenous material as determined by vegetative tests. The referee submitted several minor modifications, and recommended that the method with these modifications be adopted provisionally, and that the alkaline permanganate method be further tested. These recommendations were adopted by the association.

Potash.—In the absence of the referee, C. L. Hare, the report was read by B. B. Ross. The accuracy of the Lindo-Gladding method in case of mixtures of acid phosphate and potash salts was investigated, and also the use of ammonium chlorid as a possible aid in securing complete solution of the potash, and a method devised by the referee, employing milk of lime for precipitating potash from neutral solution. A mixture of potassium chlorid and acid phosphate in the proportion of 5 to 95, the theoretical amount of potash present being 3.35 per cent, gave the following average results: Lindo-Gladding method, 3.12 per cent; the Lindo-Gladding method with ammonium chlorid, 3.19 per cent, and the milk of lime method, 3.15 per cent. While the addition of ammonium chlorid gave higher results, these do not warrant the conclusion that this addition is an advantage. The large amount of ammonia salts left after expelling the sulphuric acid may cause loss from sputtering. Special attention was called to the results obtained by the milk of lime method, the details of manipulation of which were given, and the results in comparison with the Lindo-Gladding method with a large number of fertilizers containing organic materials were shown. From the results of his investigations the referee suggested that the cause of the low results obtained by the official method be further investigated, and that the milk of lime method be submitted for trial during the coming year. These suggestions were adopted.

Phosphoric acid.—In the absence of the referee, H. K. Miller, the report was read by E. G. Runyan. The work on phosphoric acid consisted in testing the determination of total phosphoric acid by the official gravimetric method in comparison with the volumetric, and the determination of iron and alumina by the acetate and the molybdate methods. From the results of the past two years and the referee's experience with the modification of the volumetric method as proposed by Runyan, he considered it not only rapid but capable of giving highly satisfactory results. But few results were reported on iron and alumina, and those obtained were quite variable. With basic slag they were not at all concordant, the manganese present interfering with the determination. With ground phosphate and a mixture containing iron and alumina the acetate method as modified by Carpenter gave quite satisfactory results, but as the data on iron and alumina were meager, no conclusions were drawn or recommendations made. The desirability of the association taking some action on a method appplicable to Thomas slag was urged. The referee considered some form of the citric-acid method advisable, and the Wagner method as worthy of the most favorable consideration. The use of the term "available phosphoric acid" was deemed unwise. As phosphoric acid is in different combinations in many materials, it was not thought probable that a single method would apply in all cases.

H. A. Huston discussed the determination of iron and alumina. He stated that results by present methods are worse than those obtained ten years ago. He suggested taking up the study of new methods, believing that the correct estimation of these elements is possible, but that it is necessary for the association to proceed along new lines.

No recommendations were adopted, but from the discussion it seemed to be the sense of the association that the referee take up the study of methods for basic slag. Digestion with citric acid was considered a proper basis upon which to proceed.

SOILS.

The report on soils by the referee, M. E. Jaffa, was read by the secretary. The work of the past year related largely to methods of determining available plant food, the citric-acid method and that of fifth-normal hydrochloric acid for available potash and phosphoric acid being studied. The results for potash were too meager to allow of a definite recommendation. The tentative conclusion was reached that any soil showing 0.02 per cent of K_2O by either of the above methods is not in pressing need of potash fertilizers. More work along this line is urgently desired, and attention was called to the fact that the citric-acid method should not be discarded without further investigation. Similarly, no definite conclusions were reached with phosphoric acid. The work along the line of humus and humus nitrogen was for the purpose of determining the relation, if any, which exists between the nitrogen extracted by ammonia and that contained in the NaOH and KOH leachings. The comparison of humus nitrogen extracted by NH_3 and NaOH solutions was not very satisfactory. There was an agreement between some of the results for the nitrogen by NaOH, but those by the NH_3 solution were not concordant. The amounts of nitrogen dissolved by KOH and NaOH were identical, but in the case of 3 samples in which the percentage of humus was high the amounts of nitrogen dissolved by KOH and NaOH were comparatively low. The referee recommended more extended investigation along this line by a committee, with the referee on soils as chairman.

The Rothamsted method of sampling soils was described, and several objections pointed out. The method is deemed less applicable to the larger part of the arable lands of California than the use of a post-hole auger, as adopted by Hilgard. The latter method requires less work and less time for taking the sample, the exact point of change from surface to subsoil can be ascertained, and much less bulk has to be handled. In view of the necessity of a rational system of sampling soils, and of a method for determining the available plant food, the referee suggested that a committee be appointed for the consideration of these subjects.

W. A. Withers presented a paper on the rate of nitrification of various nitrogenous materials. W. Frear requested the consideration of the subject of determining the proportion of soluble humus in alkali soils, and made a statement of some of the results obtained at the Pennsylvania Station.

F. K. Cameron brought to the attention of the association a paper by A. Seidell on the Chemical examination of alkali soils, published as a bulletin of the Division of Soils (see p. 428). He moved that the article as printed, or modified as might be deemed necessary, be referred to the committee on recommendations, with the view that it be accepted as the official method for the chemical examination of alkali soils.

C. G. Hopkins stated that in the work on soils in Illinois there has been trouble in the separation of alkalis. After precipitating the barium hydroxid and the calcium and barium by means of ammonium carbonate, the final filtrate was found to be by no means free from barium. To overcome this error the official method was modified by precipitating the last traces of barium with ammonium sulphate. A sufficient quantity of this latter is added so that in the ignition of the residue the alkalis are converted to sulphate and rendered less liable to volatilization.

The association adopted provisionally the method followed at the Illinois Station for soil sampling, and authorized the appointment of a committee to study methods of soil sampling. The determination of potash in soils was referred to the referee for the ensuing year, and also methods for determining soluble constituents in alkali soils. It was recommended that the referee take up the subject of the mechanical analysis of soils and report at the next meeting, and also consider the determination of available plant food in soils.

ASH.

The report on ash was read by the referee, G. S. Fraps. The work during the past year was continued on lines previously followed, viz, the methods of preparing the ash. The point to which special attention was given was whether sulphur or potash is driven off when the substance is incinerated with calcium acetate in an open dish. Two methods were tested for determining sulphur, one using calcium acetate and the other being a modified nitric-acid method. From results submitted the conclusion was reached that the calcium acetate method does not give correct values for sulphur, although the results agree to a certain extent, the loss being due to the escape of organic sulphur compounds rather than to the volatilization of sulphates. The nitric-acid method, with certain modifications proposed by the referee, gave fairly satisfactory results. With potash the conclusion was reached that the calcium acetate method does not give correct results when an open dish is used, and probably not in a closed dish. The following recommendations were made: (1) That the title of this section be changed from "Methods for the analysis of ashes" to "Methods for the determination of inorganic plant constituents;" (2) that the modified nitric-acid method for determining sulphur in plants be adopted as a provisional one; (3) that the determination of chlorin be omitted until a method can be devised which will give more accurate results; and (4) that the determination of potash by ignition of the substances with sulphuric acid, as in the determination of potash in fertilizers, be adopted as an alternate method. These recommendations were adopted, and the referee was instructed to consider further the acetate method for the determination of sulphur in plants.

FOODS AND FEEDING STUFFS.

The report on foods and feeding stuffs was read by the referee, W. H. Krug. But little work was done along this line during the year. The results reported relate to the determination of moisture, starch, pentosan, and galactan. The recommendations of the referee dealt mainly with minor changes, leading to more exact methods. It was recommended that the method used for drying sugars be adopted as optional for the drying of feeding stuffs. With the phloroglucin method it was recommended that instead of using 3 gm. of material a quantity of the material be chosen so that the weight of the phloroglucin obtained shall not exceed 0.3 gm. A number of other minor modifications of this method were suggested.

A paper on the determination of pentosan-free crude fiber was presented by G. S. Fraps. The result of a test of König's method, with modifications, for determining pentosan-free crude fiber was reported. The method is found to be much shorter than the official one, the substance being digested, filtered, and washed in 3 hours. It has the following advantages: It yields a fiber practically free from pentosans, the manipulations are less complicated, and the time is shortened. It requires further study, however, in its application to cotton-seed meal. The author suggested that it be further studied by the referee.

The use of air in moisture determination, except in substances containing drying oils, was referred by the association to the referee for further study. In the diastase method for starch, 20 cc. was adopted instead of 40 cc. in digesting with malt extract. In neutralizing, sodium hydrate in a cooled solution was adopted in lieu of sodium carbonate while hot. Instead of being digested over night with malt extract, 2 or 3 hours was adopted. The recommendation for the phloroglucin method was adopted, and several other minor modifications were made. It was recommended that the referee take up the study of the König method for the determination of crude fiber.

LIQUOR AND FOOD ADULTERATION.

The report on liquor and food adulteration was submitted by the referee, W. D. Bigelow. At the last meeting of the association this subject was divided under 15 heads, with an associate referee for each subject. Thirteen reports were combined in a report which had been submitted to 106 chemists. With some minor changes, it was suggested that these reports be printed as a separate bulletin and the methods suggested be made provisional for the present. This recommendation was adopted by the association, and the title of this subject was changed to referee on food adulteration.

W. B. Alwood made a report to the association on the work carried out at the Virginia Station on the fermentation of cider. In promoting this line of work he suggested cooperation between the horticulturist and the chemist. The study relates mainly to the micro-organisms and their action. The principal object to be kept in view in this investigation is the determination of methods for controlling the fermentations in order to obtain definite and uniform products.

DAIRY PRODUCTS.

The report on dairy products was made by the referee, J. A. Le Clerc. The work during the past year has been along two lines: (1) Determination of albumin in milk, and (2) detection of renovated butter. The methods of determining the casein in milk are now very satisfactory, but the determination of albumin by different chemists has not given concordant results. In previous work along this line various substances were used for precipitating the albumin. This year the albumin was obtained solely by means of heat, it being believed that there is no distinctly albumin precipitant. The results of the various analysts are reported, and attention called to the importance of the association making a more systematic study of the nitrogen compounds in milk. No definite conclusions were drawn, but it was recommended that the work on the determination of albumin in milk be continued.

In the detection of renovated butter six methods were followed. It was the intention when the reports were all in to send out other samples, using only those methods which gave the best results. From the work as far as reported it has been found possible to determine whether the sample is or is not genuine butter. If it is not genuine butter, the ordinary chemical methods for the examination of the fat will show whether the sample is oleomargarine or renovated butter. No recommendations were made, and it was suggested that the work along this line be continued during the coming year.

G. E. Patrick read a paper on the determination of oleomargarine and renovated butter, embodying the results obtained in the Department chemical laboratory.

SUGAR.

The report on sugar was made by the referee, E. E. Ewell. He considered it more important to devise new methods for sugars than to test and try to eliminate the deficiencies of old ones. He stated that there were several important lines of work which ought to be taken up, and called attention to the great need of an official method for sugar beets. No recommendations were made except in reference to the division of the work. These were that (1) there be a referee for optical methods, (2) a referee for the determination of reducing sugars, and (3) a referee for the study of the analytical methods of the sugar industry. These recommendations were adopted.

TANNIN.

The report on tannin was read by the referee, W. K. Alsop. Four samples of tanning materials were sent out for testing by the official method and by the chromed hide powder method. A summary of the results of the cooperative work was given, and also the opinion of the various analysts. The referee concludes from these that (1) the results obtained by the use of wet chromed hide powder are more accurate than those with unchromed hide, (2) more concordant results can also be obtained in the use of the weaker solutions, (3) the method of drying has not much influence on the tannin result when the determinations are made in the same manner, and (4) the determination of soluble solids is a weak point and some method should be adopted which chemists will follow. The greatest objection to the method of using wet chromed hide was stated to have been the length of time required, which is 3 days; but by a series of experiments the referee found that there was no necessity for chroming hide longer than 1 day. He urged, therefore, that the chroming of hide powder 24 hours with 3 gm. of chrome alum per 100 gm. of hide powder be made the official method, and also advocated a provisional method for dry chromed hide, to be carefully experimented with during the coming year. In making up the solution of tanning materials it was recommended that an amount be taken sufficient to furnish 0.35–0.45 gm. of tannin per 100 cc. instead of 0.8 gm. of solids, as at present. In evaporations 50 cc. was considered too small, and 100 cc. was therefore advocated for obtaining all residues. A number of modifications were recommended in the official method.

A report of the meeting of the International Association of Leather Trades Chemists, which met at Liege, Belgium, on August 28, was made by W. H. Krug. The changes in the methods used by that Association were (1) the adoption of Freiberg hide powder, the maximum cellulose content to be 20 per cent and the manufacturer to mark each delivery with the percentage it contains; (2) the adoption of the Official Agricultural Chemists' method for used tanyard liquors. The chromed hide powder method was not very favorably considered by the International Association. In conclusion the speaker read a letter from H. R. Proctor on the correction for the absorption of the filter paper in the determination of the soluble solids, and suggested that it be made the subject of an investigation by the referee for the ensuing year.

Minor changes were made in the wording of the methods to cover the recommendations of the referee. The wet chromed hide powder method was adopted in lieu of the one now followed, and the dry chromed hide powder method was adopted as an optional one. The determination of the acidity of tan liquors was recommended for study during the ensuing year.

INSECTICIDES AND FUNGICIDES.

The report on the majority of these materials was made by the referee, L. A. Voorhees. The past year was the first year in which any analytical work of a cooperative nature has been undertaken on these materials. The results obtained by 22 analysts were reported in detail. As they were somewhat meager, the referee did not make any specific recommendations, but called the attention of the association to the following considerations: (1) That the detection and determination of formaldehyde does not properly belong to the referee on agricultural insecticides and fungicides; (2) that the content of cyanogen in cyanid of potash is of interest, but for fumigating the determination of impurities and the character of gases which they supply will be of more value; (3) that the purity of lyes for the home making of insecticide soap is of importance, but as to the soaps themselves there is much in their analysis that is of no importance to the entomologist. It was suggested that much of the matter of minor importance in the work of the referee as reported be eliminated in order to lighten the labor of his successor. With this modification it was recommended that the methods reported be continued.

The report on arsenical insecticides was made by the associate referee, J. K. Haywood. The work of determining arsenic in Paris green was reviewed, and reasons given for choosing the methods tested. These were the sodium acetate method, as the best at the present status of the analysis of Paris green for finding the arsenic content, and the water-extraction method for showing to some extent the stability of Paris green, as giving an idea of its action in orchard practice. But few results were reported. The associate recommended that the above methods be adopted provisionally, and further tested during the coming year.

L. L. Van Slyke stated that in analyzing Paris green it should be borne in mind that arsenic in soluble form is injurious to foliage, when present beyond certain amounts. The method adopted should apply to the question of determining the danger from the application of arsenic to foliage. In the speaker's laboratory a 10 per cent mixture in water is made of the Paris green, and if, after 24 hours, the amount of arsenic in solution is insufficient to damage foliage, the product is considered all right. J. K. Haywood stated that the soluble arsenic present does not go into solution under 24 hours. The result more closely approximating its action in practice is its stability as determined by its contact with water.

The sodium-acetate method for the determination of the arsenic content of Paris green, and the water-extraction method for showing the stability of Paris green, were adopted as provisional methods, and the association directed further investigation along these lines. No formal recommendations were made in regard to cyanid and formalin, but the referee was instructed to test the cyanid process for estimating the latter.

MISCELLANEOUS.

The report of the abstract committee was made by E. W. Allen. The work during the past year was outlined, which consisted of the publication of abstracts of methods of analysis, prepared by the members of the committee, in this journal. As this abstracting can be followed up by the force in the Office of Experiment Stations, the work was turned over to that Office and the committee discharged.

In view of the fact that the object of the committee on volumetric standards had been accomplished in the establishment of the Bureau of Standards, that committee was discharged. The report of the committee on food standards, defining the meaning of terms, was made by W. Frear.

The report on fertilizer legislation was presented by H. W. Wiley, and attention was called to the need of a national law covering this industry.

The constitution was amended so as to place the appointment of the referees and associates at each annual meeting in the hands of the executive committee instead of the president. The clause relating to membership was changed to read: "All persons eligible to membership shall become members *ex officio*," etc. Section 7 was amended so as to apply to all analysis in official inspection.

A resolution was adopted providing for three committees on recommendations instead of one. These were (1) to receive recommendations on the subjects of phosphoric acid, potash, nitrogen in fertilizers, soils, ash, and insecticides; (2) on dairy products, foods and feeding stuffs, sugar, and tannin; and (3) on food adulteration.

No new method or modification of an existing method is to be submitted by a referee for general test by the association until it has been tested by him with favorable results.

A resolution was adopted welcoming the action of the State dairy and food commissioners in appointing a committee to present its views upon food standards to the association.

The executive committee was asked to consider the subject of the division of the work on nitrogen.

The president elect was authorized to appoint the new committee on recommendations of referees for the succeeding year during the sittings of the convention, and a recommendation was adopted looking to an earlier report upon the recommendations of the referees.

OFFICERS OF THE ASSOCIATION.

The following were elected as officers for the coming year: President, H. J. Wheeler, Kingston, R. I.; vice-president, R. J. Davidson, Blacksburg, Va.; secretary, H. W. Wiley, Washington, D. C.; additional members of executive committee, C. G. Hopkins, Urbana, Ill., and F. D. Fuller, Geneva, N. Y.

The referees and associate referees selected for the year have not yet been announced by the executive committee.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

Proceedings of the fifteenth convention of the Association of Agricultural Experiment Stations in the German Empire (*Landw. Vers. Stat., 56 (1901), No. 1, pp. 1–79*).—The fifteenth annual meeting of this Association was held in Bonn, September 14 and 15, 1900, Prof. F. Nobbe presiding.

Among the subjects considered in relation to fertilizers were the determination of phosphoric acid in Thomas slag, the perchlorates in saltpeter, the potash content of potash salts, and the purity of magnesium pyrophosphate obtained in the analysis of slag. The subject of food analysis was confined mainly to the examination of molasses feeds, attention being given more especially to the determination of fat, molasses, and water content. In seed testing there were considered methods of testing and effect of mechanical injury upon the germinating quality. Among the general subjects discussed were the changes in atomic weights, and the condition and needs of the agricultural experiment stations.

The methods of analysis of Thomas slag were considered at some length, especially the limits of variability allowable in the citrate-soluble method. The latitude adopted for citrate-soluble phosphoric acid in Thomas slag was 0.5 per cent.

A report was submitted upon the purity of magnesium pyrophosphate obtained from phosphatic slag by the direct and by the molybdate methods. A table showing comparative results of the 2 methods was given. It was found that by the molybdate method too high results were obtained when the yellow precipitate was allowed to stand a certain time before filtering. This period in which the error occurred fell between 1 and 5 hours. It was recommended that the Wagner method be further studied, as to the influence of the time elapsing between the removal of the molybdate precipitate from the water bath and its filtration; also, the influence on the result of adding a greater or less excess of magnesia.

The methods of analyzing molasses feeds were discussed at some length. Neubauer's methods of determining molasses in such feeding stuffs was adopted provisionally.

The subject of the composition of sugar-beet molasses was presented by Kellner. This considered the sugar and the nitrogen content of the usual refinery molasses with and without the presence of cane sugar, and the residual molasses from the strontium process. The results of the various analysts were given. The nitrogen content of the dry matter of ordinary molasses averaged 2.16 per cent; of the residual molasses from the strontium process 0.69 per cent.

Schulze discussed the water content of molasses feeds and recommended it as a subject for further study.

A report on molasses feeds was made by Emmerling, and the nitrogen content, fat, dry matter, sugar, molasses, and water content discussed. The quality and the composition of the various feeds appearing from time to time and their microscopic examination was later considered.

No changes of any importance were made in the methods of seed testing.

Some consideration was given to an improved method of potash determination, a paper on the subject being submitted by Schulze. The Neubauer method (E. S. R., 12, p. 714) was assigned for further testing.

The question of international atomic weights was discussed by Fresenius.

The subject of the condition and needs of the agricultural experiment stations was treated by König. Among the questions submitted for the consideration of the association were the overburdening of the stations by control work, so as to seriously hamper their experimental studies; the deficiency and the training of able assistants; the desirability of closer cooperation with the Association of German Scientists and Physicians; the improvement of the reports of the stations, and certain deficiencies in experimental work and in the applications of the results.

Proceedings of the committee on foods and feeding, of the Association of Agricultural Experiment Stations in the German Empire (*Landw. Ver. Stat.*, *56* (*1901*), *No. 1*, *pp. 81–94*).—This committee, composed of Messrs. Emmerling, Kellner, Loges, Schulze, and Weigmann, met in Berlin, February 11, 1901. The subjects considered were the preparation of food samples for analysis, the drawing of samples, the microscopic examination of rape cake, molasses feeds, the addition of phosphoric or sulphuric anhydrid in nitrogen determination, the tax on ether used by the stations, and the microscopic examination of foods.

The passing of all food materials for analysis through a millimeter sieve was made obligatory. A few minor changes were made in methods of drawing samples. With molasses feeds there were discussed the water content, the relative value of the proteid and non-proteid nitrogen, and the quantitative estimation of total and of invert sugar. A paper on the optical and gravimetric estimation of sugar in molasses feeds was presented by Schulze. The report on the addition of phosphoric or sulphuric anhydrid in nitrogen estimations was made by Kellner. Upon motion of the referee the method was referred to the committee for further study in comparison with the Gunning method.

A rapid method of determining carbonic acid in air, J. Haldane (*Jour. Hyg.* [*Cambridge*], *1* (*1901*), *No. 1*, *pp. 109–114*, *fig. 1*).—This method involves the use of a specially constructed apparatus, which is figured and described. A sample of the air is drawn into a gas burette, driven backward and forward through a potash solution, and again measured after the absorption of the carbonic acid. The difference between the 2 readings gives directly the number of volumes of carbonic acid per 10,000 in the sample of air. Trials show that the method is reliable to about 0.5 volume per 10,000, a degree of accuracy sufficient for most practical purposes.

The advantages of the method are that the apparatus can be easily carried about, an accurate result can be obtained in about 5 minutes, and no calculations are involved.

On the determination of humus in cultivated soils, K. Bieler and K. Asō (*Bul. Col. Agr. Imp. Univ. Tokyo*, *4* (*1901*), *No. 4*, *pp. 237–240*).—This article reports comparative tests of the accuracy of the determination of humus by means of (1) elementary analysis, (2) Knop's method, (3) Snyder's extraction method (E. S. R., 5, p. 932; 6, p. 691), and (4) Aschman and Faber's volumetric method (E. S. R., 11, p. 110). The results obtained indicate that the figures given by elementary analysis are too high. The amount of humus yielded by the extraction method was only 71 per cent of that indicated by elementary analysis. The percentages of humus found in the air-dry soil by the different methods were as follows: Elementary analysis 13.84 per cent, Knop's method 8.85 per cent, extraction method 9.79 per cent, volumetric method 6.95 per cent. The methods are to be further tested on different kinds of soils.

The determination of phosphoric acid in soils as ammonium phosphomolybdate by means of the centrifuge, E. Gully (*Chem. Ztg., 25 (1901), No. 39, pp. 419–421; abs. in Chem. Centbl. 1901, I, No. 25, p. 1342*).—This article reports tests by A. Baumann of the applicability of the Götz method described by Wedding[1] to the determination of phosphoric acid in soils. The essential features of the method are the precipitation of the phosphoric acid as ammonium phosphomolybdate in a graduated centrifuge cylinder; the separation of the precipitate by 4 minutes centrifugating at the rate of 1,100 to 1,200 revolutions per minute; and the reading of the volume occupied by the precipitate and calculating the results. A satisfactory agreement of the results by this method and by the gravimetric method in case of 63 samples of soil is reported.

A claim of priority regarding the determination of phosphates in potable waters, C. Lepierre (*Bul. Soc. Chem. Paris, 3. ser., 25 (1901), No. 16–17, p. 800*).—The author states that the method recently described by Woodman and Cayvan (E. S. R., 13, p. 319) is exactly the same as that described by him in a communication to the second International Congress of Applied Chemistry in 1896 (E. S. R., 10, p. 16).

Determination of calcium and magnesium in natural waters, L. W. Winkler (*Ztschr. Analyt. Chem., 40 (1901), pp. 82–92; abs. in Jour. Chem. Soc. [London], 80 (1901), No. 463, II, p. 347*).

The determination of ammonia, nitric, and nitrous acids in natural waters, L. W. Winkler (*Chem. Ztg., 25 (1901), No. 55, pp. 586, 587*).—The methods used by the author are given in detail, being a revision of methods previously described.[2]

Determination of dissolved oxygen in waters in presence of nitrites and of organic matter, S. Rideal and C. G. Stewart (*Analyst, 26 (1901), No. 303, pp. 141–148; abs. in Chem. Centbl. 1901, II, No. 3, p. 232*).—A series of tests are reported which, in the authors' opinion, show that by their modified Winkler process—oxidizing with permanganate in acid solution, out of contact with air, in ordinary stoppered bottles of known capacity, adding soda and potassium iodid solution and determining the liberated iodin with thiosulphate and starch—it is possible to ascertain with accuracy the amount of free oxygen rapidly in highly colored and polluted field waters.

An improved method for the rapid estimation of sugar in beets, R. S. Hiltner and R. W. Thatcher (*Nebraska Sta. Rpt. 1900, pp. 49–69*).—Attention is called to the need in plant breeding, and also in factory operations, of a rapid method for estimating the sugar in beets. Present methods give satisfactory results, but are liable to certain errors which increase with more rapid manipulation. The authors propose a modified method which they have found to give very accurate results. The factors used are those required by the Schmidt and Haensch polariscope, although other instruments may be used by changing the factors accordingly.

While all beets do not contain the same percentage of water, it does not vary within very wide limits. In a long series of determinations made at the Nebraska Station during several years, the water content in nearly all cases varied between 80 and 84.5 per cent. From these results the authors state that it is possible to assume an average factor which would not vary from the true amount of water above 2 per cent, except in very rare cases. This maximum of error will not change the dilution of the sugar solution enough to create any appreciable difference in the polariscope reading. The method of determining the water content of the beets is given, and from an average assumed factor the authors construct a table showing, at a glance, the desired volume of water to be added in analysis. In carrying out this method

[1] Stahl und Eisen, 7 (1887), p. 118.

[2] Chem. Ztg., 23 (1899), p. 454.

the cold aqueous diffusion is employed. The sample is reduced to very fine pulp, placed in a tared capsule, weighed, and the amount of water as ascertained from the table is added. As the solution must be clarified as well as made up to a definite volume, there is previously added to the water 3 per cent of a solution of lead subacetate of 54.3° Brix, or specific gravity, 1.257. If acetic acid is used it may also be added to the water. The capsule containing the pulp properly diluted is covered with a disk of wood or glass inclosed in a sheet of rubber to make it fit closely, and vigorously shaken. The mixture is then poured on a dry filter and the operation carried out as usual.

This method was employed with 60 samples. The water factor assumed in preparing the table was 82 per cent. Only 5 samples showed a variation from results obtained by the hot aqueous diffusion above what might be expected in the analyses of duplicate samples by the same method. These 5 samples, which were too low by 0.2 per cent or more, were all of very low grade beets, in which there was an unusual amount of water.

For rapid work an automatic self-registering balance should be used. The capsules should be of the same weight, aluminum being a very desirable metal to be employed in their construction. The burette should be constructed so that it will fill automatically.

As the indirect method of analysis is now generally used in factories this proposed method was tried in that way, using the factor 85 for making the calculation. As compared with two other methods the proposed method was found to be applicable in indirect analysis. The advantages of the proposed method are that no specially constructed apparatus is necessary and it is susceptible of great speed of manipulation.

An improved method for the rapid estimation of sugar in beets, R. S. Hiltner and R. W. Thatcher (*Jour. Amer. Chem. Soc., 23* (*1901*), *No. 5, pp. 299–318*).—This is noted above from another source.

Determination of purity of beet juice by Krause's method, F. Ehrlich (*Ztschr. Ver. Deut. Zuckerind., 1901, pp. 3–16; abs. in Jour. Soc. Chem. Ind., 20* (*1901*), *No. 3, p. 268*).—The author made a number of experiments to determine the influence of various factors, as temperature, time of digestion, fineness of pulp, etc., on the purity of beet juice, as given by Krause's method. It was found that the temperature of digestion has an important influence on the quotient of purity. With increase of temperature, the density of the juice obtained increases, the polarization remains constant, while the quotient of purity diminishes. The fineness of the pulp has no effect on the result. As the time of digestion of the pulp increases, the amount of dry substance increases, the quotient consequently diminishing. The quotients obtained by Krause's method are in general 5 to 7 units lower than those of the old method. Some modification of Krause's method to facilitate working and obviate the de-aeration is desirable.

Methods of analysis, Graftiau (*Bul. Agr.* [*Brussels*], *17* (*1901*), *No. 2, pp. 178–182*).—In comparisons of the Kjeldahl and Gunning methods it was found that digestion was complete by the former 30 minutes after the disappearance of the reddish coloration; by the latter the total time required for digestion was reduced to 35 minutes. From a test of various forms of distilling apparatus it is concluded that such apparatus should be provided with a rectifier, a straight tube of sufficient size and length being very satisfactory for this purpose. Soda was found to be easily carried over in distilling, sulphuric acid less so, and phosphoric acid least of all.

The estimation of glycogen in flesh, G. Breustedt (*Arch. Pharm., 237* (*1899*), *p. 637; abs. in Ztschr. Analyt. Chem., 40* (*1901*), *No. 3, pp. 175–177*).

The composition of the ether extract from a number of fodders, N. Tulaikov (*Izv. Moskow Selsk. Khoz. Inst.* [*Ann. Inst. Agron. Moscow*], *6* (*1900*), *No. 4, pp. 429–439*).—This article is a contribution to the study of the ether extract of clover, alfalfa, rye straw, and oat straw. The analytical results are shown in the following table:

Fat from a number of feeding stuffs.

Feeding stuff.	Melting point.	Iodine number.	Neutral fats.	Free fatty acids.	Nonsaponifiable portion— Soluble in ether.	Insoluble in ether.	Total.	Nitrogen.	Pentosans.	Ash.	Lecithin.
			Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Clover	65°–66°	47.07	25.66	29.71	35.21	3.61	38.82	0.78	0.50	0.55	......
Alfalfa	63°	71.50	1.36	34.09	27.18	26.67	53.85	.75	.04	1.31	......
Rye straw	......	......	19.33	23.49	21.09	11.28	32.37	.37	......	.60	......
Oat straw	63°	......	2.33	9.76	28.57	43.80	72.37	.00	......	.76	6.86

In the author's opinion it is obvious that the crude fat of fodders consisted of a mixture of different compounds in which neutral fat is not the principal constituent, being exceeded by free fatty acids, including considerable quantities of the unsaturated acids. The quantitative analyses of the nonsaponifiable matter showed it to be a complicated mixture containing many other bodies belonging to the terpenes and phytostearine.—P. FIREMAN.

Outline of work on foods and feeding stuffs for 1901, W. H. KRUG (*U. S. Dept. Agr., Division of Chemistry Circ. 7, pp. 3*).—This gives the amended methods adopted at the seventeenth annual convention of the Association of Official Agricultural Chemists (E. S. R., 12, p. 507). Outlined directions are given for the determination of moisture, starch, pentosan, and galactan.

The analysis of potable water, milk, foods, and other materials, H. LAJOUX ET AL. (*L'eau potable, le lait de femme et le lait de vache, matières alimentaires et médicamenteuses. Reims: F. Michaud, 1900, pp. 172, figs. 6*).

Succinct directions for the analysis of wines, beer, cider, and vinegar, P. GOUPIL (*Tableaux synoptiques pour l'analyse des vins, de la bière, du cidre et du vinaigre. Paris: J. B. Baillière & Sons, 1900, pp. 80, figs. 10*).—Treats of the reagents, apparatus, and methods employed in determining the constituents, adulterations, and diseases of the liquors named.

The detection of arsenic in beers, brewing materials, and food, W. THOMPSON and J. P. SHENTON (*Jour. Soc. Chem. Ind., 20 (1901), No. 3, pp. 204–208*).

The pentosan content of various fruits and vegetables, C. WITTMANN (*Ztschr. Landw. Versuchsw. Oesterr., 4 (1901), No. 3, pp. 131–139*).—Tables of analyses are presented, giving the percentage of pentosans in a large number of seeds, fruits, vegetables, and beer extract.

The distinction of true extract of vanilla from liquid preparations of vanillin, W. H. HESS (*Michigan State Dairy and Food Com. Rpt. 1900, pp. 195, 196*).—While synthetic vanillin is identical with that extracted from the vanilla bean, there are other characteristics of the latter, including delicacy of aroma, which it is impossible to produce artificially. The author states that among the constituents of the vanilla bean the resin, ranging from 4 to 11 per cent, serves as a valuable means of distinguishing the artificial from the natural product. In order to obtain all the extractive matter from the bean an alkaline carbonate is sometimes added to the alcohol, thereby producing an inferior natural product deficient in flavor. A simple method is given for determining the use of alkali in extraction and also for the separation and determination of the resin.

Coumarin and vanillin; their separation, estimation, and identification in commercial flavoring extracts, W. H. HESS and A. B. PRESCOTT (*Michigan State Dairy and Food Com. Rpt. 1900, pp. 197–199*).—Tonka beans, by reason of the possession of the odoriferous principle coumarin, are often used to adulterate vanilla extract.

The determination of coumarin in the presence of vanillin has, therefore, become a problem for the analytical chemist.

A method of separation and identification is submitted by the authors. This method depends upon the aldehyde and phenol character of vanillin. The alcohol is evaporated from the extract to be examined, normal lead acetate added, and the precipitate extracted with ether. The ether solution is treated with dilute ammonia when the vanillin is extracted, leaving the coumarin. Detailed directions are then given for their identification.

Contribution to the analysis of tanning materials, J. Paessler (*Bul. Assoc. Belge Chim., 15 (1901), No. 3, pp. 115–122*).

Determination of tanning matter in tanning materials, T. Koerner (*Leather Manufacturer, 11 (1900), pp. 241–248; abs. in Jour. Soc. Chem. Ind., 20 (1901), No. 3, pp. 286, 287*).—Methods of analysis as presented and discussed in a paper read by O. Carr before the meeting of the Association of Official Agricultural Chemists, held at Washington, D. C., November, 1900.

Notes on the absorptive influence of the materials used in the determination of total soluble matter in tanning extracts, A. B. Searle (*Leather Trades Rev., 34, pp. 82–116; abs. in Jour. Soc. Chem. Ind., 20 (1901), No. 3, pp. 264, 265*).—Tests of various filter papers.

Selected methods of chemical analysis, A. Classen (*Ausgewählte Methoden der analytischen Chemie. Brunswick: Friedrich Vieweg & Son, 1901, vol. 1, pp. XX+940, figs. 78*).—Qualitative and quantitative analytical methods of determining common and rare elements and the alkalis.

The influence of agricultural chemistry on soil culture, E. Haselhoff (*Der Einfluss der Agrikulturchemie auf die Bodenkultur, 1900, pp. 10*).—A historical review.

On the velocity of chemical reactions, W. Duane (*Amer. Jour. Sci., 4. ser., 11 (1901), No. 65, pp. 349–356*).

Inorganic ferments; the preparation of colloidal metals by the electrical method and the investigation of their catalytic properties, G. Bredig (*Anorganische Fermente. Darstellung kolloidaler Metalle auf elektrischem Wege und Untersuchung ihrer katalytischen Eigenschaften. Leipsic: Engelmann, 1901, pp. 99*).

On inorganic ferments. II, The paralysis of platinum catalysis by poisons, G. Bredig and K. Ikeda (*Ztschr. Physikal. Chem., 37 (1901), pp. 1–68*).

A simple method for obtaining a saturated aqueous solution of sulphuretted hydrogen, or a constant supply of the gas, F. M. Perkin (*Jour. Soc. Chem. Ind., 20 (1901), No. 5, p. 438, fig. 1*).

An automatic filtering apparatus, J. Winklhöfer (*Chem. Ztg., 25 (1901), No. 59, p. 628, fig. 1*).

Microchemical technique, T. H. Behrens (*Mikrochemische Technik. Hamburg: Leopold Voss, 1900, pp VIII+68*).

BOTANY.

Manual of the flora of the Northern States and Canada, N. L. Britton (*New York: Henry Holt & Co., 1901, pp. X+1080*).—This manual gives descriptions of the ferns, fern allies, and seed-bearing plants which are known to occur within the area extending from Newfoundland to Manitoba, and southward to the southern boundaries of Virginia, Tennessee, and Kansas. Considerably more than 4,000 species are enumerated, many of which are described for the first time. In conformity with many recent scientific publications, the metric system of measurements has been adopted throughout.

This work is based upon the text of Britton & Brown's Illustrated Flora (E. S. R., 8, p. 291), the illustrations of which have been omitted and the descriptions abridged so as to bring the subject-matter within the compass of a single volume. The systems of arrangement and nomenclature of the previous publication have been retained. References are given to the figures in the Illustrated Flora, and the only synonymy quoted is that made necessary by changes resulting from further studies of the nomenclature of many species. By the use of thin paper, narrow margins, and small clear type, the publishers have produced a compact volume that will be preferred by many to the 3 bulky volumes of the original publication.

American grasses, II, F. Lamson-Scribner (*U. S. Dept. Agr., Division of Agrostology Bul. 17, rev. ed., pp. 349, figs. 325*).—This is a revised edition of a bulletin previously mentioned (E. S. R., 11, p. 219). In the present publication the synonymy has been revised and extended, and many of the descriptions have been entirely rewritten and considerably extended so as to include brief economic notes which were omitted from the previous edition.

Plant life of Alabama, C. Mohr (*U. S. Dept. Agr., Division of Botany, Contributions from the U. S. National Herbarium, vol. 6, pp. 921, pls. 13*).—This publication gives a description of the plant life of Alabama as observed by the author during a 40-year residence in the State. A short sketch is given of the physiographical features of the State and on the general aspect of the flora of Alabama, its relation to that of adjoining States, and to the continental and extra-continental floras. A general discussion is given of the geographical distribution of plants, the floral divisions of the State introduced by the author being considered as only tentative. The general and secondary factors influencing plant distribution are mentioned and various plant formations and associations are described. Following this is given a complete enumeration of the plants, nearly 4,500 species and varieties being given. The distribution of the species in the State is indicated, and descriptive and economic notes given of many.

The genus Salix in Iowa, C. R. Ball (*Contrib. Dept. Bot. Iowa State Col. Agr. and Mech. Arts, 1900, No. 18, pp. 141–154, pls. 3*).—An enumeration is given of the willows known to occur in Iowa and the distribution of the different species throughout the State is indicated.

A monograph of the genus Melilotus, O. E. Schulz (*Bot. Jahrb. [Engler], 29 (1901), No. 5, pp. 660–735, pls. 3*).—A historical sketch is given of the genus and statements made concerning the economic value of some of the species. The morphology of the different parts of the plant is described and the geographic distribution of the species indicated. In all, 23 species are recognized.

A contribution to the knowledge of the Chytridiaceæ, R. Lüdi (*Inaug. Diss., Bern, 1900, pp. 44–62, figs. 5*).—The first part of this dissertation is given up to a description of *Synchytrium drabæ*, n. sp., in which its morphology and affinities are discussed. In the second part the biological relationship of a number of species of Synchytrium is discussed, particular attention being given to *S. taraxaci.* The results of many inoculation experiments with this fungus are reported and discussed, from which the author has decided that *S. taraxaci* is not only morphologically distinct, but also biologically. In this group the species seem to be more sharply differentiated and specialized as to host plants than is usually the case with related fungi. The results of studies on the resting spores and other means of propagation are given in conclusion, the principal studies being made with *Cladochytrium menyanthis.*

Anatomical characteristics of agarics, J. Godfrin (*Bul. Soc. Sci. Nancy, 3. ser., 1 (1900), No. 6, pp. 188–211, figs. 17*).—Describes the anatomical structure of a number of species of Panæolus.

Inventory of foreign seeds and plants, J. G. Smith (*U. S. Dept. Agr., Section of Seed and Plant Introduction, Inventory No. 8, pp. 106*).—This inventory includes the seeds and plants imported for distribution in cooperation with the various experiment stations in the country, describing numbers 3401 to 4350, inclusive. Most of these seeds and plants were collected by the special explorers of the Section, principally by D. G. Fairchild and W. T. Swingle.

Plant physiology, W. F. GANONG (*New York: Henry Holt & Co., 1901, pp. VI + 147, figs. 35*).—This book is designed principally for practical use, and with few exceptions all the experiments and recommendations described have been repeatedly tested by the author and his students. Detailed directions are given for the construction of a greenhouse and physiological laboratory, both of which are essential to the prosecution of a course of study such as is outlined. The apparatus, appliances, and plants for study are described and the more common methods of manipulation are clearly stated. The outline of a course in experimental plant physiology is given which includes a study of the structure and properties of protoplasm, the nutrition of plants, growth, reproduction, irritability, locomotion, and protection. In connection with the different chapters, bibliographies are given of important works which should be consulted by the student in the prosecution of the course.

Influence of various organic substances on the respiration of plants, W. PALLADIN (*Rev. Gén. Bot., 13 (1901), Nos. 145, pp. 18–32; 146, pp. 93–96; 147, pp. 127–136*).—In a previous publication (E. S. R., 6, p. 194) the author has shown that etiolated leaves of beans, which are rich in proteids, respire very feebly while those lacking such material, if grown in a saccharose solution, have their respiration considerably increased. In the present paper the author gives an account of experiments in which a number of different carbohydrates have been tested to ascertain their influence upon the respiration of plants. Experiments were made by cutting off the growing tips of etiolated plants and dividing them into 2 lots. One lot was placed in shallow vessels containing a solution of saccharose, and the quantity of carbon dioxid given off by this plant in a certain time was taken as the unit of comparison. The other lot of leaves was placed under identical conditions, except that a different carbohydrate was used, and the quantity of carbon dioxid liberated by this second plant was compared with that of the first. The carbon dioxid was determined by the use of Pettenkofer tubes, and in a similar manner the nondigestible proteids were determined by the Stützer method, and the total nitrogen by the Kjeldahl method. As a result of the experiments the author found that the energy of respiration depends upon the substances given the plants. Of those investigated the greatest amount of carbon dioxid per 100 gms. of fresh plant substance was secured with fructose, followed by glucose, saccharose, maltose, raffinose, glycerin, and mannite. The proportion of carbon dioxid liberated per 100 gms. of fresh weight of the plants, during 1 hour, is shown in tabular form. The author also determined that in the absence of carbohydrates the nondigestible proteids not only were not diminished during the growing of the plants, but were increased to an appreciable degree. However, the increase was much greater when solutions containing some form of sugar were at the disposal of the plant. In one case where the etiolated bean plants were placed in water culture, the nondigestible proteids in 4 days increased 13 per cent, while in the second culture containing saccharose, in the same time, the quantity of proteids was increased 39.5 per cent.

Studies concerning variegation, H. TIMPE (*Inaug. Diss., Göttingen, 1900, pp. 124; abs. in Bot. Centbl., 85 (1901), No. 3, pp. 75–77*).—A report is given of some of the phenomena attending variegation as ascertained in the study of a large number of plants. As a rule, the variegated portions of leaves are thinner than the green parts, the palisade parenchyma and intercellular spaces being considerably reduced. The quantity of tannin in leaves is usually greater in the inner tissues of the variegated areas than in the green parts, although tannin is sometimes entirely wanting in the variegated portion of the leaf. Starch is normally deposited only in the green parts of leaves, while reducing sugars are most abundant in the colorless portions. From the sugar solutions in the variegated portions of the leaves a considerable quantity of starch is formed, which is colored a reddish violet with iodin. Variegated monocotyledonous plants do not transform the sugar in their cells into starch.

Chlorophyll assimilation through cork, Mathilde Goldflus (*Rev. Gén. Bot.*, *13* (*1901*), *No. 146*, *pp. 49–92*, *pls. 2*, *figs. 2*).—A detailed report is made upon experiments in which the author sought to ascertain the effect of a cork layer on the photosynthesis of plants. The stems of a large number of plants were examined, in which there was a well-developed layer of chlorophyll parenchyma underlying the bark. Sections of these were placed in a special apparatus, the amount of carbonic acid in the atmosphere determined before respiration began, and again at periods of 12 hours. About 20 species of woody plants were examined. Chlorophyll is distributed more or less through the branches of most trees and frequently occurs in their trunks, but is there limited to the region where the cork layer is more or less ruptured and furrowed. The author found that there was considerable assimilation in the sections of stems examined, and as the chlorophyll does not disappear from these regions during the winter its functions are probably continuous throughout the year, as there seems to be nothing to indicate a winter resting stage.

Are the lower chlorophyll-bearing algæ able to assimilate atmospheric nitrogen? W. Krüger and W. Schneidewind (*Landw. Jahrb.*, *29* (*1900*), *No. 4–5*, *pp. 771–804*, *pls. 3*).—The authors report extensive experiments with several species of Stichococcus, Chlorella, and Chlorothecium, in which their ability to assimilate atmospheric nitrogen, when grown in pure cultures and sterilized media, was tested. As a result of the experiments, the authors claim that without the presence of combined nitrogen, either in organic or inorganic form, there was but slight development of the different species of algæ; while if the substratum, upon which they were grown, contained combined nitrogen they made abundant growth. There appears to be nothing to indicate that these algæ are able to fix the atmospheric nitrogen. Green algæ, according to their investigations, are unable to assimilate the free nitrogen, and when experiments are conducted that appear to show an increase in the nitrogen content, it is explained by the fact that the algæ offer conditions very favorable for the development of soil and other bacteria which are able to assimilate atmospheric nitrogen.

Concerning the modifications of structure produced in vegetable cells by freezing, plasmolysis, and wilting, L. Matruchot and M. Molliard (*Compt. Rend. Acad. Sci. Paris*, *132* (*1901*), *No. 8*, *pp. 495–498*).—A study of the effect of freezing, plasmolysis, and wilting upon the leaves of Narcissus and some other plants shows that the conditions produced by each of these phenomena are identical.

The effect of temperature and oxydizing enzyms on the formation of transitory starch, J. Grüss (*Wchnschr. Brau.*, *1899*, *No. 40; abs. in Bot. Centbl.*, *85* (*1901*), *No. 1*, *pp. 8–11; also in Jour. Roy. Micros. Soc.* [*London*], *1901*, *No. 2*, *p. 181*).—In experiments with germinating barley, the author found that the formation of transitory starch began at a temperature of 0° C. and increased in the rapidity of formation until the optimum was reached at about 30° C. At 40° C. it was checked, and ceased altogether at 50°. Intimately associated with the formation of transitory starch was found an enzym to which the name spermase is given. Sucrose is said to be the first carbohydrate used during the germination of barley, and starch is not utilized until the embryo attains a stage in its development when it is able to furnish the enzyms necessary to render the starch available. The rootlets of the young plant are said to be inclosed for a time in a kind of gum which is believed to be some form of galactan, and it contains a liquefying enzym.

Concerning the occurrence of cane sugar in plants, J. Anderssen (*Ztschr. Physiol. Chem.*, *29* (*1900*), *No. 4–5*, *pp. 423–428*).—The author identified cane sugar in the rhizome of *Aspidium felix mas* and *A. spinulosum*, and other ferns.

The effect of germination on the pentosans in seeds, A. Schöne and B. Tollens (*Jour. Landw.*, *48* (*1901*), *No. 4*, *pp. 349–354*).—An account is given of experiments with barley, wheat, and peas, in which the effect of germination upon the pentosans in the seed was investigated. Instead of being a loss in pentosans, there was found in every case a slight increase when the germination was carried to about the degree used in malting grains.

Canadian experiments with Nitragin for promoting the growth of legumes, F. T. SHUTT and A. T. CHARRON (*Trans. Roy. Soc. Canada, 2. ser., 6 (1900–1901), Sec. III, pp. 55–69, pls. 2*).—A report is given of a series of experiments with Nitragin, the results of which have already been noted (E. S. R., 10, p. 845; and 11, p. 816).

Root tubercles of alfalfa, N. PASSERINI (*Bul. Soc. Bot. Ital., 1900, pp. 16, 17; abs. in Jour. Roy. Micros. Soc. [London], 1901, No. 3, p. 297*).—According to the author the roots of alfalfa are abundantly provided with root tubercles during the first year of cultivation. Very few occur during the second year, and none at all on plants 3 or more years old. It is inferred that the plant makes use of atmospheric nitrogen only during its first year's growth, or until the roots have attained sufficient length to obtain the necessary nitrogenous food materials from the deeper soil.

Methods of plant histology, C. J. CHAMBERLAIN (*Chicago: Univ. of Chicago Press, 1901, pp. VIII + 159, figs. 74*).—This book is the outgrowth of a course of instruction in histological technology given by the author at the University of Chicago. The methods described were originally published in the *Journal of Applied Microscopy* (E. S. R., 11, p. 29), and have since been revised and enlarged. The technique is well covered, special attention being given the paraffin method, which the author believes is best adapted to the study of plant histology. In the first part of the work the principles of fixing, staining, etc., are described in sufficient detail to enable any worker to adopt the author's suggestions. In the second part the principles are applied to special subjects, the arrangement and choice of material being such as to furnish preparations for a thorough study of plant structures from Algæ to Spermatophytes. Special formulas for the different reagents and a list of class preparations are given in separate chapters.

METEOROLOGY.

Monthly Weather Review (*U. S. Dept. Agr., Weather Bureau, Monthly Weather Review, 29 (1901), Nos. 4, pp. 145–199, figs. 3, charts 9; 5, pp. 201–241, pls. 4, charts 9; 6, pp. 243–289, pls. 4, fig. 1, charts 9*).—In addition to the usual reports on forecasts, warnings, weather and crop conditions, meteorological tables and charts (for the months of April, May, and June, 1901), recent papers bearing on meteorology, etc., these numbers contain the following articles and notes:

No. 4, special contributions on The theory of the formation of precipitation on mountain slopes (illus.), by F. Pockels; On the ionisation of atmospheric air, by C. T. R. Wilson; The climatology of Antigua, W. I., by W. H. Alexander; and The seasonable variations in the climate of Antigua, W. I., by H. H. Kimball; together with notes by the editor on Mr. Alexander Ashley, Mr. Charles Davis, Lorin Blodget, Hawaiian weather for February, 1901, Weather Bureau officials as instructors, earthquakes in Montana, dust storms in Burma and elsewhere, the permanence of climate, fog in New York Harbor, sleet, rainfall and grazing, the first number of the Monthly Weather Review, bombardment of hailstorms, sand dunes and the wind, the glacier as an index of climate, an old record at Pensacola, Fla., the kite work of the German Antarctic expedition, and average temperature of upper strata.

No. 5, special contributions on Some causes of the variability of earthshine, by H. H. Kimball; and Twenty years' study of snow crystals, by W. A. Bentley; and notes by the editor on the effect of the moon on vegetation, publications of the United States Weather Bureau, wind and temperature, reduction to standard gravity at Mexican stations, snowfall and its equivalent in water, hail insurance, Weather Bureau men as instructors, annual meeting of the German association of investigators and physicians, and Mr. Gustavus A. Hyde.

No. 6, special contributions on Sun spots and the weather, by H. H. Kimball; An instance of ball lightning at sea, by R. Seyboth; The climate of Harpoot, Turkey in Asia, by E. Huntington; Reforestation and rainfall in the Leeward Islands (illus.), by W. H. Alexander; Climatology of St. Kitts—comparison of barometers, by W. H. Alexander; and Weather Bureau exhibit at the Pan-American Exposition, Buffalo, N. Y., by D. T. Maring; and notes by the editor on hail and thunderstorms in Oregon, meteorology in French Indo-China, a rain of small fish, sun spots and meteorology, meteorology in the universities, the International Meteorological Congress, Paris, September 10–16, 1900, and Knut Angstrom on atmospheric absorption.

Department of meteorology, J. E. BONEBRIGHT (*Idaho Sta. Bul. 29, pp. 21–33*).—A tabular record is given of daily observations at Moscow, Idaho, on temperature, pressure, precipitation, and cloudiness during each month of 1900.

Weather and crop records for 1898, 1899, and 1900, J. H. SHEPPERD and A. M. TEN EYCK (*North Dakota Sta. Bul. 48, pp. 777–779*).—Tables are given which show the average soil and air temperatures, temperatures of mean dewpoint, relative humidity, average and total evaporation, and total rainfall for the crop-growing periods (May to August); also the monthly weather and crop records for the periods from April to September, inclusive, of each year.

Meteorological (*Rpt. Dept. Agr. Northwest Territories, 1900, pp. 5–15*).—The data reported include mean temperature and precipitation during April-September, 1900, at 12 different places in the Territories; annual precipitation at 8 places during 1886–1900, inclusive; and annual and monthly summaries of observations on precipitation and maximum, minimum, and mean temperature during 1900 at about 30 different places. The general meteorological features of the year (1900) are discussed.

General summary of meteorological observations made in different parts of Mexico during 1900 (*Bol. Mens. Obs. Met. Cent. Mexico, 1900, No. 4, pp. 46–48*).—Tabular monthly summaries of observations on atmospheric pressure, temperature, humidity, precipitation, per cent and direction of clouds, velocity and direction of the wind, and evaporation are given.

Meteorological summary, 1900, H. DUFOUR and D. VALET (*Chron. Agr. Canton Vaud, 14 (1901), No. 17, pp. 421–424*).—Monthly and annual summaries are given of observations in different parts of the Canton of Vaud, Switzerland, on temperature and rainfall during 1900 and 25 years (1874–1898); and on hours of sunshine during 1900 and 10 years (1886–1895), and intensity of sunshine during 1890 and 25 years (1876–1900). The results of semiweekly measurements of soil temperatures at 3 depths are also reported.

Report of the imperial station of meteorology and terrestrial magnetism at Vienna (*Jahrb. K. K. Central-Anst. Met. u. Erdmagnet., Vienna, n. ser., 35 (1898), pp. XXI + 145; 36 (1899), pt. 1, pp. 192*).—The detailed official report of observations in Austria during the years 1898 and 1899.

Magnetical, meteorological, and seismological observations made at the government observatory, Bombay, 1898 and 1899 (*Bombay: Government Central Press, 1901, pp. 196, charts 11*).—This report contains an account of the organization and operations of this institution during the years named, and tabular records of continuous observations with automatic instruments during 1898 and 1899; observations at 5 different hours daily during 1898 and 1899; five-day means 1898 and 1899; principal disturbances recorded by Milne's seismograph from September, 1898, to December, 1899; absolute magnetic observations, 1898 and 1899, with hourly means of declination, horizontal and vertical force, for 1894 to 1899; mean hourly values of temperature and pressure, 1876–1895, with harmonic analyses of the temperature and pressure at Colaba; and temperature, pressure, and rainfall normals, 1873–1896.

The distribution of rainfall over the land, A. J. HERBERTSON (*London: John Murray, 1901; rev. in Nature, 64 (1901), No. 1661, p. 423*).

The moon and wet days, A. B. MACDOWALL (*Nature, 64 (1901), No. 1661, p.*

424, fig. 1).—A chart is given which shows the rainfall for each lunar phase during the whole year and the summer months, April–September, compiled from observations during 24 years at Greenwich. The curves "agree in presenting a minimum between the full moon and the last quarter (the third, second, or first day before last quarter)." The maximum fluctuated between new moon and first quarter.

Investigations relating to "weather shooting," J. M. PERNTER and W. TRABERT (*Meteor. Ztschr.* [*Vienna*], *17* (*1900*), *No. 9, pp. 385–414*).—This article describes the construction and gives results of tests of various forms of apparatus used for dissipating hail storms by means of vortex rings. Numerous measurements of the velocity and force of the vortex rings produced by both vertical and horizontal firing are reported and their nature and action are discussed. In the more successful cases of horizontal firing the rings reached a distance of only about 200 meters, in vertical firing 300 meters, although sometimes going in the latter case as high as 400 meters under exceptionally favorable circumstances. In order that the system may be completely effective the cannon should be so placed as to agitate the air to a height of 800 meters, as hail clouds are sometimes that high, though never higher according to Stiger, Roberto, and others.

WATER—SOILS.

On the value of evaporometric indications to agricultural practice, N. MALUSHITSKI (*Izv. Moscow Selsk. Khoz. Inst.* [*Ann. Inst. Agron. Moscow*], *6* (*1900*), *No. 3, pp. 325–403*).—The object of the investigation here reported was to find if possible the relation between the evaporation from a free water surface (as indicated by an evaporometer) and that from bare and cultivated (covered) soils. For this purpose the author carried out several lines of experiments, viz: Observations on rainfall and on evaporation from a free water surface, and from soil in large zinc lysimeters, and in small glass lysimeters.

The evaporation from the free water surface was studied with the aid of Michelson's and of Wild's evaporometers. Wild's apparatus was found more reliable and was used in comparing the evaporation from a free water surface and from the soil.

In the experiments with the large zinc lysimeters 5 instruments were used. They were filled with soil and subsoil. The author studied with them the evaporation by oats during the whole of its period of vegetation, by rye in the fall period, from black fallow, and from sod (chiefly *Aira cæspitosa*, *Veronica latifolia*, and *Taraxacum officinale*). Since these lysimeters were heavy (weighing 131–139 kg.) and did not admit of accurate weighing, the author also experimented with 12 small glass lysimeters in which a layer of soil 10–15 cm. thick (corresponding to the medium depth of plowing in case of cereal crops) was placed. On some of the lysimeters rye was grown while the others were left without a crop.

On the basis of his own experiments and a survey of the whole literature on the subject, the author arrives at the following conclusions:

(1) The establishment of a correlation between the indications of a water evaporometer and the evaporation from a cultivated soil under natural conditions is impossible, since the structure of the soil and the state of its surface, which are in most cases beyond our control, exert an immense and varied influence on the stored up humidity as well as on its evaporation from the soil, an influence which does not affect the evaporometer.

(2) Exceptions may perhaps be admitted in the case of soils (a) saturated with moisture and (b) possessing a more or less constant amount of moisture with a constant structure and unchanging surface.

(3) The correlation in question can still less be established in case of soil covered with cultivated plants on account of the added disturbing factor of the varying evap-

oration by the plants as influenced by light, period of vegetation, humidity of the soil and air, etc.

(4) In order to measure the accumulation, evaporation, and percolation of water in the soil it is necessary to have recourse to lysimeters. If it is desirable, in addition, to trace the movement of the water under the influence of capillary forces, difference of temperature, etc., from the higher to the lower layers, and *vice versa*, there remains one of two ways open, either to construct a segmented lysimeter, consisting of a series of cylinders (each capable of being weighed separately) filled with the given soil and subsoil, or to determine the moisture by taking samples of the whole depth of the layer under investigation.

(5) The determination of the moisture of the arable soil layer at various stages of culture is possible only by taking samples for the estimation of moisture, or, perhaps, by measuring the electric conductivity of the soil as described in some recent investigations, for the determination of the moisture of the cultivated soil layer can not be made with any degree of accuracy either by means of the evaporometer or by the aid of a weighed lysimeter.—P. FIREMAN.

New evaporometer for the study of the evaporation from grass, and observations with it in the Constantine observatory in 1896, M. RIKACHEV (*Abs. in Zhur. Opuitn. Agron., 1 (1900), No. 1, pp. 115–117*).—The apparatus is claimed to be better adapted than others which have been proposed for the study of evaporation from various cultivated plants and soils under the influence of different meteorological, soil, and culture conditions. The evaporometer consists of three rectangular zinc boxes, of which the outer one is placed in the ground, while the other two, one above the other, are fitted tightly into the first one. The lower box of the last two has an entire bottom and shoulders projecting inward, while the upper one has a bottom with perforations 1 cm. in diameter, separated by distances of 1.5 cm. The upper box rests on the shoulders of the lower one. The upper box is 40 cm. long, 25 cm. wide, and 15 cm. deep. The length and width of the lower one are the same, but the depth is only 10 cm. The area of the inclosed space is about 1,000 sq. cm. In order to make observations with the apparatus, water is poured into the lower box until it forms a layer 5 cm. deep, and a thermometer is placed in the apparatus on supports provided for it. The upper box receives on its perforated bottom first a layer of coal 1 cm. thick and then a piece of sod cut to closely fit the box. Experiment showed that a piece of sod retained its fresh appearance during 3 months without the application of water. Into the sod a thermometer is introduced so that its bulb is buried to a depth of 10 cm. The whole apparatus, together with the sod and water, weighs about 24 kg. When it rains the excess of water percolates into the lower box. The presence of water here must, according to the author, maintain a constant degree of humidity in the lower layer of the upper vessel. Observations were made 3 times every day, for which purpose both inner boxes were taken out and weighed together, the temperature of the sod taken, the upper box removed, and the temperature of the water taken. The decrease of weight between two observations was taken as a measure of the evaporation from the sod during that time. When the midday observation was made the lower vessel was also weighed separately, and if an increase of water caused by a rain was noticed, the excess was poured off, leaving a layer of water weighing 4,410 gm. (5 cm. deep).

The evaporation from sod as measured by this apparatus exceeds that found by Wild's evaporometer 2 to 3 times.—P. FIREMAN.

Solution studies of salts occurring in alkali soils, F. K. CAMERON, L. J. BRIGGS, and A. SEIDELL (*U. S. Dept. Agr., Division of Soils Bul. 18, pp. 89, figs. 10*).—This is a series of technical papers giving preliminary accounts of studies made during the past year. Investigations are reported on the equilibrium between carbonates and bicarbonates in aqueous solutions, in which it is shown that when in equilibrium with the air aqueous solutions of sodium or potassium normal carbonate necessarily contain some bicarbonate, and, conversely, solutions of bicarbonate necessarily contain some normal carbonate. At equilibrium, which depends upon the concentration of the solution, the temperature, and the partial pressure of the carbon dioxid in the surrounding atmosphere, there is a definite distribution of the base between the two acids. At any given concentration the proportion of normal carbonate increases with rise of temperature. Conversely, at any given temperature the proportion of normal carbonate increases with the total concentration, provided the latter is not very great. In presence of normal or excessive amounts of carbon dioxid calcium is found almost entirely in form of bicarbonate. Magnesium, however, under the same conditions, is largely (over 50 per cent) in form of normal carbonate. "It seems probable, therefore, that the presence of much magnesium carbonate, as compared with calcium carbonate, in the soil would have a much more marked effect in producing soluble normal carbonates or the dreaded 'black alkali.'"

Studies on the solubility of gypsum in aqueous solutions of sodium chlorid (alone or in the presence of solid calcium carbonate) and of certain other electrolytes—magnesium chlorid, calcium chlorid, sodium sulphate—are reported, which developed certain facts of value in explaining the solution and transportation of gypsum in the soil, its precipitation from the soil solution in the presence of large quantities of other soluble salts, and the formation of gypsum layers at different depths in the soil as observed in many localities of the arid region. The light which these studies throw on the formation of alkali and alkali crusts has been utilized in a comprehensive classification of alkali lands on a chemical basis (E. S. R., 13, p. 232).

"It seems probable, from the results of this investigation, that wherever gypsum occurs in the soil there will be a considerable amount of calcium in the soil solution. This is now known to be a matter of great importance from a physiological point of view, enabling the plants to withstand much larger quantities of the more soluble salts than would otherwise be possible. . . .

"Calcium sulphate is much more soluble than calcium carbonate, even when there is a considerable amount of carbon dioxid present, and the solubility of the latter salt is thus increased through the formation of the more soluble hydrogen carbonate. It has therefore seemed probable that it would be better in many cases to use the sulphate for liming soils, because in this way more calcium is brought into the ground solution and its ratio to the other bases dissolved is much increased, and because its active mass in the solution is greater and its effect upon other soil components is correspondingly increased. On the other hand, it can not have the effect that either the carbonate or hydrate of lime has in counteracting an excess of carbonic or other organic acids in sour soils or in making them slightly alkaline—a condition which appears to be desirable for certain crops. Furthermore the carbonate and hydrate have certain well-marked effects on the texture of soils, which are sometimes of as much or more importance than the purely chemical results; consequently it seems desirable that the comparative value of these lime salts, or mixtures of them, on soils of various character should receive more attention than has hitherto been given, both in the laboratory and in actual field practice.

"The application of soluble mineral fertilizers to the soils of humid areas unquestionably affects the solubility of mineral components of the soils. Such cases are analogous to the gypsum solution, in that a slightly soluble substance is brought into contact with solutions of much more soluble substances. The idea suggests itself that, as with gypsum, possibly the mineral components of the soil may have maximum solubilities, in solutions of the more soluble salts of definite concentrations, far below the limit of solubility with respect to the readily soluble salts."

Investigations of the same kind on the solubility of calcium carbonate in aqueous solutions of certain electrolytes in equilibrium with atmospheric air showed "that sodium chlorid in solution has an important rôle in causing the solution, transportation through the soil, and reprecipitation of calcium carbonate, and that this rôle is modified, but does not disappear, when calcium sulphate is present. The rationale of the application of gypsum or land plaster to soils containing 'black alkali,' or sodium carbonate, resulting from the action of sodium chlorid upon calcium carbonate, is made apparent.

"Sodium sulphate has been shown to have an astonishingly great effect on the solubility of calcium carbonate, the resulting solutions containing not only hydrogen carbonate, but normal carbonate as well. Further, there is no necessary precipitation of the lime carbonate with increasing concentration with respect to sodium sulphate; but the solubility of the lime carbonate steadily increases with increasing amounts of sodium sulphate in the solution, up to the saturation point of this latter salt."

A detailed description is given of the method of chemical examination of alkali soils worked out in the laboratory of the Division along the lines indicated by the results of the investigations above noted. The salient features of this method are—

"(1) The aqueous solution of the soil alkali is made under similar conditions in all cases.

"(2) The electrical resistance of the soil solution is used in facilitating the analytical processes.

"(3) A direct determination of the total solids in the soil solution is not made.

"(4) A unique, satisfactory, and accurate volumetric method is used for the determination of carbonates and bicarbonates (E. S. R., 12, p. 819).

"(5) All the constituents, including sodium, are determined directly, and no results are obtained by difference.

"(6) The possible necessity for duplicate determinations is made evident by the calculation of the results obtained.

"(7) Finally, the report of the analysis includes the percentage of alkali present in the soil and the relative percentage composition of this alkali; it is stated in terms of the possible ions present in the solution as well as their combinations as electrolytes."

Comparative tests are reported which indicate that Congo red may in some cases be substituted with advantage for methyl orange as an indicator in the method of determining carbonates and bicarbonates referred to above.

"For some eyes and under certain conditions Congo red is to be preferred to methyl orange; for those who can use it, however, methyl orange seems to be the more delicate indicator.

"It is essential to the satisfactory use of the method that during the titration the solution should not be in contact with carbonates, bicarbonates, or metallic hydroxids in the solid phase."

Soil and soil moisture investigations, J. D. TINSLEY and J. J. VERNON (*New Mexico Sta. Bul. 38, pp. 55–95, pls. 12*). This bulletin reports the results of a study of the physical character and of the fluctuations of moisture during the season of 1900 in 12 plats of soil planted to corn. The methods and apparatus employed are described and the results of determinations of moisture on the different plats at depths of from 3 in. to 10 ft. are tabulated. A form of auger for taking soil samples and a shaker for use in mechanical analysis are described. With these exceptions the methods and apparatus were essentially those of the Division of Soils of this Department. The soils of the experimental plats were found to be very uneven in texture. This is stated to be due to the fact that 4 different factors have entered into their formation, (1) river deposit, (2) wash from the foothills, (3) sediment from irrigating water, and (4) drift of soil by the winds. In studying the porosity of the soils comparative tests were made of 4 methods, namely, Beeson's (E. S. R., 9, p. 429), Whitney's, A. Mayer's, and Wolff-Wahnschaffe's. The Wolff-Wahnschaffe method was found to give the most concordant results and was used in the examinations reported. The studies on soil moisture were conducted on the same plan as in previous years (E. S. R., 12, p. 425). Moisture determinations were made by drying and by the electrical method devised by the Division of Soils of this Department at depths of 3 to 6 and 15 to 18 in. The samples were taken the first of each month and the readings of the soil hygrometer were taken every 2 days. In 1899 sweet potatoes, winter wheat, and corn were grown on the plats on which the determinations were made. In 1900 the plats as already stated were planted to corn. The method of cultivation and irrigation of the plats is described in detail and the results of the moisture determinations are tabulated. The results are summarized as follows:

"(1) The moisture content of irrigated land is apt to vary within wide limits.

"(2) The results of this season's work indicate that when the moisture in this soil falls below a fairly definite limit the corn begins to cure. This limit lies near 20 per cent, calculated on dry weight of soil, or about 50 per cent of the water capacity of the soil, at 3 to 6 in.

"(3) The crop showed very unequal growth within short distances, the reasons for which we are not yet able to explain.

"(4) The results indicate that under the climatic conditions which prevailed during last season at least 3 irrigations are necessary to produce a crop of corn, and that the late irrigation showed more marked effect than the early irrigations.

"(5) The cultivation (as practiced this season) does not seem to have had the desired effect in conserving moisture in this soil.

"(6) Good germination is readily produced by irrigating to produce germination after planting, even when the water is quite muddy.

"(7) Subsoiling had apparently no effect either on moisture content or yield."

Soil moisture studies, J. H. SHEPPERD and A. M. TEN EYCK (*North Dakota Sta. Bul. 48, pp. 735–776, figs. 3*).—As in previous years (E. S. R., 11, p. 325), studies on soil moisture were continued during 1900 in connection with comparative tests of methods of culture of wheat (see p. 442), the same plats being used and the same methods followed as in the earlier experiments. The summarized results of 3 years' work along this line are reported in this bulletin. The growing season of 1900 was somewhat abnormal, being very dry in the earlier part and very wet in the later months. It thus gave opportunity for study of the moisture conditions of the soil under extreme conditions. The results reported show that—

"Corn land went into the winter season, November 15, 1900, with 2 in. more water in the soil than wheat or flax land, and 1 in. more than potato and millet ground, despite the heavy summer and autumn rains.

"Bare, cultivated land contained the largest amount of moisture and timothy ground the least at the close of the season.

"Little change occurred in the moisture content of the soil during the winter of 1900–1901.

"On July 24, 1900 (before the rain fell), corn ground contained 5.7 in. more water than wheat ground.

"Barren summer fallow (plowed once) with no cultivation is little better than continuous wheat growing for conserving soil moisture.

"The manured ground produced 9 per cent greater crops, but contained 5 per cent less moisture in the soil at harvest time, than did the unmanured ground.

"In the spring of 1901 the manured land contained more moisture in the surface soil than the unmanured land.

"The water table falls during the winter season, but there is little or no loss of soil moisture, and there is an actual gain of moisture in the surface soil, which is not due to rain or snow.

"The Campbell method has yielded small crops of wheat and has given no appreciable saving of soil moisture.

"Poorer yields were obtained upon shallow than upon deep plowing.

"Disk plowed land has not yielded so well as shallow plowed.

"Subsoiling has increased the yield, but required a little more water to produce the crop.

"Subsurface packing and harrowing after plowing have given a slight increase in yield, and have conserved the soil moisture.

"Rolling and harrowing have given increased yields in wheat, especially upon spring plowing, but the soil has been left drier than the ordinary plowing at harvest time.

"Harrowing wheat conserved the soil moisture and proved beneficial.

"As an average for all trials for 2 years, it required about 1 in. of water to produce 2 bu. of wheat.

"Moisture stored in the soil seems to do the crop more good than that which falls as rain during the average season."

A soil survey in Salt Lake Valley, Utah, F. D. GARDNER and J. STEWART (*Utah Sta. Bul. 72, pp. 77–114, pls. 11, figs. 5, maps 4*).—This is an account of a survey made by the station in cooperation with the Division of Soils of this Department, reprinted from Report No. 64 of the Department (E. S. R., 12, p. 522).

Some Idaho soils, H. T. BEANS (*Idaho Sta. Bul. 28, pp. 31*).—Mechanical and chemical analyses of 20 samples of soil are reported, and the results are discussed with reference to classification and distribution in the State. (See also E. S. R., 7, p. 486.) The soils of the State are tentatively grouped as follows: (1) Coarse sandy soils of the foothills and timber lands; (2) fine sandy silt soils; (3) river sand soils; (4) sandy soils of the arid regions, and (5) alkali soils.

"The first class comprises those soils formed mainly from the talus of the foothills. They are characterized, physically, by their light brown color, very coarse sandy or gravelly texture, and abundant quantities of feldspar fragments and mica. The principal chemical characteristics seem to be a low lime and nitrogen content with high percentages of phosphoric acid and potash and especially of magnesia.

"The second class includes the fine-grained soils of basaltic origin, such as are found in the Palouse and Potlatch regions. These soils are characterized by their dark color and fine texture. Mechanical analysis shows them to contain practically no coarse material, about 41 per cent of fine sand, 47 per cent of silt, and usually not over 2 per cent of clay. The distinguishing chemical features of these soils are high percentages of all the mineral plant foods except lime and unusually large amounts of organic matter and humus. Many of our best wheat soils belong in this class.

"The third class, found mostly along the larger rivers, comprises those soils formed almost entirely from river sand and 'wash.' They contain about 90 per cent moderately fine sand (mostly quartz and mica), the silt and clay having been for the most part washed out. Like most sandy soils, this type is highly insoluble in acids, contains very little organic matter, humus, and nitrogen, and has very limited capacity for retaining moisture.

"These soils are somewhat analogous physically to the early truck soils of the East, but unlike them chemically in that our river sand seems to contain large amounts of potash and phosphoric acid.

"The fourth group consists of those sandy soils of the irrigated region that do not contain an excess of soluble salts. These soils are usually of a light brown color and are made up of about 60 per cent sand and 20 per cent silt, with some gravel and clay. They are of volcanic origin and are usually rich in the mineral plant foods, but contain small percentages of nitrogen, and some are rather deficient in lime.

"The fifth group comprises the soils of the arid region that contain an excess of salts soluble in water. The term 'alkali soil' is no longer used in a derogatory sense, but means simply a soil in which there is an excessive accumulation of these salts. This excess of alkali salts may or may not be large enough to be harmful to vegetation. In any case, the alkali soils are almost without exception exceedingly rich in mineral plant food, and when the alkali condition is corrected, often form our most productive soils.

"In general, it may be said of our Idaho soils, that they are unusually rich in all the mineral plant foods except lime. The volcanic origin of the greater part of our soils makes them especially rich in potash and phosphoric acid. Some of the soils of the humid regions contain unusually high percentages of humus and nitrogen.

"The extent of 'alkali' in the State has not yet been investigated, but thus far in our soil work no soils analyzed have contained harmful amounts of either white or black alkali. The soils received from Cassia County contain both kinds of alkali, but not as yet in sufficient quantity to be dangerous to crops."

Soil analyses, F. T. Shutt (*Rpt. Dept. Agr. Northwest Territories, 1900, pp. 29–31*).—Analyses, including determinations of available potash, phosphoric acid, and lime, of 4 samples of surface soil from the Calgary Experimental Station, Northwest Territories, are reported. Two of the samples were of the same soil, irrigated and unirrigated, which were examined with a view to ascertaining the effect of irrigation on the plant food present. The results were not conclusive.

The soils of the northern marshes of the Vendee, their composition and exhaustion under culture without fertilizer, M. Artus (*Ann. Sci. Agron., 1901, I, No. 2, pp. 288–295*).—The soils of these sea marshes which have been reclaimed by natural or artificial means are very clayey and difficult to cultivate. The area included in the study here reported was about 50,000 hectares. Chemical analyses of 8 samples of the soil of the region are reported. These show that as a rule the soils are abundantly supplied with nitrogen, potash, and phosphoric acid. The latter, however, was found to be but slightly soluble in water by the Schloesing method, and the productiveness appeared to vary with the proportion of soluble phosphoric acid present. The effect of continuous culture without manure shows itself especially in the reduction of the amount of soluble phosphoric acid.

Soils, Graftiau (*Bul. Agr.* [*Brussels*], *17* (*1901*), *No. 2, pp. 170–172*).—Analyses of 9 samples of soil and subsoil of the Campine and of 1 sample of chernozem from Bulgaria are reported.

Condition of the aluminum in cultivated soils, T. Schloesing (*Compt. Rend. Acad. Sci. Paris, 132* (*1901*), *No. 20, pp. 1203–1212; abs. in Jour. Chem. Soc.* [*London*], *90* (*1901*), *No. 465, II, p. 471, and Chem. Centbl., 1901, II, No. 3, p. 222*).—The author found in examination of a number of Madagascar soils that most of them contained either free alumina or aluminum silicates readily attacked by a dilute solution of sodium hydroxid. The alumina and the silica, however, were chiefly in a sandy condition and did not increase the tenacity of the soils.

Soil temperature at Hawkesbury Agricultural College, Richmond, New South Wales, C. T. Musson (*Agr. Gaz. New South Wales, 12* (*1901*), *No. 6, pp. 669–680, pls. 2*).—Observations extending over a period of one year, May, 1898, to April, 1899, are reported. The observations were made at depths of $\frac{1}{2}$ in., 6 in., 1 ft., and 2 ft., in a light-colored sandy loam. The daily temperature variations are charted and discussed with reference to the effect of rainfall and other conditions.

Humus and soil nitrogen, E. F. Ladd (*North Dakota Sta. Bul. 47, pp. 685–704*).—In continuation of previous investigations (E. S. R., 11, p. 224) studies were made on nitrifying organisms and the nitrates and nitrites in different soils; the percentage of nitrogen in the first and second 6 in. of the same soil at different dates; the percentage of organic matter and humus in the first and second 6 in. of plats subjected to different systems of cropping and culture; and on the changes which take place in manure heaps.

The number of colonies of ordinary bacteria in the first 3 in. of soil was found to range from 10,000 to 52,000, and of anaërobic bacteria from 400 to 8,000. Nitrifying bacteria were not found in bare summer fallow below 2 ft. Probably they do not occur normally below 18 in. In the first 6 in. of the soil there was found 415 lbs. of nitrates per foot-acre (an acre of soil to a depth of 1 ft., or 3,142,800 lbs. of soil); in the second 6 in., 234 lbs.; at a depth of 3 ft., 675 lbs.; at 7 ft., 294 lbs. Since 85 per cent of nitrifying organisms were found in the first 6 in. of soil and none were found below 2 ft. it is evident that the nitrates found at a greater depth had leached down from near the surface. The largest amount of nitrates was found in a plat on which wheat had followed peas, but "on July 14 the field on which corn had been grown the preceding year contained 39 per cent more nitrates than for the continuous wheat field. On July 30 the difference was even more marked, being 61 per cent more of nitrates." Large amounts were also found in bare fallow, but small amounts under prairie sod.

"The continuous growing of wheat, or other grains, or cultivated crop, rapidly depletes the organic matter from the second 6 in. of soil. The growing of clover and peas in a crop rotation causes a marked increase in the organic matter and humus in the soil in both the first and second 6 in. . . . Plowing under a green crop does not produce as beneficial results as come from plowing grass lands. Plowing under a green crop leaves the organic matter in a mass and not uniformly distributed throughout the soil. After grass in a crop rotation the soil shows a large increase in amount of organic matter, but less than two-thirds as much as is found in adjoining fields of native prairie soil. . . .

"Soils on which wheat has been grown continuously since 1883 were found to be in bad condition, chemically and physically. They do not retain water well in the cultivated portion, and failed to mature a crop of wheat in the dry season of 1900. The available plant food and the principal feeding ground of the wheat roots seems to be in the first 8 in. of soil. . . .

"Newly broken soils do not blow. . . . The great mass of fine roots intertwined about the particles of soil in the virgin prairie prevented the soil from blowing." The same result may be attained by adopting a system of rotation which includes grass.

"The system of agriculture most nearly ideal for maintaining soil fertility would be one with 2 years in grass followed by cultivated crop, then 2 years in grain crops, making a 5 years' rotation."

The decomposition and transformation of nitrogen compounds in soils by lower organisms, and their influence on the growth of plants, W. Krüger and W. Schneidewind (*Landw. Jahrb., 30 (1901), No. 4, pp. 633–648, pl. 1; abs. in Deut. Landw. Presse, 28 (1901), No. 73, p. 619*).—On the basis of the results of plat and vegetation experiments during 1900 the authors conclude that the effect of coarse manures in interfering with the assimilation of nitrogen of the soil by plants is due not only to denitrification but also largely to the transformation of assimilable nitrogen (including that of ammonium sulphate) into insoluble and unassimilable nitrogen compounds (albuminoid substances). For previous investigations of the authors on this subject see E. S. R., 12, p. 728.

On the action of organisms in soils and manure, L. Hiltner (*Deut. Landw. Presse, 28 (1901), Nos. 24, pp. 203, 204; 25, pp. 212, 213; 27, pp. 231, 232*).—A general discussion of this subject.

On nitrification and denitrification, A. Beddies (*Chem. Ztg., 25 (1901), No. 49, pp. 523, 524; abs. in Chem. Centbl., 1901, II, No. 3, p. 222*.

Treatise on the origin and formation of soils, L. Milch (*Die Grundlagen der Bodenkunde. Leipsic: Franz Deuticke, 1901, pp. 162; abs. in Geol. Centbl., 1 (1901), No. 19, p. 581*).—This book discusses the more important mineralogical and geological facts relating to soil formation.

The vertical movement of the surface soil, H. Darwin (*Rev. Sci., 4. ser., 16 (1901), No. 6, pp. 183, 184*).—This is a note on a communication to the Royal Society of London on observations, in continuation of those of the elder Darwin, on the rate at which stones and other objects left on the surface sink into the soil.

What is a steppe? G. I. Tanfilyev (*Abs. in Zhur. Opuitn. Agron., 1 (1900), No. 3, pp. 278, 279*).—The author gives the following definition: "A steppe is a more or less plain tract, treeless in its natural state, not subject to inundations, covered with more or less continuous sod and with a more or less dark soil layer on a subsoil rich in carbonates and other soluble salts." From deserts which are connected with it by a series of transitions, the steppe differs by containing carbonates as a predominating constituent of its soluble salts while they are also rich in soluble chlorids and sulphates.—P. FIREMAN.

Some apparatus for soil investigation, T. L. LYON and Y. NIKAIDO (*Nebraska Sta. Rpt. 1900, pp. 20–28, figs. 3*).—Apparatus for determining soil moisture and soil temperatures are described. The first consists of a sampling tube, 200 gm. soil cans of aluminum with wooden case, and double-walled constant-level oven of sheet copper containing a mixture of 3 parts of glycerin with 1 of water for drying the soil in the cans at 100° C.

The apparatus for determining soil temperatures consists of a thermometer inclosed in a hollow steel tube, which may be driven into the soil to the desired depth. "The thermometer proper consists of a thin glass bulb 3 in. long and ½ in. in diameter joined to a capillary stem 30 in. in length. The bulb and the stem are filled with mercury to such a point that the zero point of the thermometer is 15 in. above the bulb. The stem is inclosed in a glass case ½ in. in diameter at the lower or ungraduated portion, and 1 in. in diameter at the upper portion which carries the scale. This leaves a dead-air space surrounding the stem of the thermometer, which tends to prevent changes of temperature in it during the measurement of the soil temperature. The total length of the ungraduated portion of the stem is 18 in. This permits the determination of the temperature of the soil at any desired depth down to that limit." For inserting the thermometer into the soil a solid steel rod closely fitting the hollow steel tube, referred to above, is placed in the latter, the lower end, which is of the same diameter as the bulb of the thermometer, projecting a few inches below the end of the tube, and the whole is driven into the soil to the desired depth. The rod is then withdrawn and the thermometer is lowered into its place. "The bulb of the thermometer will then come in contact on all sides with the soil at the depth indicated on the tube. The mercury of the thermometer will reach a constant level, so that a reading can be taken in 10 or 15 minutes."

The electric method of Whitney and Means for the determination of the salt content of soils, K. GEDROIZ (*Zhur. Opuitn. Agron., 1 (1900), No. 1, pp. 21–48*).—This is a critical discussion of the electric method proposed by Whitney and Means for the determination of the salt content of soils.—P. FIREMAN.

FERTILIZERS.

Losses in farm manures and the value of nitrogen of such manures, E. B. VOORHEES (*New Jersey Stas. Bul. 150, pp. 27*).—This bulletin discusses, from the practical standpoint of increase in crop, the losses which occur in farm manures; the relative usefulness of the nitrogen of fresh and leached manures; and the comparative value of nitrogen in commercial forms and in natural manures. The plan of experiment has been described and the results partially reported in a previous publication (E. S. R., 12, pp. 321, 322).

"Solid manure exposed for an average of 109 days lost 37.6 lbs. of nitrogen from every 100 lbs. contained in it, 51.9 of phosphoric acid from every 100, and 47.1 of potash from every 100.

"Solid and liquid manure combined, exposed for an average of 109 days, lost 51 lbs. of nitrogen from every 100 lbs. contained in it, 51.1 of phosphoric acid from every 100, and 61.1 lbs. of potash from every 100. . . .

"On the average for 3 crops, 1 of corn and 2 of oats, the increased yield from the application of fresh solid and liquid manure combined was 3.38 times as great as from the application of the solid manure alone, though the same amount of nitrogen was applied in each case.

"The nitrogen in the leached solid manure was on the whole more effective than in the fresh, while in the leached solid and liquid combined, it was much less effective than in the fresh. The loss of the liquid portion very materially reduced the effectiveness of the manure.

"The residual effect of the nitrogen in yard manure was very considerable, and was greatest in the solid, fresh.

"Nitrogen in the commercial products, nitrate of soda, sulphate of ammonia, and dried blood, was more effective than in the natural manure products. Of these 3 forms, the nitrate was the most effective.

"In these experiments for every 100 of gain derived from nitrate of soda, there was a gain of 73.3 for sulphate of ammonia, and 65.3 for dried blood.

"There was no increase in crops obtained from the residues of the nitrate, the ammonia, and the dried blood, though in the case of the ammonia and blood a very considerable portion of the amount applied was not recovered in the first crop.

"The percentage increased yields obtained in the crop immediately following the application of the different products showed that if nitrogen in the form of nitrate, which was used as the standard, cost 15 cts. per pound, the nitrogen in the manures would be worth relative to it, as follows: Nitrogen in solid manure, fresh, 2.07 cts. per pound; nitrogen in solid and liquid manure, fresh, 6.99 cts. per pound; nitrogen in solid manure, leached, 2.41 cts. per pound; and nitrogen in solid and liquid manure, leached, 4.54 cts. per pound.

"When the residual effect of nitrogen of the manures is taken into account and no further applications of nitrate are made, the values of the nitrogen in the manures relative to the nitrate are: In solid manure, fresh, 6.22 cts. per pound; in solid and liquid manure, fresh, 11.69 cts. per pound; in solid manure, leached, 7.04 cts. per pound; and in solid and liquid manure, leached, 6.73 cts. per pound."

Experiments on the application of manure, L. MALPEAUX and E. DOREZ (*Ann. Agron., 27 (1901), No. 8, pp. 353-356*).—This is an account of experiments with fodder beets followed by wheat grown on plats on which manure was (1) plowed under as soon as applied, and (2) spread and allowed to lie on the surface about 2 months during winter before being plowed under. The results were decidedly in favor of plowing in immediately after application.

Green manuring, A. L. YAKOVLYEV (*Izv. Moscow Selsk. Khoz. Inst. [Ann. Inst. Agron. Moscow], 6 (1900), pt. 4, pp. 503-583*).—In order to compare the availability to higher plants of the nitrogen of green manure with that of nitrate of soda, various kinds of animal manures, and other nitrogenous fertilizers, the author raised crops of oats in pots using as sources of nitrogen (1) nitrate of soda, (2) liquid manure, (3) fresh horse feces, (4) fermented horse manure, (5) fresh cow manure (6) blood meal, and (7) green manure. The experiments were made on sandy soil containing 0.076 per cent of nitrogen. Each pot contained 6 kg. of soil. All the mineral nutrients were present in quantities sufficient for a maximum yield, while nitrogen was deficient. Nitrate of soda was added in amounts furnishing 0.5 gm. of nitrogen, while the other fertilizers were used in quantities containing 1 gm. of nitrogen. The largest crop was secured from the pot on which green manure was used. The order of effectiveness of the other fertilizers was—nitrate of soda, blood meal, and liquid manure. The animal manure either did not increase the yield (as was the case with the fermented horse manure) or diminished it (as was the case with the cow manure, and especially with the fresh horse feces).

Another series of experiments led the author to the conclusion that fresh green manure and dry green manure are equally effective as nitrogen fertilizers.

Other conclusions based partly upon a survey of the literature of the subject and partly on the experiments of the author, are as follows: (1) When leguminous plants are plowed under no loss of nitrogen in the gaseous state occurs owing to the absence of denitrifying bacteria, differing in this respect from the conditions noted when straw is plowed under; (2) enriching the soil in humus by green manures exerts a beneficial effect on the physical properties of light soils, increasing their capacity for moisture and improving the structure in a larger measure than barn manure, since the root residues on rotting are better adapted to that purpose, and (3) a disadvantage of green manuring is its drying effect on the soil.—P. FIREMAN.

Contribution to the knowledge of green manuring on heavy soils, F. HANASCH (*Ztschr. Landw. Versuchsw. Oesterr., 4 (1901), No. 7, pp. 772–778*).—Experiments with mustard, horse beans, vetches, and several kinds of peas and clovers are reported. The best results were obtained with white mustard followed by vetches, the poorest with field peas.

Clover and phosphorites, P. BUDRINE (*Abs. in Zhur. Opuitn. Agron., 1 (1900), No. 3, pp. 293–295*).—The author reports the results of experiments with phosphatic and other fertilizers carried out on the experiment fields of the Novo-Alexandria Agricultural Institute. The results show among other things that the crops of clover may be considerably increased by the aid of phosphorites.—P. FIREMAN.

Experiments on the relative value of nitrate of soda and sulphate of ammonia, P. WAGNER (*Mitt. Deut. Landw. Gesell., 16 (1901), Nos. 10, pp. 55, 56; 11, pp. 57–60*).—The results of these experiments show no difference in effectiveness of the fertilizers, whether the entire quantity was applied February 25, or only half the quantity applied that date and the rest on April 27. Seventy-three per cent of the nitrogen applied in nitrate of soda and 67 per cent of the sulphate of ammonia was regained in the grain and straw of barley. The total yield obtained with sulphate of ammonia was about 90 per cent of the total yield with nitrate of soda. The report discusses at some length, the relation of the kind of crop, the time of applying fertilizers, weather conditions, physical condition of the soil, and the presence of calcium carbonate in the soil to the efficiency of these fertilizers.

Fertilizer experiments with sulphate of ammonia and nitrate of soda, BONSMANN (*Deut. Landw. Presse, 18 (1901), No. 52, pp. 463, 464*).—A critical discussion of the methods which have been used by various investigators in determining the relative value of these fertilizing materials.

Experiments with chemical fertilizers on garden soils, E. FRANCAIS (*Bul. Agr. [Brussels], 17 (1901), No. 2, pp. 222–234*).—Comparative plat tests of chemical fertilizers and barnyard manure during 3 years on a variety of plants are reported. The results were to a large extent inconclusive, due probably to the originally fertile character of the soil experimented with. However, it seemed that manure was much more effective on legumes than on other common crops. This is attributed to the combined chemical, physical, and biological properties which the manure possesses in greater degree than chemical fertilizers.

The use of commercial fertilizers in winter, GERLACH (*Deut. Landw. Presse, 28 (1901), No. 61, pp. 530, 531*).

On the fertilizing value of flue ashes, J. KÖNIG (*Deut. Landw. Presse, 28 (1901), No. 69, p. 592*).—Analyses are reported which show that such ashes contain from 8.65 to 10.33 per cent of potash, 6.1 to 7.8 per cent of lime, and small amounts of phosphoric acid. The lime and potash are partly in the form of sulphate and partly silicate. The composition of this product is very variable and depends upon a number of conditions, but mainly upon the composition of the coal used in the furnaces.

The fertilizing value of stable manure when tobacco waste has been used for bedding, N. PASSERINI (*Atti. R. Accad. Econ. Agr. Georg. Firenze, 4. ser., 23 (1900), pp. 327–330*).—The tobacco waste referred to consisted mainly of midribs of the leaves.

The utilization of residues from wine making and of spoiled wine as fertilizers, F. GARRIGOU (*Compt. Rend. Acad. Sci. Paris, 133 (1901), No. 4, pp. 252–254;*

abs. in Chem. Centbl., 1901, II, No. 12, p. 735).—Figures are given which show the total amount of these materials annually wasted in France, as well as the amounts of fertilizing constituents which they contain, and suggestions regarding the saving and utilization of the various by-products of the wine industry (including the ashes of the prunings and leaves) for fertilizing purposes are made.

Production of soluble potash salts from potassium feldspar (orthoclase), J. G. A. Rhodin (*Jour. Soc. Chem. Ind., 20 (1901), No. 5, pp. 439, 440*).—The author claims that by heating 100 parts of finely powdered feldspar with 53 parts of slaked lime and 40 parts of common salt to a temperature of 900° C. for an hour from 80 to 90 per cent of the potassium of the feldspar is converted into potassium chlorid.

Formation of oceanic salt deposits, particularly of the Stassfurt beds. XXII. Gypsum and anhydrite. II. The soluble anhydrite ($CaSO_4$), J. H. van't Hoff, W. Hinrichsen, and F. Weigert (*Sitzber. Kgl. Preuss. Akad. Wiss. Berlin, 1901, pp. 570–578; abs. in Jour. Chem. Soc. [London], 80 (1901), No. 466, II, p. 506*).—Investigations are reported which indicate that gypsum is transformed into anhydrite at 98° C.

Commercial fertilizers, H. A. Huston and W. J. Jones (*Purdue Univ. Spec. Bul., July, 1901, pp. 30*).—"This bulletin contains the new fertilizer law of Indiana, the detailed report and summary of inspections made in 1900 under the old law, the analysis of manufacturers' samples made between July, 1900, and March, 1901, under the old law, and the manufacturers' guarantees made since March, 1901, under the new law."

Analysis of commercial fertilizers sold in Maryland, H. B. McDonnell et al. (*Maryland Agr. Col. Quart., 1901, No. 13, pp. 1–60*).—A report of the results of inspection of fertilizers March to June, 1901.

Complete fertilizer analyses, spring season, 1901, B. W. Kilgore et al. (*Bul. North Carolina State Bd. Agr., 22 (1901), No. 5, pp. 3–36*).—This includes explanations of terms and of the valuation of fertilizers, freight rates, a discussion of the composition of fertilizers for special crops, recent changes in the State fertilizer law, and tabulated analyses and valuations of 581 samples of fertilizers.

Analysis of commercial fertilizers (*South Carolina Sta. Bul. 64, pp. 10*).—This bulletin is supplementary to Bulletin 60 of the station (E. S. R., 13, p. 332) and reports the results of analyses and valuations of 149 samples of fertilizing materials examined during the season of 1900–1901.

Report of chemist, M. B. Hardin (*South Carolina Sta. Rpt. 1900, pp. 9–15*).—A brief account of the work of the year in the chemical department of the station, including summaries of the general analytical work and of the results of fertilizer inspection, the latter of which have been reported in detail in previous bulletins (E. S. R., 12, p. 626). During the year ended June 30, 1900, 330 samples of fertilizers were analyzed. Of these 6 were deficient under the State law, their commercial value, based upon analysis, falling 3 per cent or more below the commercial value based upon guarantee. "Besides these there were 56 samples which fell below guarantee in one or more constituents, but whose money value was made up of an excess of other constituents." The average composition of the fertilizers examined is given.

Commercial fertilizers, 1901, J. H. Stewart and B. H. Hite (*West Virginia Sta. Bul. 76, pp. 181–195*).—This bulletin summarizes the provisions of the amended fertilizer law of West Virginia which took effect May 2, 1901, and reports analyses and valuations of 144 samples of fertilizers examined during 1900. Under the amended law manufacturers are not required to furnish certified samples of their fertilizers to the inspector, but to submit an affidavit stating not only the amount or percentage of nitrogen, potash, phosphoric acid, etc., but also the materials from which these constituents are derived and the form in which they exist in the fertilizers. The analysis fee required by the old law is replaced by a nominal registration fee of $1 per brand, the necessary revenue for carrying the new law into effect being derived from the sale of tags. It is claimed that this change to a tonnage tax will be of decided advantage to purchasers of commercial fertilizers by promoting competition and increasing the number of brands of fertilizers introduced into the State.

Laws relating to inspection, analysis, manufacture, and sale of fertilizers, cotton-seed meal, etc., in Florida (*Mo. Bul. Florida Dept. Agr., 11 (1901), No. 66, pp. 13–18*).—Gives text of the law approved May 22, 1901.

Report of the committee charged with the study of the revision of legislation relating to the adulteration of fertilizers and foods (*Bul. Agr. [Brussels], 17 (1901), No. 2, pp. 235–290*).—The provisions of the laws in force in England, Denmark, Spain, France, Hungary, Norway, Portugal, Sweden, and Switzerland are briefly given.

FIELD CROPS.

Report on the experimental work at the agricultural college at Tetschen-Liebwerd, E. GROSS (*Ztschr. Landw. Versuchsw. Oesterr., 3 (1900), No. 3, pp. 374–488, figs. 2*).—This report contains brief descriptions of tests with 8 varieties of winter wheat, 4 of rye, 4 of oats, 2 of clover, 7 of cowpeas, and 60 varieties of potatoes; of fertilizer experiments on meadows, barley, clover, wheat, and hops; of plant breeding work with potatoes and barley, and various other experiments, some of which have not yet been completed. Many of these experiments were in progress for several seasons.

Colossal Ladino, a sport variety of white clover, yielded 7,050 kg. of hay per hectare, as compared with 5,120 kg. of ordinary white clover. Inoculating land with soil from American cowpea fields resulted in a marked improvement in the yield of cowpeas, but neither the plants on inoculated soil nor those on uninoculated soil arrived at the blossoming stage. Of the varieties of potatoes tested 42 were new, and among them Kastellan and Badera were the richest in starch, containing 21 per cent. The fertilizer experiments on meadows consisted of applying different combinations of nitrate of soda, superphosphate, kainit, and lime at the rate of 150, 300, 400, and 250 kg. per hectare, respectively, and the use of compost at the rate of 30,000 kg. Liquid manure was applied at the rate of 160 hectoliters per hectare. The results were in favor of the complete fertilizer, the compost, and the liquid manure. During the three years of the experiments all the plats, except the one which had received lime alone, gave an increase in the yield of hay greater in value than the cost of the fertilizer applied. Harrowing the meadows was not as effective as anticipated.

Barley was grown with different applications and combinations of Thomas slag, kainit, and barnyard manure. Thomas slag and kainit were applied at the rate of 800 kg. per hectare, and the barnyard manure at the rate of 30,000 kg. per hectare. The object of this experiment was to test the effect of a slow-acting nitrogenous fertilizer like barnyard manure, in conjunction with mineral fertilizers. It is stated that a quick-acting nitrogenous fertilizer, like nitrate of soda, affects the growth of the plant in its early stage, but that the supply of nitrogen is exhausted or insufficient when the grains are developing. The results of this test showed that the addition of mineral fertilizers and barnyard manure materially increased the yield, and that the development of the grains took its normal course.

Plats which had received Thomas slag and kainit the preceding year, when a crop of barley was grown, produced from 400 to 1,050 kg. of clover hay more per hectare than plats which had received no fertilizer. Martellin, a prepared tobacco and hop fertilizer, consisting of powdered potash and finely ground peat, applied with barnyard manure for hops, decreased the yield as compared with the use of barnyard manure alone. Pruning largely increased the yield of hop plants. The unpruned plants developed too many leaves and underground stems for proper cultivation and profitable production.

Work with field crops at the experimental farms in Bombay Presidency in India, J. W. Mollison (*Ann. Rpt. Deputy Dir. Agr. Bombay Presidency, 1900, pp. 1–22, 23–36*).—This report records the results of experiments with field crops at the Poona and Surat experimental farms for the years 1898 to 1900, inclusive. The work included cultural tests with forage and fiber crops and with wheat, sugar cane, rice, and tobacco; a series of fertilizer and rotation experiments; improvement of seed by selection; and irrigation tests. Among a number of sorghums grown experimentally a variety known as Sundhia is considered as probably the best variety under cultivation in that region. Mauritius water grass proved an excellent plant for damp and even wet situations, and the successful cultivation of Guinea grass (*Panicum jumentorium*) is reported as fully established. Alfalfa gave good returns when conditions were favorable, but a mixed crop of alfalfa and Guinea grass is recommended as safer than alfalfa alone. Experiments with Egyptian and Brazilian varieties of cotton led to the conclusion that the conditions are unsuited to exotic varieties and that improvement must be along the line of developing indigenous sorts.

Rhea (*Bœhmeria tenacissima*), grown for 3 years, did not give encouraging results. *Hibiscus cannabinus* and *Crotalaria juncea* yielded 973 and 520 lbs. of fiber per acre, respectively, while Rhea produced only 56 lbs.

Five varieties of Bájri (*Pennisetum typhoideum*) are described and their value noted. Twenty-three varieties of wheat (*Triticum æstivum*) were tested, but no conclusions were drawn, and no individual varieties are mentioned. Gram (*Cicer arietinum*) was found to be an excellent rotation crop, requiring light irrigation only. Tur (*Cajanus indicus*) was grown as an intercultural forage crop with sorghum. The work in seed selection was undertaken with cotton and sorghum, and the progress of the experiments is discussed. Rice as an intercultural crop with cotton in rows wide apart proved a failure.

Sumatra tobacco was one of the earliest to mature among 10 varieties tested, and it produced a finer and softer leaf than indigenous sorts. The different varieties of tobacco are briefly described.

Agricultural experiments (*Rpt. Dept. Agr. Northwest Territories, 1900, pp. 22–28*).—The experimental work conducted in the Northwest Territories in 1900 is outlined, and the results at the Calgary Experiment Station in variety tests with wheat, barley, oats, rape, and potatoes are briefly reported. Short notes are given on culture experiments with grasses and forage crops. The meteorological record for the last 5 months of the year is shown in a table.

Crop experiments, W. T. Lawrence (*County Councils Cumberland, Durham, and Northumberland, Tech. Education, Rpt. 9 (1900), pp. 162–171*).—The experiments were carried out at the Cumberland and Westmoreland County Council Farm in 1900. The work consisted of fertilizer experiments on meadows, potatoes, mangolds, swedes, and oats, and the results obtained are here briefly summarized.

Rotation experiments at Kimblesworth, Chester-le-Street (*County Councils Cumberland, Durham, and Northumberland, Tech. Education, Rpt. 9 (1900), pp. 37–48, figs. 2*).—The experiment was made with a 5-year rotation, namely, potatoes, barley, hay, hay and oats. The work was carried out on 22 fifth-acre plats with suitable soil. Heavy dressings of barnyard manure were unusually profitable. Commercial fertilizers applied alone gave poor results, but as a supplementary application to 12 tons of barnyard manure per acre a mixture of 1½ cwt. of sulphate of ammonia, 5 cwt. each of superphosphate and kainit produced a profitable increase in the crops. The most important ingredients of the mixture applied with barnyard manure were the nitrogenous substances. Superphosphate was the best phosphatic fertilizer.

Rotation experiment at Rose Bank, Dalston (*County Councils Cumberland, Durham, and Northumberland, Tech. Education, Rpt. 9 (1900), pp. 49–65, figs. 4*).—This experiment was conducted on poor moorland soil recently broken up from pasture. The succession of crops was swedes, oats, hay, hay and oats. On this soil barnyard manure proved much less effective than commercial fertilizers. Kainit, in the absence of barnyard manure, greatly benefited the crops, especially the oat crop. In general, applying all the commercial fertilizers to the root crop proved to be a better practice than using a certain portion for each crop in the rotation.

Suggestions for the manuring of various crops (*Reading Col., Agr. Dept. Rpt. 1900, pp. 44–47*).—Brief notes on the manuring of peas, beans, swedes, turnips, rape, mangels, potatoes, cabbage, cereals, rye grass, clover, and meadow and pasture lands.

The importance of the selection cf varieties in plant culture, EDLER (*Hessische Landw. Ztschr., 71 (1901), No. 9, pp. 88, 89*).

The utilization of the agave plant in Mexico (*Mitt. Deut. Landw. Gesell., 16 (1901), Sup. to Nos. 7, pp. 51, 52; 8, pp. 55, 56*).

The production of barley for brewing purposes, VON RÜMKER (*Fühling's Landw. Ztg., 50 (1901), Nos. 2, pp. 53–58; 3, pp. 95–104*).—A paper discussing the profits in the culture of the crop and the requisite quality of barley for brewing purposes. Special attention is given to the use of fertilizers.

The influence of the fertilizers application and the water content of the soil upon the form and composition of the barley plant, VON SEELHORST and N. GEORGS (*Jour. Landw., 48 (1900), No. 4, pp. 325–347*).—This work includes studies of the influence of plant food and soil humidity on the relation of root development to the rest of the plant, on the development of the parts of the plant above ground, on the total yield of straw and grain, and on the yield of grain alone. The plants were grown in pots containing 20 kg. of soil, which was fertilized with quantities of potassium carbonate, sodium nitrate, and monocalcic phosphate furnishing 1 gm. of potash, nitrogen, and phosphatic acid, respectively. These fertilizers were applied in different combinations. Grains of barley of uniform weight were sown March 28. The soil of all the pots was kept equally moist at first to insure uniform germination. April 20 the water content of the soil was differentiated and the pots divided into three series, namely, the first series with a low water content of 49 per cent of the water-holding capacity of the soil, the second series with a medium water content of 62 per cent, and the third series with a high soil humidity of 76 per cent of the water required to saturate the soil. The results were similar to results obtained in this kind of work with oats. (E. S. R., 13, p. 125.) The conclusion is that supplying the element or elements of plant food which are present in the soil in only minimum quantities, favors the development of the roots as well as the parts of the plant above ground, and that the increase of organic substance in the soil due to the development of the roots has a beneficial effect on the succeeding crop. It was noticed that the low water content of the soil induced a greater development of the root system, and attention is called to the fact that an increase in root development means a withdrawal of plant food from the other parts of the plant. The application of nitrogenous fertilizers when only a small amount of nitrogen was present in the soil, together with a high soil humidity, favorably influenced the stooling of the plants. The increase in the number of the internodes due to a higher water content was not quite regular, but nevertheless quite perceptible. The influence of fertilization in this respect was less evident. In every case where the humidity of the soil was increased without the application of nitrogen the strength of the culm decreased, while under the same conditions with the use of nitrogen in the fertilizer the strength of the culm increased. Increasing the soil humidity and furnishing nitrogen in the plant food increased the length of the culms and of the different internodes, the increase being greatest in the 2 upper internodes. The length of the third, fourth, fifth, and sixth internodes agreed with the length of these parts as laid down by Nowacki's law, but this was never so in the case of the second internode from above. The length of the heads and the strength of the culm were effected by the same factors. The increase of soil humidity with no nitrogen shortened the heads, while with the use of nitrogen the increase in the water content of the soil lengthened them. The results further show that in general both the increase in soil humidity and the use of nitrogenous fertilizers slightly reduced the number of undeveloped spikelets. The increase in the weight of the heads was especially noticeable when the application of nitrogen in the fertilizer accompanied an increase in soil humidity. The percentage relation of the grain to the entire plant was somewhat decreased by the high degree of soil humidity. This decrease was greatest when the plants received no nitrogen, otherwise it was much less perceptible. The authors state that so long as nitrogen is present in insufficient quantities the use of nitrogenous fertilizers will increase the percentage of gain, rather than decrease it as is often believed. The average weight of the heads of plants grown under conditions of a low and high soil humidity, was as 100:125, while the weight of their grains was as 100:121. Nitrogenous fertilizers increased the number and percentage of poorly developed grains. From the results obtained upon investigating the mealiness of the grain and determining the content of nitrogen and nitrogen-free extract, the authors conclude that on dry soils nitrogenous fertilizers tend to increase the nitrogen content of the grain, but that there is less danger of producing barley too rich in nitrogen for brewing purposes by the use of nitrogen in fertilizers when the soil is moist.

Culture and improvement of field beets, A. Kirsche (*Deut. Landw. Presse, 28 (1901), No. 20, p. 167*).—A report on culture and selection tests.

Cotton production of European and Asiatic Russia (*Mitt. Deut. Landw. Gesell., 16 (1901), Sup. to No. 11, p. 73*).

Forage plants for Kansas, A. S. Hitchcock and J. M. Westgate (*Kansas Sta. Bul. 102, pp. 179–220, figs. 30, pls. 16*).—This bulletin describes briefly a large number of forage plants considered valuable for the State, including those giving promise of success at the experiment station grass garden. Directions are given for the culture of millets, sorghum, timothy, red clover, mammoth clover, and native grasses. The renovation of worn-out native pastures is also briefly discussed. The following forage plants are described: Soy bean (*Glycine hispida*), white clover (*Trifolium repens*), mammoth clover (*T. medium*), red clover (*T. pratense*), alsike clover, Swedish clover (*T. hybridum*), buffalo clover (*T. reflexum*), crimson clover (*T. incarnatum*), Egyptian clover (*T. alexandrinum*), Bokhara or sweet clover (*Melilotus alba*), alfalfa (*Medicago sativa*), hairy vetch (*Vicia villosa*), spring vetch (*Vicia sativa*), Dakota vetch (*Lotus americanus*), bird's-foot trefoil (*L. corniculatus*), white lupine (*Lupinus albus*), blue lupine (*L. hirsutus*), yellow lupine (*L. luteus*), flat pea (*Lathyrus sylvestris wagneri*), Japan clover (*Lespedeza striata*), serradella (*Ornithopus sativus*), sainfoin (*Onobrychis sativa*), chick-pea (*Cicer arietinum*), beggar weed (*Desmodium tortuosum*), Scotch broom (*Cytisus scoparius*), furze (*Ulex europæus*), velvet bean (*Mucuna utilis*), green gram (*Phaseolus mungo*), timothy (*Phleum pratense*), orchard grass (*Dactylis glomerata*), meadow fescue (*Festuca pratensis*), Kentucky blue grass (*Poa pratensis*), Canadian blue grass (*P. compressa*), Texas blue grass (*P. arachnifera*), redtop (*Agrostis vulgaris*), tall oat grass (*Arrhenatherum avenaceum*), Bermuda grass (*Cynodon dactylon*), goose grass (*Eleusine indica*), Johnson grass (*Andropogon halepensis*), awnless brome grass (*Bromus inermis*), foxtail millets (*Setaria viridis*), barnyard millet (*Panicum crus-galli*), shama millet (*Panicum colonum*), sanwa millet (*Panicum frumentaceum*), broom-corn millets (*Panicum miliaceum*), pearl millet (*Pennisetum spicatum* or *P. typhoideum*), teosinte (*Euchlæna luxurians*), sorghum (*Andropogon sorghum* or *Sorghum vulgare*), corn (*Zea mays*), rye (*Secale cereale*), rape (*Brassica napus*), Australian saltbush (*Atriplex semibaccata*), giant spurry (*Spergula maxima*), and common morning-glory (*Ipomœa hederacea*).

The botanical composition of native pastures was studied by laying off a typical square rod within the pasture, removing the entire vegetation and separating, drying, counting, and weighing the different species represented. Upland pastures in good, average, and poor conditions were chosen, and the results for each are recorded. A few brief notes on the grazing capacity of native pastures and their care and management are given. A table shows the weights in pounds per bushel of seed of 24 different grasses and forage plants.

Forage crops (*Texas Sta. Bul. 59, pp. 45–98, figs. 11*).—This bulletin contains reports of stockmen and farmers from 71 counties of the State of Texas, by whom a number of different forage crops were given a cooperative trial. The crops which entered into these tests were: Alfalfa (*Medicago sativa*), Japan clover (*Lespedeza striata*), melilotus or Bokhara clover (*Melilotus alba*), crimson clover (*Trifolium incarnatum*), white clover (*T. repens*), velvet bean (*Mucuna utilis*), giant beggar weed (*Desmodium tortuosum*), cow peas (*Vigna catjang*), rescue grass (*Bromus unioloides*), red Kafir corn (*Sorghum vulgare*), field corn (*Zea mays*), and chufas (*Cyperus esculentus*).

Brief cultural directions for each crop are given. The average annual precipitation for the State and the distribution of the cooperative tests are shown on maps and the plans of other forage-crop work pursued by the station are briefly outlined.

Pastures and meadows of Iowa, L. H. Pammel, J. B. Weems, and F. Lamson-Scribner (*Iowa Sta. Bul. 56, pp. 385–621, figs. 82*).—This bulletin describes native and introduced species of Iowa grasses, with reference to their history, distribution, and value, and presents in tabular form the chemical composition of most of the described species based on the original and water-free substance. The conditions of Iowa pastures and meadows are considered, and directions are given for sowing grass seed and maintaining grass lands. A number of weeds commonly troublesome in meadows and pastures are described, and the conditions favorable to their growth are pointed out. The chemistry of foods and feeding is discussed and the average composition of feeding stuffs, American digestion coefficients, and other data bearing on the subject of feeding are shown in tables. A number of pages are devoted to lawns and lawn making under Iowa conditions.

Brome grass and timothy compared, E. F. Ladd and Adele Shepperd (*North Dakota Sta. Bul. 47, pp. 711–721*).—These two grasses were grown to compare the yields of green grass and to study their relative value for hay, considering their yield and chemical composition. In 5 cuttings during the season brome grass yielded 5,537.6 lbs. of green grass or 1,628.3 lbs. of dry matter per acre, and timothy, 4,681.6 lbs. of green forage or 1,422.8 lbs. of dry matter. The results were decidedly in favor of brome grass for permanent pasture. Analyses were made of both crops as green forage and the results are set forth in tables. Brome hay contained about twice as much protein as timothy and no more fiber than the average for timothy grown in different parts of the country. Owing to its larger root system, brome grass is considered a better humus producer and soil improver than timothy.

Seed mixtures for hay and pasture, D. A. Gilchrist (*Reading Col., Agr. Dept., Rpt. 1900, pp. 36–43*).—Brief reports on tests of different grass mixtures for permanent and temporary meadows and pastures, and on trials with sainfoin and alfalfa.

Very intensive forage culture, San Bernardo (*Jour. Agr. Prat., 1901, I, No. 7, pp. 212–214, fig. 1*).—A report on the intensive culture of maize, barley, and oats for forage in Spain. The crop was grown under irrigation on a field of 3 hectares which had received 50,000 kg. of barnyard manure, 666 kg. Thomas slag, 500 kg. nitrate of soda, and 170 kg. of superphosphate per hectare. The corn grew to an average height of 4.30 meters and yielded 90,000 kg. of forage per hectare during a favorable season. The corn was sown early in April and cut about August 1. The second crop of corn was then grown and harvested by November 1. Following this, barley or oats was sown, which was cut for green forage the following spring, before the preparation of the land for the first corn crop. The average yield for the three years was 75,000 kg. of green forage per hectare for the first crop of corn, 65,000 for the second crop, and 27,000 kg. for the crop of barley or oats. The experiment was a financial success.

Fertilizer requirements of meadows, Clausen (*Landw. Wchnbl. Schleswig-Holstein, 51 (1901), Nos. 7, pp. 103–106, figs. 2; 8, pp. 118–120, fig. 1*).—A report on experiments with rye grass on marshy and ordinary soils.

Fertilizer experiments on clover and rye grass (*County Councils Cumberland, Durham, and Northumberland, Tech. Education, Rpt. 9 (1900), pp. 30-36*).—The results of cooperative fertilizer experiments on clover and rye grass at six different centers are reported. The application found most profitable consisted of 1 cwt. of nitrate of soda and $\frac{3}{4}$ cwt. of sulphate of ammonia per acre. Two hundredweight nitrate of soda gave almost as good results, the nitrate proving more generally useful than the sulphate of ammonia. Superphosphate was profitable in two cases only.

Experiments upon hops, 1900, A. D. HALL (*Jour. Southeast. Agr. Col. Wye, 1901, No. 10, pp. 21-32*).—The experiments here reported include a study of the effect of cutting the hop vine at picking time, a comparison of different systems of training as to the yield and observations on the effect of stripping the plants of their lower leaves and laterals. The data obtained through a series of chemical analyses, the results of which are tabulated, show that a valuable amount of nutritive material is retained by the root if the vine and leaves are allowed to ripen before their removal. The training experiments this season resulted in the best yields from the closely-planted systems. The previous season, when a much heavier crop was obtained, the results favored the widely-planted systems. Stripping materially reduced the yield, while in 1899 it caused no loss. These results were to some extent effected by the character of the seasons.

A report on tests with sport varieties of oats in 1899, K. KITTLAUSS (*Deut. Landw. Presse, 28 (1901), Nos. 18, p. 149; 19, p. 158*).

Potato growing experiments, J. S. GORDON (*Jour. Roy. Hort. Soc. [London], 24 (1900), No. 3, pp. 283-298*).—This is a report on experiments with potatoes with especial reference to seed, methods of planting, and the use of fertilizers. The selection of seed potatoes, the origination of new varieties, and the importance of tilth in potato culture are discussed. The results of tests with cuttings or whole tubers and different sized cuttings for seed and of experiments with commercial fertilizers and barnyard manure applied alone and in different combinations are presented in tabular form. The average yield of 5 varieties from cuttings and from whole tubers was 12 tons 5 cwt., and 13 tons 3 cwt. of salable potatoes per acre, respectively. Cuttings of 6 different sizes, the diameter varying from 1 to $2\frac{1}{8}$ in., were compared and the results showed that fairly large sets produce heavier yields than small sets, but they are not so profitable. It was further noticed that the yield of small tubers increases with the number of stems a potato produces, and that the varieties with the strongest stalks were the most drought-resisting. Barnyard manure was more effective than commercial fertilizers, owing to a large extent to its beneficial influence on the mechanical condition of the soil. Superphosphate in connection with barnyard manure decreased the yield. Sulphate of ammonia gave better results than nitrate of soda. An application of 15 tons of barnyard manure, 1 cwt. sulphate of ammonia, and 3 cwt. of superphosphate per acre, yielded $11\frac{1}{2}$ cwt. of salable potatoes less than the same application with the addition of 1 cwt. of muriate of potash, but the percentage of salable tubers was about the same. Muriate of potash was more effective than kainit. The use of 1 cwt. of potash gave better results than double that amount.

Experiment on potatoes (*County Councils Cumberland, Durham, and Northumberland, Tech. Education, Rpt. 9 (1900), pp. 21-29*).—The results of a cooperative experiment on potatoes conducted on 5 different farms are reported. An application of $1\frac{1}{8}$ cwt. sulphate of ammonia, $1\frac{3}{4}$ cwt. of superphosphate and $\frac{3}{4}$ cwt. of sulphate of potash per acre, in addition to 12 tons of barnyard manure, gave better results than the use of double this quantity of commercial fertilizers. The most profitable dressing of commercial fertilizers alone consists of $2\frac{1}{4}$ cwt. sulphate of ammonia, $3\frac{1}{2}$ cwt. superphosphate, and 3 cwt. sulphate of potash, but the results on other plats indicated that if $\frac{1}{2}$ cwt. of nitrate of soda and 1 cwt. of fish meal had been substituted for 1 cwt. of the sulphate of ammonia, the returns would have been still more profitable. Copious dressings of sulphate and muriate of potash were found profitable, but heavy dressing of kainit decreased the yield. The use of kainit on all farms lowered the percentage of dry matter in the tubers, the average reduction amounting to 2.88 per cent. Barnyard manure for potatoes is recommended when the crop follows a fallow, but when such is not the case commercial fertilizers are considered best.

Potato-growing experiments at Abbey Holme, Cumberland (*County Councils Cumberland, Durham, and Northumberland, Tech. Education, Rpt. 9* (*1900*), *pp. 176–178*).—A report on variety tests made in 1900.

Potato experiments in 1900 at Kloster-Hadmersleben, K. KITTLAUSS (*Deut. Landw. Presse, 28* (*1901*), *No. 21, pp. 173–178*).—A report on extensive variety tests with potatoes.

Report on the variety tests conducted at the German potato experiment station in 1900 (*Sächs. Landw. Ztschr., 49* (*1901*), *No. 9, pp. 161–166*).—The results in yield of the tubers and starch of 18 varieties of potatoes are recorded.

New varieties of potatoes, A. DUBOIS (*Jour. Agr. Prat., 1901, I, No. 11, pp. 343, 344*).—A description of several new varieties of potatoes is given.

Producing a new potato by grafting, J. R. LAWRENCE (*Amer. Agr.* (*mid. ed.*), *67* (*1901*), *No. 16, p. 568*).—The author claims to have produced a new variety by grafting the eye of Scotch Rose on a tuber of Maule Commercial.

Fertilizer experiments, KUHNERT (*Landw. Wchnbl. Schleswig-Holstein, 51* (*1901*), *No. 11, pp. 166–168*).—A report on cooperative fertilizer experiments with beets and potatoes, the results of which led to the conclusion that lime must be used on marsh soils in conjunction with commercial fertilizers if these are to be fully effective.

Culture of ramie and other fiber plants in China, M. SCHANZ (*Tropenpflanzer, 5* (*1901*), *No. 3, pp. 126–136*).—Twelve of the most important Chinese fiber plants are described, and the culture of ramie, as it is carried on in China, together with a description of the process of decortication and the methods of exportation, is discussed.

Progress in the beet-sugar industry in the United States in 1900 (*U. S. Dept. Agr. Rpt. 69, pp. 178*).—This is the customary annual report on the progress of the beet-sugar industry in the United States, and is similar in character to the reports previously noted (E. S. R., 12, p. 742).

Report of the special agent, C. F. Saylor (pp. 5–122).—This report discusses in a general way the consumption of sugar in the United States, the forces which are educating the people in regard to the beet-sugar industry, American-made machinery and implements, bounties and other methods of promoting the industry, distribution and production of seed, the utilization of wastes and by-products of factories, and the cultivation and fertilization of the soil. The crop conditions and factory operations during the year are noted in detail for each State. Factories are now in operation in California, Colorado, Illinois, Michigan, Minnesota, Nebraska, New Mexico, New York, Ohio, Oregon, Utah, and Washington. New factory enterprises are reported from Colorado, Indiana, Iowa, Michigan, North Dakota, Oregon, Utah, South Dakota, and Wisconsin. Short discussions by different investigators and beet-sugar manufacturers on insect enemies and diseases affecting the sugar beet are presented, and reports from directors of experiment stations regarding culture, sugar content, and purity of beets grown at the stations and throughout the corresponding States are reproduced. These data have largely been published in the station bulletins.

Report of the chemist, H. W. Wiley (pp. 123–171).—This report presents the results of analysis of sugar beets grown on the experimental grounds of the Department of Agriculture and on trial plats of individual growers throughout the country, to whom seed were furnished by the Department. The tabulations show the number of samples received from each State and Territory, the variety of each sample, the weight of the beets, their sugar content, the purity coefficients of the juice, and other data of interest in connection with the production of beets for the manufacture of sugar. The average results for each year since 1897 are summarized and discussed by States.

Twelve years of sugar beet tests in the United States (*Beet Sugar Gaz., 3 (1901), No. 2, pp. 29, 30*).—A summary of the results of work with sugar beets at the agricultural experiment stations of the United States during the past 12 years.

Sugar beets, 1891–1900, J. T. WILLARD and R. W. CLOTHIER (*Kansas Sta. Bul. 103, pp. 275–286*).—The results of experiments with sugar beets in 1900, together with the analyses of samples containing over 14 per cent of sugar in the juice and representing all previous sugar-beet work within the State in connection with the station, are tabulated. The average sugar content of the juice in 1900 was 9.89 per cent, with an average purity coefficient of 72.7. In the opinion of the authors only the western part of the State, where the natural rainfall is entirely insufficient and the moisture required by the crop is supplied and regulated by irrigation, offers real climatic advantages for sugar-beet production.

Experiments in the culture of the sugar beet in Nebraska, H. H. NICHOLSON and T. L. LYON (*Nebraska Sta. Rpt. 1900, pp. 29–48*).—The results here reported at some length have been noted from a previous bulletin (E. S. R., 12, p. 846).

The sugar beet in North Carolina, W. A. WITHERS (*North Carolina Sta. Bul. 180, pp. 91–106, maps 2*).—This bulletin gives the history of experimental sugar-beet culture in the State, and reports the results of cooperative culture experiments conducted by the station in 1898 and 1899. The sample beets from several counties showed over 14 per cent of sugar. The opinion is that while the State in general is not well adapted to sugar-beet culture, there are certain sections in the western part of the State where the profitable culture of the sugar beet is feasible.

Regeneration of the seed beet, F. BUBÁK (*Deut. Landw. Presse, 28 (1901), No. 22, pp. 183, 184, figs. 3*).—A report on observations in beet seed culture. The author concludes from his observations and those of other investigators that the beet which yields seed during several vegetative periods develops each year one or more branch roots which contain the reserve material, and that the life of these roots depends largely upon the successful wintering of the adventitious buds.

The sugar industry of Louisiana, R. DYKERS (*Tradesman, 44 (1901), No. 9 (22 Ann.), pp. 144–146*).—A general article on the culture of sugar cane and the present condition of the sugar industry in the State.

Culture of sugar cane (*Bol. Agr. Min. é Ind. [México], 10 (1900), Nos. 5, p. 39, pls. 2; 6, p. 39; 7, p. 64*).—This article treats of the history, classification, composition, and culture of sugar cane.

Sugar production in Mexico (*Mitt. Deut. Landw. Gesell., 16 (1901), Sup. to No. 10, pp. 65–72*).—A description of the sugar industry from an agricultural standpoint in different Mexican States.

Seedling canes (*Sucr. Indig. et Coloniale, 57 (1901), No. 11, pp. 340–342*).—The degeneration of varieties of sugar cane during the last century is considered in this article and circumstances are described which indicate that the borer, so destructive to the crop, first appeared in Guadeloupe in 1785.

Experiments on the manuring of swedes (*County Councils Cumberland, Durham, and Northumberland, Tech. Education, Rpt. 9 (1900), pp. 9–20*).—Cooperative experiments were made to determine the effects of commercial fertilizers used alone and with barnyard manure, and further, to test the soils on which the work was carried out. The average results show that where $2\frac{1}{2}$ cwt. of slag, $\frac{1}{2}$ cwt. of nitrate of soda, $\frac{3}{8}$ cwt. of sulphate of ammonia, and 2 cwt. of kainit were applied with 12 tons of barnyard manure, the increase in crop just paid for the commercial fertilizers. Considering the results of rotation experiments, it is believed that the effects of commercial fertilizers on subsequent crops would give a profit. The nitrogenous fertilizers produced the greatest increase in crop.

Sweet potato, F. S. SHIVER (*South Carolina Sta. Bul. 63, pp. 37*).—This bulletin sets forth the results of 3 different lines of observations, namely, the effect of fertilizing with different forms of potash on the starch content of the sweet potato, the effect of storing upon the composition, and the relative value of several generally used methods of storing. The results with different forms of potash as a fertilizer are presented in the following table:

Results of experiments with different forms of potash as a fertilizer for sweet potatoes.

Fertilizer.	Original material.		Water-free material.		Yield of sweet potato per acre.	Yield of starch per acre.
	Water.	Starch.	Dry substance.	Starch.		
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Pounds.*	*Pounds.*
Compost and kainit	63.81	22.86	36.19	63.16	11,403	2,607
Compost and muriate of potash	63.77	22.21	36.23	61.31	9,006	2,000
Nothing	62.07	24.58	37.93	64.80	7,986	1,963
Compost and sulphate of potash	64.97	21.63	35.03	61.75	9,576	2,071
Compost and silicate of potash	65.87	20.70	34.13	60.66	9,744	2,017
Compost	65.26	20.80	34.74	59.88	8,103	1,685

Compost was used at the rate of 1,000 lbs. per acre while kainit, muriate, sulphate, and silicate of potash were applied at the rate of 400, 100, 100, and 250 lbs. per acre, respectively. The variety used in this test was Horton yam.

The study of the effects of storing on the composition of the sweet potato was conducted with the same variety. The sweet potatoes fertilized with the different forms of potash mentioned above were stored November 28 and analyzed at that time and at different periods later.

The figures for all plats for the different periods are given in the following table:

Analyses at different periods of storing of sweet potatoes fertilized with different forms of potash.

Fertilizer applied.	November 28, 1898.				March 1, 1899.				April 17, 1899.			
	Water.	Starch.	Glucose.	Sucrose.	Water.	Starch.	Glucose.	Sucrose.	Water.	Starch.	Glucose.	Sucrose.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Kainit	63.81	22.86	0.96	5.41	65.04	18.71	1.20	6.18	67.11	15.84	0.36	7.10
Muriate of potash	63.77	22.21	1.20	6.10	63.81	18.42	1.23	7.35	66.84	14.58	.90	7.46
Nothing	62.07	24.58	1.19	5.28	67.77	17.74	.59	6.26	63.78	16.69	.59	9.51
Sulphate of potash	64.97	21.63	1.51	5.59	62.31	20.07	.89	8.05	66.61	18.43	.90	6.57
Silicate of potash	65.87	20.70	1.27	6.03	75.05	11.84	1.63	4.90	(*a*)	(*a*)	(*a*)	(*a*)
Compost	65.26	20.80	1.41	6.21	67.02	14.83	1.11	8.97	(*a*)	(*a*)	(*a*)	(*a*)

a Tubers spoiled.

After a storage of 140 days, the roots fertilized with kainit had lost 30.7 per cent of the starch originally present; those fertilized with muriate of potash, 34.4 per cent; the roots which had received no fertilizer, 32.1 per cent; and those fertilized with sulphate of potash, 14.8 per cent. The sweet potatoes from the other plats decayed.

"It would appear from these particular experiments that the loss of starch, which the sweet potato sustains on storing, is to be attributed very largely, but not wholly, to the increased formation of sucrose or cane sugar in the same. There may be possibly formed some other intermediate products, such as dextrin, but this has not yet been established."

In connection with this work the effect of storing upon the composition of different varieties of sweet potatoes was studied. The highest content of starch, 19.58 per cent, was found in the Bunch yam and the next highest in the Georgia yam. It was noticed that a high percentage of starch was usually accompanied by a low percentage of sucrose and that the glucose content of sweet potatoes is not subject to great variations. These roots were stored November 28 and an analysis made January 7 showed an average decrease of about 19.8 per cent of the starch originally present. This rapid loss of starch is attributed to storing the roots in a damp condition. The sucrose content showed an increase from 4.95 to 8.87 per cent for the same period of time. The Hanover yam preserved its starch content better than any other variety, being followed closely by the Georgia Buck varieties.

During the author's absence this work was continued by C. C. McDonell, with 4 varieties: The Pumpkin yam, Bunch yam, Georgia sugar yam, and Tennessee yam. The results of analyses made on different dates are given below:

Analyses of several varieties of sweet potatoes stored for different lengths of time.

Date of analysis.	Pumpkin yam.			Bunch yam.			Georgia sugar yam.			Tennessee yam.		
	Starch.	Glucose.	Sucrose.	Starch.	Glucose.	Sucrose.	Starch.	Glucose.	Sucrose.	Starch.	Glucose.	Sucrose.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Nov. 14, 1899..	17.38	1.08	5.17	13.92	1.38	5.47	18.41	1.08	5.08	15.74	1.41	5.02
Dec. 14, 1899..	14.57	1.12	5.93	9.61	.78	4.17	16.83	1.24	5.07	14.71	1.11	5.67
Jan. 15, 1900..	10.05	2.59	8.83	12.30	1.73	8.61	14.98	1.73	8.14	14.74	1.84	7.37
Feb. 15, 1900..	10.08	1.45	7.12	8.18	1.64	9.48	13.76	1.45	8.78	13.25	1.18	9.05
Mar. 15, 1900..	11.12	1.04	11.59	8.83	1.68	11.70	13.42	1.10	11.96	9.94	1.15	9.75

The average content of starch decreased from 16.27 per cent to 10.92 per cent during storing, while the average percentage of sucrose increased from 5.21 to 11.31 during the same period of time. It was further observed in these different experiments that the sweet potato loses very little water while in storage. The results of work along this same line conducted at the Texas Station and previously reported (E. S. R., 7, p. 684) are reproduced for comparison.

For the purpose of determining the relative value of different methods of storing, roots of the Georgia Buck variety were stored in a covered building, in straw, sand, cotton-seed hulls and cotton seed, and in the ordinary way in piles covered with straw, cornstalks, dirt, and a shelter of boards. According to an analysis of a large composite sample, the roots on November 28, before storing, contained 75.35 per cent of water, 13.13 per cent of starch, 0.77 per cent of glucose, and 4.31 per cent of sucrose. The results of analysis after storing are given below:

Analyses of sweet potatoes stored by different methods.

Method of storing.	January 7, 1899.				March 1, 1899.			
	Water.	Starch.	Glucose.	Sucrose.	Water.	Starch.	Glucose.	Sucrose.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
In straw, covered house..............	73.59	7.20	3.46	7.51	....	....	....	....
In sand, covered house	74.32	11.59	1.23	6.71	73.97	9.07	1.33	7.98
In cotton-seed hulls, covered house.	72.81	12.99	1.41	6.02	71.26	15.82	.68	5.12
In cotton seed, covered house	71.46	11.86	2.30	6.59	69.68	15.68	.55	6.04
In usual way (straw, cornstalks, etc.)	69.52	13.51	1.74	7.66	75.80	9.88	3.21	3.77

The method of storing largely influenced the changes in composition. The best results were obtained with the use of cotton-seed hulls, dry sand, and cotton seed, in the order named. Storing in straw is not considered advisable.

Climatic studies with wheat, oats, and corn, E. F. Ladd (*North Dakota Sta. Bul. 47, pp. 704-710*).—In 1899 Fife wheat was sown on April 25 and 27 and May 5 and 15. The number of days, the number of hours of sunshine, and the number of heat units required to mature the crops were observed and recorded. The results for the different sowings gave an average of 98.5 days, 779.5 hours of recorded sunshine, and 6,214.7 heat units necessary to mature the crops. The heat units represent the mean temperature of the growing period multiplied by the number of days of the growing period. In 1900 Fife, Blue Stem, and Preston wheat required an average of 103 days, 908.4 hours of recorded sunshine, and 6,560.1 heat units to mature. For the two years the average number of heat units was 6,387.4, as compared with 8,500 for all parts of Europe as given by Cooke. The period of growth averaged approximately 100 days, as compared with 115 to 184 for Europe. The author considers this difference to be due to other conditions of soil and climate, such as soil temperature, radiation, evaporation, rainfall, moisture-holding capacity of the soil, quantity of available plant foot, etc. Soil temperatures taken during the two seasons at depths of 1 and 6 inches are shown in tables. In 1899, oats required 89 days and 5,525.9 heat units, and in 1900, 92 days and 5,847.3 heat units, to complete maturity. Corn required 113 days and 7,423.3 heat units in 1899 and 114 days and 7,812.1 heat units in 1900 to ripen.

The wheat crop of 1900 grown under different methods of farming (*North Dakota Sta. Bul. 48, pp. 735–742, figs. 2*).—The results for 1900 of a series of rotation and cultivation experiments with wheat, in progress for several years, are reported. Three plats on which wheat had been grown continuously for 5 years received different cultural treatment. The first was plowed 3 to 4 in. deep and given ordinary cultivation; the second was plowed 6 to 7 in. deep, but otherwise treated as the first; the third was given better cultivation and was spring plowed 6 to 7 in. deep in 1900. The yields for the three plats were 4.7, 7.1, and 13.2 bu. per acre, respectively. Plat 4 in this experiment had been treated like the foregoing plats until 1899, when a crop of corn was grown. The grain on this plat stooled well, stood 34 in. high, and yielded 25.4 bu. per acre. Plat 5, which produced potatoes in 1899 and which had annually grown a cultivated crop since 1890, yielded 24.3 bu. per acre. Plat 6 had been treated as plat 5, but was summer fallowed in 1899. This plat yielded the longest straw and the most grain, the yield per acre being 29 bu. Plat 7, which has grown corn, wheat, flax, and corn, in the order given, during the 4 preceding years, produced 23.8 bu. of wheat in 1900. The yield on plat 8, which had grown wheat annually since 1883, was but 4 bu. per acre. In previous experiments harrowing after fall plowing, rolling and harrowing after spring sowing, and harrowing again when the wheat was 6 in. high, increased the yield 4½ bu. per acre as compared with cultivation necessary to put in the crop. It is concluded from these tests that good cultivation must be accompanied by a proper rotation of crops for the profitable production of wheat. A test of growing flax on soils treated like those above mentioned gave results similar to those of the test with wheat and led to the same conclusions.

Variety tests of wheat, G. C. Watson and E. H. Hess (*Pennsylvania Sta. Bul. 55, pp. 8*).—This bulletin is a report on a test of 23 varieties of wheat largely grown throughout the State. The work of testing varieties of wheat has been in progress at the station since 1890 (E. S. R., 11, p. 731). Attacks of the Hessian fly reduced the stand to 55 per cent of perfection, and the average yield was only 13.40 bu. per acre. The average yield of the 11 bearded varieties was 14.42 bu. and of the 12 smooth varieties 12.47 bu. per acre. The yields of grain from the different varieties varied greatly. The bearded varieties were injured less by the Hessian fly and gave a larger yield of grain and straw and a heavier weight of grain per measured bushel than the beardless or smooth varieties. The differences in yield of the smooth varieties are considered due to the differences in the damage done by the insect. Late-sown wheat was injured less by the insect pest than early-sown wheat and consequently gave better yields. In 1899 Reliable, a bearded variety, was sown on September 2 and 23, but the results in this case, owing to an early winter, were decidedly in favor of the earlier sowing. It is concluded from these results that the season governs the time of sowing, and that hence no definite date can be given. Of the varieties under test for 3 years, Reliable has produced the most grain. In 1900 this same variety was again the leader in productiveness, followed by Dawson Golden Chaff, the yields being 22.29 and 17.64 bu. per acre respectively.

The comparative values of Ontario wheats for bread-making purposes, R. HARCOURT (*Ontario Agr. Col. and Expt. Farm Bul. 115, pp. 6*).—For the purpose of making this comparison 37 ten-bushel lots of wheat were gathered from different sources. All lots were grown in Ontario in 1900, with the exception of a lot of Turkey Red imported from Kansas. These lots were ground and the flour saved from the last part of the run to assure the accuracy of all samples. The results of the work are set forth in the following table:

Average results of a comparison of the quality of flour from different varieties of wheat.

Varieties.	Number of samples.	Weight per measured bushel.	Flour.					
			Protein (N×6.25).	Crude wet gluten.	Crude dry gluten.	Water absorption.	Yield of bread per 100 lbs.	Quality of bread.
WINTER WHEATS.		*Pounds.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Pounds.*	*Per cent.*
Turkey Red	3	62.8	10.77	40.12	12.35	62.6	157.6	95.0
Michigan Amber	5	62.1	9.90	33.73	11.61	60.1	147.9	88.6
Genesee Giant	5	61.6	9.73	33.81	11.21	59.8	147.4	84.6
Dawson Golden Chaff	7	59.9	9.18	29.28	10.54	57.3	141.6	81.7
Early Red Clawson	3	60.0	8.81	27.04	9.86	57.0	143.2	75.0
Manchester	1	61.0	10.42	31.13	11.00	58.0	144.5	85.0
Scott	1	63.5	10.18	36.63	12.49	60.0	148.2	90.0
Walker Reliable	1	62.0	10.07	32.14	11.58	59.0	145.7	80.0
Jones Winter Fife	1	61.0	9.38	31.69	11.09	60.0	146.1	85.0
Diamond Grit	1	64.0	9.43	29.85	10.62	59.0	145.1	75.0
SPRING WHEATS.								
Fife	1	61.0	11.92	43.35	13.98	60.0	154.2	100.0
Herison Bearded	1	63.0	9.44	28.58	10.13	57.0	140.5	80.0
White Russian	3	60.6	9.65	34.15	11.82	58.3	145.6	83.0
Thickset	2	62.5	9.71	30.04	10.60	57.5	140.6	77.5
Colorado	2	61.2	9.33	31.68	10.85	57.0	140.0	75.0

In connection with this report the value of heavy and light wheats, the importance of gluten, the effect of baking, and the yield and quality of bread from flour are discussed, and notes on environment, season, soil, fertilizer, locality, and change of seed, so far as these factors influence the bread-making value of wheat, are given.

Varieties of winter wheats, C. A. ZAVITZ (*Ontario Agr. Col. and Expt. Farm Bul. 115, pp. 7, 8*).—This report presents the results of tests with 40 varieties of winter wheat, the most promising of 94 kinds tested for 5 years or more on about 800 different farms. These include 20 bearded and 20 beardless varieties, 32 of which are red and 8 white sorts. The average results of these different groups are given in the table below.

Average results by classes of 40 varieties of wheat grown in cooperative tests for 5 years.

	Bearded (20 varieties).	Beardless (20 varieties).	Red wheat (32 varieties).	White wheat (8 varieties).
Average height (inches)	46.2	47.1	46.5	47.3
Per cent of crop lodged	34.4	28.2	34.1	19.9
Per cent of rust	14.9	18.0	15.3	20.8
Comparative hardness of grain	80.0	76.0	80.0	69.8
Weight of grain per measured bushel (pounds)	61.2	60.7	61.2	59.8
Bushels per acre	45.7	45.8	46.1	44.5

The detailed results for each individual variety are also tabulated. Dawson Golden Chaff leads the list, with an average yield of 55 bu. per acre, followed by

Imperial Amber, Egyptian Amber, Michigan Amber, Early Genesee Giant, Golden Drop, Reliable, Early Red Clawson, and Russian Amber, in the order mentioned. All of these varieties yielded over 50 bu. per acre. Helena, the least profitable sort, gave a yield of 36.3 bu. per acre.

A new wheat industry for the semiarid West, M. A. CARLETON (*U. S. Dept. Agr., Division of Vegetable Physiology and Pathology Circ. 18, pp. 8, fig. 1, map 1*).—This publication is an advance circular of a bulletin on macaroni wheats, by the same author. The main facts concerning the characteristics of macaroni wheats, their adaptation to the region of the Great Plains, varieties, and methods of cultivation are briefly presented.

Investigation of the wheat of southern Russia, P. MELIKOV (*Zhur. Opuitn. Agron., 1 (1900), No. 3, pp. 256–267*).—On the basis of analyses of different varieties of wheat of the crops of the years 1885–1899, the author finds that the wheat of southern Russia is rich in nitrogenous substances, the proportion of the latter varying with the weather from 14 to 21.2 per cent, being highest in dry years, while in years of good crops it falls to 14 per cent.—P. FIREMAN.

Sulphate of ammonia as a top-dressing for winter wheat, KIRCHNER (*Deut. Landw. Presse, 28 (1901), No. 21, p. 171*).—This article records the results of fertilizer experiments with sulphate of ammonia and nitrate of soda as a top-dressing for winter wheat for the years 1898 to 1900, inclusive. In general the results were favorable to the nitrate of soda, but in 1900 the results were about the same for the two fertilizers.

Winter cereals and fertilizers applied as a top-dressing, GRAND (*Jour. Agr. Prat., 1901, I, No. 11, pp. 338, 339*).—An article discussing under what conditions top-dressings can be profitably applied in growing winter cereals.

Breeding of wheats rich in gluten, E. SCHRIBAUX (*Jour. Agr. Prat., 1901, I, No. 9, pp. 274–277; Semaine Agr., 21 (1901), No. 1033, pp. 68, 69*).—A discussion of this subject, in which the author states that the nitrogen content of wheat is very variable, and that it depends much more upon the conditions under which the plants develop than upon the variety. He points out that all circumstances tending to shorten the period of growth favor the formation of nitrogenous substances in the grain, and that the differences of structure in the plant and of richness in gluten between grains of the same variety are not hereditary. Grain from hard and highly glutinous seed may be the same in composition as grain grown from soft, starchy seed. A further conclusion is that the industrial value of productive varieties of wheat is not well enough known to originate varieties which satisfy both the producer and the consumer.

HORTICULTURE.

Book of gardening; a handbook of horticulture, W. D. DRURY ET AL. (*New York: Charles Scribner Sons; London: L. Upcott Gill, 1900, pp. 1198, pls. 15, figs. 720*).—This work aims to cover the whole field of horticulture, including landscape gardening and the growing of fruits, vegetables, and all the more usual outdoor and indoor flowers and plants. The 27 chapters on the various phases of these subjects have been prepared by 13 different authors. Within the chapters on the various groups of plants, like ferns, bedding plants, rock plants, orchids, stove plants, greenhouse plants, cacti, aquatics, florists' flowers, trees and shrubs, etc., the matter is arranged alphabetically; the various plants are described, and concise directions given for their culture. A chapter is devoted to each of such subjects as forcing, landscape gardening, roses, chrysanthemums, pests generally, and manures. The book is well indexed and illustrated and will be found valuable as a condensed reference work on horticultural subjects.

The century book of gardening, E. T. COOK ET AL. (*London: Country Life, 1901,* *pp. X + 610 + XIII, figs. 575*).—This is a comprehensive popular work, prepared particularly for the home gardener. It treats of all the cultural operations of the flower, fruit, and vegetable garden, and of growing and handling fruits under glass. Especial attention has been given to details and illustrations of the laying out and arrangement of larger pleasure grounds, the planting of shrubs, trees, and flowers, the arrangement of rock and water gardens, management of lakes and running water, and planting of hedges and wild gardens. Under the different subjects the various fruits, flowers, shrubs, vegetables, etc., are arranged alphabetically, thus making reference easy. Chapters on insect enemies and diseases of garden plants, fruits, and vegetables are included. An abundance of good illustrations of all the different subjects considered is one of the special features of the work.

The art and craft of garden making, T. H. MAWSON (*London: George Newnes & Co., Ltd., 1901, 2. ed., pp. 252, figs. 178*).—Garden designing and all the elements that enter into garden making, like fences, entrance gateways, terrace and flower gardens, lawns, garden walks, summer houses, trellis work, garden furniture, conservatories, greenhouses, vineries, fruit houses, fountains, lakes, streams, ponds, kitchen gardens, orchards, hedges, trees, shrubs, hardy climbing plants, roses, hardy perennials, aquatics, ferns, etc., are considered in 15 different chapters. More than 130 plans and details are given of gardens designed by the author. He believes that while formal treatment of gardens is most likely to give satisfactory results, nothing is gained by slavish adherence to style or tradition. A short history is given in the opening chapter of the several styles of laying out gardens in England, the qualities commendable in each being pointed out.

Cabbage, cauliflower, and allied vegetables from seed to harvest, C. L. ALLEN (*New York: Orange Judd Company, 1901, pp. 125, figs. 27*).—Concise and practical directions are here given for the commercial and garden culture of cabbage, cauliflower, collards, Brussels sprouts, kale or borecole, and kohl-rabi. Types and varieties of each are described, and the great value of selected seed and intensive culture pointed out. The two final chapters deal with injurious insects and the fungus diseases of the different plants.

Vegetable tests for 1900, L. R. TAFT and M. L. DEAN (*Michigan Sta. Bul. 190, pp. 123–155*).—This bulletin is similar in character to those of preceding years (E. S. R., 11, p. 250). Descriptions and data are given for tests of 23 dwarf and 12 pole varieties of beans, 34 varieties of cabbage, 16 of sweet corn, 24 of cucumbers, 40 of lettuce, 17 of peas, 130 of potatoes, 25 of radishes, 22 of squash, 4 of pumpkins, and 85 of tomatoes. An outline is given of some fertilizer experiments with potatoes, and the amount of the different elements or combinations used on the different plats. The season of 1899 was rather dry for the use of commercial fertilizers, and from a strictly cash basis the increase in yield of potatoes was not sufficient to warrant their use. In 1900 the results were contradictory.

The influence of night shelter on vegetable production, A. PETIT (*Jour. Soc. Nat. Hort. France, 4. ser., 2 (1901), Mar., pp. 196, 197*).—Various mats, screens, canvas, and other contrivances are frequently used for protecting plants at night from frost. The author investigated the value of such shelter in vegetable production aside from frost protection by selecting a number of plants which are resistant to frost. In these experiments the screens were stretched horizontally on a framework about 12 cm. above the plants at night and a record kept of the growth as compared with similar plants not thus treated. The following table shows the difference in yield of cabbage, gilliflower, and lettuce between sheltered and unsheltered plants per unit of surface (1 are):

Effect of night shelter on vegetable production.

	Period plants were sheltered.	Yield.		
		Sheltered.	Unsheltered.	Increase in favor of shelter.
		Kg.	*Kg.*	*Kg.*
Cabbage	Mar. 2-June 21	1,103	900	203
Lettuce (Blonde)	Mar. 21-June 2	613	517	96
Lettuce (Grise)	Mar. 22-May 31	969	693	276
Gilliflower	Oct. 30-May 23	349	257	92

Strawberries sheltered from October 15 grew more vigorously, developed more rapidly the following spring time, were in the neighborhood of 8 days earlier, and the crop was sensibly heavier than where not sheltered. It is believed that these experiments show that the shelter has a certain value in vegetable production besides that of protection from frost.

Report of the experiment station at Charles City, C. G. PATTEN (*Rpt. Iowa Hort. Soc., 35 (1900), pp. 156-159*).—This report is on apples, apple seedlings, plums, and pears. Four seedling apple trees obtained from crossing Pound Sweet and Briar Sweet fruited during the season. The author states that only one tree of the four is at all like the Briar Sweet in form, though all are quite markedly stamped with the size, color, texture of the leaves, and color of the bark of the Briar Sweet. Three of the seedlings have the color and bloom of the Briar Sweet, while the fourth is in its first fruiting very similar in color to the Pound Sweet. It is a pure sweet apple, more tender in flesh than the Pound Sweet, and it has the appearance of becoming a good-sized apple. The apples of the smallest seedling are nearly two sizes larger than the Briar Sweet. All are of good quality and all are fall apples, the largest one being the latest. A number of other apple seedlings of promise are noted. Some very satisfactory results are being secured in the growing of plums and pears.

A study on fruit bloom, W. GREENE (*Rpt. Iowa Hort. Soc., 35 (1900), pp. 222-227, dgms. 2*).—Diagrams are given showing the temperature and date of blooming of apples, pears, and cherries in the different sections of Iowa during the two seasons of 1899 and 1900, as reported by observers in the different parts of the State.

Peach culture, S. B. VOORHEES (*Proc. New Jersey State Hort. Soc., 25 (1900), pp. 148-159*).—The author summarizes his 15 years experience in peach culture. In an orchard of 25 acres containing about 3,000 bearing trees, the number of baskets marketed has averaged 5,160; gross receipts for same, $2,800; average gross per basket, 54 cts.; average receipts net per basket, over 29½ cts. The average cost of baskets, picking, carting, and marketing was 25 cts.

Plums and plum culture, F. A. WAUGH (*New York: Orange Judd Co., 1901, pp. 371, figs. 115*).—This gives a very complete discussion of the botany and horticulture of plums. It is intended primarily for use east of the Rocky Mountains. California plum culture is not discussed. The book is divided into 2 main parts. Part I classifies, describes, and gives the names of practically all the cultivated native plums, and all the more important European, Japan, and hybrid sorts grown in this country. Under Part II the culture and management of plums are considered. This part includes chapters on propagation, varieties for planting, orchard and garden management, pollination, geography and climatology, diseases of plums, insects affecting them, cooking plums, and the use of plum trees as ornamental plants. The book is well illustrated and is especially opportune in view of the rapidly increasing attention given to plum growing by horticulturists in this country.

Fruit culture in Russia. II, Fruit culture in the government of Kazan, V. V. PASHKEVICH (*St. Petersburg: Min. Agr. and Imp. Domains, Dept. Agr., 1899, pp. XVI + 276, figs. 56, map 1; rev. in Selsk. Khoz. i Lyesov., 199 (1900), Oct., pp. 245-247*).

The breeding of native northwestern fruits, N. E. HANSEN (*Rpt. Iowa Hort. Soc., 35 (1900), pp. 455-457*).—Some 27,000 seedlings of different orchard and small fruits have been grown by the author and some comments are made on the results obtained. The author states that the most promising of the new types of fruits grown is the sand cherry (*Prunus besseyi*). At the present time this makes a good fruit for culinary use and it is believed that but little remains to make it a choice table fruit.

The washing of cider fruits, A. TRUELLE (*Mem. Soc. Nat. Agr. France, 139 (1900), pp. 303-337*).—This paper gives the history of this phase of cider making, includes the results of the author's experiments along the same line, and discusses at some length the advisability of washing apples and pears intended for cider making. In the author's experiments 15 samples, representing 7 varieties of apples, were washed and the wash water analyzed for total impurities, tannin, pectins, albuminoids, acid, and ash. Each sample was made up of 20 kg. of apples and was washed separately. In washing, the apples were not all put in the water at once but were washed quickly one at a time by hand so that all impurities were removed. By this method only a little distilled water was required for washing each sample. The apples had been gathered according to the usual methods of harvesting for cider. The water in which the samples were washed always assumed a dirty black color, and often had a disagreeable odor. The analysis showed the total impurities for the different samples to vary from 2.05 to 26.85 gm., averaging 7.24 gm. for each 20 kg. of apples washed. The total sugar content of the wash water from 20 kg. of apples varied from 0.121 to 14.905 gm., averaging 4.63 gm.; pectins and albuminoids from 0.3 to 3.68 gm., averaging 1.412 gm.; acid from 0. to 1.153 gm., averaging 0.191 gm.; total ash from 0.19 to 2.032 gm., averaging 0.708 gm. The number of grams of soluble and insoluble ash in 9 of the samples is also worked out.

A review of the literature since 1804 on washing cider fruits shows that of the 13 writers who have investigated this subject, all are agreed that the washing of dirty fruits is essential to the production of a first-class cider product. Ten of these authors are not opposed to washing clean fruits, three are; though this dissension is believed to be due largely to a difference in the interpretation of the term "clean fruit." The author shows that it is practically impossible to obtain really clean cider fruit and that, therefore, all cider fruit should be washed. In washing, fruit should be put in a loosely woven basket, constantly agitated up and down in water for a few minutes, then lifted out and spread on clean racks to dry in the open air. Violent streams of water should not be used.

The usual objections to washing cider fruits are (1) the removal of the yeasts disseminated over the surface of the fruit, causing a delay in fermentation of the juice; (2) a dilution of the cider, and (3) a loss of aroma. Relative to these objections, the work of Behrend, as given by the author, shows that the quantity of juice yielded by washed fruit is less than when not washed; also that the yeast is as plentiful in one case as in the other. The chemical composition of the juices of washed and unwashed fruits is also practically identical. The amount of material removed by washing 1,000 kg. of fruit is calculated by the author from his analyses to be as follows: Total sugar, 231.5 gm.; tannin, 1.15 gm.; pectins, 70.6 gm.; malic acid, 9.55 gm.; dry matter, 362.9 gm.; ash, 35.4 gm. These amounts are considered too small to harmfully affect the product by their removal.

The outcome of crossing fruits and shrubs in the Northwest, J. L. BUDD (*Rpt. Iowa Hort. Soc., 35 (1900), pp. 176-178*).—A summary is given of some results secured during a series of years in crossing plums, gooseberries, roses, crab apples, and strawberries.

The cultivation of oranges, ALIÑO (*Jour. Roy. Hort. Soc. [London], 25 (1901), No. 3, pp. 341-352*).—The feature dealt with especially in this article is the fertilizing of oranges. Formulas appropriate for young trees, trees in full bearing, old trees, and trees affected with gum disease and otherwise out of the normal, are given. As a basis for calculation the author gives the average analysis of the parts of the orange tree, as determined by himself, as follows:

Analysis of orange trees.

	Total ash.	Nitrogen.	Phosphoric acid.	Potash.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Fresh fruit	3.21	0.38	0.40	0.38
Leaf	6.00	.70	.10	.38
Wood	7.00	.70	.50	.73

On the above basis, it is calculated that a hectare of oranges containing about 250 trees and yielding, when in full bearing, 30,000 kg. of fruit, would remove from the soil 114 kg. of nitrogen, 120 kg. of phosphoric acid, and 114 kg. of potash. If these elements are returned to the soil the equivalent of 760 kg. of nitrate of soda, 705 kg. of superphosphate of lime, and 225 kg. of sulphate of potash will be required. This formula is intended for soils composed mainly of siliceous sand with some lime and clay, having a good depth, and capable during the summer of receiving copious irrigation. This is considered by the author the ideal soil for oranges. On other soils this formula can not be strictly adhered to.

The evil effects attributed to an excess of nitrogen are that it produces an exuberant growth of wood and foliage, while the resulting fruit is very coarse and thick skinned, with little sugar or aroma, and of bad keeping quality. The time of ripening is also retarded. With an excess of phosphoric acid the fruits are small, numerous, well flavored, and aromatic, with thin skins and poor pulp. "When potash is superabundant, the tree does not grow very large, but the fruit is juicy, sweet, and of pleasant flavor."

As to the most desirable forms of fertilizers, the author prefers sulphate of ammonia in light soils and in those charged with organic matter; nitrate of soda is better applied to heavy soils. Superphosphate of lime is considered the best of the phosphate fertilizers. "Only in gypseous soils and those humid and rich in organic residues should the phosphate 'Thomas' be employed." The sulphate and chlorid of potash may be used indifferently, though the sulphate appears to give more delicacy and fragrance to the fruit. In rather limy soils the use of sulphate of iron is considered beneficial. In those with a little lime, and especially if inclined to be rough and clayey, the use of gypsum is advised.

In fertilizing young trees materials furnishing about one-half the nitrogen and phosphoric acid and one-fourth the potash required for an orchard in full bearing, as noted above, are required. For old trees the following is one formula recommended: Sulphate of ammonia, 300 kg.; nitrate of soda, 400 kg.; superphosphate of lime and manganese, 800 kg.; sulphate of iron, 300 kg.; chlorid of potassium, 25 kg., per hectare. In the case of orange trees which produce an abundance of wood, leaf, and flowers with but little fruit, the author believes the defect due either to a deficiency of nutrition or to a deficiency of the phosphates which promote the fecundation of the ovary of the flower, or to a superabundance of nitrogen, "which by excessively expanding the sexual organs of the flower produces its abortion." The following formula is suggested for such trees: Sulphate of ammonia, 75 kg.; nitrate of soda, 75 kg.; superphosphate of lime, 1,000 kg.; kainit, 300 kg.; sulphate of lime, 300 kg., per hectare. With orange trees suffering from gumming the use of organic fertilizers, and especially horse manure, should be avoided. The only manure required for trees in the seed bed is the free use of horse manure.

In orange fertilization the manures should be plowed under after the crop is gathered. If applied later or at blossoming time, the sap rises hastily and the "generating organs obtain an unequal or disproportionate growth, and the fecundation is bad or else noneffective; consequently the flowers prove abortive." Where phosphatic and potash fertilizers are applied to the orchard in February, nitrogenous fertilizers like nitrate of soda and sulphate of ammonia should be applied in June. The author considers it a mistake to apply manures to oranges in August, for the same reasons that apple orchards are not fertilized at this time of year.

Where it is desirable to hold the oranges on the trees for spring sales, the author considers it necessary to use a formula of mixed fertilizers, applied as follows: The superphosphate, the organic manure, and half of the potash salt should be applied in February; half of the nitrogenous mineral fertilizers and the remainder of the potash salt in July; the other half of the nitrogenous fertilizers, together with 400 or 500 kg. of gypsum, should be applied in September; and 10 or 12 days after the sulphate of iron. "The gypsum and the sulphate of iron tend to fix the fruit on the tree, and at the same time, by repressing the excessive growth of the wood and leaf, direct a great part of the fertilizing elements which might have been monopolized there to the fruit."

It is believed that the formulas recommended for oranges will apply equally well to lemons, citrons, and limes on similar soils, adding in each case from 10 to 12 per cent more of nitrogenous fertilizers, since under similar conditions these fruits require greater amounts of nitrogen than do oranges.

Notes on strawberries, L. R. Taft and M. L. Dean (*Michigan Sta. Bul. 189, pp. 111-119*).—This is a report on varieties of strawberries, similar in character to those previously rendered (E. S. R., 11, p. 931). The blooming and ripening periods, vigor, hardiness, percentage of bloom killed by frost, productiveness, size, form, color, quality, and firmness of the fruit are tabulated for 144 different varieties grown at the station. Fifty-three of the varieties are described in brief paragraphs. Frost affected a number of varieties. The loss was greatest with those varieties whose flowers were not protected by foliage, and whose petals were open. As a rule, only one flower upon a fruit stock was affected. Of the newer sorts fruited in 1900, H. and H., Echo, Emma, Gamage, Gladstone, Stouffer, Johnson Early, and Wooll are considered the most promising. Some of the older varieties which have stood at the head of the list for a number of years at the station, and which still maintain their position, are Excelsior, Haverland, Warfield, Clyde, Bubach, and Brandywine.

Modern cranberry culture; essential principles of the business (*Rural New Yorker, 60 (1901), Nos. 2684, p. 465; 2685, p. 482; 2686, p. 499*).—A popular presentation of all the details of modern cranberry culture, from the clearing of the land to picking and shipping the crop.

The grape in Oregon. I, Western Oregon, E. R. Lake et al. (*Oregon Sta. Bul. 66, pp. 63-84, figs. 10*).—A popular bulletin on grape culture in western Oregon, the purpose of which is to encourage grape growing for home consumption. The varieties growing at the station are described and cultural directions given for growing grapes in the different sections of the Willamette Valley.

"Among the best of the varieties that have been thoroughly tested in Oregon are Concord, Worden, Moore, and Eaton for black grapes; Niagara, Diamond, and Green Mountain for white grapes, and Delaware and Brighton for red grapes. All of these varieties will yield well and ripen perfectly in a favorable season and can not fail to give satisfaction, except that Worden will be found too soft for shipment. Do not attempt to grow such varieties as Black Hamburg, Sweetwater, or Muscat; they are not well adapted to this climate."

Grapes and wine: The grape in vineyards, gardens, and grape houses; wine, its preparation, distillation, and diseases, P. Jamain, G. Bellair, and C. Moreau (*La vigne et le vin. La vigne dans les vignobles, les jardins et les serres; le vin, sa préparation, sa distillation, ses maladies. Paris: Octave Doin, 1901, pp. 956, figs. 857*).—This comprehensive volume purports to be a complete study of the vine, considered from the quadruple standpoint of vineyard culture, the production of wine, distillation, and the production of table grapes in gardens and graperies. The first part of the work contains chapters on and discusses at length such subjects as varieties of grapes, propagation, grafting, plantations, cultivation, pruning, unfavorable conditions, diseases and insects affecting, trellising, grape houses, espalier culture, forcing, retarding growth, commercial culture, preservation of grapes, packing and selling, etc. The second part takes up harvesting and wine making, pasteurization, diseases of wines, distillation, wine making in Algiers, and a study and classification of the wines of France and her colonies.

The vine; notes on its intensive culture, E. L. Guardiola (*La vid; notas sombre su cultivo intensivo. Valencia, 1899, pp. 198, figs. 62*).—This is a popular work on vine growing, describing in detail intensive cultural operations, including methods of protection from insect pests and fungus diseases.

Viticulture, its processes and materials. Viticulture at the Exposition in 1900, P. Andrieu (*La viticulture, ses procédés et son matériel. La viticulture à l'Exposition universelle de 1900. Montpellier: Coulet & Sons, 1901, figs. 88*).—Part 1 of this work discusses the vineyard, stocks, French and foreign wines, reconstruction of vineyards on American stocks, culture and protection of vines, diseases and insects affecting. Part 2 takes up the subject of wine making in its various phases, such as fermentation, extraction of the marc, wine handling, analysis of musts and wine, extraction of tartaric acid, etc.

On the rational pruning of vines, F. Kövessi (*Compt. Rend. Acad. Sci. Paris, 132 (1901), No. 15, pp. 923–925*).—The author holds that the ripeness of the wood materially influences the production of fruit the following season. This is true not only of vines but of fruit trees. The influence of ripeness is felt in two ways: It modifies the number and the position of the fruit buds and also the number of fruits. With well-ripened wood the fruit buds begin close to the base of the shoot on which they are borne, say the third bud, while on shoots of poorly matured wood the fruit buds commence to form only with the fifth bud. Besides, the shoots in the first case will carry 2 or 3 bunches, while in the second there will be only one. The production of a fruit crop, therefore, is subject to the influence of the meteorological conditions of 2 seasons: The year preceding, which determines the degree of ripeness of the shoots, and thus the position and number of bunches; and that of the same year, which affects florization, fructification, and the maturing of the crop. An examination of the weather record and of vintage production over long periods of time showed that dry years, which permit of the thorough ripening of the wood, are usually followed by abundant harvests; while wet years, which favor a late, immature growth of wood, are followed by small harvests.

These facts are susceptible of practical application, and furnish a rational basis for the pruning of different varieties in different localities. If the season has been such that the vines are well matured, pruning should be short. If rainy and conducive to the production of poorly matured shoots, the pruning should be longer than otherwise. It is the condition of the shoots themselves rather than rules which must govern in pruning.

Anatomical researches on the ripening of vine shoots, F. Kövessi (*Compt. Rend. Acad. Sci. Paris, 132 (1901), No. 10, pp. 647–650*).—In the reconstruction of the European vineyards on American stock, it has been found that much greater success has been attained with well ripened than with poorly ripened graft wood. For the purpose of gaining some light on this subject the author made a study of the thickness of the cell walls and of the starch content of the two woods. The vines consisted of a number of varieties of *Vitis riparia*, *V. rupestris*, *V. berlandieri*, and *V. vinifera*. The data obtained show that the cell walls of the well-ripened wood were much thicker than those of the poorly ripened, and that the cells inclosed more starch.

The quality of the wood of vines, L. Ravaz and A. Bonnet (*Prog. Agr. et Vit. (Ed. L'Est), 22 (1901), No. 12, pp. 360–369, figs. 12*).—In pruning vines it is desirable to reserve always the more mature wood. The authors have made some investigations as to the means of determining with certainty, by a simple process, how this can be done by the vineyardist. A review is given of the investigations of earlier workers, showing that the specific-gravity method of determining the maturity of vine wood is unreliable, besides being difficult of application with the crude scales found on most vineyard plantations. Microscopic examinations of longitudinal and transverse sections of mature and immature wood showed that the starch content of the mature wood is much greater than in the immature wood, with proportionate gradations between; hence by applying the tincture of iodin test to the freshly cut wood the intensity and extent of the blue color reaction with the starch of the wood will indicate the degree of maturity. This is a simple test, requiring no special knowledge or apparatus for its application, and is considered practical.

An old rubber plantation, A. H. Berkhout (*Indian Forester, 27 (1901), No. 4, pp. 184, 185*).—A brief account is given of a rubber plantation in Java, in which the trees, *Ficus elastica*, were planted in 1864. The estimated cost of planting and cultivation was about $7 per acre, and the plantation embraces 72½ acres, and contained, when planted, 5,200 trees. The first tapping of the trees was made in 1886 and the yield of rubber from that time to 1898 is shown in tabular form. An average of the figures shows the annual net profit of $39.30 per acre, with a maximum profit of $58 for the last year.

Caoutchouc from the Kongo, L. Gentil (*Gard. Chron., 3. ser., 29 (1901), No. 748, pp. 262–264*).—This article discusses protection and forest conservancy of caoutchouc, preparation of the juice, propagation, multiplication, and planting.

Sander's orchid guide (*St. Albans, England: F. Sanders & Co., 1901, pp. 330*).—This book gives in tabular form the native country, description, season of flowering, and cultural classification of nearly all the species and hybrids in cultivation at the present time.

Report of the committee on school gardens and children's herbariums, 1900, H. L. Clapp (*Trans. Massachusetts Hort. Soc., 1900, II, pp. 248–259, figs. 6*).—This report covers the methods and work of the children of several schools in herbarium and garden making, with list of prizes, etc.

The educational status of horticulture, F. W. Card (*Amer. Gard., 22 (1901), No. 326, pp. 213, 214*).—A paper read before the Section of Botany and Horticulture at the New Haven meeting of the American Association of Agricultural Colleges and Experiment Stations.

FORESTRY.

A forest working plan for Township 40, Totten and Crossfield Purchase, Hamilton County, New York State Forest Preserve, R. S. Hosmer and E. S. Bruce (*U. S. Dept. Agr., Division of Forestry Bul. 30, pp. 64, pls. 11, maps 4*).—This working plan was prepared at the request of the Forest, Fish, and Game Commission of the State of New York, under the provisions of Circular No. 21 of the Division of Forestry of this Department, and is the first instance of cooperation in practical forest management between this Department and a State government. The main purpose of this working plan is to outline a method of management under which the merchantable timber may be cut in such a manner that successive crops may be obtained and the condition of the forest constantly improved. A general description of the township and its chief topographical features are given. The forest consists of a mixture of coniferous and deciduous trees, the principal species, in order of occurrence, being as follows: Spruce, yellow birch, balsam, hemlock, beech, hard maple, and white pine. With these are associated arbor vitæ, commonly known as cedar, black spruce, tamarack, red or Norway pine, soft maple, and white birch, with scattered white ash and black cherry. Aspen, commonly known as poplar, and bird cherry are found on the burned-over land. The underbrush is mainly witch hobble, striped maple or moosewood, and mountain or spotted maple. Spruce predominates, forming as much as 46 per cent of the mixture. The different forest areas are divided into swamp, spruce land, and upper spruce slopes, and the characteristic species of the different forest types are enumerated. The species to be lumbered are spruce, balsam, and pine, and estimates are given of the merchantable volume of these different species. The remaining species of trees should not be lumbered at present, the demand for them not being sufficient to warrant the expense of lumbering these trees at this time.

The influence of forests on water (*Chron. Agr. Canton Vaud, 14* (*1901*), *No. 11, pp. 300–305*).—This article contains a summary of investigations which have been made on the relationship between forests and rainfall. According to the author it seems probable that forests increase the volume of the total hydrometeors. The actual demonstration of this statement is difficult, and it rests mainly upon theoretical deductions. The forest cover is said to retain a considerable portion of the total moisture. Spruce and fir retain the largest amounts, while deciduous trees—such as beech, oak, and hornbeam—retain the least. It is stated that an average of 25 per cent of the total precipitation during the year is retained by the forest cover. Some of this ultimately reaches the ground, running down the larger branches and trunks, so that the soil of the forest receives about 20 per cent less water than is deposited upon an equal area in the open. The forest cover is said to greatly diminish the evaporation of water from the soil, about one-fourth less evaporation taking place from forest soil than from a similar soil in the open. Upon plains and elevations up to 500 meters forests tend to increase the volume of soil water, while from 800 to 900 meters and above they diminish it. Forest trees are said to require only a small amount of water as compared with the amount used by agricultural crops occupying an equal area.

The mechanical effect of forests is shown in the increased permeability of the soil by the penetration of the roots to considerable depths. Upon a mountain side the forest, by its influence in carrying water deep into the soil, has the same effect as would be shown by a reduction of the slope. The total effect of this influence is unknown, but is now being investigated at two of the Swiss forest stations. The proportion of subterranean water is increased and the superficial moisture diminished under a forest cover, and in general more streams have their origin in wooded areas than in cleared ones. Streams having their origin between 400 and 800 meters' elevation are usually more numerous, larger, and more constant by reason of the greater total moisture at that elevation. The effect of forests in preventing erosion is pointed out. Forests likewise tend to repress floods by reducing the superficial soil moisture and by indirectly diminishing the slope, causing water to spread more evenly. As a result, in wooded areas local floods are less frequent and less destructive than in denuded ones. However, floods due to cosmic influences are but little affected by forests.

Extermination of oaks at Lake Geneva, Wisconsin, J. Jensen (*Forester, 7* (*1901*), *No. 3, pp. 63–65*).—An account is given of the gradual death and disappearance of oak trees in the vicinity of Lake Geneva, Wisconsin. An examination made of the leaves, branches, and trees failed to reveal the presence of any fungus or other external cause of injury, and it was suggested that doubtless the trouble was due to a lack of moisture. The seasons of 1893, 1894, and 1895 were noted for their extreme drought, and the winter of 1898–99 for its extreme low temperature and light fall of snow. These factors acting together are supposed to have been the cause of the destruction of many of the trees in question. As a means of preventing further injury the author recommends covering the ground with shrubbery or herbaceous perennials, or permitting the grass to grow among the trees. This would hold the fallen leaves and snow, and form a blanket which would prevent the frost from going deep into the ground, as well as protect it against excessive evaporation during the winter.

The plane trees, W. J. BEAN (*Gard. Chron., 3. ser., 29 (1901), No. 754, pp. 363, 364, fig. 1*).—Notes are given on some of the plane trees, which are said to include the most useful and important town and street trees. Of the species of Platanus the author describes 3, *P. orientalis*, *P. acerifolia*, and *P. cuneata* as of European and Asiatic origin, and *P. occidentalis* as of American origin.

Studies concerning the genus Platanus, F. JAENNICKE (*Abhandl. K. Leopold. Carolin. Deut. Akad. Naturf., 77, No. 2, pp. 111–226, pls. 10; abs. in Bot. Centbl., 85 (1901), No. 8, pp. 257–259*).—The author gives results of 5 years' study on the genus Platanus, and among his conclusions he states that there are 6 species and 11 varieties, as follows: *P. orientalis*, with 4 varieties; *P. occidentalis*, with 6 varieties; *P. acerifolia*, which he believes may prove to be either a variety of *occidentalis* or possibly a hybrid between *P. occidentalis* and *P. orientalis; P. racemosa; P. mexicana*, with 1 variety, and *P. wrightii*. The second and last 3 species are of American origin.

The conversion of home-grown timber for estate and other purposes, D. F. MACKENZIE (*Trans. Highland and Agr. Soc. Scotland, 5. ser., 13 (1901), pp. 134–148, figs. 8*).—Suggestions are given for the conversion of timber into various manufactured products, by which the value of the forest products may be increased. Lists are given of the more common forms and purposes for which different kinds of wood are utilized, together with the average price that the material brings in the markets. Suggestions are also given for the utilization of the so-called waste products, derived during the manufacture of the timber, into different forms of lumber, etc.

Improvement felling as a financial success, F. E. OLMSTED (*Forester, 7 (1901), No. 4, pp. 85–88, figs. 2*).—The value of improvement cuttings in forest management is shown by examples drawn from the management of the Sal and Sain forests of India, in which crowded groups have been thinned out and a better quality of timber secured.

Colorado forest fires in 1900, H. MICHELSEN (*Forester, 7 (1901), No. 3, pp. 56–61, fig. 1*).—During the season covered by this report the forests of Colorado suffered severely by reason of fires. A cold spring was followed by a hot summer, almost rainless, and the first heavy snow fell on October 30. Between May 15 and the middle of September numerous fires swept over portions of the State. While no actual measurements were made of the losses, estimates are given, based upon statements of forest rangers, surveyors, and others, from which it appears that about one-tenth of the timber lands of the State were destroyed by forest fires during the summer of 1900. A list is given of the area of forest and brush lands, by counties, together with an estimate of the burned-over tracts. The area covered by the fires is estimated at 758 square miles, and the timber lands remaining at the end of 1900 at 6,407 square miles. The effect of this serious destruction of forests is expected to be shown in the coming season in the reduced amount of water for irrigation purposes late in the season, as some of these tracts were situated upon the headwaters of some of the important streams of the State.

Destruction of timber by the Galveston storm, W. L. BRAY (*Forester, 7 (1901), No. 3, pp. 53–56, figs. 3*).—The author gives an account of the extensive damage done to forests of Texas at the time of the famous Galveston storm. The forests which sustained the heaviest damage constituted an area of about 2,000 square miles, and were composed mostly of pines and oaks, the most valuable so far as lumbering is concerned being the white oak and loblolly pine. The effect of the storm was to prostrate at least 50 per cent of the merchantable pine and oak and in many cases all of the merchantable timber was overthrown. Of this amount of timber, it is estimated that not more than 10 per cent will be saved on account of the absence of mills, inaccessibility of forest tracts, etc.

A "snowbreak" for the protection of timber plantations, G. L. Clothier (*Forester, 7 (1901), No. 3, pp. 61, 62, fig. 1*).—The author states that the usual form of windbreak planted in prairie regions is almost invariably located too close to the buildings, and, if there is no natural or artificial protection beyond the grove to check the moving snow, in some cases these windbreaks are a positive damage. In order to protect forest plantations against this injury it is suggested that snowbreaks be formed on their exposed sides by planting 4 or 5 rows of trees and shrubs 8 or 10 rods to the windward. This protective belt should usually take the form of an L and the trees planted upon it should consist of species which may be broken or bent without serious injury to the plants. For such a snowbreak the author recommends the planting of white or bull pine which would be on the windward side of the belt. The next row should consist of red cedar or laurel-leaved willow; the third of Russian wild olive or chokecherry; and the fourth and fifth rows of the common wild plum. Such a snowbreak is adapted to all the requirements of either of the Dakotas or similar localities.

The forestry agitation in New Hampshire, E. M. Griffith (*Forester, 7 (1901), No. 4, pp. 79–81*).—A brief review is given of a bill which was presented to the State legislature but failed to pass. The author points out some of the most important features of the bill and calls attention to the impracticability of one section which relates to the shipment of logs under 10 in. in diameter. This requirement, which was intended to cover the size of trees cut, if applied to the logs of the upper part of the tree, would necessitate either a great amount of waste in lumbering or the selection of only a limited number of trees. The effect of forests on the water supply of the State is said to have aroused an interest in the general subject of forestry, and beneficial results are hoped to follow the inquiries that have been recently begun.

The forest laws of New York, T. Cleveland, jr. (*Forester, 7 (1901), No. 4, pp. 81–85*).—A brief review is given of the forest laws of the State of New York from 1650 to the present date.

Dictionary of German and English forest terms, K. Philipp (*Deutsch-Englisches Forstwörterbuch. Neudamm: J. Neumann, 1900, pp. 107*).—This dictionary is primarily intended for foresters, and gives technical definitions of the terms employed in forestry.

SEEDS—WEEDS.

An attempt to estimate the vitality of seeds by an electrical method, A. D. Waller (*Proc. Roy. Soc. [London], 68 (1901), No. 443, pp. 79–92, figs. 2*).—The author has conducted a series of experiments to test the possibility of the utilization of "blaze currents" in determining the vitality of seeds. By blaze current the author denotes the galvanometrical token of an explosive change locally excited in living matter. An unequivocal blaze current is in the same direction as the exciting current and can not be a polarization counter-current. The investigation is limited to the unequivocal blaze current as a criterion between living and nonliving seeds, from which the author concludes that "if the after-currents aroused by single induction of both directions are in the same direction, the object investigated is alive." His experiments were conducted with beans. The seeds were tested electrically and germination tests were carried out upon the same beans in 3 series, conducted at different laboratories under the supervision of well-known investigators. Whole beans which had been thoroughly soaked and seed which had the cotyledons removed were electrically tested, after which they were germinated, and in general the results closely coincided. The correspondence in the results was so close as to establish the fact that the blaze current reaction is a sign of life and its magnitude is in some degree a measure of the vitality of the seed. Fresh, vigorous seed manifested a large blaze response and germinated strongly. Older and less vigorous seed showed a smaller current and less active germination, while still older seeds, incapable of germination even under the most favorable conditions, manifested a still smaller blaze and finally gave such weak currents that they could not be distinguished from the counter effect due to polarization.

Vitality of seeds, H. H. DIXON (*Nature, 64 (1901), No. 1654, pp. 256, 257*).—The various experiments which have been lately conducted to ascertain the effect of low temperatures upon the vitality of seeds have led the author to investigate the effect of high temperatures upon the vitality of a large number of seeds. The author has found that by drying seeds in an oven at 65 to 75° C. for a day, and then at 90° C. for a day, a great many seeds will resist temperatures of 100° C., or even more. His experiments were made with oats, rye grass, lettuce, sunflower, musk flower, alfalfa, rape, California poppy, and poppy. Of these alfalfa proved the most resistant. After an exposure of 1 hour to 110° C. and then 1 hour to 121° C., 10 per cent of the seed germinated. Of other seeds investigated the maximum temperature was for poppies 100° C. and *Schizopetalon walkeri* 105° C. The effect of exposure to the high temperature was noticeable in all cases by the marked retardation of germination and by the extremely slow growth afterwards. The young plants were weak and there seemed to be a loss of sensibility to geotropic stimulus. Whether the plants would become normal or not was impossible to say, as the conditions of the experiments were such that they could not be grown to maturity.

The author also reviews the experiments of Giglioli (E. S. R., 7, p. 406), in which the action of both liquid and gaseous poisons to seeds was shown. In these experiments prolonged action of oxygen, chlorin, nitric oxid, alcohol, and an alcoholic solution of corrosive sublimate on seeds did not entirely destroy the power of germination. The author repeated a number of these experiments. Alfalfa seed exposed from 10 to 30 days to the action of methyl alcohol, saturated solution of corrosive sublimate and picric acid, did not have the powers of germination noticeably affected. Seeds of different kinds of poppies resisted the action of alcohol but were killed by corrosive sublimate solution. An experiment by the author seems to show that resistance to the poison is not due to a quiescent state of the protoplasm of the seed, but to the imperviousness of the seed coat. A large number of seeds of alfalfa were selected, half of them punctured, all dried, and after drying immersed in the various solutions mentioned above. The uninjured seeds were not affected by the poisonous fluids, while the punctured ones had their vitality entirely destroyed.

The effect of hydrocyanic-acid gas upon grains and other seeds, C. O. TOWNSEND (*Maryland Sta. Bul. 75, pp. 183–198, figs. 5*).—This is the completed paper, a preliminary notice of which has already been given (E. S. R., 12, p. 959). The author has investigated the effect of different strengths of hydrocyanic-acid gas upon the germination of dry and moist seeds, as well as the effect upon the edible properties of the same seeds when submitted for a considerable time to this gas. It was found that dry seeds may be fumigated with the usual strength of hydrocyanic gas for the length of time required for the destruction of animal life without in any degree interfering with the germinative power of the seeds. Dry seeds may be subjected to the influence of the gas for several months without entirely destroying the ability of the seeds to germinate. When subjected to the influence of the gas derived from 1 gm. of potassium cyanid per cubic foot the seeds lose their germinating power at the expiration of about 8 months, while the same seeds subjected to the gas from one-third the quantity of potassium cyanid will retain their vitality for at least 12 months. If exposed for from 15 to 60 days to the influence of hydrocyanic acid from $\frac{1}{3}$ to 1 gm. of potassium cyanid per cubic foot the germination of dried seeds is accelerated, although the degree is not sufficient to be of any practical value. Damp seeds are much more sensitive to the influence of gas than dry ones, and seeds soaked for 24 hours or more will not germinate in gas stronger than 0.003 gm. of potassium cyanid per cubic foot. The seeds soaked for 24 hours and then left for

7 days in the atmosphere of hydrocyanic-acid gas will remain inactive while in the gas, and for from 7 to 12 days after removal, but will eventually germinate to some extent if the strength of gas used does not exceed 0.05 gm. per cubic foot. Washing seeds immediately after treating with the gas greatly removes the injurious effects of the treatment. Dry seeds treated for several days with hydrocyanic-acid gas of any strength will not be injured for food, while damp seeds treated even for short periods of time should not be used for food until several hours after removal from the gas. The effect of the gas appears to pass off and the grain may be eaten with safety, although long exposure seems to render it unpalatable. Grain and other seeds may be fumigated with hydrocyanic-acid gas for the destruction of insect pests without injury to the germinating quality of the seeds and without rendering them injurious as foods.

The data upon which this bulletin is based are also published in *Botanical Gazette, 31 (1901), No. 4, pp. 241–264.*

Report of the seed control station at Gratz, 1900, E. HOTTER (*Ztschr. Landw. Versuchsw. Oesterr., 4 (1901), No. 4, pp. 337–345*).—A brief report is given on analyses of 913 miscellaneous articles and 337 samples of seed, 257 of which were samples of clover seed.

Report of the chief inspector of noxious weeds, T. N. WILLING (*Rpt. Dept. Agr. Northwest Territories, 1900, pp. 34–45*).—A report is given of inspection trips made by the chief inspector, as well as his assistants, and the weeds observed in various parts of Manitoba, Assiniboia, etc. The inspection work of the season was carried on at considerably less expense than usual, owing to the dry season which prevailed. It was found that many farmers did not recognize the various proscribed weeds, and when their attention was called to them they were willing to comply with the regulations requiring their destruction. A beneficial effect is noted in the attitude of managers of mills and elevators throughout the territory. As usual in the prosecution of such work the educational features must be given prominence.

Destruction of charlock by spraying (*County Councils Cumberland, Durham, and Northumberland, Tech. Education, Rpt. 9 (1900), pp. 108–110*).—A tabular report is given of the results obtained by spraying with copper sulphate solutions for the destruction of charlock at 5 different places. Strengths of solution varying from 1½ to 4 per cent were employed, the amount of solution used varying from 25 to 100 gal. per acre. The results obtained show that, if properly applied, copper sulphate solutions may be depended upon for the destruction of charlock without seriously injuring fields of growing grain. The application should be made when the weeds are about 2 in. high during calm dry weather. If properly applied the 1½ per cent solution at the rate of 50 gal. per acre is sufficient. If the weed is exceedingly abundant or well covered by the grain the quantity of solution may be increased. When applications are made late in the season the amount used should be greater than when earlier sprayings are given. When the herbicide is used in damp or threatening weather it is recommended to increase the strength of solution rather than the quantity.

On the destruction of cuscuta in alfalfa, M. BAILLE (*Rev. Vit., 15 (1901), No. 372, pp. 130, 131*).—The ordinary means of combating the cuscuta, which consist of burning over the infested patches and exercising care in seed selection, are reviewed. Where this parasite has become especially troublesome, the author states that it may be absolutely destroyed by the application of powdered sulphate of iron to the soil. This will not only destroy the cuscuta but the alfalfa also, its action being due, according to the report, to the formation of a tannate of iron in the inner tissues of the plant. This does not act as a poison, but obstructs the vessels of the plant in such a way as to destroy it. The roots of the alfalfa are not injured and the plants quickly regain their normal condition. The cuscuta, however, is said to be completely destroyed. As a cheap source of iron sulphate the author recommends the utilization of the mixture which is used in purifying illuminating gas. This mixture is said to be composed of 30 kilos of iron sulphate, 15 liters of calcium hydrate, and 10 liters of wood sawdust. During the process of purification of the gas the sawdust takes up a large amount of the iron of sulphate, and, being a refuse in gas manufacture, is very cheap, costing less than one-fifteenth of the price of iron sulphate. Where this mixture is used it must be allowed to stand for some days, and stirred, to allow the gas which had been absorbed to escape.

DISEASES OF PLANTS.

Report on the fungus diseases studied at the botanical laboratory of the agricultural institute of Gembloux during 1900, E. MARCHAL (*Bul. Agr.* [*Brussels*], *17* (*1901*), *No. 1, pp. 4–18, figs. 5*).—A report is given of a number of fungus diseases which were investigated during the season Among the prominent ones were tomato rot, mildew of cauliflower, rust of currants and white pine, a mold on the stems of potato, witches' brooms of cherries, damping off or rot of young pea seedlings, a sclerotium disease of onions, a leaf spot of currants, scab of tomatoes, and a bacterial disease of beets.

The tomato rot was caused by *Phytophthora infestans*, and proved very destructive, the conditions during the ripening season having apparently been favorable for the rapid development and spread of the fungus. It was controlled, however, where Bordeaux mixture had been thoroughly applied to the plants for some time preceding and during the ripening period.

The mildew of cauliflower, which is caused by *Peronospora parasitica*, has proven of considerable loss to market gardening, and it is stated that the market gardeners in the vicinity of Paris, upon the recommendation of Maxime Cornu, successfully combated this disease by spreading about the plants wood sawdust saturated with copper sulphate as a mulch. Where this was used, it is said there was no loss by this disease.

The relation between the rust of gooseberries and that attacking the white pine is pointed out. The fungus, to which the name *Cronartium ribicolum* is given, is described in its different phases on the 2 host plants. The fungus is quite destructive on pine seedlings, and its suppression is recommended by the burning of all diseased parts of both pine and currant.

The mold of potatoes described is said to be an unusual one and due to the fungus *Hypochnus solani*. The lower part of the petioles and sometimes the lower leaves, and occasionally even the stems, of the potato are covered with ashy splotches. While giving the plants an unsightly appearance, it has so far been of little appreciable injury. It is superficial in its attack, and if serious injury is threatened could be prevented by the use of any of the better fungicides.

The disease of pea seedlings reported is due to *Thielaria basicola*, and the fungus was particularly abundant upon plants in water cultures which were being grown to study the subject of root development. It spread quite rapidly, destroying one-fourth of the plants in a very short time. It is thought to have been an unusual occurrence that this fungus should have developed in the water cultures, as it is ordinarily of terrestrial growth.

The scab of tomatoes described is caused by a new species of fungus, to which the name *Dendrodochium lycopersici* is given. A technical description of the fungus is given, and its method of attack upon the fruit is mentioned. It first appears upon the immature fruit, causing large grayish blotches which spread rapidly and running together envelop more or less of the fruit. Underneath these spots the fruit will be found to be in an advanced stage of decomposition. It is believed that the conditions under which the tomatoes were grown were largely responsible for this disease, it having developed in a shady situation. The author believes that growing tomatoes in well aërated and well lighted situations, especially in the autumn, would prevent the occurrence of this disease.

The bacterial disease of beets made its appearance in June, at which time the outer leaves became wilted and fell to the ground, the heart leaves being unaffected. The roots, when examined carefully, were found to have their extremities brownish black and decaying. This decay spread rapidly, enveloping more or less of the root. So far it has been observed in Belgium only upon garden and stock beets, but a somewhat similar trouble is reported upon sugar beets in Germany.

Investigations of the botanical section of the experiment station of the Pomological Institute, Proskau, R. ADERHOLD, (*Centbl. Bakt. u. Par., 2. Abt., 6* (*1900*), *No. 19, pp. 620–633, pl. 1*).—Notes are given on a number of fungus diseases that have been under investigation at the station for several years. A root disease of young fruit trees has been studied for some time. The trees are attacked in their roots while in the nursery. The cambial layer becomes brown and the whole root invaded by the mycelium of the fungus, resulting in the destruction of the young trees. The wood of the roots becomes softened into a gummy mass. The cause of this disease is said to be *Septocylindrium radicicolum*, n. sp., the technical characters of which are described. It is found to attack the roots of *Pyrus malus* and *Prunus avium*. The fungus grows readily upon several media, and inoculations were successfully made, which showed that the disease was due to this cause only.

A test was made of a new fungicide called Propolisin. It seems to be some sort of oil, and was added in a 1 per cent solution to a weak soap solution. This mixture was sprayed on the apple and pear leaves and upon chrysanthemums. It was without injury to the foliage, but had no practical value as a fungicide.

Miscellaneous notes are given on an attack on apple twigs of *Monilia cinerea;* the occurrence of a number of fungi upon apple leaves, among them species of Cladosporium, Phoma, and Hendersonia; the parasitism of *Cytospora rubescens* on pear shoots; a disease of plum trees somewhat similar to black rot, but in which no organism was found; descriptions of the maple woolly louse; the destruction of white pine trees by attacks of *Rhizoctonia strobi* upon the roots of the trees; diseases of violets, hydrangea, and erica; an attack upon *Acer platanoides* by *Cytospora acerina*, n. sp., the fungus being described; a leaf spot and nematode disease of lily of the valley, the fungus causing the leaf spot being described as *Septoria majalis*, n. sp.; and a new disease of narcissus caused by the parasitism of *Phyllosticta narcissi*, n. sp.

Report of botanist, P. H. ROLFS (*South Carolina Sta. Rpt. 1900, pp. 21–28*).—The author mentions the occurrence and briefly describes a number of diseases of economic plants, including cotton-boll rot, corn rust and smut, wheat rust and leaf blight, rice-leaf spot, oat smut, hop-leaf spot, asparagus rust, tomato bacterial blight, a disease of Irish potatoes probably due to a species of Fusarium, apple rust and scab, apple canker, pear-leaf scald and blight, black knot, and peach yellows.

Investigations concerning the distribution of parasitic fungi by the wind, C. VON TUBEUF (*Arb. K. Gesundheitsamte, Biol. Abt., 2* (*1901*), *No. 1, pp. 175–177*).—The wind as a means of distribution of fungus diseases is discussed, and numerous instances cited in which the spores of the fungi have been borne by the winds to distances of from 30 to 500 meters.

A reply to Alfred Fischer relating to plant diseases due to bacteria, E. F. SMITH (*Centbl. Bakt. u. Par., 2. Abt., 7* (*1901*), *Nos. 3, pp. 88–100; 4, pp. 128–139; 5–6, pp. 190–199, pls. 11*).—The author reviews some of the literature relating to bacterial diseases of plants, and describes at length his experiments in which he worked out the nature of the cucurbit wilt, due to *Bacillus tracheiphilus* (E. S. R., 7, p. 311); the cabbage brown rot (*Pseudomonas campestris*) (E. S. R., 9, p. 849); and the bacterial rot of potatoes, caused by *Bacillus solanacearum* (E. S. R., 8, p. 895).

The cultural characters of Pseudomonas hyacinthi, P. campestris, P. phaseoli, and P. stewarti, four one-flagellate yellow bacteria parasitic on

plants, E. F. Smith (*U. S. Dept. Agr., Division of Vegetable Physiology and Pathology Bul. 28, pp. 153, figs. 2*).—The morphology and pathogenic properties of these species of bacteria have been previously described by the author and others. The first, known as Wakker's hyacinth bacterium, was described in a previous bulletin (E. S. R., 13, p. 63); the black rot of cabbage (E. S. R., 9, p. 849); the blight of beans (E. S. R., 10, p. 1058); and the bacterial disease of sweet corn (E. S. R., 10, p. 1056). In the present report the behavior of these organisms in a large number of different kinds of media, their sensitiveness to various reagents, and other cultural characteristics whereby they may be definitely distinguished, are given.

Bean diseases and their remedies, B. D. Halsted (*New Jersey Stas. Bul. 151, pp. 28, pls. 4, figs. 9*).—The author has been engaged in a study of the diseases of beans for a number of years, and the present bulletin describes those which are most common on the kidney and Lima beans. Among the more important of these are the anthracnose, bacteriosis, and downy mildew. The anthracnose has been previously described by the author (E. S. R., 4, p. 52) and suggestions given for its prevention. This disease produces the brownish spots upon the pods afterwards developing into sunken ulcers. The infection of young seedlings through the seed is shown and the treatment of the seed when planted is commented upon. Conflicting testimony is given relative to the value of seed treatment. Experiments in which the plants were sprayed with Bordeaux mixture, ammoniacal copper carbonate, and other fungicides, have shown that the disease may be to a great extent controlled by their use. The effect of mulching and distance in planting was studied, and the plats which had been mulched bore a considerably increased amount of diseased pods over the unmulched checks. The effect of distance of planting on the production of disease shows that where the plants are widely separated there is less tendency to the production of diseased pods.

The bacteriosis of the bean, due to *Pseudomonas phaseoli*, is described at some length, together with the organism (E. S. R., 9, p. 1058). The foliage, stems, and pods are subject to attack, and the disease may be readily distinguished from any other to which they are subject. Measures tending to check the ravages of bean insects, it is thought, will also prevent the spread of the bacterial disease. A number of investigations have been conducted upon bean plats, the results of which apply to both of the preceding diseases. Irrigation was found to largely increase disease, and planting on old soil seemed to have the same effect. Mulching appears to increase the tendency to disease to some extent, while ridging the land was without any apparent effect. Considerable difference in susceptibility of varieties has been noted, the Green Flageolet being most susceptible and Early Refugee the least.

The downy mildew of Lima beans, which was first described by the Connecticut State Station in 1889 (E. S. R., 2, p. 482), is described at considerable length, and quotations are given from Connecticut State Station Report for 1897 (E. S. R., 10, p. 261). Various precautions are mentioned for the prevention of the downy mildew, and from the Connecticut experiments the conclusion is drawn that even in unfavorable seasons a thorough treatment of the vines with Bordeaux mixture will insure a crop.

In addition to the foregoing, the author reports the occurrence of Lima bean pod blight, due to *Phoma subcircinata;* the bean rust, caused by *Uromyces appendiculatus;* a bean-leaf spot, caused by *Isariopsis griseola;* and a bean-leaf blotch, caused by *Cercospora cruenta*. These diseases are briefly described, and so far as known suggestions given for their prevention.

On Trichosphæria sacchari; a fungus causing a disease of the sugar cane known as rind fungus, A. Howard (*Ann. Bot., 14 (1900), No. 56, pp. 617–631*).—The author reports studies conducted under tropical conditions, with a view of ascertaining the effect of local conditions upon the life history of the fungus, the investigations being designed to supplement those of Massee, who has described the disease. Three distinct phases of the disease were investigated—the Melanconium, micro-, and macroconidial stages. Extensive cultures were made with the Melanconium stage of the fungus in which its parasitism was definitely established, but all attempts to produce the micro- and macroconidial phases of the fungus, in sterilized media, failed. Later specimens of diseased canes were found which, being split open, showed an abundant development of spores which, from their size and origin, agreed with the micro- and macroconidia described by Massee. Cultures made with these spores readily developed the Melanconium phase of the fungus. Spores of this kind are seldom met with in Barbados, the Melanconium stage being the predominant form. So far, all attempts to inoculate a healthy cane with the spores, without wounding the plant, failed. However, the tunnels of the moth borer provide means of entry for the spores, and infection speedily takes place. It is said that little attempt is made in Barbados to keep the fungus under control. Large piles of rotten cane are left in the fields to serve as centers from which the disease may be widely spread. Inoculation experiments were made in the field with the micro- and macroconidia, in which precautions were taken to prevent the entry of other spores, with the result that the tissues of the canes became infested in 8 to 10 days, while control specimens showed no infection. An extended search of diseased canes has so far failed to reveal the presence of any perithecia, and as a result the ascigerous stage of the fungus in this region is as yet unknown.

Fungus diseases of sugar cane, A. Howard (*West Indian Bul., 2 (1901), No. 1, pp. 46–56*).—An account is given of the rind and root rot of sugar cane. The effect of the diseases is described, and it is stated that there is probably a very close connection between the fungi causing them. Whether they are identical remains to be determined. Various suggestions are offered for their control, among them that all rotten canes be burned, and that a rotation of crops and a selection of healthy plants and disease-resisting varieties be practiced.

Powdery mildew of the apple, L. H. Pammel (*Contrib. Dept. Bot. Iowa State Col. Agr. and Mech. Arts, 1900, No. 17, pp. 177–182, pls. 3*).—A review is given of some of the literature and synonymy of the powdery mildew of the apple. The species most prevalent and probably the only one in Iowa is said to be *Sphærotheca mali.* The fungus is characterized, and spraying trees with Bordeaux mixture or ammoniacal copper carbonate is recommended as a treatment.

On a bacterial disease of the turnip, M. C. Potter (*Proc. Roy. Soc. [London], 67 (1901), No. 440, pp. 442–459, figs. 6*).—In a previous publication (E. S. R., 11, p. 1061) the author called attention to the occurrence of the bacterial disease of the turnip. In the present paper it is more fully described, the organism causing the disease is characterized, and its methods of attack are stated. In the autumn, when the activity of the turnip plant is devoted mainly to the storage of reserve material, it is said to be very common to find among plants still growing in the fields some whose roots are quite rotten and with a highly offensive and peculiar smell. The plants thus affected can be recognized by the drooping yellowish leaves, the older leaves being the first to show any indications of disease. The leaves next in age exhibit the signs of premature decay, and this proceeds until finally the young leaves are attacked. The time taken for the collapse of the leaves varies with different individuals, but it is about 2 weeks from the time of the first infection.

The roots of the plants examined present a very characteristic appearance. The decaying portion may be of grayish white or a dark brown color, and quite soft to the touch. In the particular disease under investigation the infected portion always remains white and on this account the disease is characterized as "white rot." It can be readily communicated to sound roots, it being sufficient to make a slight incision and add a small portion of the rotten mass upon the injured surface to immediately set up a decay. Within 24 hours the previously healthy cells around the inoculated surface will show the characteristic changes of form and color to the depth of ¼ in. or more.

The author conducted a series of cultures in which he finally succeeded in isolating a bacterium which liquifies gelatine and which, when sown on sterile specimens of living turnips, produced the characteristic white rot. Pure cultures of the bacterium sown upon plants growing in the garden gave identical results. The characteristics of the organism, to which he has given the name *Pseudomonas destructans*, are described.

The organism can live for many generations as a saprophyte without losing its virulence as a parasite. In 1898 the author isolated and passed the organism through several cultivations, and in August, 1899, sound turnips were inoculated with the old cultures and in 5 days the rot was found to have penetrated deeply into the tissues with all the distinctive characteristics of the white rot.

In order to ascertain the action of the bacterium and to determine whether it produced any ferment capable of acting upon the cell wall, cultures were precipitated with alcohol, filtered and digested with distilled water, after which the solution was passed through a Pasteur-Chamberland filter. In this manner a clear, pale, straw-colored liquid was obtained free from bacteria. Thin sections of turnips were subjected to the action of this liquid, with the result that the middle lamella was attacked and dissolved, proving that the bacterium secretes an enzym which dissolves the middle lamella and causes the softening and swelling of the cell wall. The author tested the juice expressed from a rotten turnip and obtained, on the addition of calcium chlorid, a precipitate of calcium oxalate. Cultures were undertaken which showed the presence of oxalic acid as a product of the organism causing this disease. The oxalic acid acts upon the cell, dissolving the calcium pectate which enters largely into the composition of the middle lamella. In this characteristic the action of the bacterium is said to be precisely similar to that of certain parasitic fungi; in both cases the organisms produce oxalic acid which acts as a toxin to the protoplasm and decomposes the calcium pectate, furthering the dissolution of the cells. There is also secreted a cytase which has a destructive action upon the cell wall and intercellular substance.

From numerous observations made in the field, the author concludes that *P. destructans* is introduced at a wounded surface. Except in cases where the disease has proceeded to a large extent, the point from which the decay spreads is indicated by a wound in the epidermis and adjacent tissues. This observation is further supported by failures to infect sound roots except by first making a small incision. Wounds caused by snails, slugs, and larvae would furnish the bacterium a means of entrance, and it is probable that the attack is made in this way.

Studies of some shade tree and timber destroying fungi, G. F. ATKINSON (*New York Cornell Sta. Bul. 193, pp. 198–235, figs. 39*).—The author gives the results of several years' study on the injuries produced by some of the higher fungi upon shade and timber trees. A number of the more prominent species are selected and the relation between the fungus and its host traced. The species described are *Polyporus borealis*, occurring on living or dead pines, spruces, and hemlocks; *P. sulphureus*, which occurs on the living trees of the apple, walnut, butternut, locust, oak, ash, pine, hemlock, spruce, etc.; *P. igniarius*, which occurs on the apple, oak, alder, beech, birch, maple, and other species of broad-leaved trees; *P. pinicola*, which has hitherto been considered as confined to various conifers, although the author reports having observed it on the beech, birch, and maple; and *Trametes abietis*, common on spruces and balsams. The effect of these different fungi, as shown in the wood and timber of the different trees, is described, and the importance of proper pruning in order to prevent means of entrance of the mycelium is shown.

The dry-rot fungus (Merulius lacrymans), E. HENRY (*Bul. Soc. Sci. Nancy, 3. ser., 1 (1900), No. 6, pp. 214–227*).—After describing the botanical character of the fungus, a résumé is given of its physiology, conditions for its existence, action on wood, and suggestions for preventing its attacks.

A Fusoma disease, C. VON TUBEUF (*Arb. K. Gesundheitsamte, Biol. Abt., 2 (1901)*, *No. 1, pp. 167, 168, figs. 2*).—A report is given of a disease which attacked and destroyed many young pine and spruce seedlings which were growing in pots. The fungus causing the trouble was isolated and cultivated. Inoculation experiments were conducted and it was found that a species of Fusoma, which is as yet undetermined, was the cause of the disease.

Infection experiments with Æcidium strobilinum, C. von Tubeuf (*Arb. K. Gesundheitsamte, Biol. Abt., 2 (1901), No. 1, pp. 164–167, figs. 5*).—A report is given of inoculation experiments with the æcidial spores taken from cones of a spruce, upon *Picea excelsa*, *Prunus padus*, various species of Campanula, Betula, Epilobium, Tussilago, and Carex, and upon *Salix purpurea*, *S. caprea*, and *Sorbus aucuparia*. The infections were successful only upon *Prunus padus*, upon the leaves of which uredo- and teleutospores were formed, showing that the alternate generations of this fungus were spent upon the spruce and this species of Prunus.

Infection experiments with the rust of white pine, C. von Tubeuf (*Arb. K. Gesundheitsamte, Biol. Abt., 2 (1901), No. 1, pp. 173–175*).—An account is given of a number of experiments conducted by the author and others, in which the relationship between *Peridermium strobi*, the rust of the white pine, and that occurring on various species of Ribes, is shown by inoculation experiments.

Concerning Tuberculina maxima, a parasite of the leaf rust of white pine, C. von Tubeuf (*Arb. K. Gesundheitsamte, Biol. Abt., 2 (1901), No. 1, pp. 169–173*).—A brief review is given of the literature of the genus Tuberculina, and the systematic position of *T. maxima*, a parasite of the rust fungus of white pine, is discussed.

Infection experiments with Gymnosporangium juniperinum from the leaves of Juniperus communis, C. von Tubeuf (*Arb. K. Gesundheitsamte, Biol. Abt., 2 (1901), No. 1, pp. 177, 178*).—Infection experiments upon a number of plants are reported, in which it was shown that the Rœstelia stage of *Gymnosporangium juniperinum* occurs on *Sorbus aucuparia* and upon *Amelanchier rotundifolia;* and the same stage of *Gymnosporangium tremelloides* is found upon *Pyrus malus*, *Sorbus aria*, and *S. chamæmespilus*.

Further investigations on the abnormal outgrowths of Hibiscus vitifolius, Elizabeth Dale (*Bot. Centbl., 85 (1901), No. 11, pp. 372–375*).—Experiments were undertaken to determine the cause of the formation of outgrowths upon this plant. The outgrowths consisted chiefly of greatly enlarged epidermal cells, with very thin walls. Sometimes the underlying parenchyma was also affected. The cells concerned were always in the immediate vicinity of stomata so that the guard cells were lifted up as the outgrowth developed. Experiments were conducted to test the effect of moisture, temperature, and light in favoring the growth of these swellings. Most of the experiments were made in the open air, as the occurrence of the outgrowths is very common on plants growing in greenhouses. Various combinations of dry and damp air, and soil, were investigated, with the result that outgrowths were always formed in damp air, provided there was sufficient light and heat, while damp soil had no effect. The effect of light upon their production showed that outgrowths were developed upon plants under clear glass, and under red and yellow glass, but not under blue or green glass, in poor light, or in darkness. The formation of outgrowths was found to be favored by increased temperature, when the other necessary conditions were favorable. The immediate effect of damp atmosphere is to check transpiration, and the swellings were only produced where transpiration was reduced. They occur only in plants in which there is an accumulation of starch. The formation of the outgrowths was accompanied by the production of oil, not found in normal leaves. It is considered probable that these outgrowths are due to the local accumulation of osmotically active substances produced under abnormal conditions, such as reduced transpiration, and consequent lack of minerals, while carbohydrates are developed in excess. In addition to the experiments made upon the Hibiscus, similar observations were made upon *Ipomœa woodii*.

ENTOMOLOGY.

Report of injurious insects in Finland for the year 1899, E. REUTER (*Landbr. Styr. Meddel.* [*Helsingfors*], *1900, No. 32, pp. 44*).—Experiments were made in combating *Charæas graminis*. These experiments included the use of lysol, "lila," and Paris green. Lysol was obtained from several firms, some samples being strongly alcoholic, others slightly alcoholic, and still others being crude lysol. It was found that a thorough spraying with a 2 per cent solution of lysol and water quickly killed all the larvæ which were touched by the fluid. A careful application of the 2 per cent solution had a better effect than a less thorough spraying with a 3 or 4 per cent solution of lysol. Lila is described as a violet colored fluid of unknown composition. When used in a 5 per cent solution it had no effect in destroying the larvæ. The use of Paris green in combating this insect proved also unsatisfactory. Experiments with Paris green were conducted on a large scale. It was found that the larvæ continued to feed upon grasses which had been sprayed with Paris green and that only a small percentage was killed. Detailed statements are given of the prevalence and injurious attacks of this insect in various localities. When the species occurs in unusually large numbers it is recommended that rotation of crops be adopted and that the remedies which are in common use against the army worm should be adopted.

Further observations were made on the insects which cause the silver-top condition of various grasses. These observations were made for the most part on the same species of insects which were studied and reported upon in a previous publication by the same author (E. S. R., 12, p. 970). Brief notes are given on a few insects which are injurious to cereals, including *Hadena secalis*, *Chlorops tæniopus*, *Oscinis frit*, and *Physopus tenuicornis*. Garden crops were depredated upon by a large number of insects; and notes are given on the habits and life history of *Athalia spinara*, *Meligethes æneus*, *Cassida nebulosa*, cabbage-root maggot, and scales. Brief notes are also presented on some of the insects which feed upon fruit trees, berry bushes, conifers, deciduous trees, and roses.

Injurious insects, F. SHERMAN, JR. (*Bul. North Carolina State Bd. Agr., 22* (*1901*), *No. 6, pp. 3–29, figs. 16*).—The author gives brief descriptive biological and economic notes on the harlequin cabbage bug, cabbage plusia, cabbage butterfly, white grubs, Hessian fly, tobacco flea-beetle, bagworm, imported elm-leaf beetle, San José scale, scurfy scale, oyster-shell bark louse, woolly aphis, codling moth, peach-tree borer, and plum curculio.

The variegated cutworm (Peridroma saucia), R. W. DOANE and D. A. BRODIE (*Washington Sta. Bul. 47, pp. 16, figs. 5*).—The authors give a brief account of an unusually extensive outbreak of this species in the State of Washington in 1900. The insect attacked all sorts of plants, including field crops, garden crops, and fruit trees. Some young orchards were completely ruined and hop fields suffered severely. A description is given of the insect in its various stages. The authors did not determine whether the species was single or double brooded in the State. It may pass the winter in the larval, pupal, or adult stages, but probably hibernates as a rule in the pupal condition. Two parasites were reared from the cutworm and are identified as *Ichneumon maurus* and *Meteorus indigator*. The artificial remedies which are recommended for the control of this insect include clean cultivation, ditching, banding of trees, protecting small plants by paper wrappings, spraying with Bordeaux mixture, spraying with arsenicals, and hand picking. Potato vines which were sprayed with Bordeaux mixture were well protected against the attacks of the insect, while unsprayed vines in the same field were entirely destroyed.

Two new wheat pests, W. W. FROGGATT (*Agr. Gaz. New South Wales, 12* (*1901*), *No. 3, pp. 350–356, pls. 2*).—The grain aphis is reported as having injured wheat near the base of the stems to such an extent that the stems broke down when the grain was coming into head. The grain was attacked when about 6 in. high and the work of the grain aphis caused bending of the stems, which later led to their breaking.

The Rutherglen bug (*Nysius vinitor*) is similar in habits to the chinch bug, but has a great variety of food plants, attacking wheat and other field crops, as well as various fruit trees and garden crops. In combating the insect on fruit trees, the author had good success with the use of a tray 3 by 2½ ft., containing water covered with a film of kerosene into which the insects were jarred in the early morning. Experiments with hydrocyanic-acid gas indicated that this method could be used to advantage in destroying these insects.

The grain aphis, W. G. Johnson (*Weekly Mod. Miller, 26 (1901), No. 44, p. 13, figs. 3*).—Brief notes on the damage caused by this insect, especially in Texas, together with an account of the parasitic insects and fungus diseases which help to keep the grain aphis in check.

The Hessian fly in Minnesota, E. B. Forbes (*Farm Students' Rev., 6 (1901), No. 9, pp. 133, 134*).—It is reported that the Hessian fly occurred in unusual numbers during the season and that the wheat crop was damaged in some localities to the extent of 50 per cent. The insects seemed to be present in all parts of the State. Brief notes are given on the life history of the insect, and it is recommended that in combating the attacks of the Hessian fly attention should be given to the burning of stubble, rotation of crops, and plowing.

Insects that attack grains and meals, A. M. Lea (*Jour. Dept. Agr. West. Australia, 3 (1901), No. 3, pp. 183–188, figs. 6*).—Notes on the habits, life history, and means of combating *Sitotroga cerealella*, *Tribolium ferrugineum*, *Gnathocerus cornutus*, *Silvanus surinamensis*, *Lasioderma serricorne*, *Tenebrio molitor*, *Carpophilus dimidiatus*, and *Tyroglyphus siro*.

Observations on insects injurious to sugar beets in Italy, G. del Guercio (*Nuove Relaz. R. Staz. Ent. Agr., 1. ser., 1900, No. 3, pp. 371–409, figs. 6*).—The author describes *Melolontha vulgaris* in all its stages and gives details of observations concerning the life history of this insect. An investigation was made to determine the periods during which the species is most active and most injurious, and the results of this study are presented in tabular form. The injuries from this species during certain seasons reach great proportions. Conditions which are favorable to the development of the cockchafer are temperate climate, protection from strong winds and heavy rains, and against severe and sudden changes of temperature. The life history of the species occupies about 3 years in France and countries of the same latitude, but is somewhat shorter in Italy. Although the larvæ are usually found near the surface of the ground, they occasionally penetrate to the depth of a meter or more. The means usually recommended for the destruction of this species include infection with the spores of *Botrytis tenella*, the collection and destruction of the larvæ and adult insects, and the use of carbon bisulphid in the soil. The author believes that the last 3 methods promise the best success, and recommends the use of bisulphid of carbon in quantities of from 300 to 500 kg. per hectare.

Pentodon punctatus is described and illustrated in its various stages and brief notes are given on its life history and habits. The conditions which are most favorable for the rapid development of this species are similar to those which favor the spread of the cockchafer, and the artificial remedies which promise the most success are the same as those already recommended for the latter species. The use of cylinders made of reeds, tin or other metal, is said to have been attended with considerable success. Such cylinders prevent the attacks of this insect upon the young plants.

Some insects injuring market garden crops, H. T. Fernald (*Massachusetts State Bd. Agr. Rpt. 1900, pp. 322–335, figs. 5*).—Descriptive, biological, and economic notes are given on the asparagus beetle, imported cabbage butterfly, squash bug, root maggots of onion, cabbage, and turnip, flea-beetles, and cutworms.

Insects injurious to fruit, A. H. SNYDER (*Agr. Student, 7 (1901), No. 9, pp. 171–175*).—Brief notes are given on the codling moth, apple-tree borers, tent caterpillars, plum curculio, rose chafer, currant worms, cankerworms, May beetles, etc.

Insect enemies of the stone fruits, L. BRUNER and W. D. HUNTER (*Rpt. Nebraska Hort. Soc., 31 (1900), pp. 51–116, figs. 71*).—A list is given of all the insects which have been reported as injuring stone fruits in the United States. Economic and biological notes are presented on the more important of these insects, including the peach-tree borer, apple-twig borer, bark beetles, plant lice, oyster-shell bark louse, scurfy bark louse, San José scale, leaf crumpler, cankerworms, May beetles, rose chafer, grasshoppers, plum curculio, and plum gouger.

San José scale, with a few suggestions for its treatment, and rules and regulations adopted by State board of entomology, M. L. DONALDSON ET AL. (*South Carolina Sta. Bul. 65, pp. 12*).—Brief notes are given by way of description of the San José scale, and an account of its present distribution in South Carolina. The authors present a summary statement of remedies which may be recommended for summer and winter treatment against this insect. The text is given of an act of the South Carolina legislature creating a State board of entomology, defining its powers, and providing for the inspection of fruit trees, vineyards, and vegetable farms in the State. A copy is also given of the rules and regulations adopted by the State board as created by this act.

The cottony cushion scale (Icerya purchasi), H. A. GOSSARD (*Florida Sta. Bul. 56, pp. 309–356, pl. 1, figs. 6*).—A historical account is given of this scale in Australia and other foreign countries, as well as in California and Florida. It is stated that the insect was introduced from California into Florida in 1893, near Clearwater, and that it has subsequently become distributed more widely in the immediate neighborhood of the first point of infestation. The insect was sent from California in the same packet with specimens of *Novius cardinalis*, so that this important enemy of the scale is also present in Florida to hold it in check. The town council of Clearwater, and later the board of commissioners of Hillsboro County, appropriated money for the extermination of this pest, and the efforts in this direction were partly successful. During the summer of 1899 the scales decreased in number, but they increased again in 1900, reaching a maximum about July 1. At this time all the orange groves in Clearwater seemed to be infested. Then the pest began to decrease rapidly in numbers on account of the attacks of its natural enemies, especially the Australian ladybird. Since this time the insect has been held in check to a large degree by the ladybirds. An extensive list of food plants of the cottony cushion scale is given, and descriptions are presented of the insect in all its stages. The larvæ are most active during the hotter parts of the day and remain almost stationary at night. Badly infested leaves have a black or smutty appearance on account of the growth of a black mold in the honeydew which is excreted by the scales. The natural methods of dissemination of this insect are discussed and a detailed account is given of the appearance and habits of the Australian ladybird and of its introduction into Florida. A number of scales were destroyed by a fungus disease which proved very effective on some trees. The nature of the fungus has not been determined. Experiments show that the scale may be effectively held in check by persistent application of resin wash or kerosene preparations. Fumigation with hydrocyanic-acid gas is considered very efficient but rather expensive.

Report of the gypsy moth commission, A. PRATT ET AL. (*Massachusetts State Bd. Agr. Rpt. 1900, pp. 355–370*).—A brief report is made, containing a summary of the observations of F. C. Moulton on the condition of the infested territory during 1900. Since the lapse of the regular appropriation for carrying on the work of fighting the gypsy moth it is reported that the insect has increased somewhat in numbers in nearly all infested localities. Attention is called to the discovery of the value of arsenate of lead as an insecticide and to the improvement in spraying machinery which were incidental to the work in exterminating the gypsy moth.

Pineapple mealy bug (Dactylopius bromeliæ), H. TRYON (*Queensland Agr. Jour., 8 (1901), No. 4, pp. 297, 298*).—This insect, although widely distributed in pineapple plantations of Southern Queensland, is seldom especially injurious. In the northern districts the insect is more extensively attended by ants and causes more damage. It increases rather slowly and is usually kept somewhat in check by its natural enemies. Fumigation with hydrocyanic-acid gas is recommended in combating this insect.

Animal enemies of coffee in Java. II, J. C. KONINGSBERGER and A. ZIMMERMANN (*Meded. 'S Lands Plantentuin, 1901, No. 44, pp. 125, pls. 6, figs. 59*).—The authors present detailed biological and economic notes on the worms, mites, insects of various orders, birds, and other animals which are recognized as injurious to coffee in Java. In connection with the discussion on each pest, the approved artificial remedies for combating it are mentioned, together with notes on its insect enemies and fungus diseases.

Cockchafer grubs destroying strawberry plants, W. W. FROGGATT (*Agr. Gaz. New South Wales, 12 (1901), No. 4, pp. 473-476, figs. 5*).—Descriptive and biological notes are given on *Anoplognathus analis* and *A. porosus*. The larvæ of these species feed upon the roots of strawberries, sometimes completely destroying them, so that the plant falls over or is readily pulled out of the ground. As a treatment for badly infested strawberry fields, it is recommended that top-dressing of kainit or nitrate of soda be applied. As the adult beetles sometimes occur in large numbers in trees, they may be captured by jarring into collectors.

The redwood mealy bug (Dactylopius sequoiæ, n. sp.), G. A. COLEMAN (*Proc. California Acad. Sci., 3. ser., Zool., 2 (1901), No. 11, pp. 407-420, pl. 1*).—A detailed description is given of this insect in all its stages. The species is considered as new, and is reported as occuring on *Sequoia sempervirens* throughout the Sierra Morena Mountains. An undetermined species of parasitic fly was bred from certain of the specimens. The young larvæ crawl about over the leaves and twigs within a few days after hatching. Various stages of the insect were carefully studied in the laboratory.

Monophadnus elongatulus as an enemy of the rose, D. VON SCHLECHTENDAL (*Allg. Ztschr. Ent., 6 (1901), No. 10, pp. 145-147*).—The literature relating to this species is briefly reviewed and especial attention is devoted to a discussion of the process of egg laying and the entrance of the larva into the vegetable tissue. The eggs are deposited in the petiole of partly developed leaves, the puncture being made on the under side of the petiole.

Note on the respiration of Aleurodes citri, C. W. WOODWORTH (*Canad. Ent., 33 (1901), No. 6, pp. 173-176*).—A study was made of the respiratory organs of this insect for the purpose of determining their relationship to the reaction of the insect toward fumigation with hydrocyanic-acid gas. The spiracles of this insect are located on the ventral side of the body, and since the body is cemented to the leaf it is necessary that breathing folds should be developed in the epidermis which admit air from the outside to the spiracles. The breathing folds are highly specialized grooves in the outer skin of the insect and are armed with minute scattered elevations, together with a pair of combs at the outer opening. A detailed description is given of the structure of the tracheæ through the interior of the body of this species.

Respiratory organs of botflies, G. ENDERLEIN (*Sitzber. Math. Naturw. Cl. K. Akad. Wiss. [Vienna], 108 (1899), No. 5, pp. 235-303, pls. 3*).—The botflies which have thus far been found in the stomachs of herbivorous animals belong to 16 species, and the host animals are elephant, horse, zebra, ass, and rhinoceros. A general account is given of the anatomical and histological characters of the various parts of the respiratory system of these insects, with especial reference to the peculiar conditions under which they live. One feature of the spiracles by which the botflies are distinguished is the presence of an apparatus for closing the openings and thus preventing the entrance of the digestive fluids by which the insects are surrounded. The openings of the spiracles are long and narrow and can be closed so as to be water tight. A bibliography of the subject is appended to the article.

Notes on Cerrococcus, ROSE W. PATTERSON (*Proc. California Acad. Sci., 3. ser., Zool., 2 (1901), No. 9, pp. 385–394, pls. 3*).—Of the 3 species which are recognized as belonging to this genus, 2 are commonly observed in California on oaks and were studied. These are *C. ehrhorni* and *C. quercus*. Detailed descriptive and biological notes are given on these species and brief notes are also presented on *C. corticis*.

The rearing of hymenopterous borers in pruned branches, W. BAER (*Allg. Ztschr. Ent., 6 (1901), No. 11, pp. 161–163, figs. 4*).—Two species of boring wasps were found in the twigs of *Fraxinus excelsior*. Detailed notes are given on the structure and course of the burrows. The species concerned were *Psen atratus* and *Crabro capitosus*.

Monograph of the Sesiidæ of America north of Mexico, W. BEUTENMÜLLER (*Mem. Amer. Mus. Nat. Hist., 1 (1901), No. 6, pp. 217–352, pls. 8, figs. 24*).—This monograph contains an elaborate discussion of the characters of the family and genera, with analytical tables for the determination of genera and species and also tables for the determination of the larvæ from their food habits. In connection with the discussion of each species a detailed bibliography is presented, and a general bibliography of the literature concerning the family of moths and including 542 titles is appended to the article.

Smerinthus quercus, L. VON AIGNER-ALBAFI (*Allg. Ztschr. Ent., 6 (1901), No. 9, pp. 137, 138*).—The larvæ of this moth feed from July until September upon a species of oak, especially *Quercus robur*. The moths appear from March until June. They are readily attracted to electric lights and may be taken in large numbers in such situations.

Syrphus flies and colors of flowers, F. PLATEAU (*Mem. Soc. Zool. France, 13 (1900) No. 4, pp. 266–285*).—The author has previously investigated the relationship of the color of flowers to the visits of insects and a number of other crops, and from these results in connection with the study of the Syrphidæ concludes that insects are influenced in no way by the color of the flowers which they visit.

Trapping insects on fruit trees (*Landmandsblade, 34 (1901), No. 36, pp. 432–434, figs. 2*).—A description is given of a band for use in catching the larvæ of the codling moth. The band is made of coarse cloth with narrow strips of pasteboard attached to the cloth at frequent intervals in vertical planes. The band is fastened to the tree so as to bring the strips of pasteboard next to the bark. Good success is reported from the use of these bands.

Hints on spraying (*Jour. Jamaica Agr. Soc., 5 (1901), No. 4, pp. 145, 146*).—This article contains brief notes on spraying apparatus and a few of the common insecticides.

Catalogue of collections of pests and insecticides (*Com. Agr. Parasit. Secy. Pub. Prom. Mexico, 1901, pp. 6*).—Brief notes on *Trypeta ludens*, *Anthonomus grandis*, *Termes castane*, various species of bark lice, mosquitoes, bean weevil, etc., with brief notes on plant parasites and insecticides. The cucaracha herb is reported as being an effective remedy for destroying lice and fleas on dogs, cockroaches, mosquitoes, and other insects. The fresh plant costs 1 ct. per kilo and may be used in infusion. *Microsechium helleri* is useful in destroying plant lice and underground insects. The root of the plant costs $40 a ton.

How to get rid of fleas, J. A. MOFFAT (*Canad. Ent., 33 (1901), No. 6, p. 172*).—The effect of tarred paper in the construction of houses upon infestation by fleas was perhaps first reported from New South Wales. A similar experiment was tried at the suggestion of the author, and was found to be an effective means for ridding houses of these pests.

Fleas, W. W. FROGGATT (*Agr. Gaz. New South Wales, 12 (1901), No. 5, pp. 535–542, *pl. 1*).—A general account is given of the classification and economic relations of fleas, with especial reference to the possibility of transmission of infectious diseases by means of these insects. Special notes are given on *Pulex irritans*, *P. serraticeps*, and *P. fasciatus*. An extensive list of fleas is given, together with the host animals upon which they live.

An experiment in the importation of beneficial insects, F. M. Webster (*Canad. Ent.*, *33* (*1901*), *No. 6*, *pp. 183, 184*).—Specimens of *Exochomus nigromaculatus* were shipped from South Africa to Ohio in good condition. It is expected that these lacy beetles may be of service in checking the multiplication of mealy bugs in greenhouses.

Animal parasites, IV, E. P. Niles (*Virginia Sta. Bul. 111*, *pp. 39–50*, *figs. 6*).—Brief descriptive and biological notes on the horn fly, screw-worm fly, forest fly (*Hippobosca equina*), and sheep tick.

Animal parasites, V, E. P. Niles (*Virginia Sta. Bul. 112*, *pp. 51–68*, *figs. 14*).—Brief notes on the appearance, habits, and life history of *Sarcopsylla penetrans*, dog flea, bedbug, crab louse, head louse, body louse, *Hæmatopinus phalanges ovis*, *H. piliferus*, *H. eurysternus*, *H. vituli*, *H. urinus*, and *H. asini*.

Animal parasites, VI, E. P. Niles (*Virginia Sta. Bul. 113*, *pp. 69–80*).—Brief biological and economic notes on *Goniocotes abdominalis*, *Gonoides stylifer*, *Lipeurus polytrapezius*, *L. squalidus*, *Trichodectes subrostratus*, *T. latus*, *T. sphærocephalus*, *T. asini*, *T. scalaris*, and *Menopon pallidum*.

Animal parasites, VII, E. P. Niles (*Virginia Sta. Bul. 114*, *pp. 81–96*).—Brief popular notes on the poultry tick, cattle tick, wood tick, *Ixodes ricinus*, *Argus americanus*, sheep-scab mite, and *Sarcoptes scabiei*. A brief statement is also given on the common insecticide methods which are used in combating these pests.

Annual report for 1900 of the zoologist, C. Warburton (*Jour. Roy. Agr. Soc. England*, *3. ser.*, *11* (*1901*), *pt. 4*, *pp. 742–750*, *figs. 4*).—Biological and economic notes on scaly leg of fowls, tapeworms in dogs, mosquitoes, Hessian fly, *Chlorops tæniopus*, *Oscinis frit*, *Hylemyia coarctata*, wheat midge, wheat sawfly, and other insects.

Influence of the honeybee on the fruit crop, L. D. Stilson (*Rpt. Nebraska Hort. Soc.*, *31* (*1900*), *pp. 226–228*).—A brief general discussion of the agency of the honeybee in fertilizing the flowers of fruit trees.

The method of artificial swarming in frame hives for preventing natural swarming, maintaining the apiary, and increasing the yield of honey, R. Pincot (*L'Apiculteur*, *44* (*1901*), *No. 6*, *pp. 247–254*).—In an experience of 6 years with this method the author has had complete success in preventing natural swarming and in securing a larger yield of honey. A young and vigorous queen is selected for the portion of the swarm which is removed artificially, and by having the matter in control the most favorable time for the establishment of a new colony may be selected.

The relation of honey to beeswax, L. Moupy (*Rev. Internat. Apicult.*, *23* (*1901*), *No. 4*, *pp. 68–71*).—This is a controversial article, in which the main problem is discussed concerning the question of what substances contribute to the formation of wax and what quantity of honey is necessary to produce a given quantity of wax. The author believes that wax is formed almost exclusively from honey and that about 375 to 400 gm. of honey are required for the formation of 100 gm. of wax.

Twenty-first annual meeting of the Ontario Bee-Keepers' Association (*Ann. Rpt. Bee-Keepers' Assn. Ontario*, *1900*, *pp. 64*).—At this meeting, held in Niagara Falls, Ontario, on December 4–6, 1900, a number of papers were read, a few of which are mentioned here.

Moving bees to fall pasturage, R. H. Smith (pp. 10, 11).—It is recommended that large colonies of bees should not be moved during hot weather without allowing plenty of ventilation, by covering the super with a wire screen so as to allow the bees about 2 in. space above the frames. The author believes that where bee pasturage becomes poor in the fall in the immediate neighborhood of the apiary, profitable returns may be obtained by moving the colonies into the vicinity of more abundant honey plants.

Brief notes are given on wintering bees in and out of the cellar, by H. G. Sibbald (pp. 19, 20). It is recommended that bees should be left on their summer stands until from November 20 to December 1 before being placed in the cellar.

The production of extracted honey is discussed by A. Dickson (pp. 27, 28). Brief notes are given on the construction of a room for this purpose, and on the size, form, and material of tanks for use in extracting honey.

W. McEvoy reports finding foul brood in 33 out of 100 apiaries which were inspected during 1900.

M. B. Holmes reports on some practical experience with queen bees. Attention is called to the great difference in productiveness in different queens and to the necessity of inspecting hives in order to determine whether a sufficient number of eggs are being laid.

Notes on experiments with foul brood are given by F. C. Harrison. This is a brief form of another paper by the same author (E. S. R., 12, p. 966).

J. Fixter reports on experiments in wintering bees. Eight experiments were tried on wintering bees in the cellar, in a pit dug in the side of a hill, in a root house, in a house apiary, and out of doors. The average loss in weight of honey and bees was greatest in the colonies which were wintered out of doors and least in those which were wintered in the cellar.

J. Fletcher gives an account of the value of bees in fruit orchards. In this paper the author discusses the general relationship of bees to fruit trees, including the question whether bees eat fruit or not and their value in fertilizing flowers. It is believed that it is practically impossible for bees to puncture the skin of uninjured fruits.

FOODS—NUTRITION.

The functions and uses of food, C. F. Langworthy (*U. S. Dept. Agr., Office of Experiment Stations Circ. 46, pp. 10*).—A brief discussion of some of the principles of nutrition, together with a summary of the composition of the more common food materials, and a method for calculating the results of dietary studies and the digestibility of different foods.

Science in the daily meal, A. Broadbent (*Manchester, England: Author, 1900, 2. ed., pp. 45, fig. 1*).—A number of menus which the author considers suitable to special conditions are proposed. The volume also contains brief discussions of food.

The chemist-cook, E. J. David (*Le cuisinier-chimiste. San Francisco: Author, 1901, pp. 50*).—Foods, nutrients, preserving food, cooking, and similar topics are treated of.

Piedmont peasant bread, E. Bertarelli (*Riv. Ig. e San. Pubb., Roma, 11 (1900), Sup.; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), No. 16, pp. 758, 759*).—A comprehensive study of the bread eaten by the peasants in the Piedmont region.

Sandy bread, B. Fischer and C. Grunhagen (*Jahresber. Chem. Untersuchungsamtes Breslau, 1899–1900, p. 9; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), No. 16, p. 757*).—A chemical and microscopical examination of sand in bread.

Patent oat breakfast foods; their chemical composition and nutritive value, G. W. Chlopin (*Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), No. 11, pp. 481–488*).—According to the author a number of brands of American oat breakfast foods are on sale in Russia. Analyses of such foods and similar products of Russian or other European manufacture are reported, and also digestion experiments in which the author was himself the subject. It was found that 87.43 per cent of the dry matter and 71.83 per cent of the nitrogen was digested when the diet consisted of oatmeal porridge (made with water), a little butter and sugar. When the diet consisted of porridge made with milk, the following average coefficients of digestibility were obtained: Dry matter, 92.49; nitrogen, 86.43; fat, 92.0, and carbohydrates, practically, 100. The comparative digestibility of oatmeal and other foods is discussed. According to the author, oatmeal and milk furnish the body with somewhat more energy than a like amount of bread and milk. This, however, is not considered a sufficient basis for the extravagant statements made by manufacturers concerning the nutritive value of such goods.

Eggs in cold storage, M. COOPER (*Chicago: H. S. Rich & Co., 1899, pp. 88, figs. 10*).—The theory and practice in preserving eggs by refrigeration are discussed. Much of the information given was received in answer to requests addressed to individuals and companies commercially interested in the subject of preserving eggs by refrigeration. The author also reports the results of experiments on the effects of low temperatures on eggs.

The danger attending the increased consumption of sugar, G. VON BUNGE (*Ztschr. Biol., 51 (1901), No. 2, pp. 155–166*).—In the author's opinion there is a possible danger in consuming considerable amounts of sugar, due to the fact that this material is lacking in calcium and iron salts. These salts are present in honey and sweet fruits and the author believes their use is not attended with harmful results. A detailed ash analysis of honey is reported as well as estimations of the calcium and iron in figs, dried plums, dates, fresh pears, and dried malaga grapes.

Food and the principles of dietetics, R. HUTCHINSON (*London: Edward Arnold, 1901, pp. XVIII + 548, col. pls. 3, figs. 34*).—The general topic of food, its composition and digestibility, theories of nutrition, etc., are treated of extensively. A noteworthy feature of this volume is the large amount of analytical and other data regarding patent and commercial foods and food products, a class of goods in regard to which it is difficult to secure reliable information. The volume is provided with a full index, and references are uniformly given for the large number of investigations cited.

Food supply [during the siege of Mafeking], R. S. S. BADEN-POWELL (*South African Dispatches, Vol. I. London: Harrison & Sons, 1901, pp. 106, 107, 110*).—A detailed account is given of the food supply during the siege of Mafeking. The foods consisted generally of canned meats, horse flesh (largely used for making sausages), bread from ground oats, sowens (a form of porridge made from oat bran), and fresh vegetables (largely grown within the defenses), with some condiments. The daily ration per man, at first, was made up of 1 lb. meat, 1 lb. bread, 1 lb. vegetables, $\frac{1}{3}$ oz. coffee, $\frac{1}{2}$ oz. salt, 2 oz. sugar, and $\frac{1}{2}$ oz. tea. Later in the siege the amounts were reduced to $\frac{3}{4}$ to 1 lb. meat, 5 oz. bread, 6 oz. vegetables, $\frac{1}{3}$ oz. coffee, $\frac{1}{2}$ oz. salt, and 1 qt. sowens. [The first ration has been calculated to furnish 142 gm. protein and 2,500 calories; the latter, 149 gm. protein and 2,700 calories.—ED.]

The theory and practice of military hygiene, E. L. MUNSON (*New York: William Wood & Co., 1901, pp. XII+971, pls. 8, figs. 389*).—The water supply for troops and the ration under different conditions of peace and war are treated of at length, as well as the numerous other topics pertaining to military hygiene. In every case, in addition to original material, the author has given a careful summary of the work of other investigators on the topic, and in this and other ways the work is a very complete manual of the subject treated.

Food products: A manual for traders and others, C. J. HIGGINSON (*London: E. Wilson, 1900, pp. XVI + 179*).—As the sub-title states, this is a consolidation of the "Sale of food and drugs act, 1875" (of Great Britain); "Sale of food and drugs act amendment act, 1879;" "Margarine, 1887;" and "Sale of food and drugs act, 1899." The general orders issued by local authorities regarding the registration of manufactories and premises and the regulations as to the competency of public analysts are also included.

The difference between light and dark meat for invalid diet, J. R. Offer and E. Rosenquist (*Berlin. Klin. Wchnschr., 36 (1899), pp. 937-939, 968-970, 1086, 1087; rev. in Sci. Amer., 82 (1900), No. 18, p. 276*).—The total nitrogen, nitrogen of extractives, and nitrogen of meat bases, were determined in different kinds of fish, fowl, fresh meat, and preserved meat. The total nitrogen and nitrogen of extractives were also determined in raw and fried veal. Light meat is often said to be preferable to dark meat in special diets, but no constant difference in the kind or amount of nitrogenous materials present was observed which would in the author's opinion warrant this belief.

The effect of light and dark meat in cases of chronic kidney disease, A. Pabst (*Berlin. Klin. Wchnschr., 37 (1900), pp. 547-550*).—Both sorts of meat were found to be equally satisfactory under the conditions studied.

On the behavior of olive oil in preserving fish, O. Klein (*Ztschr. Angew. Chem., 1900, pp. 559, 560; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), No. 14, p. 646*).—A study of the specific gravity, iodin number, etc., of oil used for sardine manufacture and taken from old and freshly prepared cans.

Concerning the extractives in muscles, W. Gulewitsch and S. Amiradzibi (*Physiologiste Russe, 2 (1900), No. 26-30, pp. 114-118*).—Analytical work on a body which the authors call "carnosin" is reported.

Lectures on the physics of organic metabolism, E. Du Bois-Reymond (*Vorlesungen über die Physik des organischen Stoffwechsels. Berlin: A. Hirschwald, 1900, pp. 208, figs. 26*).—These lectures, which are edited by E. Du Bois-Reymond, treat of the physical processes involved in the metabolism of living things—transfusion, emulsion, capillarity, osmosis, and similar topics being considered.

Experimental investigations with man on the effect of muscular work upon the consumption of food material, and the value of different nutrients as sources of muscular energy, H. N. Heineman (*Arch. Physiol. [Pflüger], 83 (1901), No. 10-12, pp. 441-476*).—Using the respiratory quotient apparatus and the methods elaborated by Zuntz and his associates, a study was made of the different nutrients as sources of energy, the special object being to determine whether the nutrients replace each other in direct proportion to their heat of combustion. In connection with the work, the hourly excretion of nitrogen was studied.

Investigations on the source of muscular energy, J. Frentzel and F. Reach (*Arch. Physiol. [Pflüger], 83 (1901), No. 10-12, pp. 477-508*).—A number of experiments which are similar in purpose and method to those noted above.

Concerning protein cleavage and gain during muscular work, W. Caspari (*Arch. Physiol. [Pflüger], 83 (1901), No. 10-12, pp. 509-539*).—The income and outgo of nitrogen was studied with a dog, with special reference to the question of protein in relation to muscular work. It was found that when the diet was constant and a considerable amount of muscular work was performed there was a continual gain of nitrogen in the body.

Muscular work and over-feeding with protein, K. Bornstein (*Arch. Physiol. [Pflüger], 83 (1901), No. 10-12, pp. 540-556*).—The author was himself the subject of experiments similar in purpose to those noted above. The respiratory quotient was studied as well as the income and outgo of nitrogen. According to the author the experiments show that the normal body when overfed with protein and at the same time performing muscular work, is capable of gaining protein without gaining fat.

Concerning the value of different nutrients as sources of energy, N. Zuntz (*Arch. Physiol. [Pflüger], 83 (1901), No. 10-12, pp. 557-571*).—A theoretical discussion based on the 4 preceding investigations.

Ureine, W. O. Moor (*Physiologiste Russe, 2 (1900), No. 26-30, pp. 128-131*).—The author believes he has isolated a new compound from urine, for which the name "ureine" is proposed.

Concerning Moor's ureine and its physiological properties, A. Kuljabko

(*Physiologiste Russe, 2 (1900), No. 26–30, pp. 131–132*).—The body called ureine, according to the author, is a mixture of several substances and not a new chemical compound.

ANIMAL PRODUCTION.

Analyses of fodders from forage crops cut at different stages of growth, R. W. THATCHER (*Nebraska Sta. Rpt. 1900, pp. 73–80*).—To learn the effect of the time of cutting upon the composition of forage crops, analyses were made of oats and peas, field corn, millet, sorghum, Kafir corn, and cowpeas. In every case the second sample analyzed was cut three weeks later than the first. The results of the analyses follow:

Composition of feeding stuffs at different stages of growth.

Feeding stuffs.	Water.	Protein.	Albuminoids.	Ether extract.	Nitrogen-free extract.	Crude fiber.	Ash.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Oats and peas:							
Pea pods beginning to form, oats beginning to head	12.67	16.19	9.66	2.90	30.24	28.15	9.85
Pea pods all filled out, oats in full bloom.	11.32	16.27	12.54	2.40	35.99	25.41	8.88
Field corn:							
Tassels beginning to appear	13.03	8.08	6.17	1.37	40.43	27.09	10.00
Corn full grown, some ears formed	13.85	6.69	5.49	1.38	45.74	24.04	8.30
Millet:							
Heads just appearing	10.24	8.41	5.79	2.54	32.03	35.86	10.92
Headed out, seeds nearly ripe	10.47	6.12	4.49	1.52	43.33	29.10	9.41
Sorghum:							
Heads just appearing	13.50	8.65	5.24	2.97	34.56	30.62	9.70
Headed out, seeds beginning to form	11.23	6.27	4.65	1.90	41.69	30.05	8.86
Kafir corn:							
Heads just appearing	11.37	8.53	6.00	1.76	35.94	32.74	9.66
Headed out, seeds beginning to form	12.95	6.98	4.86	2.06	37.42	31.38	9.21
Cowpeas:							
Vines 16 in. high, no heads formed	11.76	19.77	11.10	2.70	28.64	21.68	15.45
Well developed, some pods formed	12.60	19.09	12.82	2.71	30.25	21.33	14.02

"The conditions of growth of the crops this season were about equally favorable for each of them and some tentative conclusions may hence be drawn from the results of this season's work. . . . The mixed crop, oats and peas, improves in composition as it grows older and should probably be allowed to stand as long as the pea vines will remain fairly erect. The proportion of flesh-forming to fat-forming constituents in the fodder obtained from this crop is very nearly the correct one for a well-balanced ration for most classes of animals and it would probably be found unnecessary to supplement this fodder with grain or other foods.

"Field corn, millet, sorghum, and Kafir corn decrease rapidly in protein content while heading out. The percentage of crude fiber also decreases somewhat. Both of these changes are probably due to the rapid accumulation of starch and sugars in the plant juices at that time, as shown by the increased proportion of nitrogen-free extract. In order to obtain a fodder having as narrow a ratio of flesh-forming to fat-forming foods as possible the crop should be cut at as early a stage as it can be well cured. For 'roughage' to be fed in connection with highly nitrogenous foods, it may well be allowed to grow until seeds are formed. After that period, however, the stalks rapidly become woody and the proportion of waste is greatly increased.

"No very significant change in composition of the cowpeas is apparent. This year's experience would seem to indicate that the consideration of chemical composition is of minor importance in the selection of the proper stage for harvesting this crop for fodder. As compared with the other fodders analyzed this year, this one is by far the most desirable, on account of its high proportion of nitrogenous material and small percentage of difficultly digestible fiber."

The composition of cotton-seed meal, W. A. WITHERS and G. S. FRAPS (*North Carolina Sta. Bul. 179, pp. 77–86*).—A number of analyses of cotton-seed meal are reported. In addition to the constituents usually determined, the authors report determinations of betain, cholin, gossypein, organic acids, and several members of the carbohydrate group. The principal conclusions follow:

The average amount of betain and cholin in 7 samples of cotton-seed meal is 0.28 per cent. The ratio of betain to cholin in 2 samples is 79:21 and 78:22. Gossypein, if present, is in minute quantity.

Of the nitrogen-free extract in 9 samples, 29.2 per cent is composed of pentosans, and 47.4 per cent of raffinose. The pentosans of cotton-seed meal are not soluble in diastase, and are contained entirely in the nitrogen-free extract, unless an unusually large quantity of hulls is present. Cotton-seed meal contains no starch. No appreciable quantity of sucrose or reducing sugars is present.

Small quantities of organic acids are present, the average of 5 samples being 0.48 per cent.

Concerning blood molasses, a new feeding stuff, F. STROHMER (*Oesterr. Ungar. Ztschr. Zuckerind. u. Landw., 29 (1900), p. 161; abs. in Centbl. Agr. Chem., 30 (1901), No. 9, pp. 596–598*).—Molasses proved a valuable addition to blood feeds, since it improved the feeding value and acted as a preservative. Analyses of a number of blood molasses feeds are reported.

Analyses of feed stuffs sold in Maryland (*Maryland Agr. Col. Quart., 1901, No. 12, pp. 2–19*).—The State feeding-stuff law is quoted, and analyses reported of a number of samples of cotton-seed meal, flaxseed meal, pea meal, middlings, gluten feed, germ-oil meal, gluten meal, mill feed, hominy chop, shipstuff, old-process oil cake, bran, ground corn, corn fodder and hay, distillery grains, linseed meal, cereal breakfast food by-products, mixed rations, and poultry feeds. Three samples of insecticides were also examined. Brief directions are given for mixing rations, and condiments and condimental feeds are discussed.

Analyses of concentrated commercial feeding stuffs, H. J. WHEELER and A. W. BOSWORTH (*Rhode Island Sta. Bul. 77, pp. 173, 174*).—Analyses of 19 samples of gluten meal, 1 of gluten feed, and 2 of linseed meal.

Analyses of feeding stuffs, H. J. WHEELER and A. W. BOSWORTH (*Rhode Island Sta. Bul. 78, pp. 177–181*).—In compliance with the State feeding-stuff law, analyses were made of hominy meal, chops, damaged whole wheat, spring-wheat bran, winter-wheat bran, middlings, cotton-seed meal, linseed-oil meal, gluten meal, animal meal, oats, ground beef, beef scrap, and a number of commercial feeds for poultry and stock, mostly by-products from the manufacture of cereal breakfast foods.

Feeding stuffs, A. HALENCKE and N. KLING (*Jahresber. Thät. Landw. Kreis Vers. Stat. Speyer, 1900, pp. 5–8*).—A number of analyses of feeding stuffs and molasses are reported.

Digestion experiments with Kansas feeds, J. T. WILLARD and R. W. CLOTHIER (*Kansas Sta. Bul. 103, pp. 253–275*).—The digestibility of a number of feeding stuffs was tested with steers, with the results shown in the table below. These included alfalfa hay of different cuttings, Buffalo-grass hay, prairie hay, Kafir-corn stover, Kafir-corn meal and soy-bean meal. Kafir-corn stover was fed with the last two materials, the digestibility of the concentrated feeds alone being calculated.

Digestibility of a number of feeding stuffs by steers.

Feeding stuffs.	Total dry matter.	Protein.	Fat.	Nitrogen-free extract.	Carbohydrates.	Crude fiber.	Ash.
Alfalfa hay:	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
1st cutting, 10 per cent plants in bloom	59.49	78.52	60.00	75.31	62.05	46.10	63.49
2d cutting, 50 per cent plants in bloom	58.29	75.14	30.39	71.99	61.74	50.44	56.91
3d cutting, plants in full bloom	60.03	76.70	51.65	75.24	62.65	50.63	60.94
Buffalo-grass hay	50.08	54.39	62.41	61.71	62.75	64.65	6.04
Prairie hay	51.45	17.67	56.57	61.25	61.07	61.18	25.30
Kafir-corn stover	57.74	49.81	60.00	66.53	66.68	66.64	43.40
Kafir-corn meal fed with Kafir-corn stover	61.23	54.78	....	80.32	77.97	....	18.31
Soy-bean meal fed with Kafir-corn stover	71.79	89.79	98.49	68.27	56.57	....	63.27

Studies on the nutritive value of asparagin, F. ROSENFELD (*Ztschr. Ver. Deut. Zuckerind, 1900, pp. 1055–1079; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), No. 13, p. 602*).—The special object of the investigation was to determine whether the influence of asparagin on the nitrogen metabolism of flesh-eating animals was changed when a definite quantity of crude fiber (hay) was added to the ration. In tests with a dog the nutritive value of asparagin and of albumin was compared, hay being mixed with the ration in one case. The conclusion was reached that the favorable effect of asparagin, and that of other amids also, was dependent upon the feeding of materials containing crude fiber at the same time.

Concerning experiments on artificial feeding, F. STEINITZ (*Inaug. Diss., Breslau, 1900, pp. 46*).—A number of artificial food mixtures were studied with dogs. In the rations the protein was furnished by casein, edastin, or vitellin; the carbohydrates by milk sugar or rice starch, and the fats by olive oil, margarine, or bacon. A salt mixture appropriating the ash content of meat was added to the ration when necessary. From the experiments the author believes that it is possible to nourish animals satisfactorily for a long time on artificial food mixtures if properly prepared. Among other points attention is drawn to the desirability of supplying a nucleoproteid containing iron.

Feeding of farm animals, M. E. JAFFA and L. ANDERSON (*California Sta. Bul. 132, pp. 55, figs. 3*).—Tables are quoted showing the composition and digestibility of a considerable number of feeding stuffs, especially those of local importance. The analyses not previously reported include marsh (Briston) grass, peas and oats, oat silage, orchard-grass silage, beet-pulp silage, olive pomace, pie melon, hay from mixed cereals, wild-oat hay, alkali weed, gourd or mock orange vines, Lima-bean straw, plump wheat, shrunken wheat, crushed barley, blood meal, dried blood, meat meal, and a commercial poultry feed. A number of the feeding stuffs are discussed at length. Special attention is given to sugar-beet pulp. Silos for storing the pulp are described and information gathered from California feeders on the value of this material for farm animals is summarized, showing, according to the authors, "that beet pulp should not be depended upon as the sole diet either for producing milk or meat, the chief reason being that it does not adequately nourish the animal. When fed in connection with other and dry feed it not only serves to keep the digestion in a healthful condition, but adds materially to the store of actual food substance. The amount of pulp which can be fed profitably is reported by all who feed for meat to be all the animals will readily consume in addition to the portion of hay or straw and grain, as already mentioned. In the case of the profitable quantity to feed for milk production there seems to be a wide difference of opinion. It may be that 25 or 30 lbs. per day of pulp will induce as large a flow of milk as 80 lbs. per day when the rest of the feed is dry, the notion being that the lesser quantity gives the cow all the succulent food and change of diet which she really requires for the best production. Where the pulp must be hauled a long distance and the cost of transportation is therefore great, it would undoubtedly be unwise to feed it in larger amounts than would give the necessary succulence to the ration, and 25 lbs. is probably sufficient for this purpose. But where the dairy is situated adjacent to the sugar factory . . . it might pay to feed the pulp in much larger quantities."

The feeding value of fruits is also discussed at some length. It frequently happens that owing to an overabundant crop, fruits (fresh or dried) have a low market value. Windfalls are more or less abundant on fruit farms and of little commercial importance. Regarding the feeding value of such materials the authors point out that green fruits have a high water content, while dried fruits constitute a fairly concentrated feed. In general, fruits supply little nutritive material except carbohydrates, and should be combined with concentrated feed to make a well-balanced ration.

A feeding test with a sow weighing 260 lbs., from which a litter of pigs had just been taken, is reported. After a preliminary feeding of barley and dried figs she was fed all the dried figs she would consume for 9 days. The average daily gain was 3⅓ lbs., the amount of figs consumed per pound of gain being 7.3 lbs. The author points out that the conditions were unusually favorable for gains in weight. Rating pork at 4½ cts. per pound live weight, the figs eaten were worth $1.35, or at the rate of $12.50 per ton. As regards the economy of feeding fruits the authors state:

"It may be a difficult question at times to decide, when prices are extremely low, which would be the better economy, to feed the fruit to cattle, or to receive whatever small returns might be offered for it in the market. In such emergencies a short soliloquy and a little arithmetic will decide the whole matter.

"When there is no market for the fruit there is sometimes nothing left to be done but to feed it to stock. Under any circumstances, when stone fruit is used as fodder for hogs, it is to be feared that when the animals crack large quantities of pits, poisoning may occur from the oil of bitter almonds and prussic acid present in the kernels. Precaution in this direction is unnecessary for stock, as they do not crack the pits. The stones or pits can be used to great advantage as fuel in the economical management of the farm."

Feeding wheat, H. M. COTTRELL (*Industrialist, 28 (1901), No. 1, pp. 3–6*).—A discussion of the subject with citations of station work.

Shelled corn vs. corn chop for calves, D. H. OTIS (*Agr. Expts., 1 (1901), No. 3, p. 63*).—A brief account of a test at the Kansas Station, which showed that better gains were made on shelled corn than on corn chop.

Sheep-feeding experiment, W. T. LAWRENCE (*County Councils Cumberland, Durham, and Northumberland, Tech. Education, Rpt. 9 (1900), pp. 172–175*).—In continuation of previous work (E. S. R., 11, p. 1077), a test was made at Newton Rigg, Penrith, on the value of yellow turnips and pasture, 3 lots of 20 crossbred sheep each being used. Lot 1 was hurdled on yellow turnips and lot 2 grazed for 10 weeks. Both lots were fed in addition ½ lb. linseed cake and ¼ lb. oats per head daily, as well as hay *ad libitum*. Lot 3 was hurdled on turnips and given hay *ad libitum* in addition for 7 weeks. For the next 3 weeks the sheep were given the same grain ration as lots 1 and 2. They were then pastured on grass for 3 weeks longer and the grain ration was continued with turnips *ad libitum*. The average weekly gain per head of lot 1 was 1.53 lbs.; with lot 2 it was 1.26 lbs. While on turnips and hay only the average weekly gain per head of lot 3 was 0.55 lb.; when fed linseed cake and oats in addition it was 1.52 lbs., and when pastured on grass and fed grain, hay, and turnips in addition it was 1.07 lbs. The financial returns are discussed. The author believes that pasturing sheep on turnips is more profitable than on grass, and that there is an advantage in feeding grain and hay in addition.

Feeding experiments with sheep (*Jour. Bd. Agr. [London], 8 (1901), No. 1, pp. 17–20*).—A brief account of experiments noted above from another publication.

The influence of soil and manure on the feeding value of swedes, and influence of manures on the composition and feeding value of seeds hay, T. H. MIDDLETON (*County Councils Cumberland, Durham, and Northumberland, Tech. Education, Rpt. 9 (1900), pp. 111–127*).—The influence of manure and the effect of soil on the chemical composition and feeding value of Swedish turnips was tested. The turnips were fed to sheep. The author also studied in a similar way the composition and feeding value of hay (clover and rye grass) manured in different ways. All the animals in the first test and half of those in the second were fed under cover. The work is summarized as follows:

"Between swedes grown with farmyard manure alone, farmyard manure and artificials, and artificials alone, very slight differences in feeding value were found. If an artificial manure grows and ripens a good crop of swedes the feeding value is not likely to suffer.

"Swedes grown on a good soil in East Lothian proved not quite equal to swedes of the same variety grown with the same manure on an inferior soil at Cockle Park; but the latter were quite up to the average quality of the district, whereas the former were not.

"Of four qualities of clover and rye-grass hay tested, hay grown with 1¼ cwt. nitrate of soda, 7 cwt. of slag, and 4 cwt. of kainit per acre proved inferior to a sample grown with slag and kainit only, and also to hay grown with ⅞ cwt. and 1¾ cwt. of sulphate of ammonia with slag and kainit. In this particular case the chemical and botanical analyses of the hay indicate that the inferiority was due to overripeness.

"Twenty sheep fed under cover left 4½ cts. per head per week more for their keep than 20 similar animals fed outside.

"When sheep were fed on a diet consisting chiefly of swedes it was found that 69 per cent of the live-weight increase in passing from a 'store' to a moderately fat condition was carcass. When sheep were fed on a limited ration of swedes and a full supply of hay 77 per cent of the live-weight increase was mutton.

"The feeder who fattens cattle under cover appreciates the swede. At Cockle Park it was found that for sheep fed under cover the swede is a valuable food. Sheep fed in the house for a period of 35 days were allowed as many swedes as they would eat; they consumed about 15 lbs. per head per day; they gained 6.25 lbs. per head upon this diet, although it contained less nutriment than is usually assumed to be necessary for maintenance. Twenty similar sheep fed in the same house and for the same period were allowed 8 lbs. swedes per day and as much seeds hay as they would eat; they consumed about 1⅐ lbs. per head of the latter; they gained only 1.64 lbs. per head in 35 days, although the diet from a chemical standpoint was more liberal than the other. This result is explained by the fact that it takes more digestible food to supply the animal's needs when the food is presented in a form difficult to digest—as in hay—than when in a form easy to digest—as in swedes."

The improvement of pasture as tested by the effects on sheep, W. Somerville (*Dept. Agr. Cambridge Univ. Rpt. 1901, pp. 9–16*).—The value of different fertilizers for pasture grasses was tested by grazing sheep on plats manured in different ways. The tests were made in Essex, Cambridgeshire, Norfolk, and Northampton. In the experiments at Cambridgeshire, plat 1 was not manured but the sheep were fed daily 0.86 lb. linseed cake per head. Basic slag was used on plats 2 and 4, and superphosphate on plat 5, while plat 3 was unmanured. A botanical analysis of the hay from the different plats is given. The principal conclusions follow:

"The live-weight gain, per acre and per sheep, was distinctly greater on the 3 manured plats (Nos. 2, 4, 5) than was the case on plat 1, where the sheep got daily considerably more than ¾ lb. per head of linseed cake. A similar result was got in Northumberland in 1898.

"Plat 2, receiving ½ ton of basic slag, carried nearly 2 sheep more than plat 4, which was dressed with half the quantity of slag, but the gain per head per week in the latter case was somewhat higher.

"When equal amounts of phosphoric acid were used in the 2 forms of basic slag and superphosphate, the latter produced the larger live-weight gain. A similar result was got in the first year of the Northumberland experiments.

"The unmanured plat gave decidedly the lowest yield of animal increase."

The other tests are very briefly reported, as they are not ended.

The influence of manures on the feeding value of pasture grasses, T. H. Middleton (*County Councils Cumberland, Durham, and Northumberland, Tech. Education, Rpt. 9 (1900), pp. 128–149, fig. 1*).—Abstracted from another publication (E. S. R., 13, p. 175).

California Angoras; a few chapters on the practical side of the Angora industry (*San José: C. P. Bailey & Sons, 1899, pp. 31, figs. 9*).—The care of Angora goats and similar topics are discussed in a popular way. Persian fat-tailed sheep are also briefly mentioned.

Home pork making, A. W. FULTON (*New York: Orange Judd Co., 1900, p. 124, figs. 36*).—The author points out the advantage of making pork on the farm, and gives directions for slaughtering, dressing, and curing pork, the preparation of ham and bacon, etc. The book also includes a large number of recipes for cooking pork and pork products.

American breeds of fowls. I, The Plymouth Rock, T. F. MCGREW (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 29, pp. 32, col. pls. 6, figs. 10*).—The topics discussed in this bulletin include, among others, the origin of the Plymouth Rock breeds, descriptions of the Barred variety, White Plymouth Rocks, Buff Plymouth Rocks, the Pea-Combed variety, as well as the Jersey Blue and Rhode Island Red breeds which are allied to the Plymouth Rocks. Information is given regarding mating, breeding, and related topics.

Farm poultry: A popular sketch of domestic fowls for the farmer and amateur, G. C. WATSON (*New York: The Macmillan Co., 1901, pp. 341, figs. 95*).—Poultry raising as a business, the breeds suitable for the production of eggs and meat, fancy breeds, poultry buildings, incubators and brooders, poultry feeding, preparation for the market, and related topics are treated of.

Practical poultry keeper, L. WRIGHT (*London: Cassell & Co., 1901, pp. 311, pls. 8, figs. 37*).—A new and revised edition. The volume treats of poultry houses, poultry rearing, and the different breeds of domestic poultry.

New egg farm; or, the management of poultry on a large scale for commercial purposes, H. H. STODDARD (*New York: Orange Judd Co., 1900, pp. 331, figs. 145*).—A general treatise on the subject.

Incubators and chicken-rearing appliances; how to make and use them (*London: Cassell & Co., 1899, pp. 64, figs. 36*).—Directions are given for making incubators of different sizes, and making brooders, and for operating incubators. Heat regulators for incubators are also described and discussed.

DAIRY FARMING—DAIRYING.

Hand feeding of cows for milk and butter production, G. S. THOMSON (*Jour. Agr. and Ind., South Australia, 4 (1901), No. 12, pp. 945–968, figs. 6*).—Under the above heading the author discusses a number of subjects connected with dairying. The benefits of feeding during the dry season in South Australia are brought out, and the rations used are discussed. One of the foods employed was copra cake, the residue from crushed cocoanut kernels. It is highly recommended as a part of a ration for milch cows, but must be given sparingly at first, or cows will not eat it. A quarter of a pound to a ration is sufficient in the beginning and may be increased to 2 lbs. daily. The cream from cows fed copra is said to require a higher temperature for churning. The butter grains are firmer and the melting point of the butter is higher. Heavy feeding of copra injures both the texture and the flavor of the butter.

Rations for milch cows, H. J. WHEELER and J. A. TILLINGHAST (*Rhode Island Sta. Bul. 77, pp. 131–172*).—Sixty-one rations for milch cows as reported by different feeders throughout the State are given, with modifications and comments by the authors of the bulletin. The principles of feeding are briefly discussed, and notes are given on methods of feeding and on the relative manurial value of several feeding stuffs. A table for use in calculating rations is reproduced from Vermont Station Bulletin 81 (E. S. R., 12, p. 877).

Domestic pasteurizing methods and the care of milk in the home, J. NELSON (*New Jersey Stas. Bul. 152, pp. 22*).—The author discusses in a popular manner the souring of milk, relation of milk fermentations to health, disease germs in milk and their destruction, the use of ice and heat in preserving milk, pasteurization and sterilization, etc. Methods of pasteurizing adapted to home use are described and suggestions given for pasteurizing infants' food. The bulletin is summarized at some length.

A study of the pasteurization of milk, H. Weigmann (*Milch Ztg., 30* (*1901*), *No. 27, pp. 417–419; No. 28, pp. 433–434*).—An experimental study of different systems and makes of apparatus.

Influence of pasteurization upon the properties of milk and the processes of butter making, R. Steiner (*Milch Ztg., 30* (*1901*), *No. 26, pp. 401–403; No. 28, p. 435*).—The author made a study of the effect of pasteurizing upon the viscosity and the specific gravity of milk, and also its effect upon the action of rennet. Milk to be tested was divided into two portions, one left at room temperature for 3 hours and the other heated 15 minutes at 70° C. and rapidly cooled.

It was found that pasteurizing lowered the viscosity of the milk. This result seemed to depend somewhat upon the concentration, for when water was added to replace evaporation the effect was lessened. The specific gravity was influenced but little and that not constantly. The coagulation was made with 0.1 cc. of rennet in 100 cc. of milk. In all cases the time of coagulation was increased with the pasteurized milk.. The time varied with different milks, apparently depending upon the composition. The completeness of the coagulation was also hindered by pasteurization. The following table shows the effect of pasteurization upon duplicate samples of similar milk:

Effect of pasteurization upon coagulation.

Treatment.	Loss of albumin.	Time of coagulation.
	Per cent.	*Min. sec.* *Min. sec.*
Not pasteurized		5 37 to 6 15
Heated at 60° for 25 minutes		14 22 to 15 ..
Heated at 70° for 20 minutes	6.90	20 .. to 22 30
Heated at 80° for 15 minutes	55.74	27 30 to 30 ..
Heated at 90° for 10 minutes	76.55	No coagulation in 1 hour.
Heated at 95° for 5 minutes	78.64	
Heated at 100° for 3 minutes	82.54	

A study was also made of the influence of pasteurization upon butter making. In this the fat content of the whole milk, skim milk, and buttermilk was determined and the total fat of the cream and butter estimated. The cream from the separator was divided into two portions, one cooled to 10° and the other heated to 75° for 15 minutes and cooled. Both portions were kept in the usual manner for from 20 to 24 hours and churned. From the results two points were clear: First, that the time of churning was shorter with the pasteurized milk, and second, the fat content of the buttermilk was lessened. Taking the average of 6 trials the buttermilk from the unpasteurized milk contained 1.2297 per cent of fat, while that from the pasteurized milk contained only 0.8819 per cent. The quality of the pasteurized butter was higher than that of the unpasteurized, the former scoring an average of 96.60, while the latter averaged 94.91. The average duration of the time of churning with the pasteurized cream was 73 minutes; with the unpasteurized, 92 minutes.

Why cream tests vary (*Creamery Jour., 11* (*1901*), *No. 143, pp. 6, 7, 30, 31*).—Statements from several creamery men as to the causes of the variations of the tests of cream from farm hand separators.

The mechanical introduction of water in butter, E. Sergeant (*Public Health, 14* (*1901*), *No. 1, pp. 10–12*).—The author discusses the adulteration of butter in Great Britain by the addition of water. The amount which may be added by mechanical means is stated to range between 18 and 36 per cent.

The manufacture of hard cheese from pasteurized milk, H. Tiemann (*Milch.

Ztg., *30* (*1901*), *No. 25*, *pp. 386, 387*).—After a discussion of the subject of making cheese from pasteurized milk, the author gives the following method as practiced at the Dairy Institute at Wreschen: After heating to 90° C. for about 15 minutes the milk is rapidly cooled. To 50 kg. there is added 20 gm. calcium chlorid and 750 cc. of a pure culture of lactic acid and peptonizing bacteria. This pure culture is made in sterilized skim milk and is added for the purpose of incorporating in the cheese the proper bacteria for assisting in the ripening. The whole milk is then brought to 40° and the rennet added. After putting into form the cheese is first pressed lightly and later hard, and salted. The finished cheese is placed in a somewhat dry cellar for 4 months and then in one containing more moisture—from 90 to 95 per cent.

After a period of 9 months the cheese is described as follows: Ripening normal, porosity good, taste sharp and pleasant, although the cheese is somewhat dry.

From 100 kg. of milk there was obtained 22 lbs. of ripened cheese, while the same amount of unpasteurized milk made only 18 lbs., a gain of about 18 per cent with the former. It required only 1½ hours from the addition of the rennet to the pasteurized milk to the pressing of the cheese into form.

Experiments in curing cheese, G. L. McKay (*Iowa Sta. Bul. 57*, *pp. 14*, *pl. 1*, *figs. 2*).—Experiments were conducted for the purpose of testing the feasibility of central curing rooms, and the effect of climatic conditions upon the curing of cheese. Cheese fresh from the press was shipped from the Iowa Station to the Guelph Dairy School and a factory at Stratford, Ontario, to be cured, and both of the latter shipped new cheese to the Iowa Station for curing. Cheese from the same lot in each case was cured where made. The scorings are tabulated. The results are considered as showing that "shipping the cheese 750 miles by express during the heat of summer did not affect the flavor." Central curing rooms which could be better constructed for controlling temperature and moisture are therefore considered desirable in warm and dry climates.

Other results of the experiments at the station are summarized as follows:

"Cheese cured in musty ice box at temperature of 55° F. compared favorably with cheese cured in well-ventilated room at a moderately low temperature during the month of October. Cheese cured in ice box scored 2¾ points higher on flavor and ½ a point higher on texture.

"Cheese can be exposed the first 5 days to a temperature as high as 90° without injuring its flavor if sufficient acid has been developed to make a firm-bodied cheese and it is cured at 60° afterwards.

"Cheese cured at a temperature of 60° F., with a high percentage of moisture, scored higher than cheese cured at a temperature above 65°.

"Adding artificial moisture through pine shavings in a box worked very satisfactorily in the curing room and left no bad odors.

"Fumigating with formaldehyde gas to destroy the mold-producing bacteria gave good results."

The ripening of cheese and the rôle of micro-organisms in the process, F. C. Harrison (*Trans. Canad. Inst.*, *7* (*1901*), *I*, *No. 13*, *pp. 103–134*).—The author reviews the work done on cheese ripening during the past 25 years and calls attention to the difficulties in the investigation, owing to the many different kinds of cheese, methods of manufacture, and other factors. A bibliography of the work is appended.

The work of the author is given, in which he sought to determine the causes of the ripening of cheese. He made a study of the acid content, and especially of the micro-organisms, and carried out an experiment similar to that of Russell and Weinzirl (E. S. R., 11, p. 487), except that his work was on Canadian Cheddar cheese and the culture media used were somewhat different. It was found that the bacteria developed in the curd and cheese with the greatest rapidity up to the age of 2 or 3 days. This was followed by a period of rapid decline until about the thirteenth day. From this period the decrease was gradual, up to 130 days, when only 1,400 bacteria per gram were found. The results agree with Russell as to the enormous development of lactic-acid bacteria, but differ somewhat as to the period of increase and decline. The greatest increase in acidity occurred between milling and salting. From this point until the cheese was 40 days old there was a gradual increase. The prevailing species of lactic-acid bacteria was the *Bacterium acidi lactici*. Next in numbers was *B. lactic ærogenes*, or a closely allied form. When cultures of these two organisms were introduced into sterilized milk a firm curd was produced, with little or no gas.

The gas-producing bacteria belonged usually to either the *B. coli* group or the *B. lactic ærogenes* group. In the presence of the former the cheese was sometimes mottled.

The liquefying bacteria were not numerous in the Canadian cheese examined, and they decreased in numbers as the cheese ripened, being seldom found after 3 weeks. In one instance the presence of a large number of digesting bacteria was associated with a bad flavor in the cheese. Two or three forms closely related to *B. fulvus* were found in young cheese. This group gave rise to bad flavor or odors in milk.

Yeasts were quite commonly found in Canadian cheese and frequently in large numbers. The experiments indicate that they are the only micro-organisms that actually increase in cheese. While the name yeasts is applied to this class, most of them were species of Torula, as they formed no spores. Some were beneficial, acting somewhat like lactic-acid bacteria, while others were injurious, causing undesirable fermentations. One species produced a mottled appearance in the cheese. These yeasts show a remarkable tolerance to acidity, so that it is difficult to overcome their action by the addition of a vigorous lactic-acid starter. Some grew in peptone solutions containing 2.25 per cent of lactic acid.

The author discusses at some length the causes of the ripening of cheese, as shown by his own work and that of others. He gives the following as important facts which are well supported by the evidence of careful experiments: (1) The enormous number of lactic-acid bacteria in hard cheese, and the very small numbers of liquefying or digesting bacteria; (2) the existence of galactase, a natural enzym inherent in fresh milk; and (3) the ability of rennet to cause the change of nonsoluble nitrogenous products to soluble ones."

The author's experiments with Canadian cheese indicate that the amount of acid present is sufficient to inhibit the action of galactase in cheese ripening, and that this enzym is therefore of little importance. On the contrary, rennet acts more quickly and with greater power in acid solutions. It would therefore seem that the rôle of the lactic-acid bacteria is to create a requisite acidity, so that the pepsin of the rennet can exercise its digestive action on the cheese.

"Summarized, the ripening of cheese may be said to be caused by the digestive action of the rennet on the insoluble nitrogenous matter of the cheese, in the presence of acid formed by the lactic-acid bacteria. The large amount of acidity also prevents or inhibits the growth of other (and perhaps undesirable) species of bacteria."

Danish trade in dairy produce in 1900 (*Jour. Bd. Agr.* [*London*], *8* (*1901*), *No. 2, pp. 233–234*).—Report to the foreign office from the British consul at Copenhagen.

Siberian butter trade (*Jour. Bd. Agr.* [*London*], *8* (*1901*), *No. 2, pp. 230–233*).—Report of H. Cooke, commercial agent of the board in Russia.

VETERINARY SCIENCE AND PRACTICE.

Report of the veterinarian, W. H. DALRYMPLE (*Louisiana Stas. Bul. 64, 2. ser., pp. 595–624, figs. 11*).—The station undertook to encourage the importation of highbred cattle from the North, and for this purpose volunteered to immunize such cattle without expense to the owners. Among the cattle sent to the station for this purpose the following breeds may be mentioned: Polled Durham, Hereford, Shorthorn, Red Poll, Jersey, grade Hereford and Shorthorn, and grade Hereford and Holstein. About 50 cattle were artificially immunized by blood inoculation and all passed through the 60-day period during which they were under observation without any mishap or without the necessity of medical treatment. The blood used in inoculations was from a steer imported from Missouri which had previously passed through an attack of fever. All the animals passed through a primary and secondary attack of fever. It is considered that the best time for inoculation is in the late fall or winter, for the reason that when the animals are turned out to pasture for the first time after immunization the ticks will not be numerous enough to cause a relapse. The author believes that the operation of blood inoculation is so simple that it can be successfully carried out by practical stockmen without the assistance of a trained veterinarian. All of the cattle which were inoculated at the experiment station were later shipped to their respective owners in different parts of the State and were placed on tick-infested pastures. A few of these animals had relapses and some died, but the history of the different cases indicates that the relapses and deaths could largely have been prevented by careful attention to the animals when they were first turned out to pasture. Recently inoculated animals should not be turned into pastures where the ticks are exceedingly numerous for the reason that an excessive infestation of ticks may overcome the partial immunity which is already produced in the animals.

An outbreak of anthrax occurred in 1900 on the experiment station grounds. A cow died rather suddenly from the disease and the carcass was thoroughly burned. The remainder of the cattle on the pasture were changed to other grazing ground and later were inoculated with the first and second lymph of anthrax vaccine. About a month after the outbreak of anthrax the vaccinated cattle were turned on the pasture where the first case occurred, but no further cases of the disease were noticed. One mule and one horse became affected and died. It is believed that the infection which caused this outbreak came from a bull which died in a neighboring farm 3 or 4 weeks before the outbreak on the station grounds occurred. Anthrax was not so prevalent during 1900 as during the 2 or 3 previous years, and it is believed that this was due to greater sanitary precautions being taken by stock owners throughout the State. Several outbreaks of blackleg occurred and were reported to the station. Inoculation with blackleg vaccine was recommended and the spread of the disease was checked. A serious outbreak of glanders occurred as a result of the importation of diseased animals from Kansas City. Of 223 animals which were inspected, 39 were found to have glanders. Of these, 11 died and 28 were killed on account of clinical symptoms of glanders or after reacting to the mallein test. It is stated that there is no law in Louisiana requiring shippers to give any guarantee as to the healthfulness of horses and mules which are shipped in from other States. It is urged that a law be passed by which the stock owners of the State may be protected against unscrupulous stock dealers who might otherwise ship in glanderous horses and mules. A nervous disease of cattle, characterized by trembling of the head, neck, and other portions of the body, was investigated, and the author believes that the disease was due to slight poisoning from eating unwholesome weeds. All cases recovered, the treatments recommended including a change of grazing ground, purgation with Epsom salts, and administration of bromid of potash.

A disease is reported among cattle as due to eating rotten sweet potatoes. The chief symptoms were difficulty of respiration and groaning. The sweet potatoes were probably affected with the black-rot fungus. Brief notes are given on the nodular disease of the intestines of sheep. This disease is reported as prevailing throughout the State, and it is stated that experiments are in progress which are designed to discover means for eradicating it from pastures so far as possible.

Annual reports of proceedings under the diseases of animals acts, etc., 1899 (*London: Board of Agriculture, 1900, pp. 102, pls. 2*).—The report of the chief veterinary officer, A. C. Cope (pp. 7–22), contains an account of rabies, foot-and-mouth disease, pleuro-pneumonia, hog cholera, glanders, anthrax, and sheep scab. Tables are given showing the decrease in the number of cases of rabies since the Board of Agriculture undertook the eradication of this disease in 1897. It is believed that rabies has been completely eradicated in Great Britain, the last case having been observed in November, 1899. In order to prevent the reintroduction of the disease, orders have been issued restricting the importation of dogs from abroad and subjecting them to quarantine for a period not to exceed 6 months.

During 1899 reports were received of 11 suspected outbreaks of pleuro-pneumonia. The investigation showed that in each case the animals were suffering from tuberculosis or some disease other than pleuro-pneumonia. It is reported that hog cholera occurred on premises where it had never been known before. In one instance 33 fresh premises were infected as a result of exposure of some infected but not evidently diseased animals in a certain market. Glanders has increased in the number of cases during the year, and its distribution has become wider. It is suspected that certain horsemen are using mallein as a diagnostic agent for glanders and then selling the horses which react on the public market. This might account for the spread of the disease. Brief notes are also added on the extent and distribution of anthrax and sheep scab.

The assistant secretary, J. T. Tennant (pp. 23–41), gives a statistical report on trade in foreign animals, animals brought from Ireland, and cattle markets and fairs. A copy is given of the order relating to the importation of dogs into Great Britain, and a brief account is presented of the measures which have been taken by the board for preventing the further distribution of hog cholera. Statistical tables are given showing the various orders issued by the Board of Agriculture regarding animal diseases, the international trade in animals, the number of animals of various species in Great Britain, and the number of cases of various diseases among these animals.

Report of the cattle commissioners, A. Peters (*Massachusetts State Bd. Agr. Rpt. 1900, pp. 395–482*).—The work of the cattle commissioners with reference to tuberculosis included the maintenance of the quarantine and testing herds at the request of owners. A paper is reprinted on obstacles to enforcing regulations requiring the tuberculin test in interstate cattle traffic (E. S. R., 13, p. 390). During the year 3,249 cattle were quarantined, and of these 1,178 were killed and paid for as being tuberculous. Statistical tables are given showing the number of cattle inspected in various towns of the State. Glanders prevailed to a greater extent than ever before, being reported from 128 cities and towns. In 1900, 699 animals were destroyed as glanderous. Detailed notes are given on some especially interesting cases of glanders with which the cattle commissioners had to deal. Blackleg is reported as having caused the death of a number of young cattle in parts of Worcester County. No cases of Texas fever were discovered during the year. A few cases of rabies were reported, and 11 outbreaks of hog cholera required investigation.

Report on animal diseases, W. H. Kelly (*Rpt. New York State Dept. Agr., 7 (1899), I, pp. 486–513*).—Brief notes are given on the occurrence and extent of actinomycosis, verminous bronchitis, blackleg, infectious mammitis, tuberculosis, and rabies. In one dairy 39 out of 92 cows were found to be tuberculous, and the owner was forbidden to sell the milk without previous sterilization. A number of cases of rabies were reported in cattle and horses, and the most of these were traced definitely to bites of mad dogs.

Report of veterinarian, G. E. Nesom (*South Carolina Sta. Rpt. 1900, pp. 18–21*).—Texas fever is reported as occurring in isolated localities throughout the State. The cattle ticks are especially abundant in low country, large swamps, and pine forests. The station proposes to undertake the immunization of cattle which are shipped into the State from north of the quarantine line. Brief notes are given on the occurrence of glanders and milk fever. It is reported that experiments in the use of arecoline as a remedy for colic and acute indigestion in horses indicate that this substance is fairly effective.

Eleventh annual report on the veterinary service in Hungary, F. HUTYRA (*Jahresbericht über das Veterinärwesen in Ungarn. Budapest: Agr. Dept., 1900, pp. 180*).—This volume contains a general account of the personnel and extent of veterinary service. Brief notes are given on the losses caused by animal diseases during the year. A detailed account is presented of the outbreaks and extent of cattle plague, anthrax, rabies, glanders, foot-and-mouth disease, pneumonia, sheep pox, mange, hog cholera, swine plague, tuberculosis, etc. Statements are made concerning the extent of traffic in domesticated animals during the year and the results of protective inoculation against anthrax, hog cholera, and blackleg. Copies of some of the veterinary regulations are also given.

The infectious diseases of domestic animals, N. V. ELMANOV (*Besyedui o zaraznuikh bolyeznyakh nashikh domashnikh zhivotnuikh. Moscow: K. I. Tikhomirov, 1900, pp. 67, figs. 15; abs. in Selsk. Khoz. i Lyesov, 199 (1900), Dec., p. 754*).—A general account of anthrax, glanders, cattle plague, contagious pleuro-pneumonia, tuberculosis, rabies, cowpox, and scabies.

The suppression of tuberculosis, R. KOCH (*Nature, 64 (1901), No. 1656, pp. 312–316*).—This is a paper read at the British Congress on Tuberculosis, July 23, 1901. The author presents a general discussion of the problem concerning the possibility of transmission of tuberculosis from animals to man and from man to animals. Numerous experiments indicate that human and bovine tuberculosis are two quite distinct diseases. Young cattle, which were shown by the tuberculin test to be free from tuberculosis, were inoculated hypodermically, intravenously, or in the peritoneal cavity, with pure cultures of tubercle bacilli from cases of human tuberculosis, or with the tubercular sputum of consumptive patients. In addition to these experiments, 6 animals were fed with tubercular sputum almost daily for a period of 7 or 8 months, and 4 were made to inhale great quantities of bacilli from the same source by means of a spray from an atomizer. In all, 19 cattle were used in these experiments, and none of them developed any symptoms of disease; on the contrary, they gained considerably in weight, and after from 6 to 8 months a post-mortem examination showed no trace of tuberculosis in any organs. When similar experiments were conducted on cattle with pure cultures of tubercle bacilli, or tubercular material of bovine origin, the result was entirely different, and all inoculated animals showed symptoms of generalized tuberculosis within a few weeks. Some of them died at the end of a month.

With regard to the other phase of the problem, the possibility of the transmission of tuberculosis from animals to man, the author believes that while the question is not absolutely decided, the infection of human beings from this source is of rare occurrence. It is stated that the transmission of infection by milk from fresh tuberculous animals is probably not greater than that by heredity, and it is therefore considered unnecessary to take any measures against possible danger to human beings from such sources. Attention is called to the reports of older experiments by other writers, in which it was found that calves, pigs, and goats fed with milk and tubercular material from cattle always contracted tuberculosis, while those which received sputum from human patients did not become infected. It is believed by the author that tuberculosis in man is transmitted only from tuberculous human patients, and that the disease in animals is transmitted only from one animal to another.

Report of the tuberculin committee, J. MCFADYEAN ET AL. (*Jour. Roy. Agr. Soc. England, 3. ser., 11 (1900), pt. 4, pp. 708–723*).—The experiments recorded in this paper were conducted for the purpose of determining the effect of repeated doses of tuberculin and the length of time after infection before a reaction to tuberculin takes place. For this purpose apparently healthy animals were selected and tested with tuberculin. If they failed to react they were inoculated with the tubercle bacillus and tested at intervals afterwards, in order to determine how soon they would react to tuberculin. One animal which gave a decided reaction when tested on October 9 subsequently failed to react, or reacted alternately. For 2 months it received large quantities of tuberculin and entirely ceased to react. The animal was inoculated with tubercle bacilli on February 6 and reacted to tuberculin 8 days after inoculation. The animal was then treated with large doses of tuberculin without reaction. When killed on May 22 no trace of tuberculous lesion was found except a casefied and inert tubercle in a mesenteric gland. In other experiments it was found that in many cases reaction to tuberculin did not occur until from 40 to 50 days after the animals were inoculated with tuberculosis. In several cases which reacted decidedly on the first test, a complete failure to react was noted if the test was repeated within a short time. The authors believe that repeated injections of tuberculin may have some curative effect, or may retard the progress of the disease to some extent, and that this matter is largely influenced by the individuality of each animal. A few animals could not be inoculated with virulent tubercle bacilli, although they had not been previously treated with tuberculin, and appeared to be entirely resistant to tuberculosis. The facts elicited with regard to reaction of animals to a second or later test with tuberculin were so variable that no attempt was made to tabulate them. From the numerous experiments the author concluded that with few exceptions tuberculosis may be recognized in a post-mortem examination of animals which give a decided reaction to tuberculin, and that no such lesions are found in animals which fail to react or react only slightly to the tuberculin test.

Is the Bacillus tuberculosis of cattle permanently different from that of man? J. Law (*Rpt. New York State Dept. Agr., 7 (1899), I, pp. 513–554*).—The author gives a general review of the literature of this subject, dealing especially with the possibility of transmission of tuberculosis from man to animals and from animals to man, and also with direct experiments in infecting animals with tubercle bacillus of human origin. A general account is also given of the nature, value, and reliability of tuberculin.

Tuberculosis in calves, Rabus (*Wchnschr. Thierheilk. u. Viehzucht, 45 (1901), No. 9, pp. 97, 98*).—A brief discussion of the literature of this subject, together with notes on a case observed by the author which was apparently of prenatal origin. The percentage of tuberculosis in calves in Bavaria, as shown by statistics based upon several million calves, is from 0.02 to 0.05.

Contribution to tuberculosis in the horse, F. Hendrickx (*Ann. Méd. Vét., 49 (1900), No. 10, pp. 575–584*).—Detailed description is given of the symptoms and pathological lesions of 2 cases in horses. The disease is quite easily distinguished from glanders. The lungs in both cases were affected, and caseous tubercles were found in the liver and kidneys. The spleen was somewhat enlarged and contained pathological structures which were probably tubercles in the process of formation.

Historical and bibliographical study on the use of raw meat in the treatment of tuberculosis, C. Richet (*Ann. Méd. Vét., 49 (1900), No. 8, pp. 410–427*).—A critical review of the literature of the subject, with numerous bibliographical references. It is concluded from this study that the evidence for the value of raw meat in the treatment of tuberculosis is very strong, and that raw meat or muscle plasma is not only a nutritious food, but has also the effect of an antitoxic agent.

Arrangements for inoculation against tick fever (*Agr. Gaz. New South Wales, 12 (1901), No. 4, p. 497*).—Since the cattle tick appears to be making only a slow progress in its distribution from Brisbane as a center, the stock inspector has deferred the general preventive inoculation of cattle. In order to be prepared, however, for the sudden appearance of ticks among cattle outside of the infested area, arrangements have been made to secure immune cattle from which blood may be obtained for inoculation.

Tristeza, J. LIGNIÈRES (*Ann. Inst. Pasteur, 15 (1901), No. 2, pp. 121–128, pl. 1*).—Tristeza is the name for a cattle disease in Argentina, which is identical with Texas fever. The author quotes the results of investigations upon this disease, during which the results already obtained by American students are largely confirmed. It is stated also that the examination of blood, although the most important element of diagnosis ante-mortem, is not an infallible test. An atypical form of the disease is occasionally observed, in which the destruction of red blood corpuscles is not very pronounced, or takes place slowly, and in which the corpuscles in general circulation are not attacked by the blood parasite until shortly before death. It is maintained that this form of the disease does not correspond to the benign form already described by the American writers. The author succeeded in making cultures of *Pyrosoma bigeminum* in a round form, and showed by experiment that the administration of quinin and arsenical compounds has no effect in preventing or curing the disease.

Tristeza or Texas fever in the Argentine Republic, J. LIGNIÈRES (*La "tristeza" ou malaria bovine dans la République Argentine. Buenos Ayres: Jacobo Peuser, 1900, pp. 172, pls. 16*).—A preliminary account of work on this subject has already been noted (E. S. R., 12, p. 885). The present volume contains a detailed account of the author's observations and experiments on this disease.

Parturient paralysis and the Schmidt treatment, J. J. REPP (*Iowa Sta. Bul. 58, pp. 17–30*).—A general account is given of the history, distribution, cause, pathological anatomy, symptoms, diagnosis, course, and treatment of parturient paralysis. The author considers this name preferable to either parturient paresis or milk fever.

In order to determine the effectiveness of the Schmidt treatment, as applied by the practicing veterinarians of Iowa, a circular letter was sent to 150 veterinarians requesting a report on the number of cases treated and the history of those cases. In all, 166 cases were reported to the author by 33 veterinarians, of which 119 cases were reported as successful, while 47 were fatal. The majority of the affected cows were between the ages of 6 and 9 years, and at the birth of the third to the sixth calf. Most of the cows were reported as being fat and at pasture, not receiving any other food. As a rule, the affected animals were heavy milkers. The disease developed usually within 24 hours after parturition. The infusion of potassium iodid was repeated in from 8 to 12 hours in 22 cases, and in 2 cases was repeated twice. In 6 cases the disease was complicated with pneumonia and resulted fatally in each case. The author believes that pneumonia may be the result of attempting to give medicines by way of the mouth when the animal is unable to swallow. The material might under such circumstances be carried into the lungs and produce an infection of these organs. In 7 of the cases which were treated a more or less serious affection of the udder was produced, probably from the use of instruments which were not properly sterilized. Allowing for cases which were complicated with pneumonia and other trouble, the author considers that 76.5 per cent of cures is to be placed to the credit of the Schmidt treatment. This treatment is recommended as being the most effective one which has yet been devised.

Parturient paresis, S. S. BUCKLEY (*Maryland Sta. Bul. 76, pp. 199–201*).—The author presents a brief account of the Schmidt treatment for milk fever, together with formulæ for solutions to be used and directions for applying the treatment. The usual symptoms of milk fever are mentioned, and statistics are given on the percentage of cures effected by the Schmidt method. Of 7 cases treated by the author, 6 recovered. In 2 cases which recovered severe attacks of mastitis subsequently developed.

Milk fever, E. W. HOARE (*Veterinarin, 74 (1901), No. 879, pp. 138–140*).—The author had good success in the treatment of milk fever by administering chloral hydrate in doses of 1 oz. and treacle in doses of 1 lb., followed by ammonium carbonate. In one case the cow received in all 7 oz. of ammonium carbonate and 9 lbs. of treacle.

It is stated that since the Schmidt treatment is based on empirical grounds, further investigation is needed to elucidate the nature of milk fever.

Effects of iodid of potash as an injection in the mammary gland, P. COUREMANS (*Ann. Med. Vet., 49 (1900), No. 5, pp. 240–243*).—A description is given of the usual method for making intramammary injections of this substance. Experiments were conducted for the purpose of determining whether oxygen compounds of iodin were contained in the commercial iodid of potash. It was found that such compounds were not present.

Infectious pneumonia of calves, SAUER (*Wchnschr. Thierheilk. u. Viehzucht, 45 (1901), No. 12, pp. 133, 134*).—Brief notes on outbreaks of this disease. After thorough disinfection of the premises no more cases of the disease developed.

Thrush in cattle, HAJNAL (*Berlin. Thierärztl. Wchnschr., 1901, No. 9, pp. 153–155*).—The author calls attention to the difficulties of differential diagnosis between infectious foot-and-mouth diseases and other forms of cattle diseases which are included under the term thrush. It is stated that stomatitis aphthosa, oidica, and diphtheritica are readily distinguished from infectious foot-and-mouth disease when a number of cases are to be had for observation and when the history of cases can be obtained; but that diagnosis is uncertain when based upon a brief inspection of an infected animal.

Foot-and-mouth disease and sanitation, E. THIERRY (*Jour. Agricole [Paris], 12 (1901), No. 131, pp. 29–32*).—A general discussion of the efficiency of various sanitary methods in preventing the spread of this disease.

Suspicion of infection with foot-and-mouth disease in the sense of the inspection regulations, REUTER (*Vrtljschr. Bayer. Landw. Rathes., 5 (1900), No. 4, Sup., pp. 641–653*).—The author presents a general discussion of the requirements of the law concerning this disease and of the accuracy of phraseology.

Analyses of hog-cholera remedies, R. W. THATCHER (*Nebraska Sta. Rpt. 1900, pp. 70–72*).—Analyses are reported of 5 preparations sold in the State as remedies for hog cholera.

Diagnosis of rabies in dogs by microscopic examination of the nerve ganglia, G. HEBRANT (*Ann. Med. Vet., 49 (1900), No. 6, pp. 302–309*).—Changes in the nervous tissue were especially well marked in the gasserian ganglia in cases of rabies. The ganglia of the left side were rather more acutely attacked than those of the right.

The agglutination of Staphylococcus aureus by the serum of vaccinated and infected animals, J. NICOLAS and C. LESIEUR (*Compt. Rend. Soc. Biol. Paris, 53 (1901), No. 4, pp. 87–89*).—The authors studied the influence of serum from an immunized goat upon cultures of this organism which were already developed and upon those which were in the process of development. Other experiments were also made in the agglutination of other species of Staphylococcus. The serum of rabbits and guinea pigs was tested with reference to the agglutinating power. From their experiments the authors conclude that the serum of goats immunized by means of repeated hypodermic injections of cultures of *Staphylococcus aureus* causes an agglutination of this organism, but that the serum of animals suffering from an acute infection from the same organism possesses no agglutinating power.

The histogenesis of malignant tumors, SCHÜTZ (*Ztschr. Veterinärk., 13 (1901), No. 3, pp. 101–117*).—An elaborate discussion of this subject, with a critical review of the literature and a bibliography.

On disinfection, W. L. MACKENZIE (*Vet. Jour., n. ser., 3 (1901), No. 15, pp. 141–150*).—The use of formalin for disinfection is discussed in detail, and notes are given on methods of applying disinfectants to surfaces, including disinfection by free gas, by moist brushing or rubbing, jet, or shower, and by spray.

STATISTICS—MISCELLANEOUS.

Biennial Report of Idaho Station, 1899 and 1900 (*Idaho Sta. Bul. 29, pp. 35*).—Reports of the director and heads of departments on the work of the station, and financial statements for the fiscal years ended June 30, 1899 and 1900. The report of the chemist contains analyses of 4 samples of baking powder, 1 sample of watermelon sirup, and 6 samples of water. The report of the meteorologist is noted elsewhere.

Fourteenth Annual Report of Nebraska Station, 1900 (*Nebraska Sta. Rpt. 1900, pp. 80*).—A report of the director on the staff, work, and publications of the station during the year; a financial statement for the fiscal year ended June 30, 1900; and several articles abstracted elsewhere.

Annual Report of South Carolina Station, 1900 (*South Carolina Sta. Rpt. 1900, pp. 32*).—The different lines of station work are reviewed at some length in departmental reports, parts of which are noted elsewhere. A financial statement is given for the fiscal year ended June 30, 1900.

Twelfth Annual Report of Texas Station, 1900 (*Texas Sta. Rpt. 1900, pp. 287–308, pls. 3*).—The report of the director reviews the different lines of station work during the year and summarizes some of the results obtained by the station during 12 years. Resolutions adopted by the Texas Farmers' Congress and by the Texas Live Stock Association relative to experiment station work in the State are given. Reports of the heads of departments are included, one of which states briefly the results of some experiments in marketing peaches. A financial statement is given for the fiscal year ended June 30, 1900. A subject list is given of station publications, those still available being indicated. The front elevation and first and second floor plans are given of the agricultural-horticultural building erected in 1900.

Sources of the agricultural imports of the United States, 1896-1900, F. H. Hitchcock (*U. S. Dept. Agr., Section of Foreign Markets Bul. 24, pp. 120*).—Tables are given showing in detail the quantities and values of all the agricultural products imported into the United States from the several countries of supply during each of the five fiscal years 1896–1900. A similar report for the fiscal years 1894–1898 was published as Bulletin 17 of the Section (E. S. R., 12, p. 98). The average annual value of the agricultural imports during the 5 years was $376,369,368. Of the articles imported sugar constituted over 23 and coffee 18 per cent. Brazil supplied 12.99 per cent of the total imports, the United Kingdom 8.96, Germany 6.88, and Cuba 6.10 per cent.

Distribution of the agricultural exports of the United States, 1896-1900, F. H. Hitchcock (*U. S. Dept. Agr., Section of Foreign Markets Bul. 25, pp. 182*).—Statistical tables show the quantities and values of all the various agricultural products exported from the United States to each country of destination during the 5 fiscal years 1896–1900. A similar report for the fiscal years 1894–1898 was published as Bulletin 16 of the Section (E. S. R., 12, p. 98). The average annual value of the agricultural exports during the 5 years was $752,120,133. The United Kingdom received 51.77, Germany 14.20, France 6.08, and the Netherlands 5.22 per cent of the total exports. Breadstuffs, cotton, and meat products constituted, respectively, 32.17, 29.38, and 20.02 per cent of the total exports.

Apprenticeships in agriculture (*Maryland Agr. Col. Quart., 1901, No. 13, pp. 61, 62*).—A brief statement regarding the apprenticeships offered in the dairy and horticultural divisions of the stations.

Nature teaching, F. Watts (*London: Dulau & Co.; Bridgetown, Barbados: Bowen & Sons, 1901, pp. XII + 109*).—This book treats of the general principles of agriculture and is intended for the use of schools. A chapter is devoted to each of the following subjects: The seed, the root, the stem, the leaf, the soil, plant food and manures, flowers and fruits, weeds and insects.

Industrial progress in North Carolina (*Bul. North Carolina State Bd. Agr., 22 (1901), No. 8, pp. 3–23*).—Gives lists of cotton, woolen, and silk mills and other industries, and cattle, horse, swine, sheep, goat, and poultry registers.

NOTES.

Connecticut Storrs Station.—W. A. Stocking, jr., has been appointed dairy experimenter, and W. M. Esten, assistant in dairy bacteriology at the station. George S. Palmer, of Norwich, and B. C. Patterson, of Torrington, have been elected members of the governing board in place of T. S. Gold and S. O. Bowen, and appointed on the executive committee of that board.

Hawaii Federal Station.—The first bulletin of this station has just been issued. It describes chicken diseases in Hawaii, which have prevailed to such an extent as to very seriously interfere with chicken raising in the islands.

Hawaii Sugar Planters' Station.—Owing to ill health, R. E. Blouin has resigned from the position of director of the station and has returned to the Louisiana Station as assistant director, the position formerly held by him before going to the islands. C. F. Eckart, assistant chemist, has been appointed director and chief chemist of the station; S. S. Peck has been made first assistant chemist, and E. J. Lea appointed second assistant chemist. A new laboratory has been erected and thoroughly equipped for the execution of all kinds of chemical work bearing on the growing and manufacture of sugar.

Maine University and Station.—G. E. Fellows, Ph. D., assistant professor of history in the University of Chicago, has been elected president of the University of Maine. M. B. Cummings, B. S. (University of Vermont, 1901), has been appointed assistant in horticulture at the station and entered upon his duties January 1.

Minnesota College and Station.—Thomas Shaw, professor of animal husbandry and widely known as an agricultural writer, has resigned his position, to take effect April 1, to become editor of *The St. Paul Farmer*. The school of agriculture is taxed to its full capacity this winter, there being over 450 regular students, and 110 factorymen in attendance at the dairy school, some of the latter being there for the second or third time. A special course for farmers was begun January 14.

Missouri Station.—T. I. Mairs, assistant in agriculture, has been elected assistant in home reading courses at the Pennsylvania State College and entered upon his new duties January 1. R. B. Oliver, of Cape Girardeau, has been selected as a member of the board of curators during the absence of Walter Williams in Europe.

Nebraska Station.—At the November election, Elisha C. Calkins, of Kearney, and Carl J. Ernst, of Lincoln, were elected to membership on the board of regents to succeed H. L. Goold and C. H. Morrill, whose terms expired January 1.

New Jersey Stations.—William P. Allen has been appointed assistant chemist.

Cornell University.—The Forestry School of Cornell University will hereafter confer the degree of Forest Engineer in place of Bachelor of the Science of Forestry, the former being thought more appropriate and more expressive of the kind of work for which the student has been prepared.

Oklahoma College and Station.—T. B. Ferguson, of Watonga, has succeeded Wm. M. Jenkins as Governor and *ex-officio* member of the board of regents.

Oregon Station.—A note in *The Oregonian* announces experiments at the Oregon Station in preserving silage by a new method. Two silos were filled with corn in the usual way, which was then thoroughly cooked by steam, and the silos sealed up airtight. One silo has recently been opened. The experiment is thought to have been entirely successful. The silage is described as sweet, and contains only 0.27 per cent of acid.

Pennsylvania Station.—Thorne M. Carpenter has been appointed assistant chemist of the station.

Rhode Island College and Station.—The death is announced of J. A. Tillinghast, instructor in agriculture at the college and agriculturist to the station. A small glass house is being built, connected with the new house just completed for experiments in the rearing of incubator chicks. It will be used solely to supply green food to the young chicks.

South Carolina Station.—The experiments in the evaporation of sweet potatoes have been successful, and an exhibit will be made at the Charleston Exposition.

Tennessee Station.—A hog barn, 100 by 18 ft., is in process of construction on the university farm. It is designed as a breeding and experimental feeding barn as well. It will have the usual yards in the rear for exercise, and is so situated that grazing experiments of various kinds can be carried on in a most convenient manner. It is proposed to maintain two or three of the principal pure breeds best adapted to the South. The work in animal husbandry is being extended as fast as possible.

Texas College and Station.—Chas. H. Alvord, assistant professor of agriculture (dairying and live stock), will withdraw from college and station work at the close of the present college year. At a meeting of the board of directors December 9, 1901, Acting President R. H. Whitlock was made president *pro tem.* and treasurer of the college, *vice* L. L. Foster, deceased. The committee from the board of directors have located the new experiment station at Troup, in Smith County.

Wyoming College and Station.—Frank E. Emery, formerly director of the North Carolina Station, has been elected professor of agriculture and horticulture in the college and station, *vice* Luther Foster, who, as already noted, resigned to become president of the New Mexico College and director of the station. The station is continuing lamb-feeding experiments inaugurated a year ago, and is also carrying on an extensive cooperative sheep-feeding experiment, with 1,900 sheep, at Fort Steele.

Society of Official Horticultural Inspectors.—The first general meeting of the Society of Official Horticultural Inspectors for the United States and Canada was held in this city November 11 to 13, 1901, with S. A. Forbes as president and H. T. Fernald as secretary. At the majority of these sessions representatives from fifteen States were present. A circular had been issued by the president in which topics were suggested for discussion, and this served as the programme for the meeting.

With regard to the limits of time within which nurseries may be inspected, it was found impossible to decide upon any definite period for all States, and after considerable discussion a resolution was adopted leaving the time of inspection to the discretion of the inspector in each State. It was also resolved that the certificate should not extend beyond the time of the beginning of the breeding period of the San José scale for the next year. In case a part of a nursery is affected by a dangerous fungus or insect pest not likely to involve other parts of the nursery, it was decided that the certificate should be so worded that stock could be sold after objectionable stock had been treated as suggested by the inspector. It was declared to be the sense of the society that certificates should specify the date of the completion of the inspection, should be worded in an impersonal form, and should not mention specifically the name of any insect or fungus pest.

Discussion on the acceptance of the certificate of inspection beyond the boundaries of the State showed that it had been the quite general policy of inspectors to accept certificates from State inspectors and from experiment station entomologists from outside States, but no formal expression of opinion on this point was taken.

Considerable time was devoted to a discussion of the nursery pests which should be regarded as dangerous enough to influence or prevent the granting of a certificate. The pests which were mentioned by different inspectors as of chief importance included crown gall, peach yellows, pear blight, San José scale, woolly aphis, and sinuate pear borer.

A lengthy discussion was given to the question of the best insecticide programme for orchards infested with San José scale. The results of experiments with kerosene and crude oil in different States have not been uniform and in some cases have been somewhat contradictory. As a rule, no bad results were reported from the use of kerosene and crude oil on apples and pears, and other hardy trees; on peaches and plums more precaution has to be observed. Whale-oil soap, while effective and safe on all kinds of trees, was objected to on the ground of greater expense. A committee appointed to prepare recommendations regarding the best insecticides to use for the destruction of the San José scale in orchards and nurseries, reported as follows: For nurseries, fumigation with hydrocyanic-acid gas, after inspection; for orchards, treatment with dilute solutions of insecticide soaps, oils, or other insecticides to kill the young scales, in late summer and fall; winter treatment with insecticide soaps or oils strong enough to kill the scale and safe for application on all kinds of trees.

During a discussion of the question of the proper public policy with respect to the division of the costs of inspection between the State and the property owners, a variety of conditions existing at present and their advantages and disadvantages were brought out. It was argued, on the one hand, that the work of inspection was directly for the benefit of the nurseryman or property owner, and, on the other hand, that since the general extension of inspection, requiring all nurserymen to be inspected, the financial advantage of a certificate is largely destroyed. Several inspectors stated that they had experienced more or less serious difficulty in collecting the assessments against nurserymen and property owners, and others that the fee led small nurserymen doing a local business to avoid inspection. The society gave formal expression to the view that in States which require inspection of nursery stock, the expense of inspection be borne by the State.

A discussion was had on the question of the desirability of national legislation on nursery inspection, and the society indorsed the bill providing for national control of interstate commerce, already recommended by entomologists, nurserymen, and orchardists. It was voted to request this Department to publish a practical article on the principal nursery pests of the country, for distribution among horticultural inspectors and nurserymen. With regard to a practical definition of nursery stock, it was voted that strawberry plants, grape cuttings, and general ornamental stock grown out of doors be included in that term.

A committee appointed to consider the propriety of making a permanent organization of the society, recommended that no such action be taken.

The society adjourned to meet next year in connection with the Association of American Agricultural Colleges and Experiment Stations.

Ontario Agricultural and Experimental Union.—The twenty-third annual meeting of this organization was held at the Ontario Agricultural College at Guelph, Canada, December 9 and 10. An interesting programme of papers was provided, prominent among which were discussions of the cooperative experiments of the Union. During the season of 1901 cooperative experiments were carried on with 1,885 experimenters on grain crops, 222 on root crops, 146 on forage crops, 180 on field beans and sweet corn, 66 on fertilizer experiments, and 261 on miscellaneous experiments; there were also 309 experimenters testing small fruits and 21 testing different methods of preserving eggs. In all there were over 3,000 Ontario farmers conducting cooperative tests upon their own farms during the year. The number has grown steadily from 12 in 1886, the year the cooperative experiments were started. Prof. C. A. Zavitz, the director of this work, says: "Both the financial and the educational influences of this work throughout Ontario are great. The benefits are not confined to the experimenters themselves, but are shared by thousands of others who examine the growing crops, who attend the annual meetings, who read the annual reports, or who become familiar with the results through the columns of the public press, in the meetings of the farmers' institutes, and in various other ways."

Meeting of American Chemical Society.—The winter meeting of this society, which was its twenty-fifth general meeting, was held in Philadelphia December 30 and 31. It was one of the largest winter meetings which the society has had, and was attended by chemists prominent in general, theoretical, industrial, and agricultural chemistry. The sessions were presided over by Prof. F. W. Clarke, president of the society, who delivered the presidential address on the subject of the development of chemistry. In this he called attention to the limited opportunities for systematic research on the larger problems which were open to chemists connected with educational institutions, the Government laboratories, and industrial establishments, in all of which chemistry was to a large extent a means for the attainment of a desired end. He strongly emphasized, therefore, the great desirability of public or private endowment of research laboratories, whose main object should be systematic research in the science of chemistry, and through which cooperation in investigation might be arranged.

Dr. Hale, the secretary of the society, briefly reviewed the growth of the society since its meeting in Philadelphia 11 years ago. During the past year 344 new members have been added to the society, making the total membership at present about 2,000, with 13 local sections aside from the one now forming on the Pacific coast.

F. W. Clarke presented the report on atomic weights, noting the more important work in that line during the year. The international committee on atomic weights had not been able to make a report on the standard of values to be used—whether O=16 or H=1. A communication from the new U. S. Bureau of Standards proposed cooperation with the society in fixing methods of testing glassware apparatus and in adapting the work of the Bureau to the needs of chemists. A resolution urging Congress to make the use of the decimal system compulsory in all departments of the Government except the Public-Land Surveys, and to provide for its immediate adoption in the Mint and the Post-Office, was referred to the council of the society.

The programme of the meeting contained a list of 37 papers, only 20 of which could be read, aside from the address of the retiring president, on account of lack of time. The papers presented dealt quite largely with analytical and industrial phases of chemistry, although there were several on general and theoretical chemistry. Among those which were not reached on the programme were several on subjects relating to agricultural chemistry.

A long list of excursions to various industrial establishments was provided for the afternoons. These were quite generally participated in by the chemists, and, with the purely social features, made the meeting one of unusual interest and profit.

Dr. Ira Remson, president of Johns Hopkins University, was elected president of the society for the coming year, and Dr. Albert C. Hale was reelected secretary. The editor of the journal of the society, Edward Hart, having resigned, W. A. Noyes was elected to that office, and the edition of the journal was increased to 3,000 copies. The next meeting of the society will be at Pittsburg in June, in connection with the meeting of the American Association for the Advancement of Science.

Necrology.—Thomas Meehan, long one of the most prominent horticulturists and botanists in this country, died of heart trouble in Philadelphia November 19, 1901, at the age of 75 years. Mr. Meehan was a recognized authority on the broader lines of botany, a prolific writer on botanical and horticultural subjects, and one of the most prominent nurserymen of eastern United States. Of English birth, he inherited a love of plants from his father, who was a skillful gardener. At 19 he entered the

Royal Gardens at Kew, where he remained until 1848, when he came to America. In 1852 his present extensive nursery business in Germantown was founded in partnership with the late William Saunders, afterwards superintendent of the experimental gardens and grounds of this Department. Mr. Meehan was editor of *Gardeners' Monthly Magazine* for nearly 30 years, and in 1890, in company with his younger sons, established the present *Meehan's Monthly Magazine*, devoted to general gardening and wild flowers. His published writings include The American Handbook of Ornamental Trees, an octavo volume of 257 pages, published in 1853; The Native Flowers and Fruits of the United States in their Botanical, Horticultural, and Popular Aspects, published in 1879–80, and more than 1,000 shorter scientific articles.

In his public life his name was closely allied with the movement for the establishment of the smaller parks in Philadelphia, and it is largely to his foresight and efforts that their number and beauty are due.

Prof. Dr. Robert Hartig, professor of botany of the University of Munich, died on October 9, 1901. He was born at Brunswick May 30, 1839, and began service as forester to the Duke of Brunswick in 1865. In 1867 he became attached to the Prussian Academy of Forestry at Eberswalde, and in 1877 became professor of botany in the University of Munich. The principal works which he has published are Investigations on the Growth and Production of Oak and Beech; Principal Diseases of Forest Trees, which has gone through a number of editions and been translated into English, French, and possibly other languages; The Decomposition of Wood; Report on the Investigations of the Forestry Institute of Munich; A Manual of Anatomy and Physiology of Plants; A Monograph of the Wood of German Conifers; and The Beech considered from an Anatomical, Physiological, Chemical, and Forestry Basis.

The death of Henry Settegast, director of the agricultural institute of the University of Jena, occurred December 4, 1901. He was born October 12, 1853, at Ragnit in East Prussia. During his life he held important positions in agricultural institutions and made valuable contributions to the science of agriculture.

Personal Mention.—D. W. May, a graduate of the Missouri Agricultural College and for two years past an assistant in this Office, has been appointed animal husbandman at the Kentucky Station and entered upon his duties January 1.

W. J. Spillman, agriculturist of the Washington College and Station, has succeeded F. Lamson-Scribner as agrostologist in this Department. Professor Scribner, as previously announced, has become chief of the newly established Bureau of Agriculture in the Philippine Islands and will sail for Manila about the middle of February.

Marcus L. Floyd, tobacco expert in the Bureau of Soils of this Department, has resigned to accept the position of manager with a company formed to grow wrapper tobacco under shade in the Connecticut Valley.

Miscellaneous.—According to a note in *Science*, taken from the London *Times*, the National Association of British and Irish Millers has decided to institute an inquiry into the whole question of the relative strengths of English and American wheats, and have secured the cooperation of the Southeastern Agricultural College at Wye. The question has arisen in consequence of complaints of English farmers that the millers give the preference to American wheat, though they have to pay a higher price for it. The millers reply that they can not sell for bread-making purposes flour made from English wheats because they lack the strength of the American sorts. The coming season the Southeastern Agricultural College will grow the same wheats on different soils and with different manures, and milling and baking tests will be made of the grain in each case. New varieties are being obtained from Canada and the United States, and an attempt will be made to improve the yield of the old varieties by selection and cross breeding to increase the number of grains in the ear.

A note in *Nature* gives the results of experiments in hop culture carried on at the Southeastern Agricultural College at Wye. These experiments have in some cases been going on continuously on the same plats since 1895. Training experiments are favorable, on the whole, to the system of wide planting and broad alleys. The umbrella system of training has generally given the maximum yield per acre, but is thought to have various disadvantages as compared with the Butcher system. Cutting the vine at picking time is found to result in a considerable loss of material to the hop plant and weakening and loss of crop in the succeeding year. Stripping off the lower leaves and laterals is found to be harmful in seasons of short growth, but without effect when the plant is vigorous. The growth of hops continuously on the same plat for 7 years without any cultivation beyond surface hoeing has aroused considerable interest, and the trial is to be extended to other soils. Fertilizer experiments at a number of places were chiefly with mineral fertilizers.

The Agricultural Education Committee [English], a committee formed in 1899 and composed of members of Parliament and others interested in the promotion of agricultural education, passed the following resolutions at its December meeting, which, according to *Nature*, have been confirmed by the Agricultural Education Association:

"(1) That, if the Board of Agriculture retain their present educational work, it is essential that there shall be complete cooperation between that board and the Board of Education on all educational matters specially affecting the agricultural classes. (2) That for purposes of agricultural education the country should be divided into districts, and such inspectors appointed as may be necessary. (3) That groups of counties, not yet affiliated to any collegiate center, should be formed, each group being affiliated to some center. (4) That, after due inquiry, reports should be issued dealing with the most appropriate forms of agricultural education for each county. (5) That permanent demonstration stations should be organized in each county or group of counties. (6) That official information bearing upon all matters of agricultural interest, whether educational or otherwise, should be distributed to the public free of cost. (7) That to carry out the above objects it is essential that larger funds be placed at the disposal of the Board of Agriculture for educational purposes. (8) That the work of the Board of Agriculture might be facilitated by the appointment of a consultative committee on the analogy of those of the Board of Education and of the Department of Agriculture in Ireland. (9) That copies of the above resolutions be sent to the presidents of the Boards of Education and of Agriculture."

A general index has been issued to the first 25 volumes of *Biedermann's Centralblatt für Agrikulturchemie*, prepared by Konrad Wedemeyer. The period covered is from 1872 to 1896. The volume comprises over 300 pages, and contains author and subject indexes. As this journal covers a wide range of literature relating to agricultural science and experimentation and reviews many of the more important investigations in that field, the index will render a very large amount of literature available for reference and be a great convenience in gathering that on any particular subject.

The first number has recently appeared of a new periodical, *Biometrika*, a journal for the statistical study of biological problems. While published in England, the periodical is cosmopolitan, the editors inviting contributions in German, French, or Italian as well as English.

The Yearbook of the Scientific and Learned Societies of Great Britain, recently issued, contains, in addition to the list of the societies and other institutions, their officers, meetings, publications, and other information, and a list of the papers read before each society from January, 1900, to June, 1901.

With the completion of the first volume (13 numbers) *La Grêle*, published by the Viticultural Station of Villefranche and devoted mainly to the subject of hail prevention by cannonading, suspends publication.

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EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Assistant Director.*

EDITORIAL DEPARTMENTS.

Chemistry, Dairy Farming, and Dairying—The Editor and H. W. Lawson.
Meteorology, Fertilizers and Soils (including methods of analysis), and Agricultural Engineering—W. H. Beal.
Botany and Diseases of Plants—Walter H. Evans, Ph. D.
Foods and Animal Production—C. F. Langworthy, Ph. D.
Field Crops—J. I. Schulte.
Entomology and Veterinary Science—E. V. Wilcox, Ph. D.
Horticulture—C. B. Smith.
With the cooperation of the scientific divisions of the Department and the Abstract Committee of the Association of Official Agricultural Chemists.

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EXPERIMENT STATION RECORD.

Vol. XIII. No. 6.

The death of Dr. William LeRoy Broun, of Alabama, removes one who has been a prominent figure in educational matters in the South for nearly a half century. His splendid career as president of the Alabama Polytechnic Institute for nearly twenty years stamps him as a man of rare wisdom in educational affairs, marked executive ability, and a strength of character which commanded the confidence and support of his colleagues and legislators alike. He maintained the individuality and integrity of the institution during a period which was fraught with many disruptive and formative changes in other colleges, guiding it along the lines of a well-conceived plan, and developing one of the foremost institutions of its kind.

A Virginian by birth and an honor graduate of the University of that State, Dr. Broun's entire mature life was devoted to educational work except during the period of the civil war. As an instructor he occupied successively the chairs of mathematics and of physics in a college in Mississippi, the University of Georgia, Vanderbilt University, and the University of Texas. He founded Bloomfield Academy in Virginia in 1856, which he conducted successfully until the outbreak of the war; and was for three years (1872–1875) president of the Agricultural and Mechanical College of Georgia. His connection with the Alabama Polytechnic Institute, formerly the Agricultural and Mechanical College, dated from 1882, when he was elected president, but remained only a year. He was recalled in 1884 and continued as the guiding hand of that institution up to the time of his death, retaining the details of administration very largely in his own hands. He was the executive officer of the experiment station from 1892 to 1897, and was president of the station council at the time of his death.

Although of late Dr. Broun had not been active in educational movements outside his State, there were many evidences of his continued interest in the progress of education. He was one of the pioneers in technical education, his interest being especially strong in that branch relating to the mechanic arts. He established the first manual training laboratory in the South, and the first well-equipped electrical engineering plant. He had a high appreciation of the study of the natural sciences, and encouraged the building up of a first-class biological laboratory. His high conception of the aims and purposes of the land-grant colleges was clearly set forth in his presidential address before the Association of American Agricultural Colleges and Experiment Stations at the New Orleans meeting in 1892. This was an earnest plea for that form of technical education which trains and develops the mind as well as the hand, and this, he urged, called for both breadth and liberality in the curriculum. The institution whose development he is so largely responsible for is a worthy exponent of his views on that subject.

The rapid development of agricultural education in this country during the past few years has rendered obsolete many of the notions regarding its possibilities which have hitherto passed current. Unfortunately this fact is not always recognized in discussions on the subject, even in educational bodies. Much stress has been laid, for example, on the great difficulty of getting students to attend the regular college courses in agriculture. Undoubtedly such difficulty has existed in the past, and in a way still exists. But in recent years it has been shown that much may be done to overcome this difficulty by proper provision for adequate courses, by special plans to excite interest in thorough training in the science and practice of agriculture, and by the creation of an atmosphere of cordial sympathy with agricultural education in the college community.

We have outgrown the notion that a farm and a professor of agriculture are sufficient means for the promotion of agricultural education in our colleges, and it were well that this should be universally recognized in practice as well as in theory. Data in considerable amount have accumulated, showing that where a strong faculty of specialists in different branches of agricultural science is organized, and arrangements are made to meet the varying needs of students by special agricultural courses or schools, it is not difficult to gather in a considerable number of students and to increase materially the number who will elect to take the complete college course in agriculture. It is also pretty well recognized that institutions for agricultural education have not done their full duty until they have strenuously endeavored to widen their base of operations by extension work through farmers' institutes, correspondence courses, etc., with a view to arousing their agricultural constituency to the importance of technical training in their art and the opportunities which such training opens up, and thus laying a broad foundation for successful college courses in agriculture.

It is idle for members of governing boards or college presidents to publicly profess interest in agricultural education unless they are actually pursuing modern methods in their own institutions to make their agricultural courses effective. It will not do to plead lack of funds or lack of interest among the farmers. It is the plain duty of the managers of agricultural colleges to secure funds and to arouse interest along agricultural lines, and until it is clear that they are making earnest and intelligent efforts in this direction they should not expect to escape criticism from the friends of agricultural education. "Where there's a will there's a way" is true in agricultural education as in other lines of human activity. The way has been pointed out in a number of States, and the success which has been achieved in attracting and training students for their life work and in broadening the influence of the institution along agricultural lines should stand as an inspiration to instructors and directing officers alike.

The initial report of the new Department of Agriculture and Technical Instruction for Ireland outlines the various plans which have been put into operation for the promotion of agriculture and the education and assistance of the small farmers in that country. The department was organized under the agriculture and technical instruction (Ireland) act of 1899, and intrusted with a variety of duties pertaining to technical education, lands, fisheries, control of animal diseases, etc., which had formerly been in the hands of separate boards and commissions. One of its chief objects is "to bring order and simplicity into branches of administration where correlated action was not properly provided for before." It is provided with an annual endowment of £166,000 (over $800,000), together with funds for maintaining a number of institutions turned over to it. It embraces six branches, i. e., agriculture, technical instruction, fisheries, statistics and intelligence, veterinary, and accounts.

The work of the department will be carried out very largely in cooperation with the different counties and boroughs, rather than as an independent government undertaking, and its financial assistance will be rendered in the form of subsidies to local enterprises of various kinds. In planning for this, two important principles have been laid down, namely, that the department will seek to evoke and fortify the self-reliance, enterprise, and sense of responsibility of local communities, and that in encouraging local initiative and responsibility it will guard against an indiscriminate multiplication of unrelated local schemes. The national as well as the local point of view will be kept in mind, and the attempt made to coordinate various undertakings and render expert aid, which are the most important functions of the central authority. To this end the department has established direct and personal relations with the local authorities, societies, schools, and other organizations of the people generally with whom its work has to do. Correspondence has not been relied upon for this purpose, but representatives have been sent out to aid local authorities in perfecting their "schemes" for agricultural education or improvement.

The distinctively agricultural features already inaugurated are along the lines of agricultural instruction, the improvement of live stock, and agricultural experiments and investigation. The facilities for regular instruction in agriculture have been provided in the Royal College of Science for Ireland, where a three-years' course has been established; in the Albert Institute (Glasnevin), which will serve as the chief center for training male students in higher technical and practical agriculture, and the Munster Dairy School and Agricultural Institute, which is to be given up entirely to the instruction of girls in dairying and domestic science.

Itinerant instruction is for the present to constitute a rather prominent feature of the scheme for agricultural instruction. These itinerant instructors will give practical and technical advice and lectures in each county on tillage, dairying, poultry raising, fruit culture, bee keeping, and other subjects. The plan is for the county to take the initiative in this matter, and on the acceptance of its scheme for the department to bear one-half the expense of carrying it out. Such instructors have already been appointed in a number of counties, and the lack of properly trained instructors is beginning to be felt. A number of "pioneer" lectures have been given with a view, for the most part, to showing the character of the work that might be done by itinerant instructors, in order to stimulate the counties to action.

The plans for the improvement of live stock are similar, in some respects, to those followed in a number of European countries. The best stallions to be found are registered by the department, and "free nomination tickets," good up to £3, are issued for mares which are judged of sufficient merit, entitling the owners to have them served by the registered males. During the year 1,700 of these nomination tickets were issued. Money is loaned to farmers at a low rate of interest for the purchase of registered stallions and premium bulls, which are to be insured and paid for in annual installments. The fact that sixty-one farmers took advantage of these loans the first year shows the interest which is felt in the improvement of the live stock. Premiums of £12 each were offered for approved pure-bred yearlings and 2-year-old bulls of any breed, but only about half of the 737 premiums offered were awarded, as there was not sufficient stock exhibited which came up to the standard. This, it is thought, will act as a stimulus to farmers to improve their stock, and thus have quite as great an influence as the premiums which were awarded. Premiums were also offered for approved rams and boars.

The benefits of these measures are confined to counties which adopt schemes for the encouragement of stock breeding, and all but two counties have already done so, the county usually bearing half the expense. The sum of £5,000 was loaned to cooperative creameries for the erection of plants for pasteurizing their skim milk, and a plan to organize and advance capital to agricultural credit associations, from which small farmers may obtain loans for purchasing separators and other expensive dairy utensils, in order to encourage home dairying, is under consideration.

A variety of cooperative experiments were carried out, mostly by cooperative societies and organizations formed for the purpose; and special experiments in tobacco growing were made in twenty-five counties, under the supervision of an expert from France, to determine the possibilities of successful culture of that crop. Flax culture, which has fallen off greatly in Ireland in recent years, will receive special attention from the department. Experts have been brought over from Holland and Belgium, and experiments inaugurated in growing flax and in improving the method of scutching. A dairy herd has been leased for experiments in cheese making, and experiments in calf-feeding with skim milk were made on a private farm. A seed-testing station has been established at the Royal College of Science, where seeds are tested for farmers at merely nominal charges.

It will be seen that, as regards the promotion of agriculture, the steps which have already been taken and those which are outlined are, for the most part, on a very practical basis, and are directed toward some of the most immediately important problems in Irish agriculture under present conditions. These facts, together with the cordial relations which have evidently been established and the interest which the first year's operations have aroused, bespeak a career of much usefulness for the new department.

The announcement has been received of the establishment of a new experiment station in England—the Aynsome Agricultural Experiment Station and Farm, located at Grange-over-Sands, Lancashire. The station is a private enterprise of J. S. and T. M. Remington, located on their joint estate, and "consists of a fully equipped experiment station of the latest continental and American type." The features of its equipment are a chemical laboratory, a laboratory for water analysis, microscopic work, and bacteriology, a greenhouse for pot culture experiments and researches in plant physiology, and a farm. The latter includes a model dairy, a special barn for experiments with cows, sheep, and steers, and about 12 acres to be used for plat experiments. The remainder of the farm will be conducted on a strictly commercial basis and not as a hobby.

Soil investigations will be made a prominent feature of the work, including physical and chemical investigations; but fertilizer experiments with different crops and feeding experiments will also receive much attention.

A rather unusual feature of the station is the provision for receiving pupils for instruction in theoretical and practical agriculture, general and agricultural chemistry, and other branches of agricultural science, making it a farm school as well as a station. As the announcement states, this is the first station to throw its doors open to pupils in scientific and practical agriculture; and it must be said that there is an element of doubt as to the wisdom of the combination of effort in this case. Usually the case is reversed, the institution for instruction having a department for experimentation. Whether the institution at Aynsome shall ultimately become an experiment station in the true sense or largely an agricultural school will depend upon the management and the conditions which develop.

CONVENTION OF ASSOCIATION OF AMERICAN AGRICULTURAL COLLEGES AND EXPERIMENT STATIONS.

The Association of American Agricultural Colleges and Experiment Stations held its fifteenth annual convention at Washington, D. C., November 12 to 14, 1901. The representation was a quite general one, the various sections of the country, including the far West, sending delegates. Several topics of importance at this time, such as providing opportunity for graduate study at Washington, the graduate summer school of agriculture, and cooperation between the stations and this Department, were freely discussed, and the convention again recorded its opposition to changing the name or the scope of the association.

A very enjoyable social feature of the meetings was a reception given to the members of the association by the Honorable Secretary of Agriculture and Miss Wilson on the second evening of the convention. A committee appointed to pay the respects of the association to the President was cordially received by him and given assurances of his interest and high appreciation of the work of the agricultural colleges and experiment stations.

The Association of State Universities met at Washington simultaneously with the association of colleges and stations, and a plan for formal cooperation between the two associations was considered by both. The project was, however, abandoned.

The Society of Official Horticultural Inspectors for the United States and Canada also held its first general meeting in Washington in connection with the association, as many of the inspectors are college or station men. An account of their meeting was given in the last number (p. 496).

GENERAL SESSIONS.

The general sessions of the association were held in the hall of Carroll Institute, and were presided over by President A. W. Harris, of the University of Maine, who delivered the presidential address on the first evening of the convention. This address set forth clearly the more important things for which the land-grant colleges stand, and summarized the results of their work. The land-grant act of 1862 was considered important not only in providing for agricultural education, but as the first sufficient recognition of study and investigation as the basis of the best success in the arts and industries. It also proclaimed the duty of the National Government to promote industrial education and in its results demonstrated the effectiveness of governmental cooperation. The most important of the direct results of this act to agriculture was the experiment station. "If the agricultural college did nothing more than to establish, maintain, and officer the experiment station it would be justified many times over." The establishment of the agricultural colleges also resulted in the strengthening and broadening of industrial education along all lines, and has culminated in a great system of technical education. "It is a great result of the land-grant college to have asserted and established the doctrine that education in all its forms, from the lowest to the highest, is a State function in which the State has the fullest rights and for which it must bear responsibility, sharing the privilege and responsibility with private corporations only as it thinks best." The speaker considered State aid and control in higher education as necessary, under present conditions, to the best national development, especially as the results of this higher education thus become the property of all the people. The address concluded with an eloquent tribute to the memory and worth of the late Justin S. Morrill.

The association expressed its appreciation of the address by a vote of thanks, and directed that the Secretary of Agriculture be requested to publish it as a separate.

The report of the executive committee, presented by its chairman, H. H. Goodell, called attention to the fact that the bill for the establishment of schools or departments of mining and metallurgy in connection with the land-grant colleges passed the Senate, but failed to be called up in the House of Representatives during the last session of Congress. The introduction of a similar bill into the present Congress was recommended. Efforts of the committee to have all land-grant colleges made designated depositories of Government publications were unsuccessful. The plan for holding a summer school of graduate instruction in agriculture during 1902, suggested by the Ohio State University, was approved.

The report of the bibliographer, A. C. True, noted the work of a bibliographical character being done by the Department of Agriculture, and enumerated, with explanatory notes, 44 general and partial bibliographies in lines relating to agriculture which had appeared during the past year.

The report of the treasurer, E. B. Voorhees, showed that the receipts during the year amounted to \$1,132.97 and the expenditures to \$1,105.40, leaving a balance of \$27.57.

The report of the committee on revision of the constitution called forth a vigorous discussion. The various proposals to change the name of the association, to extend separate representation to the departments of mechanic arts of the colleges, and to limit the number of sections to two, were voted down. Amendments were adopted striking out the provisions requiring a synopsis of the proceedings of each section to be presented to the association at the close of every convention, and requiring the chairman of each section to make at the annual convention a report of the progress during the year along lines pertaining to his section. An amendment was adopted providing for the election of officers by ballot upon nomination made upon the floor of the convention. An amendment relative to the program for the annual convention provides for the distribution of programs sixty days before the annual convention of the association, and contains the following provisions: "The program for a convention of the association shall designate the time and place of the convention, shall present a well-prepared order of business and of subjects for discussion, and shall provide an arrangement for the meeting of the general sessions and of the sections. The subjects provided for consideration by a section at any convention of the association shall concentrate the deliberations of the section upon not more than two main lines of discussion, which lines shall so far as possible be related. Not more than one-third of the working time of any annual convention of the association shall be assigned to miscellaneous business." The provision for amending the constitution was also made more specific. The executive committee was authorized to appoint, subject to the approval of the association, "an advisory committee on program, whose duty it shall be to prepare a program of topics to be discussed in general or sectional meeting at the next annual convention and to secure presentation of appropriate papers and engagement of suitable speakers under the provisions of the constitution and by-laws of the association, said program to be submitted to the executive committee for approval and distribution at least ninety days in advance of the annual meeting." The following were appointed members of this committee: E. A. Bryan, W. H. Jordan, H. W. Tyler, C. E. Thorne, and H. T. Fernald.

The committee on graduate study at Washington reported that no progress had been made in securing a bureau in Washington for the administration of graduate work since the last convention. The committee was directed to exhaust every effort to devise a plan whereby graduate study and research in the several departments of the Government may be efficiently organized and directed under Government control, and in the meantime to secure, if practicable, the same opportunities for study and research in other departments of the Government as are at present afforded graduate students in the Department of Agriculture. A resolution was also adopted by the association recording its appreciation of the action of the Government in making available the facilities for research and advanced work in the Department of Agriculture, and expressing a desire that these facilities be still further extended and that a national university devoted exclusively to advanced and graduate research be established.

A sixth report of progress was submitted by the committee on methods of teaching agriculture. Syllabi of courses in agrotechny, rural engineering, and rural economics, completing the outline of the college course in agriculture, were completed by the committee since the New Haven convention and published in the proceedings of that convention and also as Circular No. 45 of this Office. In surveying the progress of agricultural education in this country during recent years, the committee "found abundant evidence that the attitude of this association and the work of this committee as its representative have already borne good fruit in stimulating and aiding the movement for the specialization of agricultural instruction in our colleges, the strengthening of the agricultural faculties, and the bettering of the material equipment for agricultural education." The collation of information regarding courses in agronomy in our agricultural colleges and the facilities for instruction in this subject was undertaken by the committee during the year, and considerable progress was made. The nature of the work was explained and some of the material already accumulated was exhibited.

The committee on cooperative work between the stations and the Department of Agriculture made the following recommendations as supplementary to those embodied in the report submitted at the last convention: "(1) When cooperation is desired by the station, it is deemed advisable that the proposal for such cooperation be made to the Department by the director of the experiment station; where, on the other hand, the Department desires the cooperation of the station, it is deemed advisable that the proposal be made in the first instance to the director rather than to members of the staff. (2) While it is well understood that no financial obligations can be undertaken beyond the end of the fiscal year, yet it should be recognized that any arrangement for joint experimentation which requires some years to complete creates a moral obligation upon both parties to carry the work to conclusion. (3) Where a line of investigation has been in progress in any State under the auspices of either institution, it is, as a rule, unwise for the other party to undertake independently the same line of investigation, at least until after full consultation upon the subject." The committee was continued, with the addition of B. T. Galloway from the Department of Agriculture.

The report of the committee on indexing agricultural literature was submitted by the chairman, A. C. True. Attention was called to the fact that the Library of the Department of Agriculture would be able to do this work if an appropriation of not less than $2,500 could be secured for the purpose. A resolution was later adopted by the association urging such an appropriation. A paper on Agricultural college libraries, prepared and presented by Miss Josephine A. Clark, Librarian of the Department of Agriculture and a member of this committee, completed the report. This paper emphasized the great importance of libraries as aids to work of investigation and instruction, and pointed out the necessity of systematic arrangement and complete cataloguing of agricultural college libraries. Arrangements in progress by the Library of the Department for assisting agricultural colleges in classifying and cataloguing their libraries were explained. Of six libraries recently visited by the speaker, only two were considered well organized and administered. The functions of a library and a librarian were discussed. The paper also reviewed the work done in indexing agricultural literature during the past year.

The report of the section on horticulture and botany, by L. R. Jones, summarized rather fully the more important tendencies and results along these lines during the year. In the discussion of college work, facilities for instruction, courses of study, etc., were considered. The marked strengthening of advanced courses was noted. The demand for specially qualified men in horticulture was stated to exceed the supply. In the discussion of station work, progress in bacteriological and physiological investigations and in the selection and breeding of plants was reviewed. The relation of college to station work was discussed at some length.

M. V. Slingerland submitted the report of the section on entomology. The review of progress in this science during the year as presented touched upon the work of the colleges and stations as regards instruction, investigation, inspection, institute work, and correspondence. A plea was made for the continuance of the section, and its previous meetings were reviewed. Failure to publish a full account of the section meetings was thought to have been a drawback to the success of the section.

The report of the section on mechanic arts was presented by the chairman, H. W. Tyler. This reviewed at some length the progress of work in mechanic arts during the year. Data were given concerning the courses and attendance in the department of mechanic arts in the several colleges. A proposed outline for the work of the section, especially as regards the character of the papers to be presented at the conventions, was presented and discussed. This had been the subject of considerable correspondence during the year, the results of which were given in condensed form.

No reports were presented from the sections on agriculture and chemistry and on college work.

The general plan of the graduate summer school of agriculture as proposed by the Ohio State University at the last convention, and approved by the executive committee, was explained and discussed by W. O. Thompson and A. C. True. It was stated that sufficient encouragement had been received from the leaders of agricultural education and research to warrant a decision to hold the first session of the school at the Ohio State University at Columbus, Ohio, during the summer of 1902. It was announced that Secretary Wilson had cordially approved the plan for this school, and that acting under his advice, Dr. A. C. True, Director of this Office, had consented to act as dean of the school. The Ohio State University makes itself responsible for the general management of the first session of the school, but if it proves a success it is proposed to make it a cooperative enterprise, to be managed by a committee of control appointed by the association. The execution of the plan after the session of 1902 was referred to the executive committee.

The desirability of a collective college and station exhibit at the St. Louis Exposition in 1903, and plans for its preparation and care were considered at some length by the association. A committee, composed of W. H. Jordan, A. C. True, H. J. Waters, W. M. Hays, and C. F. Curtiss, was appointed to confer with the Secretary of Agriculture with a view to securing the assistance of the Department, and to prepare, if considered feasible, an exhibit setting forth the progress of education and research in agriculture in the institutions represented in the association. A similar committee, composed of W. E. Stone, J. K. Patterson, and J. H. Washburn, was appointed to consider the advisability and the preparation of an exhibit setting forth the progress of education and investigation in mechanic arts in the land-grant colleges.

The committee on animal and plant breeding submitted a report of progress. A tentative plan for securing cooperation in the study of different features of this work was adopted by the committee. C. F. Curtiss and H. J. Webber were appointed members of the committee in place of A. A. Brigham and H. P. Armsby.

The report of the committee on pure-food legislation, recommending the enactment of a national pure-food law, was submitted by the chairman, W. A. Withers.

The report of the committee on uniform fertilizer laws was presented by the chairman, H. J. Wheeler, and the subject briefly discussed.

The association was briefly addressed by Philippe de Vilmorin, of the seed firm of Vilmorin-Andrieux & Co., of Paris, who paid a high compliment to the activity of the American stations and especially the extensive publication and distribution of the results of their work.

Resolutions of respect to President George T. Fairchild and Dr. John A. Myers, who died during the past year, were unanimously adopted.

A report of a committee of the section of agriculture and chemistry on nomenclature of terms relating to nutrition was read, and on the recommendation of that section was adopted by the association.

A resolution, introduced by W. A. Henry, was adopted by the association, urging upon Congress "the necessity and wisdom of providing a building for the accommodation of the Department of Agriculture, which in magnitude shall be sufficient to provide for its future as well as its present needs, and which shall properly represent in its architecture the enormous importance of agriculture in this country, and which shall constitute a worthy addition to the Government buildings in this the capital of the United States."

A resolution was adopted urging upon the authorities concerned the fostering of the beet-sugar industry as far as consistent with public policy.

The dues for the ensuing year were increased to $15 for each institution represented in the association. Invitations were presented for the association to meet in Ohio, New York, and Illinois.

The following officers were elected for the ensuing year:

President, W. M. Liggett of Minnesota; vice-presidents, W. O. Thompson of Ohio, H. J. Waters of Missouri, J. H. Washburn of Rhode Island, J. H. Worst of North Dakota, and J. C. Hardy of Mississippi; secretary and treasurer, E. B. Voorhees of New Jersey; bibliographer, A. C. True of Washington, D. C.; executive committee, H. H. Goodell of Massachusetts, G. W. Atherton of Pennsylvania, Alexis Cope of Ohio, and H. C. White of Georgia.

Section on college work.—Chairman, J. L. Snyder of Michigan; secretary, W. E. Stone of Indiana.

Section on agriculture and chemistry.—Chairman, H. J. Waters of Missouri; secretary, C. G. Hopkins of Illinois.

Section on horticulture and botany.—Chairman, J. Craig of New York; secretary, A. Nelson of Wyoming.

Section on entomology.—Chairman, F. M. Webster, of Ohio; secretary, H. E. Summers, of Iowa.

Section on mechanic arts.—Chairman H. W. Tyler, of Massachusetts; secretary, F. P. Anderson, of Kentucky.

MEETINGS OF SECTIONS.

SECTION ON AGRICULTURE AND CHEMISTRY.

A prominent feature of the proceedings of this section was the discussion of the question as to the extent to which the Department of Agriculture and the experiment stations may profitably cooperate and what lines of work are likely to yield the most important results. The discussion was introduced by a paper by B. T. Galloway, of this Department, who outlined the cooperative forage plant work which is now in progress. He believed the success of the undertaking depended upon grouping the stations with reference to the problems to be solved in different sections of the country, and devising a working plan for each group, with one of the stations as a central agency, for the distribution of seeds and other assistance. As examples of what might be done in this direction he cited the range improvement work in the Southwest in cooperation with the Arizona Station, and the grass and forage plant investigations in the Northwest, with the Minnesota Station as a central agency. The following lines of work were suggested: (1) The introduction of crops from foreign countries, (2) the growth and dissemination of introduced crops after they have become in a measure established, (3) the dissemination of native crops of local value, (4) breeding crops for certain conditions, and (5) increasing production by improved culture methods.

R. H. Forbes described the grass and forage crop conditions of Arizona, and dwelt upon the ways and means of solving existing problems. For the improvement of the worn-out range the exclusion of grazing in connection with sowing and harrowing in seeds of native plants, the construction of small embankments for holding storm water, and the introduction of desert forage plants were recommended. Range reclamation conducted by the Arizona Station for two years along the lines mentioned, on a reserve of 350 acres, has given promising results. *Lippia repens*, an Egyptian lawn plant, was reported as having made a very good growth during the dry summer.

F. Lamson-Scribner, of this Department, described the arrangement and plans of cooperative work with the stations, the method of keeping records, and the work done by voluntary experimenters.

In a paper on Quantitative studies in the transmission of parental characteristics in hybrid offspring, W. J. Spillman presented the results obtained in breeding wheat with a view to originating a non-shattering winter variety for the Palouse country of Washington, the range of variation as observed in the first and second generations of hybrid plants being illustrated by specimen heads. The hybrids produced were the progeny of a variety of club wheat (*Triticum compactum*) and a variety of *T. vulgare*. In the first generation the hybrid plants of the same breeding showed little variation, but in the second generation they split up into many types, representing on nearly every plat the characters of the two parents and intermediate combinations. These types were classified into groups and the proportion of the different groups on each plat was presented graphically. W. M. Hays also presented a paper on wheat breeding, discussing the results obtained at the Minnesota Station. In the experience of the author, the distribution of seeds of new varieties on a commercial basis, rather than by sending out small packages, has given the best results.

Following a paper by B. W. Kilgore on the methods for determining the fertilizer requirements of soils, there was a quite general discussion of the subject, which brought out the difficulties in this work and the many factors which tend to vitiate results in practice as well as in field experiments. From this discussion it appeared that the problem of a suitable means or method for this work is far from solved, despite the large amount of investigation which has been directed toward it.

W. A. Withers and G. S. Fraps submitted a paper discussing the nitrification of various fertilizers in the soil and the favorable influence of lime upon this. The importance of the presence of nitrifying organisms was pointed out, and a further study of the question of liming was recommended as a subject worthy of more extended study.

The question of the practicability of irrigation in humid regions, and the crops and circumstances under which it is likely to prove profitable, was discussed by Elwood Mead, E. B. Voorhees, and H. J. Waters. As indicative of the profitableness of irrigation in humid regions, Mr. Mead pointed to the highly successful results obtained in Louisiana and Texas with its use in growing rice, and to other results obtained in the Middle West during the past season. Efficient pumping machinery which may be operated without the attention of skilled labor was mentioned as an important factor in this connection. A great future was predicted for irrigation in the humid sections of the United States. E. B. Voorhees showed from the rainfall record for New Jersey for the past 60 years that in 3 out of every 5 seasons during that period all crops have been more or less injured by drought, while one or more crops, and usually the money crop, was injured every year. Experiments by the New Jersey Stations for the past 5 years have shown a gain every year from the application of water, notably with asparagus and blackberries. Irrigation plants established in New Jersey are paying investments in all cases, and in the majority of instances the equipment paid for itself the first year. H. J. Waters stated that he had found the irrigation of the compact clay soils discouraging at first, owing to the packing of the surface. This was obviated by mulching. Irrigation at the Missouri Station has been found very profitable with nursery stock. F. H. Newell, of the U. S. Geological Survey, submitted a paper on the work of the agricultural census on irrigation, indicating a great increase in the practice of irrigation under a variety of conditions. The irrigation work of the Geological Survey was briefly outlined, and a description given of early irrigation in Massachusetts and irrigation by sewage, as now practiced in the vicinity of Boston.

SECTION ON HORTICULTURE AND BOTANY.

In a paper on College or station work, E. S. Goff called attention to the condition existing in many institutions in which the workers are called upon to devote their attention to both college and station duties, and raised the question as to the advisability of such a combination of duties. He believed it desirable when sufficient men are provided to perform the proper functions of both teaching and investigating without allowing either to suffer. This paper called forth an earnest discussion of the relations of instruction and research in horticulture in the agricultural colleges, developing the general opinion that while a combination of teaching and investigating was often desirable, it would frequently prove more profitable to allow the horticulturist especially qualified for investigation to devote himself largely to that field, provided the conditions of the institution would permit, and by specializing to raise his work to a high order of excellence. A large amount of elementary teaching was generally held to be detrimental to thorough station work.

A paper by B. D. Halsted, on Observations concerning the first and second generations of plants, gave the results of the author's observations in crossing sweet corn, cucumbers, beans, tomatoes, eggplants, and salsify. A pink-colored sweet corn, obtained by crossing a white variety and the Egyptian, proved very unstable in the second generation, many of the ears reverting to the Egyptian type. Cucumber crosses were all exceedingly variable, and with beans no two varieties were obtained which were alike. In crossing tomatoes many of the plants were identical with or very similar to the mother plant, while a few were variable in foliage, habit, shape, and color of fruit. With eggplants some very satisfactory crosses were made. Crossing garden salsify with a wild species of the same genus gave true hybrids, which in the second generation proved very variable in the color of flowers, and showed a strong tendency toward reversion. The paper led to a quite general discussion of the subject of plant breeding, in which the experience and views of a number of speakers were recounted.

A paper by J. Craig, on Cooperation between the farmer and the experiment station, while favoring this line of work, called attention to some of its difficulties and recommended that it be confined to practical lines and that there be personal supervision of the work on the part of the station. The discussion developed the fact that at a number of stations cooperative work with farmers has been found both practicable and profitable, and that it is being undertaken by horticulturists to a considerable extent.

In a paper on the effect of light and heat on the germination of Kentucky blue grass, E. Brown, of this Department, reported a series of experiments covering a variety of conditions. The best results were obtained when the temperature alternated between 20 and 30° C., and light was found to be apparently without effect upon the germination of this seed. The effect of different degrees of moisture appeared to be of little consequence, provided the seeds were kept sufficiently moist for germination. Attention was called to the beneficial effects of alternation of temperature upon a number of varieties of seeds while others require a constant temperature; each particular kind of seeds seems to possess its own optimum temperature for germination. In another paper by the same author on The quality of some commercial samples of grass and clover seed, specimens from the Pan-American Exposition were exhibited illustrating the work of the seed laboratory of this Department.

L. C. Corbett described the Arlington Experimental Farm, conducted by this Department, together with its object and purpose. It is planned to plant extensive collections of varieties of fruit to furnish authentic new specimens for comparative studies, and by planting seed-growers' novelties to avoid duplication of varietal names. Tests of cultural methods for fruits and crops and phenological investigations are to be undertaken. The plan received the hearty approval of the horticulturists, and a number of suggestions were made of lines which it was hoped might be taken up.

J. S. Newman reported some observations on apple-twig blight, F. D. Gardner exhibited specimens of a number of kinds of fruit from Porto Rico, and H. J. Webber showed specimens of cowpeas which are believed to be resistant to the attacks of nematodes. The latter brought out considerable evidence of the possibility of obtaining fruits and grains which are resistant to various diseases and pests.

SECTION ON ENTOMOLOGY.

The convention brought together a rather larger number of entomologists than usual, due perhaps to the meeting of the Official Horticultural Inspectors in Washington at that time.

J. B. Smith gave an account of a year's experience with crude petroleum in New Jersey. This insecticide was used successfully on peach, apple, and pear trees, and all the scales which were touched by it were killed. Crude oil was considered most effective on pear trees, where under favorable conditions the San José scale can be entirely exterminated even in a large orchard. The scale is dying in large numbers on pear trees in the southern part of New Jersey and seems to be rapidly losing its economic importance.

H. T. Fernald discussed a few of the more important insects of Massachusetts; notably the gypsy moth and the brown-tail moth. The gypsy moth was reported from several new localities and in slightly increased abundance, and a colony was discovered during the year near Providence, R. I. The brown-tail moth is found quite abundantly in nurseries, and may become widely distributed from such sources.

In a paper on Notes and suggestions, M. V. Slingerland urged the continuance of the section, called attention to the desirability of greater uniformity in popular names of insects, and gave brief notes on the outbreaks of a number of insects.

A paper by F. A. Sirrine described a folding fumigator, which is perfectly gas tight and hinged in such a manner that it may be folded so as to occupy but little space. Unbleached sheeting of medium weight was used as the cover.

A brief account was given by C. B. Simpson of experiments with the codling moth in Utah, Idaho, Arizona, and Washington. In the Rocky Mountain States broods of this moth were reported as overlapping to such an extent that the determination of their number became a difficult matter. A combination of spraying with Paris green and banding the trees was found effective in reducing the amount of damage.

Other papers presented before this section were as follows: The time of emergence and oviposition of the spring brood of the Hessian fly, by H. Garman; The life history of the sugar-cane borer in Louisiana, by H. A. Morgan; Florida observations and experimental work, by H. A. Gossard; and Apple aphids, by E. D. Sanderson.

A committee, consisting of J. B. Smith, W. E. Britton, and S. A. Forbes, was appointed for the purpose of proposing topics for discussion by the section at the next annual meeting.

SECTION ON COLLEGE WORK.

The two main subjects considered by this section were the relation of the agricultural colleges to the proposed national university, and the value of short courses at the agricultural colleges. A paper on the first subject by W. O. Thompson opposed any official relation between the association and any private corporation, like the Washington Memorial Institution. He believed that "the relation of the agricultural colleges to a national university should be that of sympathetic cooperation and enthusiastic support, as against all other measures whether proposed as substitutes or stepping stones." This paper called forth a lively discussion, in which it appeared that there was a general sentiment in the section in favor of securing some agency under Government control for making the laboratories, museums, libraries, and other educational facilities in Washington available to advanced students. This sentiment was voiced by the convention as a whole in its instructions to the committee on graduate study at Washington, as noted above.

The discussion on the value of short courses was led by W. M. Liggett, who described briefly the longer courses in the college of agriculture and the school of agriculture in Minnesota, and then turned his attention to the farmers' course of 8 weeks for persons of mature age, given last winter for the first time, and to the short dairy course of 4 weeks, both of which he considered valuable adjuncts to the longer courses.

Honorable J. H. Brigham, Assistant Secretary of Agriculture, spoke of the short courses as a means not only of giving valuable instruction to farmers, but also of bringing about more cordial relations between the agricultural colleges and the farmers. In his judgment "the best way to secure the support of farmers is to let them come to the college even for a short time and see that you are trying to do good."

W. A. Henry pointed out the conditions which led to the establishment of the dairy course and the farmers' course in Wisconsin, both of which he described in detail.

The workings and advantages of the short courses in a number of other States were briefly discussed by other speakers.

SECTION ON MECHANIC ARTS.

The sessions of this section were occupied in discussing the future policy of the section as suggested by H. W. Tyler in his reports to the association for the year. The general policy advocated in Dr. Tyler's paper was that of giving more attention to the discussion of one or two broad engineering subjects in the section meetings, rather than encouraging the presentation of papers on isolated independent technical subjects. This plan was indorsed by the section. A decided sentiment in opposition to abolishing the section was manifested.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

A hydrolytic derivative of the globulin edestin and its relation to Weyl's albuminate and the histon group, T. B. Osborne (*Connecticut State Sta. Rpt. 1900, pt. 4, pp. 388–399*).—A continuation of work previously reported (E. S. R., 12, p. 512) on the proteids. The action of water or very dilute solutions of acids converts the globulin edestin into a substance insoluble in saline solutions of moderate concentration. This derivative of edestin is formed by hydrolysis and is the same substance as that designated "albuminate" by Weyl, which is the first product of the hydrolitic changes leading to the formation of so-called acid albumin. This substance the author terms edestan, and it is of the same composition, as determined by analysis, as that of edestin, from which it is formed. Edestan forms salts with hydrochloric acid, possessing an acid reaction; it is insoluble in water, less soluble in potassium hydrate than edestin, and insoluble in all except very strong ammonia solutions. The aqueous solution of edestan chlorid, when concentrated, has an acid reaction, and is precipitated by neutralization, the precipitate being soluble in strong ammonia. It gives a precipitate with nitric acid, which dissolves on warming and reappears on cooling; a precipitate with ovalbumen solutions, with the alkaloidal reagents, and with mercuric chlorid. These reactions agree closely with those given by Kossel as characteristic of histons. With the true histons, however, edestan has little in common.

The basic character of the protein molecule and the reactions of edestin with definite quantities of acids and alkalis, T. B. Osborne (*Connecticut State Sta. Rpt. 1900, pt. 4, pp. 399–441*).—From a large number of experiments the author draws the following conclusions: The proteins are basic bodies, and with acids form true salts. For example, the preparations of native proteins usually obtained from slightly acid or neutral solutions are salts of the basic protein substance. The acid of these salts can be separated from the proteins insoluble in water by neutralizing with potassium or sodium hydrate. The acid may then be identified by filtering, evaporating, and analyzing the alkali salt obtained. Preparations of edestin made in the usual way partake of the nature of the salts from which they are crystallized. Those obtained from sodium chlorid solutions dissolve to a considerable extent in washing, the soluble portion being twice as acid as that undissolved. From the reaction of the insoluble portion edestin must form salts corresponding to a mono- and a bi-chlorid. The crystals of edestin and its different salts are isomorphous, the small amount of combined acid not being able to effect a change in crystalline form.

The action of acids upon edestin is treated at some length. Ten times as much sulphuric acid as of hydrochloric acid is required to dissolve a given quantity of edestin, while the latter dissolves more nearly the calculated quantity than acetic acid. Phosphoric acid reacts with edestin as a mono-basic acid, and nitric acid forms a salt which corresponds to the bi-chlorid. Edestin is dissolved in centinormal potassium, or sodium hydrate solution, in an amount closely proportioned to 1 molecule of the base to 1 of protein. This solution after a time becomes turbid, depositing some of the dissolved protein. Edestin is soluble in a smaller amount of sodium hydrate than of sodium carbonate. It conforms strictly with the definition of a globulin, being insoluble in water, but readily soluble in neutral solution of sodium chlorid of sufficient strength. Edestin mono-chlorid is insoluble in water but soluble in saline solutions, while potassium and sodium edestin are soluble in water and insoluble in dilute solution of neutral salt, though soluble in more concentrated solutions. As edestin and its acid salts are soluble in neutral solution of sodium chlorid, it shows that the solution of globulin does not depend upon an alkali, as stated recently by Starke.

A type of reaction by which sodium carbonate and hydrochloric acid may be formed in the animal organism, T. B. Osborne (*Connecticut State Sta. Rpt. 1900, pt. 4, pp. 441, 442*).—From the examination of the resulting precipitate produced by carbonic acid in a dilute sodium chlorid solution of edestin, the author deems it probable that sodium carbonate and hydrochloric acid may be formed from sodium chlorid in the organism.

Sulphur in protein bodies, T. B. Osborne (*Connecticut State Sta. Rpt. 1900, pt. 4, pp. 443–471*).—The author sought to determine as accurately as possible the total sulphur in a considerable number of different proteids in order to learn if this element forms a definite constituent of these substances, and also whether the fraction of this sulphur converted into sulphid by heating with strong alkalis corresponds to a definite number of the atoms in the formulas calculated. Schulz's method of boiling in a reflex condenser and recovering the sulphur as lead sulphid was followed in obtaining the loosely-bound sulphur. These results were compared with those obtained by treating the proteids under pressure with strong alkalis at various temperatures. The total sulphur was also determined, the method followed being described. The various protein bodies from different sources were analyzed, the results being shown in the following table:

Sulphur content of protein bodies.

	Total sulphur.	Loosely-bound sulphur.
	Per cent.	*Per cent.*
Edestin	0.884	0.346
Excelsin	1.088	.350
Legumin	.385	.166
Vignin	.426	.214
Amandin	.429	.217
Glycinin	.710	.320
Gliadin	1.027	.619
Hordein	.847	.348
Zein	.60	.212
Oxyhæmoglobin from dog's blood	.5618	.335
Ovalbumin	1.616	.491
Ovovitellin	1.028	.362
Casein of cow's milk	.80	.101

From an examination of the figures, of which the above represents averages, it appears that those proteids which can be obtained in crystals, and therefore quite pure, show a uniform proportion of sulphur, and there can be no doubt but that this element is a definite constituent of their molecules. The substances, vicilin, phaseolin, and conglutin gave no constant proportion of sulphur, and average figures are not therefore reported. By using the simplest empirical formulas for a number of proteids the molecular weights are calculated. These are regarded as only approximate, since the methods of analysis precludes great accuracy. Carbon and nitrogen may be determined with sufficient precision, but a slight error in sulphur leads to serious differences in the formulas. A table is shown giving the composition and formula ot a number of vegetable, animal, and compound proteids.

On the proteid reaction of Adamkiewicz, with contributions to the chemistry of glyoxylic acid, F. G. HOPKINS and S. W. COLE (*Proc. Roy. Soc.* [*London*], *68* (*1901*), *No. 442, pp. 21–33*).—Adamkiewicz in 1874 described the now familiar reaction of the production of a violet color when strong sulphuric acid is added to the solution of a proteid in glacial acetic acid. Of late years this reaction has been employed in determining the presence of carbohydrate groups in certain proteid derivatives, though its uncertainty has been several times noted. The authors find from their investigations that the proteid reaction is not a furfurol reaction, but depends upon the presence of small quantities of an impurity in the acetic acid employed, and that this necessary substance is glyoxylic acid. A dilute aqueous solution of glyoxylic acid forms an admiral test for proteids, and may be substituted for the acetic acid of Adamkiewicz' test.

Nitrites in milk, H. W. BETTINK (*Nederl. Tijdschr. Pharm.*, *13* (*1901*), *pp. 67–70; abs. in Chem. Centbl., 1901, I, No. 15, p. 854; Jour. Chem. Soc.* [*London*], *80* (*1901*), *No. 464, II, p. 422*).—The method of Riegler (E. S. R., 9, p. 322) is recommended. To apply this method to milk, 20 cc. is coagulated with 12 drops of strong hydrochloric acid, filtered, and the filtrate examined in the usual way.

The examination of market butter, W. VON KLENZE (*Ztschr. Landw. Versuchsw. Oesterr.*, *4* (*1901*), *No. 2, pp. 77–80*).—In a comparison of methods of determining the Reichert-Meissl number of butter fat, the author obtained slightly higher results by the use of glycerol-soda solution over the use of alcoholic-soda solution in the saponification. As favorable results were obtained by the use of copper as with glass saponification flasks, while the loss from breakage was eliminated.

A simple, practical method for estimating the salt content of butter and at the same time indicating the admixture of margarine, B. ORZECHOWSKI (*Ztschr. Hyg. u. Infectionskrank.*, *37* (*1901*), *pp. 275–277; abs. in Chem. Centbl., 1901, II, No. 3, p. 239*).—The method is carried out by treating the butter fat with a solution of alcohol and ether, and allowing the salt to crystallize out from the solution. One gram of butter is rendered soluble in 3 cc. of a weak alkaline mixture of alcohol and ether in the proportion of 3:7. In testing for the presence of oleomargarine the fat is collected in a glass tube, and if clear is said to be unadulterated.

A study of the saponification number of fats, O. SCHMATOLLA (*Apoth. Ztg.*, *16* (*1901*), *p. 425; abs. in Chem. Centbl., 1901, II, No. 3, pp. 239, 240*).

Estimation of fat in fodders, M. JAHN (*Ztschr. Oeffentl. Chem.*, *8* (*1901*), *pp. 137–140; abs. in Jour. Chem. Soc.* [*London*], *80* (*1901*), *No. 464, II, pp. 431, 432*).—Instead of the usual paper cartridge the author used one made of tin, 70 mm. high and 19 mm. wide, the bottom consisting of brass gauze of 35 meshes to the cm. The gauze is covered inside with a piece of filter paper and a thin layer of cotton wool, upon which the material to be extracted (5 to 10 gm.) is placed and covered with another layer of cotton wool. The ether not being able to escape from the sides must find its way through the mass. With substances containing very little moisture and yielding only a small amount of soluble matter to water or alcohol the previous drying is unnecessary.

The determination of cocoanut oil in cacao butter and in chocolate, J. WAUTERS (*Bul. Assoc. Belge. Chim.*, *15* (*1901*), *No. 3, pp. 131, 132*).—The author states that cocoanut oil is often used to adulterate cacao butter and chocolate, and proposes a method for determining its presence in the articles named. This is accomplished by his method of determining the addition of cocoanut oil to oleomargarine and butter, *i. e.*, by the determination of the soluble and insoluble volatile acids.

The determination of sesame oil in chocolate, G. POSSETTO (*Gior. Farm. Chim.*, *51*, *pp. 241–245; abs. in Chem. Centbl., 1901, II, No. 3, p. 236*).—The determination is made by means of the Baudouin reaction.

Boiled linseed oil; analytical constants, M. Kitt (*Chem. Rev. Fett u. Harz-Ind., 8 (1901), No. 3, pp. 40–42; abs. in Jour. Soc. Chem. Ind., 20 (1901), No. 5, p. 484*).—A table is given in which the alterations in linseed oil on boiling are represented at 6 different stages, from a thin oil to the consistency of India rubber. The changes are represented by the variations in the acid value, saponification value, iodin number, iodin number of fatty acids, acetyl acid value, and acetyl saponification value.

A comparison between the bromin and iodin absorption figures of various oils, H. T. Vulte and Lily Logan (*Jour. Amer. Chem. Soc., 23 (1901), No. 3, pp. 156–159*).—A revision of the bromin and iodin figures of various animal and vegetable oils is offered. Of the 15 oils examined, only 6 were found to be at all capable of forming substitution products.

Kjeldahl method for the determination of sugar, R. Woy (*Ztschr. Oeffentl. Chem., 6 (1900), pp. 514–519; abs. in Jour. Soc. Chem. Ind., 20 (1901), No. 4, p. 395*).—The author indorses the Kjeldahl method with the Jessen-Hansen extension (E. S. R., 11, p. 614) in the estimation of sugar. The different reducing sugars are reduced under similar conditions, thus permitting comparisons by means of the copper values determined. Again, the method employed is so simple as to admit of closely agreeing results by different analysts. A source of great error, however, lies in the absorptive power of the alkali solution for carbon dioxid. The author suggests the working out of similar tables to those of Kjeldahl, but using sodium carbonate instead of caustic soda.

Influence of salts on the rotary power of sugars, J. de Kowalski and P. Tomartschenko (*Arch. Sci. Phys. et Nat. Genève, 11, No. 4, pp. 294–299; abs. in Chem. Centbl. 1901, I, No. 18, p. 984; Jour. Soc. Chem. Ind., 20 (1901), No. 6, p. 623*).—The authors found that the chlorids, bromids, and iodids of sodium, potassium, and ammonium at different concentrations lowered the rotation of cane sugar.

The coefficient 0.85 in the indirect analysis of sugar cane, L. Bonnin (*Bul. Assoc. Chim. Sucr. et Distill., 18 (1901), No. 7, pp. 465–467*).—In a test of 14 varieties of cane the author found that the coefficient for calculation to be exact should range from 0.789 to 0.882 and to average 0.843.

Scheibler's extraction method for the determination of the polarization of beets, A. Herzfeld (*Ztschr. Ver. Deut. Zuckerind. 1901, pp. 334, 335; abs. in Jour. Chem. Soc. [London], 80 (1901), No. 464, II, p. 426*).—A description of the method as carried out in the laboratory of the Verein der deutschen Zucker-Industrie.

Notes on sugar beets, P. F. Trowbridge (*Jour. Amer. Chem. Soc., 23 (1901), No. 4, pp. 216–223*).—The experiments reported were made in Michigan and represent the conditions at the various beet-sugar factories in that State. Tests were made of 2 methods of finding the tare on beets, in practice at Michigan factories, the sample in one case being well brushed with bristle brushes, and in the other washed in a revolving washer. The tare by the method of brushing was 10.14 per cent, while the tare by washing and draining for a few minutes was 10 per cent. Owing to the fact that there has been some controversy between the farmers and the factory managers, tests were made to determine the proper factor for estimating the sugar in the beet from the amount of sugar in the juice. From the analyses made during 2 seasons, the author found that the average factor should be 0.918, the range being from 0.875 to 0.956. He concludes that the average factor lies between 0.91 and 0.92. Attention is called to the necessity of taking similar portions of several beets for the sample.

A comparison was made of the German method of analysis by digesting with hot alcohol, and the French method of digesting with hot water. The percentage of sugar obtained by alcohol digestion averaged 13.41; by water digestion, 13.43; and in no case did the difference exceed the limit of error in ordinary duplicate analysis.

To determine the richest portion of the beet, samples were sliced transversely into 3 portions; the upper portion contained an average of 10.9 per cent sugar; the middle portion, 12.2 per cent, and the lower portion 11.7 per cent. Owing to these variations it is urged that longitudinal sections of fractional portions of several beets should be taken in sampling.

Sugar in swedes. I, Analytical methods, S. H. Collins (*Jour. Soc. Chem. Ind., 20 (1901), No. 6, pp. 536–538, figs. 2*).—The food value of any root crop depends upon the amount of dry matter, and the author states that of this the sugar is the most valuable part. As the sugars in swedes have very different rotary power, polarization is not applicable and they must be determined by reduction. For rapid work the author recommends colorimetric methods, and describes one depending upon measuring colorimetrically the unreduced copper of Fehling's solution. In applying this method to turnips it is necessary to remove other reducing substances and to hydrolyse any cane sugar present. Ten grams of swedes are ground with 100 cc. water and 1 cc. of a concentrated solution of lead acetate. After some hours, 50 cc. of the filtrate is inverted with 0.5 cc. of strong sulphuric acid, digested 20 minutes, cooled rapidly, and an aliquot added to the Fehling solution. The color of the supernatent liquid is judged by a comparison with standard tints.

Table for the determination of the degree Baumé with sirups at different temperatures, H. Nové (*Bul. Assoc. Chim. Sucr. et Distill., 18 (1901), No. 7, pp. 464, 465*).

Detection of artificial sweetening agents, saccharin, in foods (*Ztschr. Ver. Deut. Zuckerind., 1901, No. 541, pp. 95–97; abs. in Jour. Soc. Chem. Ind., 20 (1901), No. 4, pp. 393, 394*).—Three methods of detecting saccharin in foods and beverages, as set forth in a circular issued by the Russian customs authorities.

Estimation of saccharins in foods, H. Defournel (*Jour. Pharm. et Chim., 6. ser., 13 (1901), p. 512; abs. in Chem. Ztg., 25 (1901), No. 48, p. 184*).—In the described method the saccharin is found with ammonia as a salt very soluble in water. After separation the amount of nitrogen is determined and from this the amount of saccharin is estimated.

A generally applicable volumetric method for the determination of aldehydes, M. Ripper (*Monatsh. Chem., 21 (1900), No. 1079; abs. in Analyst, 26 (1901), No. 302, p. 131*).—A method based on the combination of alkaline bisulphites with aldehydes.

The occurrence and the estimation of lactic acid in wines, R. Kunz (*Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), No. 15, pp. 673–683, figs. 3*).—The author finds lactic acid to be a normal constituent of wines, and in some instances present in an amount in excess of other acids. A method of making a quantitative estimation of lactic acid in wines is given, using a specially constructed apparatus which is figured and described.

The estimation of the volatile acids and the chlorids in wines, A. Kleiber (*Schweiz. Wchnschr. Pharm., 39 (1901), pp. 295–300; abs. in Chem. Centbl., 1901, II, No. 3, p. 240*).

Estimation of methyl alcohol in vinegar, Robine (*Rev. Internat. Falsif., 14 (1901), No. 3, pp. 72–75*).

A short method for the determination of thein and its practical application, A. Nestler (*Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), No. 7, pp. 289–295*).—The proposed method is especially applicable in determining the presence of spent leaves in teas. It depends upon the formation of crystals of thein by ground unextracted leaves when heated between two watch glasses over a small Bunsen flame. The formation of crystals is favored by placing a drop of water in the center of the upper watch glass. The crystals may be examined under a microscope, and by the method of Molisch, adding a drop of concentrated hydrochloric acid and a drop of a 3 per cent solution of gold chlorid. Two grams of Souchong boiled in half a liter of water for 2 minutes and dried gave no crystals of thein by this method. The method was also used with satisfactory results in testing coffee grains, both green and roasted, coffee leaves, kola nut, and guarana, and maté leaves.

The synthesis of indigo, J. M. MATTHEWS (*Jour. Soc. Chem. Ind., 20 (1901), No. 6, pp. 551–555*).—The methods for the preparation of artificial indigo and the influence of this manufacture upon the output of the natural product.

The relative leather-forming value of the different tanning materials; their speed of tanning and weight giving, with notes on the quality, J. YOCUM and R. W. GRIFFITH (*Jour. Soc. Chem. Ind., 20 (1901), No. 5, pp. 426–436*).—This article gives the results of a research carried out at Herold's Institute, London, under the direction and support of the Leather Sellers Company. The authors made a series of experiments to determine whether the hide-powder method of tannin analysis can be relied upon for giving the tanning value of an extract, and whether the results so obtained are borne out in practice. The test was carried out as follows: A large excess of tanning liquor of known strength was used with a given weight of hide powder. The leather thus obtained was weighed and the amount of nitrogen present in the leather determined by the Kjeldahl method. The weight of leather which should have been produced was calculated from the weight of the hide powder used; and by analysis the amount of soluble matter absorbed from the liquor was determined. The work covered a period of 2 years and represents many determinations. The results, the authors claim, go to prove that, within the ordinary experimental error, the hide-powder method is an accurate representation of the leather-forming quality of a tanning material. The excess of tannin makes no practical difference in the result except to increase weight, and throughout the work the results are proportionate. A number of tables are submitted showing, among other things, the amount of leather obtained from a definite amount of substance and the percentage gain in weight in leathers made with the various tanning materials.

Among the technical points brought out are the leather-forming and the weight-giving values of the various extracts tested, the color given to the leather, the quality of the product, its imperviousness to water, and its strength.

Report to the International Association of Leather Trade Chemists on results of comparative experiments with Freiberg hide powder, J. PAESSLER (*Ledermarkt, 2 (1901), No. 1; abs. in Jour. Soc. Chem. Ind., 20 (1901), No. 4, p. 395*).—This hide powder, prepared according to Cerych's prescription, was sent out together with samples of oakwood extract, quebracho extract (pasty and solid), and valonia, to 6 chemists. The object sought was to determine whether the results obtained by the same analyst with the different hide powders correspond and whether the mean values obtained by different analysts agree.

Only the non-tannin figures are given, and the results show that the differences between maximum and minimum results of the same analyst are not important. The differences between the results of different analysts with the quebracho extract are not important, but are somewhat greater with oakwood extract and valonia. The differences appear to be due largely to the different ways of packing the filter.

The conclusion is reached that the Freiberg hide powder is very suitable for tannin analysis, and it is recommended that the filter be so packed that the quantity of filtrate required will come through in about 2 hours.

Comparison of the international filter-tube method and the official hide-power method, H. W. WILEY and W. H. KRUG (*Leather Manufacturer, 12, pp. 9–10; abs. in Jour. Amer. Chem. Soc., 23 (1901), No. 6, Rev., p. 107*).—In a comparison of the 2 methods with various tanning extracts it was found that the filter method gave lower non-tannins and correspondingly higher tannins than the official method.

Comparative hide-powder tests, W. H. KRUG (*Leather Manufacturer, 12, pp. 10–11; abs. in Jour. Amer. Chem. Soc., 23 (1901), No. 6, Rev., p. 107*).—Tests were made with acid hide powder and the same neutralized with sodium carbonate. The results show close concordance, but the neutralized powder lost in absorptive power while the filtrate was turbid and contained tannin.

The volumetric determination of zinc, P. H. WALKER (*Jour. Amer. Chem. Soc., 23 (1901), No. 7, pp. 468–470*).—From the application of Stolba's method, modified by Handy, the author obtained fairly good results with zinc in the presence of iron, calcium, and magnesium. Manganese must be previously separated.

Classification of acid and alkali indicators, J. WAGNER (*Ztschr. Anorgan. Chem., 27 (1901), pp. 138–151; abs. in Jour. Chem. Soc. [London], 80 (1901), No. 464, II, pp. 419, 420*).

Miscellaneous analyses, C. H. JONES and B. O. WHITE (*Vermont Sta. Rpt. 1900, pp. 386–390*).—Analyses are reported of 3 samples of nitrate of soda, 1 of dried blood, 1 of cotton-seed meal, 2 of tankage, 1 of ground fish scrap, 1 of ground bone, 8 of acid phosphate, 4 of muriate of potash, 3 of sulphate of potash, 7 of wood ashes, 3 of mixed fertilizers, 3 of muck, 1 of marl, 14 of feeding stuffs, and 2 of oleomargarine.

Exhibit of the Bureau of Chemistry at the Pan-American Exposition, Buffalo, New York, 1901, H. W. WILEY, E. E. EWELL, W. D. BIGELOW, and L. W. PAGE (*U. S. Dept. Agr., Bureau of Chemistry Bul. 63, pp. 29, pls. 4*).—A detailed description of the exhibit of the Bureau of Chemistry relating to pure and adulterated foods, the beet-sugar industry, and the testing of road-making materials.

BOTANY.

The brome grasses of Wyoming, A. NELSON (*Wyoming Sta. Bul. 46, pp. 21, pls. 3, figs. 9*).—A discussion is given of the forage problems of Wyoming and suggestions for the improvement of the ranges. In this State grasses suitable both for pasture and hay are desirable, but there are comparatively few adapted to this double purpose. Among the most valuable are the brome grasses of which quite a number are native to the region covered by the bulletin. Following the discussion of the forage problems, the author figures and describes a number of the more promising species of brome grass.

Agrostological notes, F. LAMSON-SCRIBNER and E. D. MERRILL (*U. S. Dept. Agr., Division of Agrostology Circ. 35, pp. 6*).—Descriptions and critical notes are given on some species of grasses, published in 1866 by Buckley; notes on the genus Calamovilfa; descriptions of 3 new species of Panicum; a new species of Poa; and some changes in nomenclature.

The comparative anatomy of the foliar organs of Acacia, P. LEDOUX (*Compt. Rend. Acad. Sci. Paris, 132 (1901), No. 11, pp. 722–725*).—The author reports having examined the leaves, enlarged petioles, and other foliar organs of a number of species of Acacia, in which he found that the flattened petioles, by their persistence, richness in chlorophyll, and numerous stomata are able to perform the ordinary physiological functions of leaves, and at the same time are better adapted to the intense sunlight of tropical regions. These petioles have a thickened epidermis, an abundant sclerenchyma, and a well-developed water conductive tissue, but the thick epidermis prevents too rapid transpiration and the abundant water-conductive tissue supplies the plant with the greatest amount of water possible.

On the relation between the structure of the sugar-beet root and its sugar content, L. GESCHWIND (*Rev. Gén. Chim. Appl., 3 (1900), No. 12; rev. in Bul. Assoc. Chim. Sucr. et Distill., 18 (1901), No. 10, pp. 785–795, figs. 36*).—The author claims in general that there is a relationship between the development of the woody structure of the root of the sugar beet and its sugar content. Usually a high sugar content is associated with a small development of the woody tissue. This conclusion, however, is subject to a number of exceptions, and the small development of woody tissues does not necessarily imply a high sugar content. The attacks of various fungi upon the roots have been shown to influence the development of the woody axis of the root and also to diminish the sugar content. While not an invariable rule, the occurrence of a poorly developed woody area, as shown by a section of the top of the beet, may be utilized in the selection of beets for propagation and breeding purposes.

On the reserve carbohydrates in Arrhenatherum elatius, V. Harlay (*Compt. Rend. Acad. Sci. Paris, 132 (1901), No. 7, pp. 423–426*).—A study is reported of the reserve carbohydrates found in the enlargements which occur between the lower nodes in the variety *bulbosum* of tall oat grass. The author dried and macerated 200 gm. of these tubercles with a solution of acetate of lead, after which it was filtered, the lead eliminated by oxalic acid, and the filtrate precipitated. The character of the filtrate is described at some length, from which it appears that in its properties it is quite similar if not identical with graminin and phlein. A special study was made of the action of different hydrolyzing agents upon the graminin from the plant under investigation, and it was found that in the presence of saliva and diastase it remained unaltered. The ferments secreted by *Aspergillus niger*, which hydrolyzes inulin, also hydrolyze graminin. This substance is found in considerable abundance in the tubercles of this grass, and is accompanied by reducing sugars. The character of the substance shows that it is undoubtedly of the same nature as levulose.

Investigations on the respiration of olives and the relation between the respiratory quotient and the formation of oil in the fruit, C. Gerber (*Jour. Bot. [Paris], 15 (1901), No. 1, pp. 9–22*).—The author has found that the respiratory quotient of olives increases with the growth of the fruit up to a maximum, which is reached about the time the color begins to rapidly change. This increase is due to the transformation of mannite to oil, which takes place in the fruit. If the fruit remains attached to the tree the leaves continue to elaborate the mannite during the ripening process, and this is transferred to the fruit so that the oil content of the fruit may be in excess of the amount of mannite present in the fruit. As the oil increases the mannite necessarily diminishes, and when the fruit has become a violet or purple color mannite disappears entirely.

The effect of smoke and gas upon vegetation, W. A. Buckhout (*Pennsylvania Dept. Agr. Rpt. 1900, pt. 1, pp. 164–192, pls. 4*).—The author popularly reviews some of the literature on the injurious effect of smoke and gas upon vegetation, particularly the publications of Schroeder and Reuss. He studied the extent of injury to the agricultural and forestry interests of Pennsylvania by pollution of the atmosphere in cokeing and other manufacturing operations, visiting a number of manufacturing centers and noting the condition of vegetation in their immediate vicinity. The injurious effect of the gases, smoke, and soot is shown in the destruction of forests and orchards in the vicinity of these manufacturing establishments. The author collected specimens of leaves in the vicinity of a number of coke ovens and iron furnaces and at chemical works, and determined the amount of sulphuric acid and chlorin in the dry substance, comparisons being made with the same kind of leaves collected in a region far from the injurious effect of such agencies. An analysis of white oak leaves, taken about three-quarters of a mile from a large range of coke ovens, showed 3.6 parts of sulphuric acid per 1,000 of water-free substance, as compared to 1.9 parts in similar leaves taken from the vicinity of the State college. Apple leaves from the vicinity of the same coke ovens gave in 1,000 parts of water-free substance 12.3 parts sulphuric acid and 2.7 parts chlorin. Leaves taken from the vicinity of large chemical works gave 6.4 parts sulphuric acid and 3.6 per cent chlorin, while leaves collected at the State college gave but 1.7 parts sulphuric acid and but a trace of chlorin. The author gives suggestions as to the prevention of some of this injury. The most practicable means are believed to be the erection of tall smoke stacks or chimneys in order to secure the most effectual aid in rapid dilution of the gases; or, if possible, the location of such works in large open plains, instead of in ravines or valleys, as is usually the case.

Action of carbon bisulphid on the growth of trees, E. Henry (*Bul. Soc. Sci. Nancy, 3. ser., 2 (1901), No. 1, pp. 27–33*).—The stimulating action of carbon bisulphid upon the growth of various plants and the results of experiments in which soil about locust trees was injected with carbon bisulphid at the rate of 400 cc. per square meter are shown. The effect of the treatment was soon apparent, and at the end of 2 years the difference in 2 lots was very evident, the treated lot weighing nearly 3 times as much as those not treated.

The factors which influence the size, number, location, and action of the root tubercles of leguminous plants, L. Hiltner (*Arb. K. Gesundheitsamte, Biol. Abt., 1 (1900), No. 2, pp. 177–222, pl. 1; abs. in Mitt. Deut. Landw. Gesell., 15 (1900), No. 45, pp. 268–270; Bot. Centbl., 85 (1901), No. 6, pp. 179–183; Centbl. Bakt. u. Par., 2. Abt., 7 (1901), No. 5–6, pp. 202–204*).—A critical review is given of the literature relating to the subject of the occurrence and function of bacteria in the root tubercles of leguminous plants, and extensive experiments are reported in which the author investigated the effect of various factors on tubercle development. It is claimed that the quantity of inoculation material does not exercise an appreciable effect upon the number, size, or activity of the tubercles. The proportion between the total development of tubercles and the development of aerial parts of plants is about constant when the other factors, aside from the inoculation material, are the same. This statement applies only where bacteria of similar virulence are employed. When races of root tubercle bacilli of low virulence are compared with more active ones, the greater activity is always with those of the higher degree of virulence. This, according to the author, determines the size, number, location, and action of the root tubercles upon leguminous plants. Active tubercles upon the roots produce in a plant a sort of immunity against other bacteria of equal or lower virulence, and such plants can be stimulated to greater tubercle development only by the use of more powerful inoculation material.

The character of the soil, as influencing tubercle development, is discussed and the dependence between poor soil and abundant tubercle development is again pointed out. Where an abundance of available nitrogen is present, extensive root tubercle development is not to be expected. The effect of moisture in the air and soil, as factors in the distribution and development of root tubercles, is also discussed.

Physiological studies with reference to the germination of certain fungus spores, B. M. Duggar (*Bot. Gaz., 31 (1901), No. 1, pp. 38–66*).—A report is given of investigations to ascertain the influence of certain special factors on germination. Most of the experiments were made with hanging drop-cultures, and comparisons made with spores grown in a standard nutrient solution. The percentage of germination of the spores of about 20 species of fungi is given. The effect of certain stimuli on the germination of spores was investigated, spores of *Aspergillus flavus*, *Sterigmatocystis nigra*, and Phycomyces being treated with various carbon compounds, metallic salts, and mineral acids. In many instances a decided stimulus was given the germination, while in others the stimulus, if any was produced, was slight. The influence of evaporation, surface tension, and other physical agents on spores was investigated, as well as the inhibiting action of various nutrient solutions. The resting stages and drying of spores was a subject of investigation, in which it was determined that the spores of certain fungi have an apparent resting stage, the germination of some increasing considerably from summer to autumn. Spores of some fungi kept dry in the laboratory for 5 years gave no germination, while material 1 and 2 years old germinated readily in nutrient media. The effect of dilution of food materials on germination was examined, and it was found that a tenfold dilution of ordinary culture media would still afford perfect germination. Dilutions below 1,000 times gave no germination except with very sensitive fungi. The spores of Aspergillus and Botrytis were germinated and dried in filter paper, and after drying for some time attempts were made to produce further growth. With Botrytis no further growth could be secured from spores after drying for 24 hours, while with Aspergillus spores grew readily after drying for 20 days, and after 65 days a new growth was produced in about half of the cultures.

The significance of mycorrhiza, E. Stahl (*Jahrb. Wiss. Bot.* [*Pringsheim*], *34* (*1900*), *No. 4, pp. 539–668, figs. 2; Ann. Agron., 27* (*1901*), *No. 3, pp. 113–135*).—The author has made a comparative biological study of the occurrence, distribution, and function of mycorrhiza, reviewing and extending the investigations of Frank, Schlicht, Janse, and others. Schlicht reported the occurrence of mycorrhiza on the roots of 70 out of 105 species of North German plants examined, and Janse states that 69 out of 75 species of plants examined in Java bore mycorrhiza upon their roots. The investigation of the author has greatly extended the knowledge as to the number of plants living in symbiosis with fungi upon their roots. He examined species belonging to nearly every group of the higher plants, as well as vascular cryptogams, and found that symbiosis is of wide occurrence in nearly all groups of the higher plants, except upon those whose roots are submerged or floating, and certain species of Cruciferæ, Cyperaceæ, and Polypodiaceæ. Upon many plants there seems to be a sort of facultative symbiosis, while in others it is obligate. In the course of his observations, tuberous and bulbous plants were examined, and some of those which contained much reserve material in their bulbs were found to live symbiotically under certain conditions.

There appears to be an intimate connection between the substratum in which plants are grown and the presence of fungi upon their roots. In soil poor in mineral matter and rich in humus the conditions are most favorable for the development of the mycorrhiza. If the nature of the soil be so modified that the plant can secure its necessary nutrition directly, the mycorrhiza tends to disappear. The author has adopted the term mycotrophic for plants which bear mycorrhiza, and autotrophic for those capable of directly drawing their substance from the soil. It is claimed that the presence or absence of mycorrhiza may be determined by morphological and physiological characters. The occurrence of a well-developed root system, active transpiration, accompanied by the excretion of much water, and the presence in the leaves of an abundance of starch, oxalate of lime, and nitrates, characterize an autotrophic plant. Those bearing mycorrhiza have reduced transpiration, the carbohydrates in their leaves are in soluble form, and the circulation of the plants is less active. Mycorrhizas convey organic compounds almost entirely to their host plants, as is shown by the lower ash content of such plants. As has been already stated, the symbiosis is more or less facultative with many plants, although obligate with others, and the difficulty attending the cultivation of mycotrophic plants is in inverse proportion to the degree of dependence on the mycorrhiza.

ZOOLOGY.

The relation of sparrows to agriculture, S. D. Judd (*U. S. Dept. Agr., Division of Biological Survey Bul. 15, pp. 98, pls. 4, figs. 19*).—In this bulletin the author reports the results of observations on the feeding habits of the various sparrows found in the United States. As a result of this study the conclusion is reached that sparrows as a class are of greater value to agriculturists than any other group of birds whose habits have thus far been investigated by the Department. They were studied by means of field observations, experiments with captive birds, examination of the stomach contents, and a combination of field work with stomach examination. A detailed description is given of the methods of examination of birds' stomachs in the laboratory and the method of making observations on feeding habits in the field.

The stomach contents of 4,273 sparrows killed in various parts of the country during different months of the year were examined. It was found that mineral matter constituted from $\frac{1}{10}$ to $\frac{1}{4}$ of the total stomach contents. From 25 to 35 per cent of the diet for the whole year consisted of animal matter, chiefly insects, the latter constituting from 10 to 20 per cent of the year's food. The insects eaten included grasshoppers, beetles, and caterpillars, as well as the representatives of various other groups. The main food of sparrows consists of seeds of grasses and weeds. The noneconomic portion of food eaten by sparrows was found to be chiefly insects, spiders, snails, and wild fruit. Sparrows cause some damage to agriculture by destroying useful insects and cultivated crops, such as grain and fruits. Grain and cultivated fruits, however, form no significant part of the food of sparrows, except in case of the English sparrow. Of 19 species of native sparrows only 2 were found to have eaten grain. The sparrows, including the English sparrow, are useful destroyers of weed seeds. As a rule, the weed seeds are cracked or otherwise injured, so that they can not germinate when vented from the body. The principal weed seeds which are fed upon by sparrows are those of ragweed, pigeon grass, smartweed, purslane, crab grass, lamb's quarters, chickweed, and amaranth. This work is done chiefly in the fall and winter and early spring. During this time the seeds of various weeds constitute about three-fourths of the food of 20 species of native sparrows. It is estimated that the native sparrows may destroy 90 per cent of the seeds of pigeon grass and ragweed within 2 months. The benefits derived from the feeding habits of sparrows are believed to be from 5 to 10 times as great as the injuries produced.

Notes are given on the individual habits of different species of sparrows. These observations were carried on especially at a farm near the base of one of the White Mountains; at Marshall Hall, Md.; and in the District of Columbia. In order to determine the possible agency of sparrows in distributing weed seeds, examinations were made which disclosed the fact that comparatively few seeds pass through the alimentary tract without being destroyed.

In the spring of 1898 feeding experiments were made with a song sparrow, a junco, and a white-throated sparrow, in captivity. It was found that these birds were readily induced to eat various beetles and bugs which were provided with volatile irritating fluids for protection. In the winter of 1900, 7 English sparrows in captivity were fed upon the seeds of different weeds, for the purpose of determining how thoroughly these seeds were destroyed. The seeds of climbing false buckwheat, ragweed, lamb's quarters, and amaranth were entirely destroyed. Two sparrows were fed with 100 seeds of crab grass and gravel was furnished to aid grinding power of the birds' gizzards. All of the seeds were destroyed. In another experiment 500 crab grass seeds were fed to the same sparrows without the addition of gravel. The result of this experiment was the same as that of the preceding one. Of 1,600 seeds of crab grass which had passed through the alimentary tract of the sparrows, not a single one was found to germinate.

A large portion of the bulletin is occupied with a special discussion of the feeding habits of the different sparrows which were studied. In the stomachs of 82 English sparrows, insects constituted 2 per cent and seeds 98 per cent of the food. The grain which had been consumed by the birds formed 74 per cent of the entire food for the year. An examination of the contents of the stomachs of 50 nestlings showed that one-third of their food was also grain. The English sparrow was found to feed less on useful insects than any other bird which appears to have been studied, but the injury to grain from attacks of the English sparrow is considered as more than counterbalancing all the benefits which accrue from its presence in the country.

The birds of North and Middle America, R. RIDGWAY (*Smithsn. Inst., U. S. Nat. Mus. Bul. 50, 1901, pt. 1, pp. XVII + 715, pls. 20*).—A description is given of all species, subspecies, and forms of birds found on the continent of North America from the Arctic districts to the eastern end of the Isthmus of Panama, as well as those which are found in the West Indies, other islands of the Caribbean Sea (except Trinidad and Tobago), and the Galapagos Archipelago. Introduced and naturalized species are included, as well as accidental and casual visitors. The system of classification is that of the most recent authorities. Analytical titles for the identification of groups and species are given, and extensive synonymy is presented in connection with the description of each species, together with complete bibliographical references.

Rabbits and their injuries to young trees, H. GARMAN (*Kentucky Sta. Bul. 93, pp. 111–118, pls. 5*).—Notes are given on the prevalence of the common species of rabbits in the State. In some nurseries it is reported that 25 per cent of the apple trees were destroyed by the rabbits. Where the rabbits are hunted extensively their numbers are kept so reduced that their injury is less noticeable. For preventing the injury by the rabbits to nursery stock and orchards, inclosure of the area with a slat fence is recommended. The slats may be bought for from $4 to $7 per thousand, and may be held in place by wires stretched between the fence posts. Several forms of traps and snares for catching rabbits are described. The use of poisoned bait and smearing trees with blood and other offensive materials are not recommended by the author. Wrapping the trunks of trees with cornstalks, straw, paper, and other material is considered very effective. Notes are given on the habits of *Lepus sylvaticus, L. palustris,* and *L. aquaticus.*

Rabbit control and destruction, A. BRUCE (*Agr. Gaz. New South Wales, 12* (*1901*), *No. 7, pp. 751–769, figs. 6*).—The methods of rabbit destruction discussed by the author include rabbit-proof fencing, poisoning, trapping, fumigation, and destruction of rabbit burrows. The use of woven-wire fences in preventing the attacks of rabbits is considered an effective and cheap method. The poisons which have proven most successful are phosphorus, arsenic, and strychnin. Phophorus may be applied with oats, wheat, or other grain. Arsenic may be used in a dry condition, mixed with grain, chaff, carrots, apples, and other substances; or may be used in solution in which these same substances are soaked. Strychnin may be added to jam or placed in carrots, apples, or twigs of trees. A most effective means of applying strichnin and arsenic in the poisoning of rabbits consists in the use of these poisons in tanks of water where rabbits go to drink. Various chemical devices are described by which the rabbits are enticed to visit the tanks in which the poisoned water is contained. The most effective substance for dealing with rabbits in burrows is bisulphid of carbon.

Vermin destruction (*Jour. Agr. and Ind., South Australia, 4* (*1901*), *No. 12, pp. 976–978*).—Detailed directions and formulas are given for the preparation and distribution of phosphorized oats, wheat, and other substances, chaff and arsenic, grain and arsenic, apples or quinces and strychnin, carrots and strychnin, carrots and arsenic, apples and arsenic, and jam and strychnin. These methods are especially adapted for the destruction of rabbits. It is recommended that the poison be distributed along freshly broken furrows where it is claimed the rabbits are much more apt to eat the poison.

Revision of the skunks of the genus Chincha, A. H. HOWELL (*U. S. Dept. Agr., Division of Biological Survey, North American Fauna No. 20, pp. 62, pls. 8*).—This bulletin discusses the history, distribution, habits, external characters, and nomenclature of the skunks of this genus, including a description of the specimens of which a study was made. The genus Chincha is subdivided into 2 subgenera, Chincha and Leucomitra. The characters of the genus, subgenera, species, and subspecies are given in detail, together with a list of the species and subspecies of the type, localities, and a key for their identification.

Rat plague, A. EDINGTON (*Centbl. Bakt. u. Par., 1. Abt., 29* (*1901*), *No. 25, pp. 889–894, figs. 4*).—The author investigated an outbreak of disease among rats in Kapstadt, where the bubonic plague was prevalent to some extent among human beings.

It was suspected that the plague had affected rats in this vicinity. An examination of rats which had died of the disease disclosed the presence of a large number of bacteria in the blood, liver, and spleen. These organisms, however, differed decidedly from those of the bubonic plague, and inoculation experiments showed that the disease which was destroying rats was not the same as the bubonic plague. These experiments showed that the disease could be transmitted to guinea pigs but not to rabbits.

Morphological and experimental researches on Trypanosoma of rats (T. lewisi), A. LAVERAN and F. MESNIL (*Ann. Inst. Pasteur, 15 (1901), No. 9, pp. 673–714, pls. 2, figs. 17*).—The literature on the subject is reviewed in connection with bibliographical references. The authors discuss the frequence of natural infection by Trypanosoma and the technique of morphological study of this organism in fresh and preserved conditions. A detailed description is given of the minute structure of the organism, including differences in the structure of various individuals and the methods of multiplication. In studying the phenomena of agglutination of Trypanosoma it was found that normal rat serum exercised no agglutinating action. The serum acquired such power after successive inoculations with blood from infected rats. One of the most striking features in connection with the agglomeration of Trypanosoma is the fact that the organisms remain mobile after agglomeration has taken place. The conclusion was drawn from this fact that the paralyzing and agglutinating properties of blood are due to distinct substances. A detailed description is given of the progress of infection of rats and guinea pigs by Trypanosoma, and the symptoms which characterize the various stages of infection. In studying the problem of immunity to infection by Trypanosoma it was found that the destruction of these organisms begins in the case of rats in the body cavity. The white blood corpuscles of immunized rats surround and devour the Trypanosoma.

Natural history of the Queen Charlotte Islands, British Columbia; natural history of the Cook Inlet region, Alaska, W. H. OSGOOD (*U. S. Dept. Agr., Division of Biological Survey, North American Fauna No. 21, pp. 87, pls. 7, fig. 1*).—This report contains an account of the physiography, flora, fauna, and life zones of Queen Charlotte Islands and the Cook Inlet region. A bibliography is given of the literature of these countries, and notes are presented on the birds and mammals which were found during the course of investigations.

Digest of game laws for 1901, T. S. PALMER and H. W. OLDS (*U. S. Dept. Agr., Division of Biological Survey Bul. 16, pp. 152, pls. 8*).—In this bulletin a discussion is given of definitions of game; restrictions as to time of killing game, methods of hunting, purposes for which game may be killed; and shipment of game within a single State or from one State to another. In addition to this general discussion, abstracts are given of federal laws, State laws, Canadian export laws, and provincial laws of Canada regarding the killing and transportation of game. At the end of the report tables are given showing the close seasons for game in the United States and Canada, and especially for game in Maryland, District of Columbia, Virginia, and North Carolina.

WATER—SOILS.

Investigations on the action of various calcium and magnesium compounds, D. MEYER (*Landw. Jahrb., 30 (1901), No. 4, pp. 619–631, pls. 2; abs. in Chem. Ztg., 25 (1901), No. 74, Repert., p. 266*).—In continuation of previous investigations (E. S. R., 12, p. 1020), the author made a series of experiments in pots of 6,000 gm. capacity containing mixtures of sand and peat ($2\frac{1}{2}$ per cent) and of sand and loess loam (10 per cent). The plants grown were oats, potatoes, horse beans, vetch, and a mixture of equal parts of perennial rye grass (*Lolium perenne*) and alfalfa. Lime was applied in form of gypsum, carbonate, and phosphate, and magnesia as carbonate, in various combinations with each other and with potash (sulphate and phosphate) and nitrogen salts (nitrate of soda and sulphate of ammonia). In case of the oats and of the grass and alfalfa mixture applications of gypsum furnishing more than 1 gm. of lime (CaO) per pot caused a decided reduction of yield. With larger applications the reduction in yield was proportional to the amount of the application. Potatoes were not thus affected by applications of gypsum. In case of this crop the effect of gypsum and of calcium carbonate was the same. The injurious effect of the gypsum was overcome by applying calcium or magnesium carbonate in connection with it. The effect of the gypsum was also reduced to a minimum by admixture of the loam soil with the sand, thus indicating that in general practice where gypsum is used in small amounts on ordinary soils the injurious effect would not be observed. Only when applied in small amounts did the magnesium carbonate increase the yield of the grass-alfalfa mixture. With larger applications of this material there was a reduction in yield. Horse beans and vetches were not thus affected by the larger applications of magnesia. The magnesium carbonate was apparently capable of almost completely replacing lime. The highest yields, however, were obtained when the carbonates of lime and magnesia were used together. It was also observed that even when lime had been applied in excess the magnesia was still capable of producing a considerable increase in yield. This is of great practical importance as indicating that dolomitic marl is of at least equal value with calcareous marl.

The plant food capital of the soils of western Germany, with especial reference to their geological nature, taxable value, and fertilizer requirements, F. Wohltmann (*Das Nährstoff-Kapital west-deutscher Böden, mit besonderer Berücksichtigung ihrer geologischen Natur, ihrer Katasterbonität und ihres Düngebedürfnisses. Bonn: Carl Georgi, 1901, pp. 63, figs. 3. Ber. Inst. Bodenlehre u. Pflanzenbau Landw. Akad. Bonn-Poppelsdorf, 1901, No. 1*).—This is a memorial prepared on the occasion of the dedication of the new institute for soil study and plant culture of the agricultural academy of Bonn-Poppelsdorf during the summer of 1901, and summarizes previous work on soils at this institution, giving in addition a brief description of the building and equipment of the new institute and a list of publications of the author from 1894 to April 1, 1901. A general discussion is given of the geological and mineralogical character of soils, their mechanical composition and physical properties, their chemical composition and plant food capital, their absorptive power with reference to salts and gases, the kind and amount of bacteria present, and the relation of soils to climatic conditions. The methods used in the soil analyses reported are described in detail[1] and the results of mechanical and chemical examinations of 66 samples of typical soils taken to a depth of 1 meter are reported and discussed. In most cases analyses were made of each soil at 4 different depths, 0 to 25 cm., 25 to 50 cm., 50 to 75 cm., and 75 to 100 cm. The results show wide variation in the composition of the same soil at different depths, this variation frequently being greater than that observed between different soils, as is shown in the following table:

Variations in the composition of soils of Western Germany.

	Variations in different soils.	Variations in the same soil at different depths.
	Per cent.	*Per cent.*
Nitrogen	0.055– 0.498	0.007– 0.498
Calcium oxid	Trace–22.067	Trace–35.600
Magnesium oxid	0.019– 0.659	0.011– 8.610
Phosphoric acid	.018– .253	.060– .305
Potash dissolved by treatment with cold acid	.026– .212	.019– .188
Potash dissolved by treatment with hot acid	.056– .504	.056– 1.133

[1] The methods here described are a revision of those given in Jour. Landw., 44 (1896), No. 5, pp. 211–234 (E. S. R., 8, p. 573).

The author claims that chemical soil analysis is of the highest value and may be safely used as a guide in determining whether a soil is so poor that it is entirely dependent upon the application of plant food for the production of crops, or only requires the return of the plant food removed by crops, or is so fertile that it may be cropped for a series of years without requiring any addition of fertilizing material. The following classification of soils, based on chemical composition, is given:

Classification of soils based on chemical composition.

Character of soil.	Constituents in air-dry fine earth (particles less than 2 mm. in diameter).				
	Nitrogen. *a*	Calcium and magnesium oxids. *a*	Phosphoric acid. *a*	Potash. Soluble in cold hydrochloric acid.	Potash. Soluble in hot hydrochloric acid.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Very rich (may be cultivated without return of fertility removed)	Over 0.3	Over 3.0	Over 0.25	Over 0.2	Over 0.5
Rich (requires partial return of phosphoric acid removed by cropping)	0.2 -0.3	1.5 -3.0	0.15-0.25	0.15-0.2	0.4 -0.5
Good (requires return of phosphoric acid removed)	.1 -0.2	.5 -1.5	.10-0.15	.10-0.15	.2 -0.4
Medium (requires return of phosphoric acid and potash removed)	.06-0.1	.25-0.5	.07-0.1	.06-0.1	.12-0.2
Poor (requires general increase in fertility)	.03-0.06	.1 -0.25	.04-0.07	.03-0.06	.08-0.12
Very poor (very much in need of increase in fertility or periodical rest)	.02-0.03	.05-0.10	.02-0.04	.02-0.03	.05-0.08
Of little value for cultivation (best suited for meadows and pastures)	Less than 0.02	Less than 0.05	Less than 0.02	Less than 0.02	0.05

a Soluble in cold hydrochloric acid.

As regards humus content the author classifies soils as follows: With 0 to 2 per cent of humus in the air-dry fine earth, soil is considered slightly deficient or poor in humus; 2 to 3 per cent, of medium humus content; 3 to 5, of good humus content; 5 to 8, well supplied with humus (humous); 8 to 10, very well supplied with humus (very humous); 10 to 15, rich in humus; 15 to 20, very rich in humus, approaching moor soil, and over 20 per cent, moorlike or peaty.

Humus substances as a nitrogenous constituent of the soil, A. Doyarenko (*Izv. Moscow Selsk. Khoz. Inst.* [*Ann. Inst. Agron. Moscou*], *6* (*1900*), *No. 4*, *pp. 440–483*).—The object was to ascertain the way in which humic acids absorb nitrogen, and in what form the latter is retained after absorption. As a preliminary study the chemical nature of the nitrogenous constituents of the humic acids of the soil was investigated. For the latter purpose the humic acids of 7 different soils was extracted with a 10 per cent solution of sodium carbonate. In order to remove the slimy impurities which always accompany the extract the latter was filtered through a porous clay filter. In the pure humic acid the total nitrogen was determined by the Kjeldahl method, the amido-acid nitrogen by Böhmer's method, the amid nitrogen by Schultze's method, and lastly the ammoniacal nitrogen. The analyses gave the following results: Amido-acid nitrogen, 22.01 to 70.27 per cent of the total nitrogen; amid nitrogen, 5.47 to 12.13 per cent of the total nitrogen.

For the study of the absorption of nitrogen by humic acid, 2 series of experiments were made with both artificial and soil humic acid. The humic acid was used either in jelly-like condition or quite dry. The absorption of nitrogen from ammonium carbonate and ammonium sulphate was attempted. The experiments were conducted as follows: Three to 5 gm. of dry humic acid (or an equivalent amount of the gelatinous preparation) was mixed in a flask with 100 cc. of a 10 per cent solution of ammonia salt and allowed to stand for a certain number of days with frequent shaking. One series of flasks of each kind of mixture was examined after 24 hours, another at the end of 7 days, and another after a month. In these examinations the unchanged ammonia salt was first removed and then determinations were made of the total and the amid nitrogen. The author sums up the results of his experiments as follows: (1) Absorption proceeds most energetically when the humic acid is soluble in the ammonia salt used, somewhat less energetically when freshly precipitated humic acid is used in connection with an ammonia salt in which it is not soluble, and least when dry humic acid reacts with an ammonia salt in which it is not soluble. (2) The energy of absorption is expressed solely by the rapidity of the reaction, the amount of absorbed nitrogen being the same in all cases. In the first case the absorption attains its limit in a short time, while in other cases the same limit is reached after a longer period of time. (3) In cases where the humic acid is not soluble in the ammonia salt the concentration of the solution of the latter is of importance, the rapidity of absorption varying with the concentration. (4) The absorbed nitrogen gives rise to the formation of amids almost exclusively. The absorption was approximately 1 to $1\frac{1}{2}$ per cent when soil humic acid was used.—P. FIREMAN.

The nitrifying capacity of normal soils and the loss of nitrates through drainage, A. V. KLUCHAROV (*Izv. Moscow Selsk. Khoz. Inst.* [*Ann. Inst. Agron. Moscou*], *6* (*1900*), *No. 2, pp. 132–166*).—In order to overcome the effect on nitrification of the stirring and aeration of soils, which, in the opinion of the author, has led to too high results in many of the investigations reported on this subject, a study of soils in their natural state was attempted as follows: Thin-walled steel cylinders open at both ends, 11 cm. in diameter and 20 cm. in height, sharpened at the lower end, were carefully pressed into the soil to the top and then withdrawn with the inclosed soil. A zinc funnel was slipped on the lower end of the cylinders and luted to the latter. The percolating water was collected in a separatory funnel. The cylinders with the inclosed soil were lowered into thin-walled iron cylinders, 50 cm. high, sunk in the ground. The steel cylinders were made to fit tightly within the iron ones and precautions were taken to prevent the rain water from getting in between the soil and the walls of the cylinders and between the steel and iron cylinders.

In the experiments reported there were determined (1) the amount of nitrates in a control cylinder of the soil at the beginning, (2) that percolating through the soil during a definite period of the experiment, and (3) the amount in the soil at the end. Observations showed that the temperature, humidity, and porosity of the soil in the cylinders were the same as in the normal soil.

Investigations were made in 1895 with 6 soils: No. 1.—Soil from the experiment field of the Moscow Agricultural Institute, a very rich clay soil which had been frequently manured with large quantities of barnyard manure, upper layer strongly colored by humus substances. No. 4.—Soil from a turf meadow on the Zhabinka River, brown in color, passing not infrequently into red yellow. No. 6.—Soil from the farm of the institute, of the same type as No. 1, but less liberally manured. No. 7.—Soil from a field in the viciniy of the institute, a clayey, light yellow, poor soil which had been little manured and badly cultivated. No. 5.—Soil of the podzol type from the forest of the institute, light gray in color, except a thin layer on the surface, which was somewhat darker in color. No. 9.—A sandy, slightly coherent soil.

The chemical composition and absorptive power of these soils were as follows:

Chemical composition and absorptive power of soils.

Number of soil.	Nitrogen.	Humus.	Absorption capacity.	Loss on ignition.
1	0.186	3.86	45.8	5.47
6	.141	3.05	45.6	5.36
5	.143	3.09	38.6	4.98
7	.121	2.61	a 51.3	4.92
9	.119	2.21	38.7	4.06
4	1.476	29.35	98.9	48.16

a The accuracy of this determination is doubtful.

The experiments were begun on May 15 and concluded on October 17. The whole time of the experiments was divided into 2 periods, (1) from May 15 to August 16, and (2) from August 17 to October 17. On August 16 the soils were removed from cylinders and analyzed, being replaced by new samples. The latter were removed October 17 and analyzed. The drainage water was removed after each rain which resulted in percolation.

The following table gives the results of the experiments in 1895:

Formation and loss of nitrates in bare soils in 1895.

Number of soil.	Amount of water percolated from May 15 to October 17.	N_2O_5 in a liter of drainage water.	N_2O_5 formed in 1 kilogram of soil—From May 15 to Aug. 16.	From Aug. 17 to Oct. 17.	Total.	Ratio of the water percolated to that of the rainfall.
	Cc.	*Mg.*	*Mg.*	*Mg.*	*Mg.*	
1	594.0	232.4	51.21	11.05	62.26	1 : 4.4
4	645.0	86.3	30.39	4.17	34.56	1 : 4.1
5	622.0	42.6	16.31	7.03	23.34	1 : 4.2
6	672.0	78.0	5.02	23.67	28.69	1 : 3.9
7	702.0	103.1	35.77	24.99	60.76	1 : 3.7
9	753.0	69.2	19.93	10.45	30.38	1 : 3.4
Mean	664.6	101.5	26.45	13.56	39.99	1 : 4.1

The above data show that with reference to the energy of nitrification the soils arrange themselves in the order indicated by the chemical and mechanical analysis as indicated above. Soil No. 1, rich in nutritive substances and mellow, gives the largest amount of nitrates, while soil No. 5, the poor podzol, difficultly pervious to water and air, gives the least amount. Soils Nos. 6 and 7 appear to be exceptions. In the opinion of the author, an error was made in the experiments with soils Nos. 6 and 7. Nitrification was more energetic in the first period than in the second, obviously on account of higher general temperature. On an average approximately one-fourth of the rainfall percolated through a layer of soil 20 cm. in thickness.

In 1896 similar experiments were made with 3 of the above-described soils, Nos. 1, 4, and 7. With the last soil 2 experiments were made. One was carried out in the usual way, while in the other the soil was taken from the cylinder in layers, pulverized, mixed, and returned to the cylinder, introducing the layers in the same order as in the normal soil. The object of the last experiment was to study the influence of stirring the soil upon the energy of nitrification.

The results show that (1) the energy of nitrification in 1896 was much greater than in 1895, which was undoubtedly due to a higher temperature prevailing in 1896; (2) as in 1895, the better soils formed larger quantities of nitrates; and (3) soil No. 7, mixed, gave more nitrates than the same soil in normal condition, the increase being 9.8 per cent. On the other hand, the difference in the amount of nitrates washed through was very great, the increase for the mixed soil being 84.5 per cent, the soil losing more nitrates than was formed during the period. As in the previous year, the poorer soil lost a smaller percentage of nitrates than the better soils.

Calculating the results for the 2 years to kilograms per hectare, the following data are obtained:

Nitric nitrogen washed out of one hectare of different soils.

Number of soil.	Nitric nitrogen in drainage water of 1 hectare.	
	1895.	1896.
	Kilograms.	*Kilograms.*
1	45.58	77.31
4	18.39	24.61
5	8.75	....
6	17.31	....
7 (normal)	23.90	12.03
7 (mixed)	....	22.18
9	17.21	....
Mean	21.85	34.03

In 1896 an experiment was also made to compare the nitrifying capacity of the soil No. 1 and its accompanying subsoil. The samples were taken as follows: First, the soil layer was cut out by a cylinder, then the opening was enlarged, and a layer of subsoil was removed by means of another cylinder. Both cylinders were fixed in the ground in the way described above. The experiment was begun at the end of June and finished at the end of October. During that period the nitrate contents in the water percolated through a kilogram of the soil was for the soil 59.95 mg., for the subsoil 9.04 mg.

The author also carried out in 1896 a series of experiments in which various plants were cultivated on the soil. The cylinders used in these experiments were of a wider diameter, viz, 20 cm. One cylinder remained without plants, for control. In 3 others were placed germinated seeds of oats, barley, and black vetch. Of the 15 seeds sown originally in each cylinder only 10, the strongest, were allowed to develop. The experiments were begun June 15 and were discontinued September 25 on account of cold weather, although the oats and barley had only reached the milk stage and the vetches, though of normal size, were still green.

As was to be expected, the control soil allowed the largest quantities of water to percolate (1,402 cc., containing 373.7 mg. of nitric nitrogen per liter). The least amount of water percolated through the soil under oats (467 cc., containing 6.1 mg. of nitric nitrogen per liter), which agrees with the experiments of various investigators (Haberlandt, Hellriegel, Sorauer, etc.), showing oats to be a plant consuming large quantities of water per unit of dry matter as compared with other cereals. Oats also consumed the largest amount of nitrates, then follows barley, under which the percolation was 534 cc. of water, containing 6.2 mg. of nitric nitrogen per liter, and lastly, vetches, under which the percolation was 616 cc., containing 103.2 mg. of nitric nitrogen per liter.

The results indicate that the amount of nitric nitrogen lost by soils covered with plants is inconsiderable.—P. FIREMAN.

The humidity of the soil and denitrification, E. GIUSTINIANI (*Ann. Agron., 27* (*1901*), *No. 6, pp. 262–285, fig. 1*).—An account is here given of 3 series of experiments to test the influence upon nitrification and denitrification of (1) temperature, in a liquid medium; (2) proportion of water, in an artificial solid medium; and (3) humidity in the soil. In the earlier experiments of the first series the medium used for observations on nitrification was made up as follows: Ammonium sulphate 94.5 mg., potassium phosphate 20 mg., calcium carbonate 1 gm., water 100 cc.; that used for the denitrification experiments contained sodium nitrate 121.5 mg., potassium phosphate 20 mg., calcium carbonate 1 gm., starch 1 gm., and water 100 cc. In later experiments the medium used in the study of nitrification consisted of ammonium sulphate 3 gm., potassium chlorid 2 gm., potassium phosphate 2 gm., magnesium sulphate 1 gm., ferrous sulphate 0.8 gm., in 1,000 cc. of water; for the study of denitrification it was the same as that used in the nitrification tests except that 3.86 gm. of sodium nitrate was substituted for the ammonium sulphate. In the culture tests 25 cc. of water was added to 25 cc. of these solutions, 0.5 gm. magnesium carbonate being also added, and in case of the denitrification medium, 2 gm. of organic matter. The temperatures employed in the experiments were 22 to 25° C., 24 to 32°, 35 to 37°, and 40 to 42°. Qualitative tests for ammonia, nitrates, and nitrites were made at frequent intervals during the experiments and quantitative determinations of these substances were made at the end.

The solid medium used was made up as follows: For the study of nitrification dry quartz sand 4 kg., ammonium sulphate 2.5 gm., potassium phosphate 0.2 gm., water 500 cc.; for the study of denitrification the medium was the same except that 3.5 gm. of sodium nitrate was substituted for the ammonium sulphate. These mixtures were brought to dryness on a water bath and 100 gm. of magnesium carbonate added. The sand containing nitrate received in addition 200 gm. of organic matter prepared from dry peat soil. The proportions of water used varied from 0 to 16 per cent.

Nitrification and denitrification were also studied in 2 soils, one rich in carbonaceous matter, the other poor in this substance. In one series of experiments the soils were used without addition of any kind; in the second series ammoniacal nitrogen was applied at the rate of 19.6 mg. per 150 gm. of soil; in the third series nitric nitrogen was added at the rate of 18.15 mg. per 150 gm. of soil. The humidity in the different experiments ranged from 0 to 16 per cent. The experiments were continued from 2 months to 70 days, the gain or loss of nitric nitrogen being determined at their close.

Among the conclusions drawn from these investigations are the following: In a liquid medium the denitrifying organisms act most energetically at a temperature which very perceptibly retards the action of the nitrifying organisms. The rapidity of nitrification of ammonium sulphate in solid media was directly proportional to the quantity of water present. Perceptible denitrification occurred in such media only when the percentage of moisture was small. In similar experiments with soils the results were more decided, especially when the proportion of sodium nitrate was increased. Denitrification took place to a marked extent only when the proportion of humidity was less than 6 per cent, an amount insufficient to promote the activity of the nitrifying organisms. The latter became decidedly active when the humidity rose to 10 per cent. In soils containing a small amount of moisture denitrification is proportional to the amount of organic matter present.

The results thus show that water is an important factor in controlling the action of the oxidizing and reducing organisms in the soil and in transforming and conserving the nitrogen compounds present.

Reclamation of salt marsh lands, T. H. MEANS (*U. S. Dept. Agr., Bureau of Soils Circ. 8, pp. 10*).—This is a report of a preliminary investigation of the character of the soils of the tide marshes around Oyster Bay, Long Island, and of the possibilities of reclaiming them for agricultural purposes. Among means of reclamation the circular briefly discusses the exclusion of the sea water and removal of excess of water by ditching, underdrainage, and pumping; the washing out of the salt; and the adoption of a system of cropping and cultivation adapted to the conditions. Mechanical and chemical analyses of several samples of tide marsh soils from the locality named are given, with a discussion of the agricultural value of such soils. It is stated that—

"Salt marsh lands have long been considered the most fertile and valuable of lands. Practically no reclamation has been attempted in America, and that which has been attempted has in many cases been a failure or has been abandoned. There are well-established methods in use in the reclamation of salt marshes, and if these were used the work should be successful. There has never been a known case of failure to effect complete reclamation, in which all proper precautions were taken. After reclamation the lands are very fertile and should repay the expenditure of reclaiming them. It is generally conceded that 1 acre of reclaimed salt marsh land is worth 4 or 5 acres of upland, and, according to the well-substantiated figures quoted from Shaler earlier in this article, the cost of reclamation should not exceed one-fifth of the final value of the land."

List of soil types established by the Division of Soils in 1899 and 1900, with brief description, M. WHITNEY (*U. S. Dept. Agr., Division of Soils Doc. 40, pp. 11*).—This includes all soil names authorized for use on the soil maps of the Division to December 31, 1900.

FERTILIZERS.

The action of kainit and high-percentage potash salts, M. GERLACH (*Fühling's Landw. Ztg., 50 (1901), Nos. 11, pp. 377–388; 12, pp. 409–416*).—The author reviews the work of other investigators and reports experiments of his own, which show that where the material has to be transported long distances kainit is more expensive than the concentrated salt. The kainit, on account of its large content of soda salts, tends more than the concentrated salt to form a crust on the soil, especially in compact soils, although this tendency may be beneficial in loose soils. The concentrated salt is preferable to kainit on soils rich in soda. Kainit is not well suited for use in connection with nitrate of soda because of the excess of soda which will thus be added to the soil. It is also not suited to plants which are sensitive to chlorids, such as potatoes, sugar beets, etc. Cereals, grasses, forage plants, and leguminous plants, however, are apparently not affected.

It appears from the data reported that the use of soda salts resulted in a saving of potash, *i. e.*, partially replaced it, especially when potash was not present in large amounts. The soda salts also set potash free in the soil, but it is doubted whether this was of benefit to the plant, because it is believed that the solvent power of the roots was greater than that of the weak solution of soda salt present.

On the assimilation of nitrogen and phosphoric acid by different crops (3 cereals and 2 Cruciferæ) in three vegetation periods, K. BIELER and K. ASŌ (*Bul. Col. Agr. Imp. Univ. Tokyo, 4 (1901), No. 4, pp. 241–254*).—Experiments with wheat, barley, oats, rape, and mustard grown in porcelain pots containing 6.4 kg. of soil in a glass house during the winter of 1899 are reported. Phosphoric acid in the form of double superphosphate, potash in the form of potassium carbonate, and nitrogen in the form of ammonium sulphate were each applied at rates of 0.25 gm. per pot, or 50 kg. per hectare, with calcium carbonate at the rate of 1 gm. per kilogram of soil. Analyses were made of the plants with reference to nitrogen and phosphoric acid at periods of $2\frac{1}{2}$ months and 4 months after planting and at the blooming period. The data thus secured are tabulated and discussed in detail. The cereals and the Cruciferæ took up nearly the same amounts of nitrogen during their period of growth. The cereals assimilated less phosphoric acid (as well as total ash) than the other plants. The largest amount of phosphoric acid was taken up by rape, followed by mustard. Of the cereals wheat showed the greatest absorptive capacity for phosphoric acid, oats standing between wheat and barley in this respect. With wheat and oats the assimilation of plant food was distributed throughout the different periods of growth, but with barley it was confined mainly to the earlier stages. The greatest assimilation occurred in case of rape after the earlier stages were passed and continued until the plants bloomed. After that period there was no further assimilation.

Analyses of commercial fertilizers, C. A. GOESSMANN (*Massachusetts Sta. Bul.*

75, pp. 24).—Analyses are reported of 220 samples of fertilizing materials, including wood ashes, lime-kiln ashes, cotton-hull ashes, muriate of potash, nitrate of soda, sulphate of ammonia, cotton-seed meal, castor pomace, tankage, bone, mineral phosphate, acid phosphates, mixed fertilizers, barnyard manure, and muck.

Fertilizer analyses, R. C. KEDZIE and L. H. VAN WORMER (*Michigan Sta. Bul. 192, pp. 175–193*).—This bulletin contains the actual and guaranteed composition of 96 samples of fertilizing materials examined during 1901, with text of the State fertilizer law and notes on valuation, explanation of terms, etc.

Analyses of commercial fertilizers, H. J. WHEELER ET AL. (*Rhode Island Sta. Bul. 79, pp. 12*).—"This bulletin contains analyses [48] of such samples of bone, tankage, and of commercial fertilizers designed for potatoes, or for potatoes and vegetables, as have been collected in Rhode Island during the present year [1901]."

Analyses of commercial fertilizers, J. L. HILLS, C. H. JONES, and B. O. WHITE (*Vermont Sta. Bul. 87, pp. 147–192*).—The results of inspection of 134 brands of fertilizers, the output of 9 companies, are reported, with a discussion of the quantity and quality of plant food furnished by the fertilizers, the selling prices and valuations, and the average composition of the brands examined as compared with that of fertilizers examined during 4 previous years. Six-sevenths of the brands were up to or above guaranty. As a rule the quality of the crude stock used was good. The average selling price approximated $28.75 and the average valuation $19.44. Selling prices have remained unchanged notwithstanding an advance in the price of crude stock. The average composition of the brands was a little higher than that of the previous year.

FIELD CROPS.

Report of the agriculturist, E. R. LLOYD (*Mississippi Sta. Rpt. 1901, pp. 12–17*).—Experiments with cotton, broom corn, Indian corn, sorghum and cowpeas, and wheat are briefly discussed. The grade of cotton grown on thin hill land was improved by the use of barnyard manure and commercial fertilizers, the improvement being most marked in the cotton from the land which had received the barnyard manure. One-half acre of Evergreen broom corn yielded at the rate of 1,600 lbs. of uncleaned heads per acre. Sorghum and cowpeas grown together for hay were sown broadcast and in drills. Notwithstanding the 2 cultivations given the drilled plats, the crop of hay was largest from the plats sown broadcast. When grown in the proportion of ¾ cowpeas and ¼ sorghum they were found ready to cut for hay about the same time. The objection to the mixture is that the peas cure much faster than the sorghum. The yield of shredded corn fodder was about 1 ton per acre. The cost of handling the fodder per ton was 75 cts. and its value, as compared to peavine hay, $5. The waste in feeding shredded corn was 12½ per cent. Twenty-five varieties of wheat, including 17 from foreign countries, and 2 varieties of winter and 1 of spring oats were tested, and the yields are here recorded. Brief notes on each variety are also given.

Systems of cropping with and without fertilization, W. C. LATTA and J. H. SKINNER (*Indiana Sta. Bul. 88, pp. 27–38*).—The experiments here reported, in progress since 1889, were conducted to study the effect of various systems of cropping on the yield and quality of the crop and on the soil. The different systems ot cropping were as follows: Series 1—corn and oats; series 2—corn, oats, and wheat; series 3—wheat, grown continuously; series 5—corn, oats, wheat, and clover; series 6—corn, sugar beets, oats, wheat, grass, and grass; and series 7—corn grown continuously. In connection with the crop rotations, a study was made of light and heavy applications of commercial fertilizers and barnyard manure. The results for 10 years are given in tables and briefly discussed. With the exception of the series in which crops were grown continuously, the effect on the quality of the crops was not marked.

Continuous wheat culture proved detrimental to both yield and quality. In series 1, commercial fertilizers produced a large increase in the yield of wheat, but they did not have much effect on the yield of corn, while barnyard manure was equally beneficial to both crops. All fertilizers produced a good effect on the yield of corn and oats in series 2, but the effect on the yield of wheat was less marked. Barnyard manure gave a larger increase in the yield of corn and wheat than the commercial fertilizers, but for oats the increase was about the same for both methods of fertilization. In continuous wheat growing the effects of commercial fertilizers and barnyard manure were comparatively small. The use of fertilizers in series 5 showed a large increase in the yield of oats and a small increase in the yield of corn. Heavy applications of commercial fertilizers largely increased the yield of wheat straw and of clover, although the clover crop was not fertilized directly. In series 6, where a 6-course rotation was followed, a heavy application of commercial fertilizers produced a marked increase in the yield of sugar beets, clover, and timothy. In general, light applications of barnyard manure gave better results than heavy applications. With the exception of the oat crop the large applications of commercial fertilizers were much more effective in this series than the large applications of barnyard manure. The light applications of both fertilizing materials gave about equal results, in the case of commercial fertilizers the effects being more pronounced on beets, wheat, and timothy, and in the case of barnyard manure on corn, oats, and clover. In continuous corn growing in series 7, the results from both kinds of fertilizers were about the same, and the authors conclude that the smaller applications of commercial fertilizers and barnyard manure were sufficient for the crop under the existing conditions. The cost of the fertilizers used in these experiments is considered, and the financial results of each series and the average gains and losses per acre with corn, oats, and wheat in the several series, are tabulated.

The influence of rolling land on the stand of grain, von Seelhorst (*Jour. Landw., 49* (*1901*), *No. 1, p. 5*).—This article is a report on experiments in rolling grain in the spring. In 1898 oats were rolled May 1, when the plants were about 15 cm. high, and in 1900 a roller was used on a wheat field May 15, when the wheat was 20 cm. high. In both cases top-dressings were applied in connection with the experiments, and in every instance the results were compared with the results of check tests. The author concludes that rolling grain before it has begun to head has a tendency to prevent lodging in 2 ways, namely, by retarding the growth of the crop at that period, due to the decrease in nitrification in the compressed condition of the soil, and by giving the roots a better chance to take hold. The compression of the soil may interfere with the growth of the plants to such an extent that the yield is materially decreased, but it was found that depression in yield due to this cause might be counteracted by a top-dressing of nitrate of soda, which, owing to the compressed condition of the soil, becomes active gradually and does not cause an unfavorable, sudden, and rapid growth.

Harrowing, rolling, and cultivating cereal crops (*Semaine Agr., 21* (*1901*), *No. 1039, p. 117*).

Experiments in the culture of leguminous plants, L. Malpeaux (*Ann. Agron., 27* (*1901*), *No. 2, pp. 65–81*).—The work here reported is a study of the effects of nitrate of soda on the development of leguminous plants grown in pots. It was found that nitrate of soda brought in contact with the seeds, especially in the case of clover and alfalfa, had an injurious effect on germination. On ordinary soils rich in nitrogen the use of nitrate of soda seemed superfluous. Inoculating with soil on which leguminous plants had been grown did not always bring about a better development of the plants. The fact that nodules almost always appear on the roots of leguminous plants when the soil has been inoculated tends to indicate, according to the author's views, the truth of the hypothesis that these bacteria are distributed by the wind and the birds, and that when a species is absent in a soil it is due to conditions preventing its development. The nitric nitrogen appeared to be assimilated directly and caused in this case a total or relative absence of nodules on the roots. The experiments are to be continued under field conditions.

Further researches on the inoculation of soil with Alinit, L. Malpeaux (*Ann. Agron., 27 (1901), No. 4, pp. 191–206*).—Experiments were conducted with oats, corn, and mustard grown on different kinds of soil inoculated with Alinit. The plants in each case were grown in the open soil and in pots. The results confirm the conclusions of previous work in this line, namely, that Alinit is active only in mediums rich in organic matter. The author attributes this influence of Alinit to the active rôle bacteria play in breaking up insoluble nitrogenous substances and rendering them soluble.

A new problem in soil inoculation, J. Stoklasa (*Ztschr. Landw. Versuchsw. Oesterr., 4 (1901), No. 1, pp. 10–29, pls. 9, fig. 1*).—The author reports a series of experiments on the decomposition of bone meal by various soil organisms, laboratory and greenhouse trials having been made with a number of the more common soil bacteria. Plants were grown in pots which received fertilizers, after which they were inoculated with pure cultures of a single species of bacteria. All the pots, except one which was given superphosphate and sodium nitrate, were given bone meal in the same amount. This contained 19.8 per cent phosphoric acid, 5.26 per cent nitrogen, and 1.5 per cent fat. The inoculation material was accompanied by glucose or xylose. The effect of the different inoculation materials upon the growth of oats is shown in the following table:

The effect of soil inoculation on the growth of oats.

Inoculation material.	Fertilizer added.	Yield.		Total.
		Grain.	Straw.	
		Grams.	*Grams.*	*Grams.*
Not inoculated	Bone meal	161.32	213.81	375.13
Do	Superphosphate and sodium nitrate.	213.98	260.13	474.11
B. megatherium	Bone meal	246.79	267.85	514.64
Do	Bone meal and glucose	285.88	306.11	591.99
Do	Bone meal and xylose	320.52	398.04	718.56
B. fluorescens liquifaciens	Bone meal and glucose	165.26	272.26	437.52
B. proteus vulgaris	do	235.26	289.03	524.29
B. butyricus	do	230.79	285.99	516.78
B. mycoides	do	263.66	350.20	613.86
B. mesentericus vulgatus	do	283.21	353.77	636.98

Observations on leguminous plants to determine the correlation of their parts, C. Fruwirth (*Jour. Landw., 48 (1900), No. 4, pp. 305–316*).—Data were collected on the percentage relation (by weight) of the different parts of the plants to the entire plant and to each other of *Vicia faba*, *Pisum sativum*, *Phaseolus vulgaris*, *Lupinus albus*, *L. angustifolius*, *Lens esculenta*, *Lathyrus sativus*, *Ervum ervilia*, *Cicer arietinum*, and *Ornithopus sativus*. The results indicate that a heavy weight of the entire plant is correlative with a high total weight and increased number of seeds and pods together, and of seed alone. The correlation of the heavy weight of the entire plant with a greater height of the plant, a thicker stem, higher weight of pods alone, higher average weight of single seeds, higher weight of straw, and the relatively higher proportion of pods with many seeds was not indicated so generally as in the other cases mentioned. The relation between the weight of the entire plant and the percentage of the weight of the seed and of the pods alone, calculated on the weight of the entire plant, could not be established from the data. The number of seeds increased more with the increase in weight of the entire plant than the average weight of single seeds, and consequently, in general, heavy plants had relatively light seeds. The rate of increase in the weight of straw of heavy plants was less than the rate of increase in the total weight of the seeds.

Seeding down to grass in New South Wales, P. Quirk (*Agr. Gaz. New South Wales, 12 (1901), No. 3, pp. 361–362*).—A popular discussion on the preparation of the land for grass and the kinds of grasses to sow.

Seeding down pastures and meadows, V. Grandjean (*Semaine Agr., 21 (1901), No. 1039, p. 117*).

Nitrogenous fertilizers for meadows, Kuhnert (*Landw. Wchnbl. Schleswig-Holstein, 51 (1901), No. 12, p. 183*).

Experiments in the improvement of pasture and range grasses, J. T. Willard (*Industrialist, 27 (1901), No. 30, pp. 369–372*).—This article is a discussion of experiments with grasses on cultivated land and on native sod injured by excessive pasturing, which were conducted by the Kansas Station in cooperation with the Division of Agrostology of this Department, in the extreme southern part of Kansas.

Agaves in Algeria, Trabut (*Bul. Agr. Algérie et Tunisie, 7 (1901), No. 6, pp 121–130, figs. 7*).—This article discusses the culture of the agave in Algeria, with special reference to *A. univittata.*

Fall seeding of alfalfa, H. M. Cottrell (*Kansas Sta. Bul. 104, pp. 4, pls. 2*).—A brief popular bulletin giving directions for seeding alfalfa in the fall. Notes are given on the preparation of the land, time and method of sowing, and the soils adapted to alfalfa culture.

Alfalfa culture (*Queensland Agr. Jour., 8 (1901), No. 3, pp. 163, 164*).—Popular directions for growing alfalfa.

Increasing the food value and dry matter of forage beets, P. Assarson (*Landw. Wchnbl. Schleswig-Holstein, 51 (1901), No. 14, pp. 210, 211*).—A brief report on the progress made in the improvement of several varieties of fodder beets since 1897. The results for 3 years show an average increase of 1.22 per cent in the dry matter.

Beet culture in Algeria, G. Cureyras (*Bul. Agr. Algérie et Tunisie, 7 (1901), No. 4, pp. 82–87*).—An article on the favorable conditions for beet culture in Algeria where the beet occurs in a wild state.

Chemical study of seed beets, M. Gerbidon (*Ann. Agron., 27 (1901), No. 3, pp. 135–144*).—The results of a chemical investigation on forage beets for the purpose of determining the amounts of plant food these plants remove from the soil, what fertilizing value their residues represent, and whether the roots after the grains have been harvested have any feeding value, are presented in tabular form and discussed at some length.

The chlorin requirement of the buckwheat plant, A. Mayer (*Jour. Landw. 49 (1901), No. 1, pp. 41–60, pl. 1*).

Prussic acid in sweet cassava, P. Carmody (*Trinidad Bot. Dept. Bul. Misc. Inform., 1901, No. 27, pp. 319–323*).—The author's results, although somewhat lower, fully confirm those of his predecessor, Francis, as to the presence of hydrocyanic acid in sweet cassava. Francis found that the so-called sweet or harmless cassava, not only yielded prussic acid, but the quantity obtained from it was nearly equal to that from the bitter, so that no line of distinction could be drawn between them. While the author's analytical results were very similar, he found that in sweet cassava the prussic acid is largely in the skin and outer cortical layer. The hydrocyanic acid content of sweet cassava ranged from 0.005 to 0.019 per cent, and averaged 0.010. The author draws the general conclusions that in sweet cassava the prussic acid is not uniformly distributed throughout the tuber, while in bitter cassava its distribution is uniform, or nearly so; and that this affords an analytical means of distinguishing between sweet and bitter cassava. Attention is called to the methods of preparing cassava for food, and especially to the fact that with local methods cassava is prepared by removing the skin of the sweet kind before cooking, the inner portion alone being eaten. There appears to be no ground for the common belief that the hydrocyanic acid in sweet cassava increases with age, nor that the locally grown sweet cassava of Trinidad is a degenerate growth, resulting from many years' association with the bitter variety.

Studies in clover, G. Martinet (*Ann. Agr. Suisse, 2 (1901), No. 1, pp. 6–19*).—The author reports upon a number of studies made with clover and clover seed at the federal seed control station at Lausanne. Comparative tests were made of clovers grown from seed of different origin, in which seed of Swiss growth was compared with that from other countries. In all, about a dozen samples were grown, covering a period of 3 years. The season of 1900 was very hot and dry, and seriously injured some varieties. In general the varieties of clover developed in the vicinity of the station proved best adapted to growth at that place. Studies were made in the relative weight, production, and value of clover seeds of different color. Considerable variation was noted in the relative weight of different colored seeds, and the author believes it possible to obtain by selection a very vigorous and productive variety of clover which will be fairly constant in the character of its seed.

Experiments on cotton at Ghizeh, G. P. Foaden (*Jour. Khedir. Agr. Soc. and School Agr., 3 (1901), No. 1, pp. 13*).—This is a brief discussion on cotton culture under Egyptian conditions, including a report on experiments with different fertilizers made by the Khedivial Agricultural Society. The general conclusions are that the cotton crop in Egypt is benefited by the judicious use of commercial fertilizers. Suitable manuring increased the proportion of the crop obtained at the first pickings, but the use of nitrate of soda alone rather counteracted this effect. Applications of superphosphate on good soil gave a beneficial result. Kainit and basic slag did not increase the yield as much as superphosphates. On poor soils fertilizers containing no nitrogen were not effective. Nitrate of soda gave much better results on poor than on good land, but the author advises its use always in connection with other fertilizers. Guano increased the yield, but proved an expensive manure. Barnyard manure and poudrette were very effective manures, but heavy applications of barnyard manure have been found detrimental to the quality of the crop. Poudrette applied by hand to the plants after thinning gave better results than any other method of application. On good land wide planting gave greater yield and a higher proportion of the crop at the first picking than close planting.

Eragrostis brownii, A. Morrison (*Jour. Dept. Agr. West. Australia, 3 (1901), No. 3, pp. 206–209, fig. 1*).—This article gives a description and the distribution of this summer forage grass.

Flax culture in Belgium, Kuhnert (*Mitt. Deut. Landw. Gesell., 16 (1901), No. 12, pp. 62–67, figs. 2*).

The Philippine hemp industry (*Hawaiian Planters' Mo., 20 (1901), No. 2, pp. 82–85*).—A brief description of the methods of growing hemp (*Musa textilis*) and its preparation for export.

Sisal hemp and its cultivation (*Jour. Dept. Agr. West. Australia, 3 (1901), No. 2, pp. 112, 113*).—Brief cultural notes.

Manurial experiments upon hops, A. D. Hall (*Jour. Southeast. Agr. Col. Wye, 1901, No. 10, pp. 33–40*).—This is a report on several cooperative experiments in progress from 1 to 6 years. The results show that the typical hop soils are not specially deficient in any one constituent, but require a general manuring. Soils such as clays, sands, and others to which hop culture has been extended, were found deficient in phosphoric acid, others in potash, and some in lime.

The manuring of mangels, J. Leslie (*Agr. Gaz. [London], 53 (1901), No. 1417, p. 116*).—This is a report on fertilizer experiments with mangels, from which the author draws the conclusions that in the absence of barnyard manure a complete commercial fertilizer including common salt and kainit or potash in some other form should be used, and that when barnyard manure is applied it is equally advisable to add common salt, but to omit the kainit.

Oat experiments, C. L. Newman (*Arkansas Sta. Bul. 66, pp. 23*).—This bulletin is a concise presentation of the results of culture, fertilizer, and variety tests with oats. It was found that cowpeas, Spanish peanuts, soy beans, sorghum, corn, Kafir corn, German millet, sweet potatoes, and second crop Irish potatoes gave profitable results when sown after oats had been harvested. Thorough preparation of the soil increased the yield of oats from 50 to 100 per cent as compared with poor preparation. Plowing the soil 8 and 10 in. deep gave better results than plowing 6 in. deep or less. Plowing in the fall and replowing in the spring gave larger returns than a single plowing either in fall or spring. Harrowing and disking after plowing and just before sowing, and covering the seed with a double-shovel cultivator, seemed to be the best method of putting in the crop.

Report on variety tests with oats in 1900, G. Martinet (*Jour. Soc. Agr. Suisse Romande, 42 (1901), No. 1, pp. 3–48, pl. 1*).

Cooperative variety tests with oats in North Germany, Clausen (*Landw. Wchnbl. Schleswig-Holstein, 51 (1901), No. 16, pp. 237–239*).—A report on varieties of oats grown on marsh and sandy soils.

The culture of oats, V. Grandjean (*Semaine Agr., 21 (1901), No. 1027, pp 101, 102*).—This article is a popular discussion on the culture of oats in France.

Harvesting the pea crop (*Farming World, 18 (1901), No. 26, pp. 590–592, figs. 6*).—A popular discussion on harvesting field peas by means of pea harvesters.

Composition of potatoes at various stages of growth, C. H. Jones and B. O. White (*Vermont Sta. Rpt. 1900, pp. 374–382*).—This report describes experiments with potatoes, conducted in 1898 and 1899, to determine the chemical differences which might exist in marketable and small tubers when dug at different stages of growth. The analyses of the different samples are shown in tables. In 1898, 2 varieties, White Star and Delaware, were grown, and in 1899 the Delaware variety only was used. The results showed that quite marked differences in composition existed between the 2 varieties. The variations between samples dug at different dates were not marked. There was a rather gradual gain in protein as the season advanced. The proportion of ash in the marketable tubers remained quite constant throughout the season, but in the small tubers there was a greater tendency to vary. Crude fiber, although present in small amounts, was very variable. The average phosphoric acid content was 0.06 per cent greater in the small than in the large tubers. The yields increased considerably as maturity advanced, showing that the ripening of the tubers affects the yield much more than the composition. In 1899 it was found that in general the percentage of dry matter and nitrogen-free extract decreased, while that of the protein, ash, and crude fiber increased as the tubers approached maturity. These results were in accordance with those of 1898.

New varieties of potatoes, E. Schribaux (*Jour. Agr. Prat., 1901, I, No. 16, pp. 496–500*).—This article describes a number of varieties of potatoes and classifies them as potatoes for the table and for feeding and industrial purposes.

Variety tests with potatoes at Calvörde, conducted by the German Potato Experiment Station, Vibrans (*Braunschweig Landw. Ztg., 69 (1901), No. 14, pp. 63–65*).—A report with tabulated results on tests made in 1900.

Variety tests of potatoes in Hungary, J. Gyárfás (*Fühling's Landw. Ztg., 50 (1901), Nos. 5, pp. 187–191; 7, pp. 247–253*).—A report on a cooperative test, making a special comparison of the variety Professor Maercker with a number of others. In a number of cases Professor Maercker gave the best results and the variety ranked well in every instance.

Exposing seed potatoes to light and air before planting (*Deut. Landw. Presse, 28 (1901), No. 22, p. 185*).—A brief note showing why the practice is to be recommended and giving directions for exposing tubers to obtain the best results.

Sainfoin as a meadow plant (*Semaine Agr., 21 (1901), No. 1038, pp. 110*).

The soy bean (*Orgaan Ver. Oudleer. Rijks Landbouwschool, 13 (1901), No. 153, pp. 77–79*).—This article is a general discussion on the soy bean.

The growth of sugar-beet culture (*Braunschweig Landw. Ztg., 69 (1901), No. 11, pp. 47, 48*).—A brief note on the increase in sugar-beet culture in various countries.

The growth of the sugar beet in England, A. D. Hall (*Jour. Southeast. Agr. Col. Wye, 1901, No. 10, pp. 3–8*).—A discussion of the crop, yield, and cost, and a report of a test with 6 varieties of sugar beets, all of which showed a high percentage of sugar and a high coefficient of purity.

Sugar cane and sugar beets, C. Daniel (*Rev. Agr. Ile Maurice, 15 (1901), No. 2, pp. 35–37*).—A historical note on the manufacture of sugar from sugar cane and sugar beets.

Tobacco culture in Ireland (*Farmers' Gaz., 60 (1901), No. 8, pp. 119, 120*).—A brief report on experimental tobacco growing in Ireland.

Influence of wheat farming upon soil fertility, H. Snyder (*Minnesota Sta. Bul. 70, pp. 247–266*).—The experiments here reported are in continuation of work previously noted (E. S. R., 9, p. 641). This work has now been in progress for 8 years, and has been conducted for the entire period as described in the previous abstract. The chemical composition of the soil, the physical composition of the subsoil, and the yields of the different plats for the years 1893 to 1900, inclusive, are reported in tables, together with the moisture condition of the soil under several systems of cropping on different dates. The results are discussed with special reference to the loss of nitrogen and humus under the several methods of cropping. It was found that the plat on which wheat had been grown continuously for 8 years lost 1,700 lbs. of nitrogen per acre, of which only 300 lbs. was used by the crop, the rest being lost by the decay of organic matter and the liberation of the nitrogen as gaseous or soluble compounds. On this plat there was a loss for the 8 years of over 21 per cent of the total nitrogen of the soil, or an annual loss of 175 lbs. per acre over the quantity used as plant food. Continuous wheat growing also caused an annual loss of over 2,000 lbs. per acre of humus, due to the fermentation and decomposition of organic matter in the soil. On the plat where wheat was grown in rotation with clover and oats, 5 crops of wheat were produced during 8 years. In this case the loss of nitrogen in excess of the quantity used by the crops was reduced to about 450 lbs. and the loss of humus from the soil was very small. Where oats and barley were grown continuously on the same soil the loss of nitrogen was nearly as large as in the case of continuous wheat growing. Corn growing from year to year on the same land caused a loss of nitrogen less than one-half the quantity lost in growing wheat continuously. The total loss of nitrogen from the soil for 8 years on the plat where corn was grown in rotation with clover and oats and barnyard manure was applied was less than 100 lbs. in excess of the quantity utilized by the crops. It is stated that corn introduced into a rotation decreases the loss of nitrogen as compared with wheat. It was found that bare summer fallowing gave rise to a heavier loss of nitrogen from the soil than continuous wheat growing. Summer fallowing also favored the decay of humus.

"The loss of humus changed the physical properties of the soil, causing it to be less retentive of moisture, lighter in color, and heavier in weight per cubic foot. During times of drought the soil from the continuous wheat cultivated plat contained less water than the soil from the plat which produced wheat in rotation with clover. Humus conserves the moisture of the soil, while the rotation of crops, the use of farm manures, and the growing of clover conserves the humus of the soil."

Winter wheat, A. M. Soule and P. O. Vanatter (*Tennessee Sta. Bul., Vol. XIV, No. 2, pp. 35–64, figs. 13*).—These experiments are in continuation of work formerly reported (E. S. R., 12, p. 1035). The best yields of grain among 45 varieties tested in 1901 were made by Blue Ridge, Kansas Mortgage Lifter, and Dawson Golden Chaff, the yields being 40, 36.66, and 36.33 bu. per acre, respectively. In the average yields for this and the preceding year, Fulcaster leads with a yield of 37.08 bu., followed by Improved Fulcaster, Poole, Improved Poole, Niger, Kansas Mortgage Lifter, and Mediterranean, yielding 36.45, 36.01, 35.97, 35.21, 35.10, and 35.05 bu. per acre, respectively. Fulcaster, Poole, Mediterranean, and Harvest King are considered as among the most satisfactory varieties tested. The best milling wheats so far grown are Fulcaster, Niger, Mediterranean, Improved Fulcaster, and Dietz Amber; while White Golden Cross, Early Genesee Giant, and Fultz were the poorest. The average yield of 13 bald varieties was 31.70 and of 26 bearded varieties 28.18 bu. per acre. Rice, Egyptian, and Mediterranean were the only varieties which equaled or surpassed the standard weight per measured bushel. Most of the foreign varieties proved unsatisfactory.

The results in seed selection with Mediterranean and Poole wheat show an average yield for the large grains of 29.4 and 27 bu. and for the small grains of 25.6 and 22.6 bu. per acre, respectively. The experiments in seed selection indicated further that the largest and choicest grains are found in the large heads, and it is concluded that they contain the largest supplies of plant food and should for this reason produce the best plants.

The results of fertilizer experiments with winter wheat after bare fallow show that the cost of the increase per bushel was 19 cts. with 250 lbs. of acid phosphate per acre in 2 applications, 26 cts. with 10 tons of barnyard manure applied in 1900 and 5 tons in 1901, and 32 cts. with an application of 50 bu. of lime in 1900; while accompanied by a crop of cowpeas plowed under, 50 bu. of lime applied in 1900 reduced the cost of increased yield per bushel to 16 cts., 250 lbs. of basic slag to 17 cts., and the same amount of Tennessee and South Carolina acid phosphates to 19 and 20 cts. Where bare fallow was followed for 2 years, the cost of the increase with these phosphates was 42, 39, and 34 cts. per bushel, respectively. The phosphates gave good results in all cases, but the applications of muriate of potash alone, of blood and bone, and of 100 bu. of lime alone were unsatisfactory. The complete ready-mixed fertilizers were unprofitable, and the complete home-mixed fertilizers were not as economical as either phosphates, lime, or barnyard manure. On impoverished soil a home-mixed application of 50 lbs. nitrate of soda, 100 lbs. acid phosphate, and 25 lbs. muriate of potash gave the best results. Cowpeas gave the best returns when pastured off on the land, and the next best when made into hay. Plowing under cowpeas on poor soil is considered as always profitable.

Wheat on thin and impoverished land suffered most from attacks of the Hessian fly. From the results obtained in sowing winter wheat on different dates "it is apparent that the date of seeding wheat determines, to a considerable degree, the amount of injury done by the fly, and it is further evident that if wheat is sown on carefully prepared land of good quality where there is an abundant supply of available food that it will stool out and in a measure make up for the original shoots destroyed by the fly. These shoots, however, will not be so vigorous, nor will they fill so well as those first thrown up."

Spelt is considered as of little utility for Tennessee.

Experiments in wheat culture, L. Foster and W. H. Fairfield (*Wyoming Sta. Bul. 48, pp. 49–69*).—This bulletin reports in tables the results of culture experiments conducted at the station, and of variety tests made at Laramie and the substations at Lander, Sheridan, and Wheatland. The culture experiments—a comparison of intertillage and field culture, begun in 1897—have not been completed, but the results so far as obtained are given. A large proportion of the varieties tested gave satisfactory results. Those recommended as among the best are Velvet Chaff, Scotch Fife, Scotch of Scotch, Saskatchewan Fife, Nox, and Pride of America. The comparison of intertillage during the growing season and of ordinary field culture seems to indicate that under existing conditions intertillage did not sufficiently increase the yield to pay for the additional labor. Results of previously reported experiments relating to wheat growing are reproduced as follows: Quantity of seed per acre (E. S. R., 10, p. 947); subsoiling *vs.* plowing (E. S. R., 11, p. 1026); wheat after alfalfa (E. S. R., 12, p. 427); and profit of wheat growing (E. S. R., 7, p. 578). Several methods of treating seed wheat for the prevention of smut are reported from other sources.

Wheat growing and general agricultural conditions in the Pacific Coast regions of the United States, E. S. Holmes, Jr. (*U. S. Dept. Agr., Division of Statistics Bul. 20, misc. ser., pp. 44, pls. 8, maps 4*).—This bulletin embraces discussions of the economical conditions of the wheat growing sections of the Pacific Coast region, a presentation of considerable statistical data with reference to the region and its wheat industry, and descriptions of the methods of wheat growing and farming generally. The monthly and annual normal mean temperature and rainfall at certain stations throughout these States are shown in tables. Owing to difference in methods of preparing the soil and harvesting the crop the region is divided into 4 sections, namely, California, Oregon, the Big Bend country of Washington, and the Palouse country in Idaho and Washington, and each of these sections is described separately. The tabulated statistical data include the total and agricultural population in 1890 and 1900; farm wages from 1866 to 1899; acreage and production of winter and spring wheat in Oregon and Washington from 1894 to 1900; acreage, production, value, and average yield of wheat per acre in California, Oregon, Washington, and Idaho; and quantity and value of wheat and wheat flour exported from this region from 1868 to 1900 inclusive.

Wheat culture in Australia (*Mitt. Deut. Landw. Gesell., 16 (1901), Sup. to No. 14, pp. 85–88*).—This article reviews the development of wheat culture in Australia, and describes the practices and methods in vogue in connection with the industry.

Experiments on wheat manures, Simons (*Agr. Jour. Cape of Good Hope, 18 (1901), No. 3, pp. 119–124*).—A report on a series of fertilizer experiments on wheat and of analyses of the soil on which the experiments were conducted.

Wheat pasture, A. B. McReynolds (*Oklahoma Sta. Rpt. 1901, pp. 150, 151*).—The value of growing wheat for pasture is briefly noted, and a table compares the analyses of 2 samples of green wheat made at the station with the analyses of several of the most common grasses obtained from other sources. Wheat pasture as a source of winter forage in Oklahoma is discussed.

The silo and silage, J. Withycombe (*Oregon Sta. Bul. 67, pp. 87–110, pls. 4*).—This bulletin discusses primarily the construction of the silo and the method of making silage. A number of analyses of silage made for the purpose of determining its acidity are given in tables. It was found that the liquid constituents of immature clover containing 79.14 per cent of moisture were lost, to a certain extent, by oozing out at the bottom of the silo. A chemical analysis of this exudate showed a protein content of 1.13 per cent. In one experiment water was added to clover silage approximately at the rate of 1 gall. per 100 lbs. of material, to determine its influence on the acidity and the protein content. The loss of dry matter and the degree of acidity were greatest in the moistened silage. It is considered that acidity and loss of dry matter, which occurs in carbohydrates and allied substances, go hand in hand. The application of water did not wash out protein compounds to any appreciable extent. The results further indicated that immaturity of the plants and extreme compactness of the silage favor the development of organic acids.

Shrinkage of farm products, C. D. Smith (*Michigan Sta. Bul. 191, pp. 159–172*).—This bulletin reports some of the observations made at the station and elsewhere on the gains or losses in the weight of stored farm products. The various experiments on this subject made at different experiment stations and the observations in this line by practical men are briefly described. The data and conclusions given in this abstract are taken from the author's summary of the bulletin. It was shown that the fluctuation in the weight of wheat under ordinary conditions does not exceed 6 per cent, but that when taken from a very dry climate to a moist region the gain may amount to 25 per cent. Oats were much less subject to fluctuations. The heaviest loss observed was 3.4 per cent in oats stored from fall until May. In one instance there was a loss of only 7 lbs. in 100 bu. The loss of weight in corn when the entire plant is stored in the silo is quite marked. Four tests showed an average loss of 8.32 per cent. In some instances the loss varied from 14.57 to 20.36 per cent. When the entire corn plant was cured in the field the variations during subsequent storing depended upon the dryness of the air. In one case 4.8 tons of cured fodder which had been cut September 1, weighed 7.5 tons on the 8th of the February following; and in another, 25.5 tons of green corn weighed 5.2 tons after curing on November 11 and 8.5 tons by February 8. Corn husked when very damp and cribbed early in October lost 30 per cent in weight by the middle of February, while dry corn cribbed October 21 lost 11 per cent by the last of January. Other cases on record show a shrinkage of less than 3 per cent by January 1. Losses of 9 and 20 per cent during an entire year are recorded for ear corn which was quite dry when put in the crib. At husking time the cob represents fully one-fourth of the total weight of the ear, but when properly stored until spring the weight of the cob decreases to less than one-fifth of the weight of the ear. The results of experiments made at Houghton Farm showed a loss of about 7.45 per cent in the weight of shelled corn from October to March, while the loss in the cobs was fully 36 per cent. Results on record show that 2 tons of fairly dry and well-stored Hungarian grass seed lost 96 lbs. in weight from November until the following July. Very dry timothy hay put in the mow from the field on June 27 lost only 7 per cent in 6 months. In other instances timothy hay lost 13.8, 15.7, and 21.7 per cent during storage. A case is reported where early and late cut timothy lost in the barn between fall and spring 29 and 21.5 per cent respectively. It is stated that clover, from the time it is mown until it is perfectly cured loses about 60 per cent in weight. Well-cured clover hay lost in one instance 9 per cent and in another only 3.6 per cent by November. In still another instance the loss amounted to 11.2 per cent between July and February. A crop of clover sown in March and cut in August had lost 22.6 per cent in weight by spring. Observations on the shrinkage of cord wood have been previously reported (E. S. R., 10, p. 195).

Grain elevators, N. A. Cobb (*Agr. Gaz. New South Wales, 12 (1901), No. 2, pp. 255–301, figs. 29, pl. 1*).—This is a comprehensive discussion of the elevator and bag systems of handling grain. Special attention is given to the American, European, and Australian elevator systems, and different appliances and apparatus are described and figured.

HORTICULTURE.

Some results obtained in crossbreeding plants, B. D. Halstead (*Proc. New Jersey State Hort. Soc., 26 (1901), pp. 144–150*).—Some results obtained in crossbreeding corn, dwarf Lima beans, tomatoes, eggplants, cucumbers, and salsify are noted. With the Lima beans the cross was made between Henderson and Burpee varieties, the idea being to combine the prolificacy of the former with the large size and good quality of the latter. The Burpee was used as the mother plant in each instance. The crossed plants were remarkably vigorous and productive. Some closely approached the Henderson and others the Burpee. It is believed that by further crossing or inbreeding, profitable new sorts may be secured. A hybrid was also obtained by crossing the ordinary cultivated salsify, having violet-purple flowers, with the wild species, having yellow flowers, which promises to be more resistant to blight and mold than the ordinary salsify.

Composition of artichokes, C. H. Jones and B. O. White (*Vermont Sta. Rpt. 1900, pp. 382–386*).—Improved French white artichokes, a variety of *Helianthus* *tuberosus*, was grown at the station, and the tops and roots analyzed with reference to food and fertilizing constituents, on 20 different dates between August 4 and November 17. These data are tabulated in detail. The average composition of the mature tubers was as follows: Water 79.59 per cent, dry matter 20.41 per cent, crude ash 7.38 per cent, protein 10.41 per cent, crude fiber 3.62 per cent, nitrogen-free extract 78.19 per cent, ether extract 0.4 per cent, phosphoric acid 0.683 per cent, and potash 2.644 per cent. The variations in composition which both the tops and roots undergo at different stages of growth, are discussed in some detail. In summing up the data the author states that the dry matter in artichokes is about the same as in potatoes, protein and nitrogen-free extract being lower, and ash, crude fiber and ether extract higher. The main constituent of the nitrogen-free extract of artichokes is inulin.

Composition of different varieties of cucumbers at different stages of growth, HEINZE (*Landw. Versuchsw. u. Thät. Landw. Vers. Stat. Preussens, 1898, pp. 249, 250*).—Bismarck, Oppelner Lokal, and Cebulla varieties of cucumbers were analyzed when a little more than a finger long, at a little older stage when ready for pickling, and when the cucumbers were ripe for seed. The following average figures were obtained:

Composition of cucumbers.

	About 1 finger long.	Older pickling cucumbers.	Ripe seed cucumbers.
	Per cent.	*Per cent.*	*Per cent.*
Water content	96.63–96.75	95.40–96.04	95.12–95.23
Dry matter	3.25– 3.37	3.96– 4.60	4.77– 4.88
Total sugar	.05– .13	.16– 1.12	.66– .69
Grape sugar		.11– .98	.55– .57
Cane sugar	.05– .13	.03– .14	.11– .12
Nitrogen-free extract	.69– .98	.56– .94	.69– .71
Fat	.08– .10	.08– .10	.22– .27
Fiber	.55– .64	.58– .68	.72– .76
Ash	.32– .34	.38– .53	.40– .43

The classification of American muskmelons, F. W. RANE (*New Hampshire Sta. Tech. Bul. 2, pp. 83–114, figs. 12*).—For the past 8 years the author has been studying the characters and general behavior of muskmelons. As a result of this work he presents an original scheme of classification based simply on the fruits. All muskmelons are grouped into 8 types, according to the size and shape of the fruit. Each type is named after the most widely known and characteristic variety within the type. Beginning with the smaller melons, the types are designated as follows: (1) Jenny Lind, (2) Rockyford, (3) Hackensack, (4) Montreal, (5) Cosmopolitan, (6) Acme-Osage, (7) Long Yellow, and (8) Bay View. After the type is distinguished, the varieties within it are subclassified as to whether shallow ribbed, deep ribbed, or not ribbed; whether netted or not netted; and whether the color of the flesh is green or salmon. With regard to color, whenever the melons had any yellowish tinge whatever they were classified as salmon fleshed, and all other varieties as green-fleshed melons. Illustrations are given of different type melons, including in all 91 varieties. The characteristics of the different types as given by the author may be briefly noted as follows:

(1) *Jenny Lind type.*—Small size (1 to 2 lbs.), flattened at ends and usually larger in diameter than in depth; mostly shallow ribbed, netted, and green fleshed, except Emerald Gem (tending to be smooth and salmon fleshed) and Christiana (salmon fleshed). Varieties included: Captain, No. 88 J. & S., Jersey Belle, Newport, Earliest Ripe, Jenny Lind, Shipper's Delight, and True Jenny Lind.

(2) *Rockyford type.*—Melons of this type closely resemble those of the Jenny Lind type, but all the fruits are oval in shape, 1 to 2 lbs., netted, shallow ribbed, green fleshed, except Paul Rose. This type of melons usually averages 10 or more matured

fruits to the hill when well grown, and is well adapted to either local markets or for shipment. "If anything this type is preferred to that of the Jenny Lind on account of its standing shipment better. The oval shape withstands pressure and handling perhaps better than the more flattened." Varieties included: Golden Gem, Rose Gem, Pineapple, Golden Netted Gem, Bird Cantaloupe, Netted Gem, Oval Netted Gem, Round Netted Gem, Rockyford, Strawberry, and Paul Rose.

(3) *Hackensack type.*—Fruits similar in appearance to the Jenny Lind type, but larger, 3 to 6 lbs., flattened at the ends, usually as broad as deep, or broader. The shallow and deep ribbed, netted and smooth, and yellow and green fleshed varieties are about equally divided in this group. The fruits average less per hill than the smaller varieties, but their increased size balances the weight in yield. Varieties included: Ironclad, Early Nutmeg, Chicago Nutmeg, Missouri, Improved Jenny, Six Oaks Cantaloupe, Satisfaction, Shumway Giant, Irondequoit, Ivy Gem, Kinsman Queen, Hackensack, Market, Long Island Beauty, Extra Early Hackensack, Arlington Nutmeg, Nutmeg, Carmes, Surprise, and Perfection.

(4) *Montreal type.*—Medium size, oval, smooth or nearly so, netted, 3 to 6 lbs. Correspond in appearance to Rockyford type. About equally divided between green and salmon fleshed varieties. Varieties included: Green Fleshed Osage, Montreal Nutmeg, New White Japan, Skillman Fine Netted, Ward Nectar, Giant Chicago Market, Miller Cream Nutmeg, Tip-top, Citron, McCotter Pride, Golden Eagle, and Nectar of Angels.

(5) *Cosmopolitan type.*—Medium size, 3 to 6 lbs., oval, netted, strongly ribbed. About equally divided between green and salmon color of flesh. Varieties included: Cannon Ball, Cosmopolitan, Netted Beauty, Columbus, Superior, Perfected Delmonico, Banquet, Blenheim Orange, Conqueror of Europe, and Buckbee No. 555.

(6) *Acme-Osage type.*—Oblong, medium size, 3 to 6 lbs., mostly shallow ribbed. The Osage, which is a dark melon with salmon flesh, and the Acme, a light skinned, green fleshed variety, are used to designate the varying characters of the fruits of this type. Varieties included: Extra Early Cantaloupe, Champion Market, Casaba, Netted Nutmeg, Anne Arundel, Atlantic City, Acme, Southern Beauty, Princess, Extra Early Grand Rapids, Osage, Delmonico, Queen of All, Honey Drop, Triumph, Lone Star, and New Hybrid.

(7) *Long Yellow type.*—Fruit over 6 lbs., 2 to 3 times as long as broad, includes both netted and ribbed sorts. Varieties included: Banana, Cassabah, Granite State, Long Yellow, and Improved Cantaloupe.

(8) *Bay View type.*—Fruit over 6 lbs., oval to oblong. Varieties included: Bay View, Large Black Paris, Montreal Market, and Large White French.

A wall supplement illustrating the different groups of melons accompanies the bulletins.

Melons under glass, F. Brunton (*Amer. Gard., 22 (1901), No. 343, pp. 505, 506, fig. 1*).—Cultural directions are given for the growing of muskmelons under glass, with suggestions as to suitable varieties.

The cultivation of onions at Antigua, W. N. Sands (*West Indian Bul., 2 (1901), No. 2, pp. 163–166*).—The adaptability of this industry to the island is pointed out. The varieties found to give the best returns are the Red and White Bermuda kinds. The principal method now adopted of growing the onions is to transplant them in land banked for cane, the young canes being planted in the furrows during the time the onions are growing.

Rates of charge for transporting garden truck, with notes on the growth of the industry, E. G. Ward, Jr., and E. S. Holmes, Jr. (*U. S. Dept. Agr., Division of Statistics Bul. 21, misc. ser., pp. 86*).—This report discusses briefly the origin and progress of the garden-truck industry in this country, and the development and present status of the trucking industry in each of the different centers of truck gardening in the country, information being given in each case in regard to the cost of production of different crops and cost of transportation to the different markets, the transportation of fruits and vegetables from southern truck farms to northern markets, the California fruit industry, and the movement of California fruits to interior points and Atlantic seaboard cities. The report also contains a schedule of freight rates and refrigerator charges on perishable products in all important sections of the country.

Report of manager [Missouri Fruit Experiment Station], J. T. STINSON (*Missouri Fruit Sta. Rpt. 1900, pp. 8–15*).—During the first year's operation of this station about 40 acres of land were brought under cultivation, 20 of which were planted in test orchards. Experiments in crossing strawberries have been undertaken, and some spraying experiments on a commercial scale for the control of apple scab and bitter rot carried out in a neighboring orchard. Eighty varieties of apples, 108 peaches, 41 grapes, and 36 strawberries were set out. Apple scab on the varieties Ben Davis and Huntsman was almost entirely prevented by spraying with Bordeaux mixture. Bitter rot was more difficult to control with Bordeaux mixture. In one experiment on Ben Davis sprayed 5 times, 60 per cent of the fruit was free from bitter rot, while on control trees only 1¼ per cent was free from it. In another part of the orchard 78 per cent of the fruit sprayed 4 times was free from rot, while on unsprayed trees all but 14 per cent was affected. The variety Huntsman, which was sprayed 3 times during the season, "gave 83 per cent free from bitter rot and 92 per cent free from apple scab, while on the unsprayed trees but 48 per cent was free from bitter rot and 69 per cent free from apple scab."

Orchard notes, F. GARCIA (*New Mexico Sta. Bul. 39, pp. 99–130, pls. 4*).—Results of observations and experiments are here given on the growth at the station and elsewhere in New Mexico of apricots, cherries, plums, quinces, and figs. The cultural data given include the results of thinning experiments with plums, and experiments in severely pruning back old peach trees that had become bare of fruiting wood at the base and had grown so tall that it was difficult to pick the fruit. The varieties of fruits grown are described, and data as to the blooming and ripening period and comparative yields given. The summarized information on the growth of the fruits in different parts of the Territory obtained by correspondence is also incorporated. The data obtained go to show that "the apricot is of no commercial importance in New Mexico, because it blooms too early to escape the late spring frosts, though the trees are perfectly adapted to the climate."

Of the cherries grown in New Mexico, the sour varieties predominate and seem better adapted to the dry, sunny climate of the Territory than sweet varieties. At the station the sweet varieties blossom late enough in most cases to escape frost injury, but as a rule set little or no fruit. The northern part of the Territory seems best adapted to cherry growing. "In the station orchard, Esel Kirsche (a sweet variety), Early Richmond, Ostheim, and an unknown sour cherry have given the best results."

Both European and native plums succeed at the station and throughout the Territory. The European varieties bloom latest and for the most part are sure bearers. The Damson is the most widely distributed plum in the Territory. Japanese plums have proved almost worthless in New Mexico for commercial purposes, owing to their early blooming habit and the consequent killing of the blossoms by late spring frosts. These varieties may be planted in private orchards where the owner is satisfied with a crop once in 5 or 6 years. The data given in regard to thinning plums show that the percentage of marketable plums is considerably increased by thinning and that the percentage is higher when thinned to 6 in. apart than when thinned to only 3 in. apart.

In cutting back old peach trees, 3 methods of pruning were used: In the first case branches 5 and 6 years old were cut back to stubs 4 to 5 ft. high; in the second, only wood 3 to 4 years old was taken off; and in the third, only 2-year-old wood was removed. "The new shoots on all the trees made a vigorous growth during the season, and on the more closely pruned trees the bearing wood was considerably nearer the ground. The following season, 1900, there were plenty of fruit buds on the new wood, and the fruit was larger and in every respect nicer on the pruned trees than on the unpruned trees of the same variety. No material difference was observed in the fruit of the differently pruned trees, except that in some cases the less severely pruned trees had more fruit, seemingly due to the larger amount of bearing wood. By the end of the second season most of the trees had made a low, dense, and vigorous growth. . . . This experiment shows that the peach tree will stand very severe pruning, and where the tree has been allowed to grow without being 'headed in' this method of pruning may prove very beneficial, and comparatively old trees can be renewed. Such pruning, to produce the best results, should not be put off until the tree is on the rapid decline."

Quinces grow well in the Territory and do best on a light soil. Figs are too tender for successful culture in the climite of the Territory.

The orchard, O. M. Morris (*Oklahoma Sta. Rpt. 1901, pp. 129–146*).—Complete directions for the location, planting, and care of orchards in Oklahoma, including methods of cultivation, pruning, and spraying the trees. Lists are also given of the different varieties of orchard fruits which are most likely to succeed in the Territory.

Fertilizing orchard fruits, Rudorf (*Fühling's Landw. Ztg., 50 (1901), Nos. 4, pp. 169, 170; 5, pp. 194–198; 6, pp. 232–235; 7, pp. 253–259; 8, pp. 288–292*).—The elements required in the fertilization of orchard fruits on different soils and the principles and methods of their application are set forth in this paper.

Variety tests of fruits, O. M. Morris (*Oklahoma Sta. Rpt. 1901, pp. 147, 148*).—A list is given of the varieties of apples, pears, cherries, plums, apricots, and peaches which set fruit at the station in 1901.

Origin and development of the apple blossom, E. S. Goff (*Amer. Gard., 22 (1901), Nos. 332, p. 330; 333, pp. 346, 347*).—The author states that "there is abundant evidence that leaf buds and flower buds are not structurally distinct. Every bud on the apple tree is formed as a leaf bud; and it is also true that every bud on the apple tree has power to become a flower bud." Leaf and flower buds are, in a measure, interchangeable. By proper pruning a flower bud may be converted into a leaf bud, and by ringing a leaf bud may become a flower bud. Flower buds may be 1, 2, or many years old before they form flowers. Factors which tend to the formation of flower buds are any restriction to the movement of prepared food in the branches, such as is caused by ringing or a wrinkling of the bark formed by the union of the fruit spur with the branch which supports it. Dry weather is also conducive to the formation of flower buds, since during such periods evaporation through the leaves is rapid and the sap becomes concentrated and rich in prepared food. Flower buds are then formed in portions of the tree where there may be no restrictions to the movement of the sap, as at the end of young shoots, etc. Whenever the water supply is increased the tendency is to wood growth and the formation of leaf buds. A decrease in water supply tends to make flower buds. A normal growth is accompanied by a normal formation of flowers. When the fruit spurs of healthy trees push into growth or sap sprouts start freely from the old wood, growth is abnormal and fruit production is postponed.

The author's investigations show that as active wood and leaf growth ceases the formation of flower buds begins and may continue until cold weather sets in. Contrary to the writings of some horticulturists, the same fruit spur has been found to fruit annually in some instances, instead of biennially. During very favorable seasons for the formation of flowers all the 1-year, 2-year, and 3-year-old buds, many older buds, and some buds formed during the year, may form embryo flowers. This explains why an excessive fruit crop is always followed by a scanty one.

On the whole, the production of flower buds on the apple tree is largely controlled by climatic conditions, but a number of other factors also enter in, over which the orchardist has control. The temperature may be modified by planting on north or northeast slopes. Early plowing prepares the ground for absorbing the spring rains, and this moisture may be preserved for the use of the tree by fine level surface cultivation. A good supply of moisture will favor the growth of healthy leaves and buds which are essential. If rains are too abundant the ground may be left rough to hasten evaporation. Since early leaf and wood growth is desirable, manures should be applied early in the season. Cover crops should be relied upon for furnishing sufficient nitrogen to the soil, while wood ashes will furnish the potash and phosphoric acid required. Where cover crops are not grown, well-rotted barnyard manure applied early in the spring may be used.

Wood growth should come to an end about July 1 in the climate of Wisconsin in order to give flower buds an opportunity to develop. A comparatively warm and dry fall is most favorable. Should growth continue much after this date it may be checked by a moderate root pruning. "If the trees are large plow a 'middle furrow' midway between the rows in both directions and follow with the subsoil plow. A slight root pruning at this season will generally start the formation of flower buds if they are backward." The plowing should be followed by a cover crop to evaporate any excess moisture in the soil. The cover crop will also serve the purpose of keeping the ground cool and of forming a winter protection. On poor soils leguminous cover crops only should be used.

Changes in the chemical composition of apples by storing, R. Otto (*Gartenflora, 50 (1901), No. 12, pp. 318–321*).—Changes during storage in the specific gravity and the acid, sugar, starch, and extract content of 8 varieties of apples were investigated. Some of the apples were in cellar storage nearly 3 months. They were analyzed on being put into the cellar and again when taken out. The data secured are tabulated and are summarized by the author as follows: With 6 of the varieties there was a constant and considerable increase in the specific gravity of the apples and in the acid, sugar, and extract content following storage. With the 2 other varieties there was a decrease in the starch and acid content and a slight increase in the specific gravity and the sugar and extract content. On the average the decrease in acid content was about 0.25 per cent and in the sugar content 1.7 per cent. The increase in sugar content with the 2 varieties was scarcely 0.1 per cent.

Cold or cool storage, Kemp (*Garden, 59 (1901), No. 1533, pp. 329–331*).—This refers particularly to the storage of apples in England.

Further contribution to the chemical composition of different varieties of apples at the Government Pomological Institute at Proskau, R. Otto (*Gartenflora, 50 (1901), No. 10, pp. 259–263*).—A table is given showing the chemical composition with reference to sugar, acid, starch, specific gravity, etc., of 26 varieties of apples.

Pollination of apples, F. A. Waugh (*Vermont Sta. Rpt. 1900, pp. 362–366*).—The self-fertility or sterility of apple blossoms to their own pollen was investigated. Thin paper bags were tied over clusters of blossoms during the blossoming season. From 10 to 30 blossoms were covered by each sack. They were thus protected from the visits of insects and all foreign pollen. After the blossoming season the bags were removed and the clusters examined. A record is given of the fruit set, of the clusters which failed to set fruit, and of the crops set on the tree by the uncovered blossoms. The record includes the data obtained with 18 varieties. It shows that only 3 apples set out of 2,586 blossoms covered. These were of the Baldwin, Esopus, and Fameuse varieties. The practical conclusion is reached that "large blocks of apples of a single variety should never be planted, no matter what the variety may be. Mix 2 or more varieties together in alternating rows."

Other considerations are that the varieties which stand next to each other in the apple orchard should blossom at the same time and that "in planting trees to secure cross-pollination, the habits of the bees are to be chiefly considered, and not the prevailing winds. Not more than 3 rows of any one variety should be planted together—better only one or two—with which some other variety or varieties should alternate."

Growing prize peaches (*Agr. Gaz. New South Wales, 12 (1901), No. 4, pp. 527–529*).—The method followed by Mr. Charles Wright, of Delaware, in growing peaches is outlined. Peaches sent by Mr. Wright to the Paris Exposition secured second prize in competition with European house-grown peaches. Mr. Wright selects buds from trees with fruit on them, using the healthiest specimens. The land is prepared as for wheat. The trees are set in the fall 22 ft. apart each way. In the spring they are pruned to a whip about 20 in. high, with 4 or 5 limbs left for a top. Clean cultivation is practiced until August 15, some hoed crop, like tomatoes, potatoes, or corn, being grown between the rows. The orchard is planted on well-drained, rather stiff land.

The peaches shipped to Paris first were picked green, wrapped in tissue paper, then in heavier paper, and packed in a 6-basket carrier. In the next shipment the peaches were first wrapped in tissue paper, then in cotton, and finally in blotting paper. They were packed and shipped in 6-basket carriers, as before, and arrived in Paris in considerably better condition than the first shipment. The first shipment occurred on August 8, and consisted of Bishop Early, Gen. Taylor, Powell Mammoth, Lady Ingold, Foster, and Carman varieties. The second shipment occurred September 12, and was made up of Reeve Smock, Garey Hold On, White Heath, Dr. Corsa Heath, Prize, Townsend, Jowell Late, Newington Free, Walker Variegated, Cowper Late, and McCollister. None of the peaches shipped were considered really first-class varieties.

Peach-tree culture, C. M. Harrison (*Proc. New Jersey State Hort. Soc., 26 (1901), pp. 167–177, pl. 1*).—A popular article on this subject, including notes on the history of peach culture in New Jersey and on renovating old trees.

Plum culture, Skillman (*Proc. New Jersey State Hort. Soc., 26 (1901), pp. 150–157*).—The selection of varieties and the culture of plums are discussed. The author tested the Stringfellow method of root pruning plums, and out of 1,000 trees thus root pruned and planted, 800 died and the remainder are making so poor a growth that they will have to be dug up. Barnyard manure has been found a very satisfactory fertilizer for plums in the author's experience. Japanese plums should be picked as soon as they begin to color.

Propagation of plums—preliminary report, F. A. Waugh (*Vermont Sta. Rpt. 1900, pp. 333–354, figs. 13*).—A brief summary is given of our present knowledge of plum stocks and their combinations with different kinds of scions. In all, 15 kinds of stocks have been used. On these the numerous varieties of 15 distinct groups of plums have been propagated.

In the author's experiments 5 varieties of plums, viz, Stoddard of the Americana group, Green Gage of the Domestica group, Chabot of the Japanese group, Milton of the Wildgoose group, and Newman of the Chicasaw group, were propagated on each of the following stocks: Americana, Wayland type, Marianna, and Peach. Each variety was propagated on each of the different stocks, thus making 20 lots in the experiment; and each lot was made up of 30 grafts. The whip-grafting method was employed. Scions were made about 5 in. long and the piece root-stocks 4 to 5 in. long. The grafts were made in winter, packed in sawdust, and set out, at Denton, Md., in nursery rows in the spring. The growth made by each variety on the different stocks is illustrated and discussed in detail.

"Stoddard gave the largest average number of trees in each lot; Chabot gave the greatest average height, considering either extremes or averages; while Newman gave the largest average number and percentage of merchantable trees. Green Gage gave the lowest average in every column. These figures indicate that Green Gage is comparatively very difficult to propagate; whereas Newman and Chabot are comparatively easy."

In the comparison of stocks, Americana gave the largest average total of trees in each lot, the tallest trees, and considerably the largest number of merchantable trees. This is considered the most striking feature brought out by the experiment. Heretofore Americana stocks have come into use only in the Northwest, and there because they are believed to be extremely hardy. Marianna gave much the smallest number of either total or merchantable trees. Going behind the averages in the tables, the author summarizes as follows:

"Stoddard—an Americana—did better on Americana roots than on any other, though the Wayland stocks gave equal results as regards number of merchantable trees and a greater average size. Green Gage seems to have done best on Wayland stocks, and to have been a failure on Marianna—a stock on which it is often propagated commercially. Chabot gave by far the best result on Americana roots, though it has generally been supposed that Marianna and Peach stocks were specially congenial to the Japanese plums. Milton made the best showing on Wayland stocks, while it was practically a failure on Peach. This last point was very striking, and came much in the nature of a surprise. Peach stocks have been supposed to be suitable for all the plums of the Wildgoose type. Newman did best on Peach, which is according to current opinion; but it gave second best results on Americana, which is not in agreement with the nursery notions commonly held. It was poorest of all on Marianna roots, though Marianna has often been specially recommended for propagating all the Chicasaws. We therefore arrive at this important notion: That a given variety does not do equally well on all stocks, and, *vice versa*, that a given stock is not equally adapted to all varieties."

Three of the best trees from each lot in these experiments were selected and planted out in permanent form at the Vermont Station. Stoddard did best in every respect on Americana roots, Green Gage on Wayland, Chabot on Marianna and Wayland. Milton made a splendid growth on all stocks but Peach, and every tree on Peach roots died. Newman did best on Wayland roots and second best on Americana roots. For the whole lot of trees, the general statement is made that every lot on Peach was inferior to the same variety on any other stock whatever.

Further work in plum pollination, F. A. WAUGH (*Vermont Sta. Rpt. 1900, pp. 355–362, figs. 3*).—In continuing this work (E. S. R., 12, p. 238), the results secured in microscopic examinations and germination tests of the pollen of 44 varieties of plums are recorded and discussed. The germination tests of the pollen were made in sugar solutions varying in strength from 3 to 20 per cent. There seemed to be little difference in pollen germination following the variations in strength of the different solutions, but on the whole the 5 per cent solutions gave the most uniform results. The quantity of pollen produced and its germinating power were found to vary greatly with the different varieties, as did also the size and plumpness of the pollen grains. Pollen grains which to the eye presented a normal appearance were sometimes lacking in protoplasmic contents. These irregularities appeared to be unusually frequent with varieties of hybrid origin. No cause for the fluctuations of the pollen grains in quantity, size, or viability could be assigned. It was concluded that the germination of plum pollen is not readily influenced by ordinary external conditions. The author summarizes briefly as follows:

"From the standpoint of the practical plum planter, there seems to be only one conclusion of consequence to be drawn from the study of pollen and pollen production; namely, that certain hybrid varieties, notably Wickson and Excelsior, probably also Gonzales and others, cannot be relied on for the pollination of other varieties, even though other conditions of simultaneous blossoming, etc., be fully met."

Some drawings and notes are given on certain curious malformations occurring in plum blossoms.

A further study was made of the agency of the wind in distributing plum pollen. Glass slips, such as are used with microscopes, were labeled at one end and the remainder painted with a mixture of vaseline and lampblack. These slips were then exposed for 2 to 24 hours in various parts of the plum orchard at the height of the pollinating season and under the most favorable conditions of wind and weather. The vaseline caught whatever pollen was carried against the slips while it was the purpose of the lampblack in the mixture to make the grains more visible. These slips were afterwards examined for pollen grains. A few grains were found on some of the slips but the amount of pollen transported even the short distance the trees were apart (10 ft.), and in direct line with the wind, was considered far too small for effective pollination. The conclusion is again reached that these fruits are pollinated chiefly, if not exclusively, by insects, and that the wind plays an inconsequential part in this work.

The myrobalan plums, F. A. WAUGH (*Vermont Sta. Rpt. 1900, pp. 366–370*).—This is a short monograph with historical notes on these plums. Their present status is given and 9 varieties described.

Summer pruning of wall plums, A. PETTS (*Garden, 59 (1901), No. 1538, pp. 332, 333*).—Details of methods of pruning wall plums throughout the summer.

Pomelos, H. H. HUME (*Florida Sta. Bul. 58, pp. 385–421, pls. 7, figs. 4*).—Notes are given on the botany and history of the pomelo.

Shaddock and grape fruit are given as synonyms of pomelo. The term pomelo is preferred to grape fruit. The term shaddock, while referring to a fruit botanically the same as pomelo, is stated by the author to be horticulturally distinct from it, this name being applied more especially to the large pyriform or necked varieties of pomelos. It is only within the past 15 years or so that the pomelo has come into commercial importance in Florida. With regard to its culture, the author states that trees in Florida bear heavily, are no harder to propagate and care for than orange trees, and come into bearing early. The following varieties, which include all those listed by nurserymen, are described, and notes given on their origin: Aurantium, Duncan, Excelsior, Hall, Marsh, Pernambuco, Tresca, Triumph, Royal, and Walters.

The weight, size, and proportion of pulp, rind, and seeds are given for 10 ripe fruits of each of 6 varieties, together with analyses of the separate parts of the fruit. The following table summarizes the physical analysis:

Physical analysis of pomelos.

Variety.	Average weight.		Average diameter.	Average number seeds.	Pulp.	Rind.	Seeds.
	Grams.	*Ounces.*	*Inches.*		*Per cent.*	*Per cent.*	*Per cent.*
Royal	541.48	19.1	3.20	46.4	69.32	27.23	3.45
Pernambuco	742.77	26.2	3.75	61.0	68.52	28.05	3.43
Manville	487.62	17.2	3.10	67.2	74.72	20.93	4.35
Aurantium	430.92	15.2	3.00	37.3	68.60	28.29	3.11
Walters	721.34	25.4	3.75	56.0	68.64	28.22	3.14
Triumph	534.60	18.8	3.15	43.3	65.16	31.82	3.02

The average weight of the different varieties, it will be noted, varied from 15.2 to 26.2 oz., and the diameter from 3 to 3.75 in. The percentage of pulp ranged from 65.16 to 74.72, of rind from 20.93 to 31.82, and of seeds from 3.02 to 4.35. The trees producing the fruits were not of the same age and had not been given the same treatment, therefore the relative amounts of pulp and rind in the different varieties are not entirely comparable.

The percentages of phosphoric acid, potash, and nitrogen were greater in the seeds in every instance than in the pulp or rind. The percentage of phosphoric acid in almost every instance was higher in the pulp than in the rind, and the potash was invariably higher in the rind. Except in one variety, the nitrogen was higher in the rind than in the pulp. The fertilizing constituents in the whole fruit was as follows:

Fertilizing constituents in pomelos.

Variety.	Phosphoric acid.	Potash.	Nitrogen.
	Per cent.	*Per cent.*	*Per cent.*
Royal	0.040	0.250	0.119
Pernambuco	.056	.213	.111
Manville	.054	.251	.102
Aurantium	.053	.239	.085
Walters	.049	.233	.129
Triumph	.050	.237	.117
Average	.050	.237	.110

On the basis of this table it is estimated that the fertilizing constituents removed in 10 boxes of pomelos, each containing 80 lbs., would be as follows: Phosphoric acid, 0.4 lb.; potash, 1.9 lbs.; nitrogen, 0.88 lb., which would be replaced by an application of 2.85 lbs. of acid phosphate, 3.8 lbs. of high grade sulphate of potash, and 5.86 lbs. of nitrate of soda. Commercial fertilizers are believed by the author to be more satisfactory for fertilizing pomelo trees than barnyard manures. "Where large amounts of organic fertilizers are used, 'dieback' will almost surely affect the trees, and ammoniated fruit or fruit containing a large amount of 'rag' and of poor shipping and keeping quality is the result." In fertilizing pomelos, the author considers it advisable to make at least 2 applications, one just before or at the time of the commencement of growth, and the other in summer, about the month of July. In some portions of the State, where the roots of citrus trees continue to grow during the winter, it is thought advisable to make a third application in the fall.

"If nitrate of soda be used as a source of nitrogen it is best to apply it in 3 separate dressings, in March, May, and July, and the phosphatic and potash fertilizers twice, as recommended above."

A new banana in the Kongo Free State (*Queensland Agr. Jour., 8 (1901), No. 5, pp. 367, 368*).—A botanical description is given of a new banana in the Lower Kongo. It has been given the specific name of *Musa gilletii*. The plant grows from 1½ to 2 meters high, is not stoloniferous, and completes its cycle of growth in 3 years. During the first year it remains low and forms only a few leaves, the second year it makes its height growth, and the third it produces fruit. The leaves are 40 to 50 cm. long, the flower spike about 40 cm. long. The plant is believed to belong to the group of *M. enseta*. Its seeds approach in size those of *M. livingstonia* and *M. proboscidea*, and like the first of these are rough; but the new banana is much lower in height than *M. proboscidea*, and in other ways widely distinct from it.

Coffee culture; influence of different manures, M. KOCH (*Rev. Cult. Coloniales, 8 (1901), No. 77, pp. 294-296*).—A review of some Brazilian fertilizer experiments with coffee, which seem to show that nitrogen is of value only when it is applied in quantities proportional to the phosphoric acid and potash in the soil. A complete fertilizer produced larger berries and grains than potash manures. Nitrogenous manures, on the contrary, diminished the size of the berries and grains.

The cultivation of cocoa in the West India Islands (*Sci. Amer., 84 (1901), No. 23, p. 360, figs. 2*).—A popular account of present methods of growing and harvesting cocoa beans, with remarks on the possibilities in the industry for investment.

Trenching and subsoiling for American vines, R. DUBOIS and W. P. WILKINSON (*Victoria Dept. Agr., Vit. Sta. Rutherglen, 1901, pp. 171, figs. 110*).—The necessity for subsoiling or deep trenching in the reconstruction of European, Californian, and

Victorian vineyards on American vines is pointed out, and the use of various mechanical appliances for this purpose noted. The work is compiled and translated from various sources for the benefit of Victorian vineyardists. Chapters are given on the use of horsegins, steam winding drums, and portable wind motors as applied to trenching and subsoiling, and these implements are described and illustrated.

Observations on some new direct producers, GRANDCLEMENT (*Prog. Agr. et Vit. (Éd. L'Est), 22 (1901), No. 17, pp. 516–525*).—The value of a number of new hybrid vines as direct producers, and their characteristics as regards resistance to Phylloxera, fungus diseases, etc., are noted.

Artificial pollination of grapes, P. PACOTTET (*Rev. Vit., 15 (1901), No. 391, pp. 658–660*).—For collecting and distributing pollen in the greenhouse culture of some varieties of grapes the following method is outlined: A smooth paper is spread in the warm sunny part of the day under a variety which produces a large amount of pollen, and the vines shaken. Pollen mixed with débris falls on the paper. The pollen is then separated out by sifting through a silk sieve. The pollen thus obtained may be preserved dry for several months. It is applied to flowers which require artificial pollination 2 or 3 days in succession, or until all the flowers on the bunch are opened, by means of a small specially arranged bellows.

Preserving grapes in bottles (*Queensland Agr. Jour., 8 (1901), No. 5, pp. 365, 366, fig. 1*).—The method here outlined is to take the bunches when perfectly ripe, allowing 3 to 6 in. of stem to each shoot below the bunch; remove all diseased berries, and put the shoot in a bottle of water, set or hung at such an angle that the berries will not touch the bottle. The storing room should be dry and have a constant temperature of 40 to 45° F. Darkness, while not essential, is considered very desirable. If the grapes are to be kept long a teaspoonful of not too finely powdered charcoal in each bottle will be advantageous. The bunches should be examined every week and all decaying berries removed. About the second or third day after the bunches are put in the bottles it will be found necessary to refill the bottles with water, since the shoots will have absorbed a considerable amount. No further refilling will be required. It is claimed that grapes have been thus preserved fresh for exhibition purposes for 8 months.

Top-working pecans, H. H. HUME (*Florida Sta. Bul. 57, pp. 360–373, pls. 3, figs. 7*).—The author suggests top-working as the most satisfactory means of improving the many pecan groves now in Florida, which produce small and inferior nuts. Directions for top-working pecan trees are given, accompanied by illustrations of methods of work, and of the appearance of successfully top-worked trees. The practice of taking scions or buds from young trees which have never borne fruit is strongly condemned. These should be secured only from thrifty, vigorous, and prolific bearing trees. Grafts should be selected from well-matured 1-year-old stock while it is in a dormant condition. They are usually cut 5 to 6 in. long, with a thickness of $\frac{1}{4}$ to $\frac{3}{8}$ in. From the middle of February until the middle of March is considered the best time for grafting pecans in northern and western Florida. If the trees are small, grafts may be made on the trunk of the tree; if of medium size, on the main branches a little way from the trunk; and if large, on the main branches still further up from the trunk. Only a few branches should be worked each year, as any sudden shock to the tree, such as the removal of all its branches, is liable to kill it. Whip grafting is suitable for limbs less than an inch in diameter, but for the larger branches cleft grafting, or a modification called cleft-sap grafting, may be employed. By the latter method the cleft for the insertion of the scion is made on one side of the center. It is preferred for working very large stocks. The author deems it inadvisable to graft stocks over $2\frac{1}{2}$ in. in diameter, since an exposure of so large a surface of wood is apt to form a starting place for rot and decay.

August and September is considered the most suitable time for budding the pecan in the Gulf States, and a modification of the annular method of budding known as Veneer shield-budding is thought preferable. The new grafts in top-worked trees grow rapidly and should, therefore, be supported until they become firmly attached. The top-worked trees begin to bear when the tops are about 2 years old.

The same methods used in top grafting trees may be employed in nursery work, though tongue grafting is usually employed. In the nursery the "scions are inserted just at the small fibrous roots and the earth heaped up so as to leave only one bud exposed. Buds may be inserted anywhere from 5 to 6 in. to 3 ft. above the crown."

The evolution of American floriculture (*Amer. Florist, 17 (1901), No. 687, pp. 1–3; Gardening, 9 (1901), No. 214, pp. 346–349*).—An account of the historical development of floriculture in this country.

Carolina bulbs, W. T. MASSEY (*Gardening, 9 (1901), No. 212, pp. 314, 315*).—The results secured by the author in growing various bulbs in North Carolina are noted.

Progress in cultivation of carnations and varieties, F. C. GOBLE (*Proc. New Jersey State Hort. Soc., 26 (1901), pp. 185–190*).—Improvements in houses for carnations and methods of carnation culture are noted, with mention of some of the more prominent varieties of carnations.

Cyclamen for seed, P. KOPANKA (*Florists' Exchange, 13 (1901), No. 21, p. 570*).—A general article covering the details of the subject.

Culture of Persian cyclamens (*Garden, 59 (1901), No. 1540, pp. 375–377*).—The various cultural operations from sowing the seed to potting and housing the plants, and the second year's treatment of the same are discussed.

California lilies and their habitats, J. P. DAVY (*Gard. Chron., 3. ser., 30 (1901), No. 760, pp. 46–48*).—This article deals with the habitats and descriptions of California native lilies.

Existence of Lilium auratum in Japan as a species, A. UNGER (*Gard. Chron., 3. ser., 29 (1901), No. 752, p. 327*).—The author believes that *L. auratum* is a native Japan species and not of hybrid origin as supposed by some.

The origin of Lilium auratum (*Amer. Gard., 22 (1901), No. 336, p. 392; Rev. Hort., 73 (1901), No. 10, p. 246*).—Some theories as to the probable origin of *L. auratum* are advanced.

The peony and its cultivation, W. A. PETERSON (*Amer. Gard., 22 (1901), No. 339, pp. 441, 442*).—The outdoor culture and forcing of peonies and their place in the border are discussed.

Growing Primula sinensis for exhibition, J. HOBSON (*Amer. Gard., 22 (1901), No. 336, p. 397, fig. 1*).—The author outlines his plans for growing Chinese primrose.

Classification of hardy primulas from the cultural point of view, H. CORREVON (*Rev. Hort., 73 (1901), No. 10, pp. 242–245*).

Culture of Perle des Jardins rose, J. F. AMMANN (*Amer. Florist, 16 (1901), No. 680, pp. 1611, 1612*).—Paper on this subject read before the St. Louis Florists' Club.

Rose stocks for grafting, H. A. SIEBRECHT (*Gardening, 9 (1901), No. 212, p. 314*).—On account of the rapid and strong growth of roses on Manetti stock, this stock is considered the most practical for forcing where the plants are wanted for only one season. For budding or grafting roses outdoors *Rosa multiflora japonica* is considered far superior to Manetti.

Tree planting on rural school grounds, W. L. HALL (*U. S. Dept. Agr. Farmers' Bul. 134, pp. 37, figs. 17*).—Popular directions are given for the planting of trees on rural school grounds for the purpose of beautifying them and protecting them from the cold of winter and heat of summer. Before planting the grounds a careful plan should be drawn up showing accurately the location of the different groups of trees to be planted and an account taken of the soils on which they are to be planted. The general plan should be under the supervision of the district authorities who should be aided and supplemented in the work by the teacher and pupils of the school. The bulletin contains many suggestions on the kinds of trees to plant, methods of obtaining and planting trees, and the care of trees.

FORESTRY.

Forest conservation in Kentucky, J. B. ATKINSON (*Forest Leaves, 8* (*1901*), *No. 2, pp. 22, 23*).—The distribution of the principal forest trees in the State is briefly indicated, and estimates made of the area of forests and the yield and value of the product which has been lumbered. The present forest area of the State is said to be about 13,000,000 acres, producing yearly lumber, fuel, etc., at the present valuation of $7,340,000.

A brief account is given of an attempt made in planting walnuts since 1888. This began with the planting of a 4-acre tract in which the ground was prepared and the walnuts planted in autumn 4 ft. apart, allowing 16 square feet of growing space. The tract has been divided into different plats in which the effect of natural and artificial thinning is shown. Where the trees have been thinned about 70 per cent have been removed, and the largest of the remaining trees are about 6 in. in diameter and 20 to 28 ft. high. On the tract left to natural conditions the trees are smaller in diameter but nearly the same height. This experiment has been continued, a few acres being planted every year or two, until now the reforested area amounts to about 30 acres.

Tree planting, O. M. MORRIS (*Oklahoma Sta. Rpt. 1901, p. 149*).—A brief summary is given of the tree planting which was conducted during the year covered by the report. In February, 1900, yearling seedlings were set out on a piece of rough land unsuitable for farm crops. The species planted and the number of trees were as follows: White elm, 9,000; soft maple, catalpa, black locust, and box elder, 5,000 each; white ash and honey locust, 3,000 each. Of these plantings on June 1, 1900, the living trees were 85, 96, 95, 97, 80, 27, and 33 per cent, respectively, of those planted. The elms were in poor condition when set out, and under normal circumstances a larger percentage would probably have survived. The black locust made the strongest growth, with catalpa and maple about equal. Box elder is third, elm fourth, honey locust fifth, and ash least of all. Black locust thrived best in mixed plantations, while the others did best in pure plantings.

Report of the forestry commissioner, J. T. ROTHROCK (*Pennsylvania Dept. Agr. Rpt. 1900, pt. 1, pp. 98–116*).—The author reports substantial progress made in forestry management by the Commonwealth of Pennsylvania during the past year. Under the laws establishing the office of commissioner of forestry, there have been purchased and added to the State forest reserves since 1898, 98,402 acres which are now under the control and management of the Division of Forestry, as a part of the forestry reservation system. These lands are briefly described, and the subject of forest fires in relation to forestry is discussed at some length. The acts of the legislatures of Pennsylvania and Indiana relative to forest management are quoted, and the text of proposed laws which have been presented to the legislatures of Michigan, Wisconsin, and Minnesota are given.

Forest fires and lumbering during the year 1899, R. S. CONKLIN (*Pennsylvania Dept. Agr. Rpt. 1900, pt. 1, pp. 116, 117, 880–884*).—During the season covered by this report the number and extent of forest fires was considerably greater than those of previous seasons. In all, 214,061 acres were burned over, entailing a loss of $406,581. In seeking the origin of these fires, it was found that most of them were started by the careless burning of brush on land that was cleared or being cleared, the fire escaping and running into the timber. The lumbering operations conducted during the year showed some increase over those reported for the previous year. About 14,000,000 ft. B. M. more pine were cut, about 39,000,000 ft. more of hemlock, and 146,000,000 ft. more of other woods. There were cut-over 126,626 acres, only 28,859 of which are to be used for farming purposes.

Studies on the coast redwood, G. J. PEIRCE (*Proc. California Acad. Sci., 3. ser., Bot., 2 (1901), No. 3, pp. 83–106, pl. 1*).—Attention is called to the habit of *Sequoia sempervirens* of reproducing itself vegetatively by means of suckers from the roots or stumps. This power is possessed by comparatively few coniferous plants. The author takes exception to the statement by Gannett (E. S. R., 11, p. 456) that "with the clearing away of the present forests the end of the species as a source of lumber will be at hand," and states that so far as the region south of San Francisco, in the vicinity of the Santa Cruz Mountains, is concerned, the redwood is reproduced in sufficient abundance and has attained profitable size, and that it still occurs in profitable quantity. The growth of the sprouts from the stumps and underground parts appears to be considerably faster than that of plants from seed. The sprouts or suckers are not wholly dependent upon themselves for the food required, and for this reason the young trees attain a considerable height and diameter in a few years. If allowed to grow and reasonably protected against drought, there appears to be no reason why valuable redwood timber should not continue to be produced. The author believes that by the method of vegetative reproduction, even under present climatic conditions, it will be possible to secure the continuance of the redwood forests in the regions where they now occur, provided lumbering operations are so conducted that the production of suckers and sprouts is not interfered with by destructive fires.

In the second part of this paper the author discusses some peculiarities noted for the vegetative shoots of young redwoods. Fasciation appears to be quite common and is probably due to external injuries producing wounds which form suckers in so great abundance as to insure the fusion of adjacent parts of the very young branches.

An interesting feature described is that of albinism, which is a peculiarity of some sprouts which come from stumps or old roots. These sprouts are sometimes perfectly white and may attain a height of 30 cm. in the course of the season. This growth is about one-third that of normal shoots and the increase in diameter is reduced in about the same proportion. While specimens of albinos that are several years old are reported, it appears that the tissues are less able to withstand the winter than those produced from green shoots, and as a result the white forms are frequently frozen to the ground. Microscopical examinations made of the 2 forms of shoots showed considerable differences, the most marked being in the leaves. In the albino forms there was little differentiation of the cell contents in the leaves, and in most cases there was no indication of the formation of plastids or chromatophores. According to the author, the albinos are probably the result of growth at a temperature too low for the production of chlorophyll, and the protoplasm of the cells is so interfered with that its normal functions are not performed. The white redwoods live parasitically upon the old roots, being dependent entirely upon the elaborated material found in the old stumps. There appears to be no tendency on the part of the leaves to form chlorophyll when the temperature is sufficiently high for its production, and the author believes that the environmental conditions are stronger than the hereditary tendency of the plant to produce chlorophyll. A single experiment, in which a plant was removed from its attachment to the roots and transplanted, is reported, the plant dying, but not until a slight coloration was noticed in some of the leaves. This phase of the subject is to be investigated further.

The Pennsylvania hemlock output (*Forest Leaves, 8 (1901), No. 2, p. 30*).—The forests of Pennsylvania are said to have yielded annually about 1,000,000,000 ft. of hemlock lumber. In addition large amounts of hemlock bark were obtained for use in tanning. Recent changes in tanning methods will, it is believed, bring about a heavy decrease in the demand for hemlock bark and as a result logging operations will be diminished. This will tend to conserve the timber and supply of bark for a much longer period than has seemed possible under the previous consumption.

The black pine, J. HUBERTY (*Bul. Soc. Cent. Forst. Belg., 8 (1901), No. 1, pp. 1–18, pls. 2*).—A description is given of the black pine, which it is claimed is a variety of *Pinus laricio*, indigenous to the Styrian Alps. The tree has been successfully introduced into sylvicultural operations, being especially adapted to calcareous soils. Notes are given of a number of artificial plantations of this pine near Rochefort, in which the annual increment and general condition of the trees are described. It is especially recommended for planting with Scotch pine as a mixture.

The relation between sap and heart wood of the oak (*Bul. Soc. Cent. Forst. Belg., 8 (1901), No. 1, pp. 30–40*).—The anatomical characteristics of heart and sap wood are described and their chief differences pointed out. The heart wood is recognized by the resorption of starch, ligneous cells, presence of tannin in these cells and their walls, and the formation of thyllæ in the larger cells. The occurrence of starch and tannin in the wood and their effect upon insect borers are discussed. In the oak there seem to be periods of maximum and minimum storing of starch, and in order to prevent attacks of fungi and insects upon the timber the trees should be cut when the starch content is at its lowest. In the case of spruce, fir, linden, etc., no starch is present during the winter, and trees should be cut at this time. With many other species starch disappears in late summer or autumn, while with others there seems to be a relation between the time of the formation of growth rings and deposition of starch.

The teak industry of Siam, H. KING (*U. S. Consular Rpts., 1901, No. 1041, pp. 1–6*).—Descriptions are given of the teak forests of Siam, that country furnishing about one-fourth of the world's supply of this timber. The annual shipments of teak from the 3 ports are given.

The fixation of sand dunes, J. DEMORLAINE (*Fixation des dunes. Paris: Assoc. Francais Avanc. Sci., 1900, pp. 14; noted in Rev. Eaux et Forêts, 40 (1901), No. 13, pp. 408, 409*).—Gives a review of sand dune fixation and reclamation, and on account of their adaptability and the demand for their timber and other products, recommends plantings of pedunculate oak and of *Pinus maritima*.

SEEDS—WEEDS.

The force exerted by swelling seeds, D. T. MACDOUGAL (*Jour. New York Bot. Gard., 2 (1901), No. 15, pp. 39–42, fig. 1*).—The author describes a series of experiments with peas in which an attempt was made to measure the force exerted by their swelling. The seeds were inclosed in an iron cylinder to which was attached a form of manometer, which is described. At the expiration of 30 hours the air pressure indicated a pressure of 120 lbs. to the square inch. This was maintained for 2 days, when it began to decrease slowly. At the end of a week it had fallen to 18 lbs. per square inch.

Seed studies, W. VON PETERY (*Bol. Agr. y Ganadería, 1 (1901), No. 16, pp. 1–50, pls. 5*).—A general report is given on the objects, methods, and standards of seed testings with special reference to Argentine conditions; together with the results of investigations conducted at the seed-testing station, organized under the direction of the minister of agriculture. Illustrated descriptions are given of the principal grass and forage plant seeds and the foreign seeds commonly associated with them.

Report of seed testing, G. VALDER (*Agr. Gaz. New South Wales, 12 (1901), No. 8, pp. 956, 957*).—A tabular report is given of the germination tests made at the Hawkesbury Agricultural College of about 100 varieties of seed, and the germinations are compared with the germination standards which have been adopted.

A cooperative investigation into the agricultural seed supply of Pennsylvania, G. C. BUTZ (*Pennsylvania Dept. Agr. Bul. 76, pp. 50, fig. 1*).—This bulletin gives the results of cooperative investigations conducted by the Pennsylvania Station and the department of agriculture of that State. In all 243 samples of seed were collected from 57 dealers in different parts of the State, and subjected to examination for their purity, vitality, and genuineness. They included timothy, Kentucky blue grass, orchard grass, clover (red, crimson, and alsike), onion, cauliflower, and sweet corn. So far as known they were grown in Pennsylvania, New York, Ohio, Maryland, Indiana, Illinois, Michigan, and California. The results of the tests are tabulated, comparisons being made with seed of standard purity, and the relative cost of the pure germinable seed in each sample shown.

The clover seeds as a rule were found quite pure. For example, only 3 samples of red clover seed out of 33 examined fell below the standard of purity and 5 below the standard of germination. The 18 samples of mammoth red clover examined were in general fully up to the required standards in purity and germination. The crimson clover seed was all up to the standard of purity, but some of the seed was old and did not germinate well. Among 39 samples of timothy seed, only 3 fell slightly below the required standard of purity, but several samples were low in germinative ability owing to the seed being old. There was great variation in the germinative power of orchard grass, the range being from 33 to 96 per cent. The greatest extremes in quality were met with in the samples of Kentucky blue grass, and only 4 of the 23 samples examined reached the required standard in germination. The author concludes that "there are farm seeds placed on sale that are exceedingly poor and even worthless;" and he advocates the passage of a pure-seed law.

The weeds represented in foreign seeds are briefly described, and the laws of several States relating to seed inspection are quoted.

Report of the section of seed control for 1899-1900, A. Voigt (*Bot. Mus. u. Lab. Waarenkunde Hamburg, Abt. Samencontrole, 1900, IX, pp. 15*).—During the year covered by this report 1,603 samples of seed were examined, 2,169 tests being made. Of the samples received 1,101 were red clover, 103 alsike, 99 white clover, 78 alfalfa, 42 timothy, 39 blue grass, 31 orchard grass, 29 bird's-foot clover, and 21 sheep fescue; the others of the 55 species of seed examined ranging from a single sample to 15 or 20. Among some of the impurities mentioned were old alsike clover seed colored with analin, sand lucern substituted for alfalfa seed, seed of *Brassica juncea* for mustard seed, etc. A specimen of African oil seed proved to be the seed of *Guizotia abyssinica*, and one called Brazilian oil fruit proved to be the fruit of a species of Araucaria. The examination of 967 samples of clover and forage plant seed for dodder showed 66 per cent pure and 11 per cent additional containing but a single dodder seed per hundred grams of the sample. A slight decrease in the total number of samples containing dodder seed is reported. The seed harvest of Germany for the year covered by this report is said to have been a poor one, and as a result numerous sophistications and substitutions are mentioned. The purity and germination tests showed a decided falling off from the percentages previously obtained for many varieties.

An experiment is reported with hard seed of red, white, and alsike clover, alfalfa, yellow clover, and kidney vetch. Five thousand seed of red clover, 1,800 of white, and 1,100 of alsike, and considerably less of the others, were soaked in distilled water, after which they were placed to germinate in the laboratory window. The germinations at the end of the different months are shown in tabular form. At the end of 6 months 60 per cent of the red clover and alsike and 50 per cent of the white clover had germinated, while all of the others had germinated within this time. The mass weight of a number of samples was determined, and observations on the origin, purity, germination, etc., of the different samples are given.

Impurities of grass and clover seeds, L. R. Jones (*Vermont Sta. Rpt. 1900, pp. 287-299*).—The station sent out a request for samples of seed to a number of farmers throughout the State, and received more than 200 samples of alsike and red clover, timothy, and other grass seeds. The seeds of timothy and red clover were examined as to purity, and the character and extent of impurities in the different samples are shown in tabular form, and a discussion is given of the results shown in the tables. In general, it appeared that low priced seed always contained a greater amount of impurities than were found in good seed, although a high price did not necessarily mean that pure seed was supplied the purchaser. In the case of timothy seed, only 9 out of 85 samples fell below 98 per cent purity; while of the red clover, out of 74 samples examined, only 29 were up to the standard of 98 per cent of purity.

Killing weeds with chemicals, L. R. Jones (*Vermont Sta. Rpt. 1900, pp. 282–286*).—The value of salt applied broadcast for the destruction of the orange hawkweed, as shown by a previous investigation (E. S. R., 8, p. 987) is stated. Sulphuric acid, diluted to 1 part of acid in 40 of water, has been claimed as more efficient than salt for the destruction of this weed. The author repeated his experiments with salt, making comparisons with a dilute sulphuric acid. The results obtained indicate that sulphuric acid is not to be compared with salt as a remedy for the hawkweed, and the author states his belief that salt is the best chemical yet tried for killing the orange hawkweed.

Experiments were conducted with copper sulphate solution for killing charlock, or "kale" as it is known in the State. In addition to the charlock 3 other species of Brassica are known as kale, but these have a smooth, glaucous foliage and are but little injured by chemicals. Sprayings were made in oat fields in which 3 and 5 per cent solutions of copper were applied. The first application was given when the plants were quite small. During the following night heavy showers fell which doubtless influenced the results. This application resulted in the injury or destruction of fully ¾ of the plants, about ¼ seeming to be uninjured. About a week later other plats were sprayed, no rain falling for several days. In this case nearly 70 per cent of the plants were killed outright and others injured. Practically every plant of charlock was killed by the last spraying and most of those by the earlier one. The oat plants were slightly injured but soon recovered. The use of copper sulphate at the rate of 1 lb. to 4 gal. of water when sprayed upon young plants is said to be efficient for their destruction, but the author believes that the best way to deal with these weeds, where it is possible, is not by the use of chemicals but by frequent rotation and clean cultivation.

DISEASES OF PLANTS.

Phytopathology and its service to agriculture, E. Marchal (*Jour. Soc. Cent. Agr. Belg., 48 (1901), No. 7, pp. 242–247*).—A brief résumé is given of the present status of our knowledge relating to plant diseases and the means of combating them.

Notes on plant diseases, E. M. Wilcox (*Oklahoma Sta. Rpt. 1901, pp. 116–128, pls. 2*).—Descriptions are given of the apple-leaf rust, and rusts and smuts of cereals. The author describes the hot-water treatment for the stinking smut of wheat and oats and the loose smut of wheat and barley, and recommends its more extended use. The corn and sorghum smuts are described at some length and references given to literature relating to the smuts and rusts of cereals in general.

Notes on some species of Helminthosporium, and the diseases of barley and oats occasioned by them, F. K. Ravn (*Ztschr. Pflanzenkrank., 11 (1901), No. 1, pp. 1–26, pls. 2, figs. 8*).—Studies are given on the morphology and physiology of *Helminthosporium gramineum*, *H. teres*, and *H. avenæ*. These fungi are parasitic, the first 2 on barley and the last on oats. The author, following Rostrup, refers to these diseases as the striped diseases of barley and oats, the name being derived from long discolored stripes occurring on the leaves, leaf sheaths, stems, etc. Prillieux has given the name Helminthosporiosis to these same diseases. Inoculation experiments with the different fungi showed that those occurring upon the barley would affect that host only, and not oats, rye, or wheat. The other species (*H. avenæ*), while most abundant upon oats, gave a few infections on barley, but none upon the other cereals. The time of seeding and temperature, during the first few days of germination, were found to have an important bearing upon the amount of disease; plants seeded in the cool months of spring or autumn were much more affected than those seeded when the average temperature was higher, July and August seedlings being almost wholly without disease. Differences in susceptibility of varieties are noted, and it is claimed that soaking the seed in hot water or in a solution of potassium sulphid prior to sowing will greatly reduce the disease.

The growth of ergot on rye and various grasses, NOFFRAY (*Mem. Soc. Nat. Agr. France, 139 (1900), pp. 501–555*).—From experiments conducted by the author it is claimed that in the germination of the ergot the sclerotia must not be more than 1 year old and the climatic conditions must be mild and humid. The occasional almost total disappearance of ergot from crops is explained by the unfavorable atmospheric conditions which prevailed at the time of the germination of the fungus. In addition to the rye, the author enumerates 30 species of grass which are subject to attacks of ergot, among them are the dog-tooth grass, couch grass, meadow foxtail, various species of brome grasses, timothy, fescue grasses, rye grass, orchard grass, and several species of Poa. For the eradication of ergot the author recommends careful screening of all seeds, and care to avoid distributing the infected material from one field to another by means of hay or stock. In case of pastures which have become seriously infected, it is recommended that some cultivated crop should be employed for a few years until the danger from propagation has passed.

Potato diseases and their remedies, L. R. JONES (*Vermont Sta. Rpt. 1900, pp. 268–281, fig. 1*).—In the season covered by this report the atmospheric conditions were, on the whole, favorable to the potato crop. The yields were somewhat reduced by dry weather, but on this account there was less disease than usual. Experiments were conducted to test the comparative value of several fungicides and insecticides when applied to potatoes. Standard Bordeaux mixture to which Paris green was added, Bug Death, Laurel green, and gypsum and Paris green were applied under similar conditions. At the time of the first application and for nearly 2 weeks thereafter but little difference could be distinguished in the condition of the several plats. By the time of the second application marked differences began to show themselves, which increased as the season advanced. In all cases the plants receiving the Bordeaux-Paris-green mixture were more flourishing and the leaves larger and of darker green color. The effect of the different fungicides, as shown by the yield of the various plats, is given in tabular form. The results are especially significant since there was no fungus whatever on any of the potatoes. Bordeaux mixture was again shown to be a valuable remedy against insect attacks. The amount of gain due to the use of this mixture when applied to experimental plats was almost exactly duplicated upon the main field of the farm, the sprayed plants yielding 223 bu. per acre as compared with 150 bu. from unsprayed rows.

The number and dates of applications to secure the best results were investigated, 3 applications being made of the Bordeaux-Paris-green mixture on July 26, August 17, and September 8. The yields of potatoes sprayed at different times showed that the first application was the most important one, and that about one-half the entire gain was attributed to that. The second and third applications were about equal in importance, each of which added about 25 bu. per acre to the entire crop.

Experiments are reported on the prevention of potato scab, in which comparative trials were made of corrosive sublimate, formalin, formaldehyde gas, sulphur, sulphur fumes, and insolation. Where the soil was free from the scab germs and scabby seed was used, a scabby crop resulted, but where the soil was clean and the seed properly disinfected a clean crop was secured. Where the soil was badly infected no method of treatment was entirely effective. Corrosive sublimate and formalin in solution both proved excellent disinfectants, and either may be depended upon in practice. Sulphur proved decidedly inferior. Exposure to the sunlight of tubers designed for seed greatly reduced the amount of scab. In this case the seed tubers were exposed for 4 weeks previous to planting and a fairly clean crop was given, even when very scabby seed was used. This treatment has the additional advantage of hastening the growth of the tubers and is often practiced for this reason alone. The exposure of seed potatoes to sulphurous gas, which has been strongly recommended by some investigators, was less efficacious than soaking, either in corrosive sublimate or formalin or exposing to formaldehyde gas. The formaldehyde gas, although the experiments are not as conclusive or satisfactory as is desirable, gave results that seem to indicate its superiority over both the formalin and corrosive sublimate solutions.

Concerning the fungi occurring in the beet-seed capsules, F. BUBAK (*Ztschr. Landw. Versuchsw. Oesterr., 4 (1901), No. 4, pp. 477, 478*).—The author reports a series of studies in which cultures were made from the capsules of beet seed, the fungi being cultivated in various sterile media. He found present as parasitic fungi *Sporidesmium putrefaciens*, *Cercospora beticola*, *Phoma betæ*, and *Entyloma betiphilum*, n. sp.; and as saprophytic fungi, numerous species of Penicillium, Aspergillus, Sterigmatocystis, Verticillium, Mucor, Rhizopus, Chætomium, as well as *Eurotium repens*, *Thamnidium elegans*, *Stachybotrys atra*, *Alternaria tenuis*, *Hormodendron cladosporioides*, *Trichothecium roseum*, *Sordaria fimicola*, *Stysanus stemonitis*, etc.

A disease of mangolds and sugar beets, R. H. BIFFIN (*Dept. Agr. Cambridge Univ. Rpt. 1901, pp. 87–89*).—The first symptoms of disease consist of the brown and dead outer leaves, while the inner leaves become yellowish green and much wrinkled. The disease usually makes its appearance on the edges of the leafstalk. When examined the roots externally show but little evidence of disease except that the affected ones are somewhat drier and harder. When cut across, the fibrovascular bundles of the diseased root are deeply stained a purplish black color, and the leafstalks are marked in a similar manner. Specimens removed from the field to a greenhouse were not destroyed by the disease but made a slow, stunted growth. Further examination showed the vessels of the fibrovascular bundles plugged with a mucilaginous mass containing large numbers of bacteria. Sugar beets have been noticed as affected in the same manner and the bacteria present are believed to be the cause of the disease, which is to be a subject of further investigation.

A soft rot of carrot and other vegetables, L. R. JONES (*Vermont Sta. Rpt. 1900, pp. 299–332, figs. 11*).—A detailed report is given on the soft rot of carrot and other vegetables caused by *Bacillus carotovorus*. The occurrence and character of the disease, morphological and physiological character of the organism, and its various relations are described at length. This disease has been the subject of a previous paper, which has already been noted (E. S. R., 13, p. 362).

A bacteriosis of kohl-rabi, L. HECKE (*Ztschr. Landw. Versuchsw. Oesterr., 4 (1901), No. 4, pp. 469–476, pl. 1*).—A preliminary note is given on the occurrence of a bacterial disease of kohl-rabi, which is due apparently to the same organism as that causing the brown rot of cabbage and turnips, which has already been noted (E. S. R., 9, p. 847).

A serious disease in the cherry orchards of Kent, W. CARRUTHERS (*Jour. Roy. Hort. Soc. [London], 25 (1901), No. 3, pp. 313–316, figs. 2; also Gard. Chron. 3. ser., 29 (1901), No. 742, p. 172*).—A brief account is given of a serious disease of cherries which simultaneously attacks the leaves and fruit, rendering the fruit unfit for market. The diseased leaves remain attached to the branches, and a further characteristic is the shortening of the branches which bear the diseased leaves. The internodes between the leaves do not appear to have been developed. Dwarfing of the branch is said to be not directly due to the fungus, but is attributed to a lack of food as a consequence of the early death of the leaf. The author reports marked differences in the susceptibility of different varieties to attacks of this disease. What is believed to be the same trouble has been described in Germany as due to the fungus *Gnomonia erythrostoma*. The rapid spread of this disease is attributed to the overcrowding of fruit trees and too much moisture. As a remedial treatment it is suggested that all diseased leaves should be gathered and burned. If this should be continued for a few years the disease would doubtless cease to be troublesome, as has already proved the case in Germany.

Plum-tree canker, F. A. WAUGH (*Vermont Sta. Rpt. 1900, pp. 370–373, fig. 1*).—Attention is called to a canker of plum trees which is distinguished from gummosis as following and often being the result of that disease. If a wound of a peach or plum tree remains unhealed for some time, either as a result of gum flow or other cause, the surrounding tissues become blackened as if corroded, so that the usual processes of healing do not take place. While the surrounding parts continue to grow the cankered portions remain dead, blackened, and sunken below the green adjacent portions. In extreme cases the branch is finally killed. It is to these blackened, unhealed, and unhealing spots that the term canker is specifically applied. Thus far, neither fungi nor bacteria are known to definitely cause the disease. It frequently begins, however, in the attacks of such fungi as brown fruit rot and the fungus causing plum pockets. Some varieties are much more susceptible than others to injury from this cause. As this disease is not known to be directly of fungus origin, spraying can not be expected to serve as a remedy and the only way to rid the tree after the canker appears is by pruning. Preventive treatment of the canker in arresting the spread of the brown-rot fungus and the plum-pocket fungus may be given by spraying with Bordeaux mixture, which should be applied early in the spring before the buds start.

Leaf scorching of trees by the wind, L. R. JONES (*Vermont Sta. Rpt. 1900, pp. 281, 282*).—About July 1, 1900, there was noticed a sudden and peculiar blighting of the leaves of many trees and shrubs. This was first noticed on elderberry. A further observation revealed similar trouble upon a number of other shrubs and trees. The blighting was begun at the tips and margins of the leaves, although in broad leaves like maple dead spots occurred irregularly between the larger veins. Considerable injury was done by this leaf scorching. A line of maple trees appeared as if scorched by fire upon one side, while the other was not harmed. The cause of injury is attributed to a peculiar combination of weather conditions. Hot, clear, dry weather was associated with heavy winds, and excessive loss of water through transpiration is believed to be the cause of the trouble. Trees that were sheltered from the wind escaped, as did many others which were in soil conditions especially favorable. With the exception of trees recently transplanted, it is believed but little permanent injury will be done.

Spot diseases of mandarins, TRABUT (*Bul. Agr. Algérie et Tunisie, 7 (1901), No. 5, pp. 112, 113*).—The author describes the causes of a number of different kinds of spots occurring upon the mandarin. One in which the spots are very numerous and quite small is said to be caused by the orange black scale (*Parlatoria zizyphi*). A second form of spot is described in which the spots become several millimeters or a centimeter, or more, in diameter, followed by a complete destruction of the skin of the fruit. This is due to the fungus *Septoria glaucescens*. This disease is sometimes quite destructive to the fruits. Another form of spot described is due to an acarid. This produces lesions in the skin and makes it possible for the easy attack by the fungus causing the previously described trouble.

Gooseberry mildew (*Jour. Bd. Agr. [London], 8 (1901), No. 1, pp. 1–4, pl. 1*).—A brief popular desciption is given of the gooseberry mildew (*Microsphæria grossulariæ*). This mildew is said to be less destructive than the American gooseberry mildew (*Sphærotheca mors-uvæ*) and its occurrence may be prevented by repeated sprayings with potassium sulphid solution. All the dead leaves should be collected and burned in the autumn and the ground under and around the bushes dug so as to bury any stray spores which may be lying upon the ground.

Leaf cast of pine, C. VON TUBEUF (*Arb. K. Gesundheitsamte, Biol. Abt., 2 (1901), No. 1, pp. 1–160, pls. 7, figs. 32*).—A review is given of the literature relating to this disease, and the various theories as to its cause are discussed. Leaf cast is a very troublesome disease in nurseries where seedlings of *Pinus sylvestris* are grown, not infrequently causing the complete destruction of all the young plants. The principal cause of the injury, according to the author, is to be attributed to *Lophodermium pinastri;* and the systematic relationships, morphology, biology, and pathological effect upon the host plant are described at some length. Numerous infection experiments are reported in which the parasitism of the fungus was clearly established.

Various methods are described for the prevention of the disease. It appears to be of unusual occurrence and of little importance upon seedlings grown among grass, weeds, or other plants; and it is recommended that mixed sowings should be made in the nursery in which some protective species are introduced. Hedges and walls along the west side of plantations are also protective to a considerable degree. The seed bed for young pines should not be placed near pine forests. As there seems to be evidence that the disease may be communicated through infested seed, special care should be given seed selection, and the young seedlings should be made as resistant as possible by promoting their rapid growth through cultivation and the use of fertilizers. A report is also given of experiments conducted at a number of different stations and covering several years, in which various fungicides were tested to determine their value as a means for the prevention of the leaf cast. The best results were obtained with fungicides containing some form of copper. Thorough and repeated applications of Bordeaux mixture, with or without sugar, or a copper-soda mixture, protected the young seedlings from serious injury.

Notes are also given of a disease resembling leaf cast caused by the larvæ of *Diplosis* (*Cecidomyia*) *brachyntera*, and statistics as to the distribution and injury caused by leaf-cast diseases are presented.

A disease of spruce twigs (*Bul. Soc. Cent. Forst. Belg., 8 (1901), No. 2, pp. 63–74, pls. 2, fig. 1*).—An account is given of a disease of spruce caused by attacks of *Septoria parasitica.* The disease usually makes its appearance in May or June, when the young shoots are rapidly growing and are quite tender. The leaves turn brown and fall away, leaving the extremities of the limbs dead and bare. The fungus seems to attack plants in the seed bed, as well as trees 20 to 50 years old. The disease ordinarily begins in the tips of the branches, where growth is rapid and the water requirements the most pronounced, spreading from this point downward. The fungus seems more prevalent in trees grown at considerable elevation or where there is a diminution of the water supply and where the circulation of air and the light are intense. The development of the parasite seems to be greatly favored by dry seasons. In addition to the disease caused by Septoria the spruce trees are quite susceptible to attacks of *Botrytis douglasii.*

The cacao disease (*Trinidad Bot. Dept. Bul. Misc. Inform., 1901, No. 27, p. 328*).—A brief account is given of the occurrence on the branches of cacao trees of growths known as witches' brooms or hexenbesens. The cause of these growths is said to be *Exoascus theobromæ.* The disease so far has been observed only in Surinam, and it is recommended that wherever observed the deformed growth should be cut out and the trees sprayed, as far as possible, with dilute Bordeaux mixture.

Hexenbesen of cacao trees in Surinam, J. RITZEMA BOS (*Ztschr. Pflanzenkrank., 11 (1901), No. 1, pp. 26–30, figs. 2*).—A technical description is given of hexenbesens or witches' brooms occurring upon cacao trees in Surinam. The author finds they are caused by a new species of Exoascus to which the name *E. theobromæ* is given.

The carnation in health and disease, A. F. Wood (*Florists' Exchange, 13 (1901), No. 8, pp. 188, 189, figs. 4; Amer. Florist, 16 (1901), No. 664, pp. 990–993, figs. 10*).—The author popularly describes the stigmonose of carnations, and briefly mentions stem rot, leaf spot, and fairy ring spot as sometimes proving serious diseases of carnations.

An injurious fungus of orchids, P. Hennings (*Notizbl. K. Bot. Garten u. Mus., Berlin, 3 (1901), No. 25, pp. 97–99*).—A brief account is given of a hitherto undescribed fungus which has been observed upon the pseudobulbs of *Maxillaria rufescens*. The fungus, to which the name *Nectria bulbicola*, n. sp., is given, is technically described. The fungus seems to be indigenous in Venezuela or Trinidad, but has been observed to cause serious injury in other localities.

A new method of combating nematodes, H. Wilfarth (*Ztschr. Ver. Deut. Zuckerind., 1900, No. 529, pp. 195–204; abs. in Centbl. Bakt. u. Par., 2 Abt., 7 (1901), No. 12, p. 445*).—On account of the excessive cost and impracticability of catch crops and chemicals for the destruction of nematodes, the author was led to investigate other means for their destruction. He reports having observed in beet fields that here and there individual specimens occurred which had not been attacked by the nematodes, and suggests the possibility of breeding a race of sugar beets which will be resistant to nematodes.

On the preventive spraying of green plants, L. Mangin (*Rev. Hort., 73 (1901), No. 4, p. 86*).—The occurrence of fungus diseases and insect enemies on palms and other plants in hothouses, especially where the atmosphere is humid, is commented upon. Palms in particular are subject to attack of *Graphiola phœnicis*, which attacks the leaves, and if conditions are favorable for its rapid propagation the plants, unless unusually vigorous, are weakened by it. Another serious trouble in the greenhouse is the fumagine which follows the presence of certain insects. For the prevention of the fungus diseases, the author recommends spraying the plants with a one-half per cent solution of copper sulphate, or a solution of naphtholbeta, 5 gm. to 10 liters of water. For the destruction of insects, tobacco extract may be added to the naphthol solution.

A calcium sulphid or a sulphur-copper fungicide, A. Seignouret (*Rev. Vit., 14 (1900), p. 437; abs. in Ann. Agron., 27 (1901), No. 6, p. 290*).—The author describes a fungicide which has been successfully used for the prevention of grape diseases. It is composed of 25 kilos of lime and 50 kilos of triturated sulphur, which are mixed with 100 to 200 liters of water and boiled for 2 to 3 hours. To this mixture 50 kilos of copper sulphate in solution are added and the volume diluted to 25 or 50 hectoliters, depending on whether a 1 or 2 per cent solution is desired. This mixture gives a complex precipitate of sulphate of lime, sulphate of copper, and sulphur. In practice it has been found that 2 applications of the fungicide—the first made in May and the second about the end of June—will protect the grapevines from mildew. The fungicide adheres very readily to the leaves, and the copper sulphate decomposing slowly retains its efficiency for a considerable time.

ENTOMOLOGY.

Notes on troublesome insects, F. M. Wilcox (*Oklahoma Sta. Rpt. 1901, pp. 112–116, figs. 3*).—*Aphis cucumeris* is reported as doing considerable damage to melons during the season of 1900. For controlling the ravages of this insect it is recommended that the ground be thoroughly cleared of all rubbish at harvesting. Badly infested plants may be sprayed with kerosene emulsion. The harlequin cabbage-bug is reported as producing 5 broods in Oklahoma. The last brood is said to winter over as nearly mature adults. It is urged that leaves and other refuse should be collected into heaps to serve as hiding places for the bugs, and that this rubbish should be burned late in the winter. For controlling *Myzus cerasi* it is recommended that infested cherry trees be sprayed with kerosene emulsion or whale-oil soap. The false chinch bug (*Nysius angustatus*) is reported as injuring turnips, rape, beets, cabbage, potatoes, and flax. The destruction of wild species of the mustard family is recommended as a means for checking this insect.

Report of the botanist and entomologist, G. W. HERRICK (*Mississippi Sta. Rpt. 1901, pp. 26–28*).—Observations have been made on insects injurious to pecans, including *Catocala viduata, Oncideres texana*, and *Sesia scitula*. The author made a study of the mosquitoes of the State, and carried out some experiments in combating the horn fly. It was found that by spraying the cattle with a 20 or 25 per cent mixture of kerosene and water nearly all the flies were killed. Even a stronger solution than this can be used without bad effect on the cattle. It was found that kerosene and water evaporated too quickly in dry weather where it is not convenient to spray the cattle oftener than twice per week. By spraying with undiluted crude petroleum it was found that one treatment was effective for from 2 to 4 days, and all the flies were killed. Even a 50 per cent solution of crude petroleum in water was equally effective. No harm was caused to the cattle.

Notes on injurious insects, E. FLEUTIAUX (*Agr. Prat. Pays Chauds, 1 (1901), No. 1, pp. 110–115*).—The seeds of a custard apple (*Anona muricata*) were found to be badly infested with an insect belonging to the genus Dryocœtes. In some cases as many as a dozen specimens of the insect were found in a single seed. The insect was found in all its stages in the same seed, and it is believed that the period of egg laying is interrupted and extends over a considerable period. A description is given of the method of egg laying and of the appearance of the various stages of the insect.

Notes are given on a number of insects which were found injuring coffee grains. The species most abundant and injurious were *Cathartus advena, Lophocateres pusillus*, and *Silvanus frumentarius*. A number of other insects, including *Chrysobothris chalcophana* and *Agrilus areolatus*, are reported as causing injury to the branches or stems of coffee plants.

Report on economic entomology for 1900, G. H. CARPENTER (*Reprint from Rpt. Council Roy. Dublin Soc. 1900, pp. 92–108, figs. 9*).—The author presents descriptive biological and economic notes on a number of injurious insects, including carrot fly, pea beetle, *Thrips physopus, Lecanium ribis, Hylurgus piniperda, Hyponomeuta cagnagellus, Psylla buxi, Tinea granella, Tenebrio molitor*, and *Tenebroides mauritanicus*.

Diseases of nursery stock, H. GARMAN (*Kentucky Sta. Bul. 93, pp 99–111, pls. 5*).—Notes are given on the fumigation of nursery stock with hydrocyanic-acid gas. The author gives formulas of materials to be used in generating the gas. It is stated, however, that where trees are exceptionally large or where only a few trees are infested it is cheaper and more convenient to spray with soap solution or kerosene preparations. Apple trees sprayed for San José scale with a 50 per cent mechanical mixture of kerosene and water were not injured in the least, while nearly all the scales were killed. In 2 orchards crown gall was found to have infested about 50 per cent of the apple trees. A brief description is given of the appearance and position of the gall. It is recommended that infected trees should be at once removed and burned. A knot disease of apple trees, similar to black knot of plums, is reported. At the base of the main branches and some times on the trunk itself smooth olive-green warts appear, which increase in size and become rough. These warts may be removed with a knife and the affected parts sprayed with Bordeaux mixture, or the whole tree may be dug out and destroyed. Attention is called to the fact that by double-working Northern Spy apples, as recommended in South Africa and Australia, a stock may be secured which is reasonably resistant to the attacks of the woolly aphis. Certain nurseries in the State have advertised trees for sale without guaranty, with the knowledge that the nurseries from which they are sold are infested with the San José scale. A vigorous protest is entered against such business.

An enemy of alfalfa, R. GAVOTY (*Prog. Agr. et Vit. (Éd. L'Est), 22 (1901), No. 28, pp. 44–46*).—The author reports serious injury to alfalfa from the attacks of *Colaspidema atrum*. The larvæ appear in April, and when occurring in large numbers cause almost total destruction of the alfalfa. Numerous experiments with different insecticide materials were made without great success. These experiments included the use of sulphate of iron in the proportion of 500 gm. to 100 liters of water, kerosene emulsion, Bordeaux mixture, tobacco decoction, and sulphur. These remedies proved to be rather expensive and were too ineffective to be recommended for further use.

The Hessian fly; its ravages in New York in 1901, I. P. ROBERTS, M. V. SLINGERLAND, and J. L. STONE (*New York Cornell Sta. Bul. 194, pp. 237–260, figs. 5*).—A general discussion is given of the occurrence and injurious attacks of the Hessian fly in New York during the season of 1901. Detailed notes are given on the relative abundance and injurious action of the insect in various localities. Cooperative experiments were carried out by several farmers of the State for the purpose of determining the most suitable varieties of wheat for growth in their locality. Some differences were noted in the resistant power of different varieties of wheat to attacks of the Hessian fly. It appears from these experiments and from the observations of others that varieties which prove highly resistant in one State or one locality may not be resistant when planted in another locality. It is believed that the Hessian fly causes more injury on dry poor land than on moist well-drained rich soils, and that thick seeding and vigorous growth assist in warding off the attack of the fly. The most resistant varieties, according to the experiments of the authors, are Dawson Golden Chaff, Prosperity, No. 8, Democrat, Red Russian, and White Chaff Mediterranean. Notes are given on the appearance, habits, and life history of this insect. It is not considered possible to give a date which will be a safe guide for sowing wheat in New York for any series of years. In general, however, wheat sown after September 20 is less injured by the Hessian fly than that which is sown earlier. Attention is called to the desirability of cooperation among the farmers, and of thorough tilling of the soil, together with the use of trap crops.

The Hessian fly in Ontario, W. LOCHHEAD (*Ontario Agr. Col. and Expt. Farm Bul. 116, pp. 16, figs. 10*).—A brief historical account is given of the Hessian fly in Ontario, and the losses caused by its depredations. The insect is described in its various stages, and brief notes are given on its life history. There are 2 broods a year in Ontario, and the eggs are ordinarily laid during the last week of August and the first week of September. Occasionally, however, the eggs are deposited as late as September 20. Brief notes are presented on the natural enemies of the Hessian fly and on the various insects which are most frequently mistaken for this pest. A list of the common food plants is also given. In a discussion of remedies against the Hessian fly, reference is made to the methods which are in common use in combating this insect. It is suggested that fall wheat should be sown in Ontario about the middle of September. It is urged that special care should be exercised in the preparation of the seed bed before sowing. Where summer fallowing is not excluded by considerations of economy this method of preparation yields the best results in the preparation of the soil for wheat. Attention is also called to the desirability of planting trap crops and burning stubble and refuse. In order that any methods against this insect may be generally successful it is necessary to secure cooperation of all farmers in any given locality.

Biological and economic notes on the bollworm, G. DEL GUERCIO (*Nuove Relaz. R. Staz. Ent. Agr., 1. ser., 1900, No. 3, pp. 143–159, figs. 6*).—The author describes the species in all stages and gives notes on its habits and life history. A number of the host plants for this species in Italy are enumerated, the most important of which are said to be tobacco, hemp, cotton, tomato, and pepper. Corn is also attacked, but this crop is not so important in Italy as in the United States. A brief account is given of the natural enemies of the bollworm and of the remedies which have been recommended for combating the insect in the larval, pupal, and adult stages. The use of arsenites against the larvæ in Italy is said to be attended with more danger than in the United States. The author recommends, therefore, tobacco decoction.

The grain lantern fly (Tettigometra obliqua), G. DEL GUERCIO (*Nuove Relaz. R. Staz. Ent. Agr., 1. ser., 1900, No. 3, pp. 135-142, figs. 4*).—The author describes this insect in all its stages and gives tables showing variation in size of various parts of the body. The damage caused by the species is probably greater than usually supposed, since some of its injury is attributed to other insects. Injuries are especially marked on the tender portions of the food plants. After the grain becomes larger and the epidermis more firm, the injury is less pronounced. In preventing damage from this insect the author recommends planting early varieties of grain and early in the season, in order that the grain may be well developed before the insects begin their attack. The use of fertilizers is also recommended for the same purpose. Stubble should be burned over in order to destroy the insects which have collected on green radicle leaves and on grasses which may grow in the grain fields.

The grain lantern fly fastens itself to the stems of grain by means of its beak and does not move until ready for its final transformations. After the grain harvest the species migrates to grasses of various sorts.

Some insects injurious to stored grain and the cereal products, B. F. MACCARTNEY (*Pennsylvania Dept. Agr. Rpt. 1900, pt. 1, pp. 83-90, figs. 8*).—Brief descriptive economic and biological notes are given on Angoumois grain moth, granary weevil, saw-toothed grain beetle, bean weevil, pea weevil, Mediterranean flour moth, Indian-meal moth, and confused flour beetle.

Species of Calandra and other injurious insects, P. BIOURGE (*Rev. Gén. Agron. [Louvain], 10 (1901), No. 7, pp. 289-294*).—Brief notes on the habits, life history, and means of combating *Ephestia kuhniella*, and common species of grain beetle.

Scale lice on the sugar cane in Java, L. ZEHNTNER (*Meded. Proefstat. Suikerriet West Java, 1901, No. 52, pp. 18, pls. 2*).—The author describes in detail an undetermined species of Aspidiotus and one of Planchonia. Notes are given on the life history and habits of these insects. The first species was found parasitized by a member of the family Encyrtinæ, while a parasite of the family Aphelinæ was bred from the second species.

The life history of two species of plant lice inhabiting both the witch-hazel and birch, T. PERGANDE (*U. S. Dept. Agr., Division of Entomology Bul. 9, tech. ser., pp. 44, figs. 23*).—The stem mothers of *Hormaphis hamamelidis* are hatched from winter eggs in early spring and make their appearance about a week before the leaves of the witch-hazel unfold. This generation causes the development of conical galls on the leaves. In each of these galls from 100 to 120 larvæ are produced by the stem mother. These larvæ reach maturity within from 16 to 20 days and are all possessed of wings constituting the migratory generation. The migratory period extends from May until July. There is only one generation of migrants in each gall. The migrating forms fly to birch trees, where they deposit larvæ on the underside of the leaves. The third, fourth, and fifth generations on the leaves of the birch are very similar in appearance and life history. The fifth generation becomes mature about the middle of August and produces larvæ which resemble Aleurodes in form. The sixth generation, after passing through 4 molts, acquires wings and migrates back to the witch-hazel. From these fall migrants another generation of males and females is developed and the eggs are deposited, in which form the species passes the winter.

The life history of *Hamamelistes spinosus* resembles that of the species just mentioned except for the fact that the galls on witch-hazel are developed in the flower buds rather than on the leaves, and the species hibernates on birch, requiring, therefore, more than a year for a complete life cycle. The winter eggs are deposited from the middle of June to the first of July and hatch during May and June of the following year, remaining dormant, therefore, nearly a whole year. The stem mothers upon hatching attack the young flower buds, and cause a rapid and peculiar development of these structures, so that the insects are soon inclosed within a hollow gall which later is covered with conspicuous spines. In these galls the second or migrating generation is developed. The migrants appear in July or about a month after the hatching of the first generation, and continue to issue until late in the fall. They migrate from witch-hazel to birch. The third generation of this species assumes a form which closely resembles species of Ctenochiton. About the middle of April, or at the time when the leaf buds of the birch begin to open, the females of this generation which have hibernated on the birch deposit their larvæ on the underside of the leaves in the folds between the transverse veins. The irritation caused by the presence of the insects induces the leaves to curl down, and finally the leaf becomes much changed in appearance by the formation of corrugations. The attack of this generation is sometimes a serious drain upon the health of birches. The winged form, or the return migrant, belongs to the fifth generation and migrates back to the witch-hazel during June.

San José scale, A. H. Benson (*Queensland Agr. Jour., 8 (1901), No. 6, pp. 451–454, pl. 1*).—The author gives a general account of this insect, with notes on its distribution, habits, and extent of injury in Australia. It is believed that the scale was introduced into Australia from California. A list of food plants upon which the insect has been found is given. The author considers the best winter spray to be lime, sulphur, and salt wash. Other artificial remedies which have been found effective are whale-oil soap, tobacco extract, sulphid of soda, and whale-oil wash and kerosene sprays. The author prefers the other insecticides to kerosene. In making the sulphid of soda and whale-oil wash, 6 lbs. of sulphur and 3 lbs. of concentrated lye are boiled in 2 gals. of water. At the same time 30 lbs. of whale-oil soap is to be dissolved in 48 gals. of water, and the sulphid of soda is to be added to this mixture. The whole is then boiled and water added to make 120 gals. in all.

A new means of combating the olive fly, A. Brian (*Prog. Agr. et Vit. (Éd. L'Est), 22 (1901), No. 28, pp. 55-57*).—According to the experiments of Prof. C. Parona, it is believed that the ordinary methods of combating *Dacus oleæ* in olive orchards are too expensive. Since it is well known that the insect prevails to an enormous extent in storehouses where olives are collected for extraction of the oil, it is suggested that special attention be given to destroying the insect in such situations. Experiments conducted for this purpose showed that the insects may be readily destroyed. It is recommended that the walls of storehouses be made of smooth lumber and that the larvæ and chrysalides be collected by hand and destroyed.

The almond bagworm (*Bul. Bot. Dept. Jamaica, n. ser., 8 (1901), No. 9, p. 141*).—The insect is considered to be *Oiketicus abbottii*, and is reported for the first time as injurious to orange trees.

Currant aphides (*Bd. Agr. [London], Leaflet No. 68, pp. 5*).—Considerable injury to currants is reported from the attacks of *Rhopalosiphum ribis* and *Myzus ribis*. In some localities the currrant bushes were entirely ruined by these insects, the leaves turning brown and the fruit falling off. Notes are given on the habits and life history of the two species. It is recommended that black currants be severely pruned in the fall following an attack of the insects, and that the pruned branches be burned. Spraying with kerosene emulsion and quassia is recommended. It is desirable that the first application be made early in the year.

Some insects injurious to shade trees, B. F. MacCartney (*Pennsylvania Dept. Agr. Rpt. 1900, pt. 1, pp. 91–97, figs. 4*).—Brief notes on imported elm-leaf beetle, white marked tussock moth, wood leopard moth, and bagworm.

The imported elm-leaf beetle, H. T. Fernald (*Massachusetts Sta. Bul. 76, pp. 8, fig. 1*).—Notes are presented on the occurrence, distribution, life history, and food plants of this insect. The most approved remedies are outlined and formulas are given for the preparation of suitable insecticides for use against this beetle, such as arsenate of lead, Paris green, kerosene emulsion, and a mechanical mixture of kerosene and water. It is recommended that trees should be sprayed when the leaves are about half grown, and that the application should be repeated during the first week in June. Loose bark on the trunk should be scraped off, and the grubs and pupæ at the base of the tree may be destroyed by spraying with boiling water or kerosene emulsion.

Tent caterpillars (*Bd. Agr.* [*London*], *Leaflet No. 69, pp. 5*).—Descriptive and biological notes are given on *Clisiocampa neustria* and the brown-tail moth. Both species are injurious to various fruit trees, especially apple, plum, and pear, but the first-named species is most common and most destructive. Besides fruit trees, it feeds on oak, elm, hawthorn, and various other trees and shrubs. The brown-tail moth has a somewhat local distribution, but occurs in great numbers wherever it is found. The egg bands of *C. neustria* should be collected in winter and burned. The tent of the brown-tail moth may be easily detected in winter and cut off and burned. Spraying with Paris green, London purple, or arsenate of lead is also effective against both these insects.

Observations on the South African locust fungus, G. Lindau (*Notizbl. K. Bot. Garten u. Mus., Berlin, 3 (1901), No. 26, pp. 119–126, pl. 1*).—The author describes in detail the growth and morphological characters of this species of fungus, which is described under the name *Mucor locusticida*. Culture experiments with this fungus indicated that it can be successfully grown on any of the usual media, and if it proves to be as effective as already suspected its culture on a commercial scale will be an easy matter.

Spraying calendar (*Pennsylvania Dept. Agr. Rpt. 1900, pt. 1, pp. 890–906*).—Brief directions are given for the preparation and application of insecticides and fungicides in the case of the common insect pests and fungus diseases of various cultivated crops.

Insect powders (*Agr. Jour. Cape Good Hope, 19 (1901), No. 4, pp. 266–270*).—Brief compiled notes are presented on the history, cultivation, preparation for use, and active principles of a species of pyrethrum which is used in the preparation of insect powders.

The new law concerning insect pests, W. E. Britton (*Connecticut State Sta. Bul. 134, pp. 6*).—A law concerning insect pests was passed by the Connecticut legislature on June 4, 1901, and approved by the governor on June 10. A copy of the law is given in the bulletin, and a brief statement is made by the author concerning the purpose of the law and the manner in which it is proposed to carry out its provisions.

How to keep white ants from a building (*Queensland Agr. Jour., 9 (1901), No. 2, p. 279*).—Directions are given for preventing the entrance of white ants into frame buildings in countries where these insects are a serious menace to such structures. The stumps on which the framework rests should be solid wood, without cracks or rotten places. All such stumps should be treated with hot coal tar so that this substance may penetrate as deeply as possible. Veranda steps should be connected with the ground by pillars treated in the same manner, and no lumber or rubbish should be allowed to accumulate under the building.

Directions for collecting and preserving insects and plants, E. M. Wilcox (*Oklahoma Sta. Circ. of Inform. 3, pp. 15, figs. 10*).—In this bulletin a request is made for observations and specimens from voluntary observers throughout the Territory. Directions are given for collecting, preserving, mounting, and shipping specimens of insects and plants to the station.

An annotated catalogue of the butterflies of New Hampshire, W. F. Fiske (*New Hampshire Sta. Tech. Bul. 1, pp. 80, figs. 55*).—This bulletin contains a brief general account of the distribution of butterflies in New Hampshire and notes on the habits and life history of 92 species which are reported as occurring in the State.

Bee culture, C. C. Miller (*Pennsylvania Dept. Agr. Bul. 77, pp. 103, figs. 12*).—This bulletin was prepared for the purpose of giving practical information on the various subjects connected with apiculture. Among the subjects which are treated by the author mention may be made of the biology of bees, bee products, varieties of bees, beehives and apiary apparatus, feeding of bees, management of queens, drones, and workers, methods of transferring, use of comb foundation, supers, extraction of honey, regulations of swarming, rearing of queens, introduction of queens, dividing of swarms, rendering of beeswax, robbing of bees, the enemies and diseases of bees, moving bees, honey plants, care of bees in winter, and a brief account of literature relating to apiculture.

Bees, and how to manage them, A. Gale (*Agr. Gaz. New South Wales, 12 (1901), No. 6, pp. 698–701*).—The author discusses the fluctuations in the honey market and calls attention to the necessity of putting up honey in an attractive form in order to secure a good price for the same. At a recent exhibition of bee products at the Royal Agricultural Show it was noticed that special interest was shown by visitors in those exhibits which were most attractively presented, and that the exhibitors secured large and profitable sales, beside giving a demonstration of the possibilities of bee raising.

The management of bees, A. Gale (*Agr. Gaz. New South Wales, 12 (1901), No. 7, pp. 840–845*).—The author discusses the collection, manufacture, and use of propolis by bees. An investigation was made of the possibility of obtaining honey from corn. The author examined many samples of honey which were reputed to be made from corn, but these samples did not agree in aroma, flavor, or color, and the idea that bees can obtain honey from corn is entirely discredited by the author.

Bee keeping in the West Indies, W. K. Morrison (*Imp. Dept. Agr. West Indies, Pamphlet No. 9, 1901, pp. 73, figs. 15*).—This pamphlet is in the nature of a manual of apiculture, and treats of the following subjects: Management of bees, breeds of bees, individuals of the colony, hives, queens, swarming, honey and wax production, comb foundation, robber bees, relation of bees to fruit growers, uses of honey, and the natural enemies and diseases of bees. A list is given of the more important literature on the subject of apiculture and of hive manufacturers, breeders of Italian bees, dealers in honey and wax, and manufacturers of comb foundation. A list is also given of the honey plants of the West Indies.

A glass observing super, H. R. Stephens (*Queensland Agr. Jour., 9 (1901), No. 2, p. 216*).—This contrivance obviates the necessity for the use of a smoker in observing the condition of colonies of bees. The observing super has one-half the depth of an ordinary hive, with a two-pane glass slide fitted into the top. It is to be placed gently and quickly in position on the top of the hive and allowed to remain as long as observations are required. A few bees fly against the glass for a short time, but the colony soon becomes quiet.

Foul brood in Tunis, P. Robinet (*Bul. Dir. Agr. et Com., 6 (1901), No. 20, pp. 251–257*).—The existence of foul brood in Tunis was first made known in 1900. Since, the disease appears to be well established in the country and rapidly spreading among the various apiaries. The author gives a general account of the disease, including the symptoms, microscopic appearance of diseased bees, the means of dissemination of the disease, and the principal methods of treatment which have been found effective in checking it.

Action of different colored rays of light on silkworms, C. Flammarion (*Bul. Min. Agr [France], 20 (1901), No. 3, pp. 493–496*).—The author continued the experiments which he had already instituted along this line and obtained results which in general confirm the results of previous experiments. The maximum production of silk took place under a clear violet-purple glass, and minimum production under a pale blue. The influence of different rays of light upon the determination of sex was somewhat marked. The number of females was reduced to 40 per cent under clear blue glass.

FOODS—NUTRITION.

On the so-called gluten and diabetic foods of commerce, H. C. SHERMAN and H. M. BURR (*Reprinted from New York Med. Jour., 1901, Oct., pp. 8*).—A number of commercial gluten foods were examined. Such goods are frequently recommended as food for diabetics, and it is usually claimed by the manufacturers that they contain only a small amount of carbohydrates.

"Of the 11 samples examined, which are believed to fairly represent the so-called glutens generally found on the market, not half are noticeably higher in protein or lower in carbohydrates than ordinary whole wheat, or Graham flour, and many are scarcely better than ordinary white flour or bread. Only 3 samples show any really material increase in the proportion of gluten, and all of these contain at least three-fourths as much carbohydrate as ordinary baker's flour. The best sample examined contained twice as much carbohydrate as protein. . . . "[Products containing much less carbohydrates in proportion to protein are on sale in England, and] there can be no doubt that equally good products will be offered by American manufacturers whenever they are seriously demanded. The sale under the name 'gluten' of such breadstuffs as those here described is certainly a most serious imposition upon both physicians and patients."

Analyses of miscellaneous food materials, C. D. WOODS and L. H. MERRILL (*Maine Sta. Bul. 75, pp. 89–112*).—Analyses are reported of the eggs of turkeys, geese, ducks, and guinea fowls, several samples of desiccated eggs, egg substitutes, prepared pancake flours, pea flour, gluten foods, condensed foods or emergency rations, acorns, Italian chestnuts, malted nuts, and 3 tropical fruits, namely, alligator pear, rosella or Jamaica sorrel, and Surinam cherry.

Analyses of buffalo butter, sheep butter, lard, and walnut oil from Bulgaria, N. PETKOW (*Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), No. 18, pp. 826–828*).—Analyses made at the Government Laboratory in Sofia, are reported.

Analysis of banana flour, H. H. COUSINS (*Jour Jamaica Agr. Soc., 5 (1901), No. 8, p. 322*).—The analysis of a flour of local manufacture is reported.

Fruits, nuts, and vegetables, A. BROADBENT (*Manchester, England: Author, 1900, pp. 103*).—The nutritive value of a considerable number of fruits, nuts, and vegetables is discussed, as well as the medicinal properties attributed to many of them.

Concerning the composition of certain fruit juices which are used in the preparation of confectionery, sirups, etc., TRUCHON and MARTIN-CLAUDE (*Ann. Chim. Analyt., 6 (1901), pp. 85–89; Jour. Pharm. et Chim., 6. ser., 13 (1901), pp. 171–176; abs. in Ztschr. Untersuch. Narh. u. Genussmtl., 4 (1901), No. 15, pp. 703, 704*).—A chemical study of the composition of the juice of cherries, strawberries, raspberries, currants, peaches, pears, quinces, and apples.

Glycerin content of dried fruits containing sugar, A. SCHMID (*Jahresber. Chem. Untersuch. Lab. Augsburg, 1901, p. 16; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), No. 15, p. 702*).—After keeping for a time, apparently owing to fermentation, glycerin is found in different dried fruits, such as plums, apricots, and cherries, the amount being dependent upon the age of the fruit. Dried plums, 2 years old, contained 0.18 per cent glycerin. Alcohol was not found, though an abundance of compounds resembling aldehydes was present.

Deterioration of artificial foods, C. H. LAWALL (*Amer. Jour. Pharm., 73 (1901), No. 10, pp. 477–481*).—The changes brought about in food products by fermentation, putrefaction, and oxidation are spoken of, as well as deterioration due to the absorption of odors.

Preservation of chopped meat and the number of spores of micro-organisms in it, A. STROSCHER (*Arch. Hyg., 40 (1901), No. 4, pp. 291–319*).—The composition of a number of commercial preservative salt mixtures is given and the value of such mixtures is discussed as well as the possibility of rendering meat preserved with them harmful on account of the presence of sulphurous acid and salts.

Concerning the chemical composition and sanitary valuation of certain meat preparations, F. KESTNER (*Inaug. Diss. Pharm. Inst., Dorpat, pp. 88; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), No. 14, pp. 646, 647*).—A study (including analyses) of a number of meat preparations.

Annual report of the progress of examination of food and condiments, 1899, H. BECKURTS and G. FRERICHS (*Jahresbericht über die Fortschritte in der Untersuchung der Nahrungs- und Genussmittel. Göttingen: Vandenhoeck and Ruprecht, 1901, pp. 138; noted in Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), Nos. 13, p. 624; 18, pp. 863, 864*).—A reprint from the *Jahresbericht der Pharmacie* for 1899.

Reports upon food and drug inspection, microscopical examination of food, and arsenic and other poisons in manufactured goods (*Reprint from Massachusetts State Bd. Health Rpt. 1900, pp. 86, pls. 15*).—This report embraces statistical matter and investigations carried on by A. E. Leach under the State pure-food law.

Diet during training, H. LICHTENFELT (*Arch. Physiol. [Pflüger], 86 (1901), No. 3–4, pp. 177–184*).—The nitrogen elimination of 2 athletes was studied. The conclusion was drawn that the long-continued severe muscular work of athletes requires more protein than ordinary work, the amount ranging from 2 to 3 grams per kilogram body weight.

Observations in China and the tropics on the army ration and the post exchange or canteen, L. L. SEAMAN (*New York: Wynkoop, Hallenbeck, Cranford Co., 1901, pp. 18; reprinted from Med. Rec., 60 (1901), No. 1, pp. 1–4*).—A paper read at the annual meeting of the Association of Military Surgeons of the United States, St. Paul, Minn., June 1, 1901.

On the effect of alcohol on metabolism in man, A. CLOPATT (*Skand. Arch. Physiol., 11 (1901), No. 5–6, pp. 354–371*).—The author was himself the subject of experiments in which alcohol was added to a simple mixed diet during part of the investigation. The principal conclusions follow: Alcohol acted as a protector of nitrogen-free nutrients and, after the body had become accustomed to it, as a protector of protein also. It has no observable effect upon the resorption ot nutrients in the intestines.

The influence of alcohol on the metabolism of protein, R. ROSEMANN (*Arch. Physiol. [Pflüger], 86 (1901), No. 7–10, pp. 307–503*).—On the basis of original experiments and the results of other investigators, which are cited in detail, the author discusses the effect of alcohol on metabolism. The conclusion is reached that alcohol is a protector of protein, but that the effect is not manifest until the body cells become able to tolerate the alcohol.

When alcohol forms part of a ration, does its potential energy serve for the production of muscular work? A. CHAUVEAU (*Compt. Rend. Acad. Sci. Paris, 132 (1901), No. 2, pp. 65–70*).—Experiments were made with a dog for a period of 389 days. The principal feature was the determination of the respiratory quotient during periods of work and rest, with a diet containing sugar and one in which sugar was replaced by alcohol. According to the author the results show that alcohol is not used to any extent, if at all, for the production of muscular work.

Influence of the substitution of alcohol for an isodynamic quantity of sugar in the diet; its effect on muscular work, maintenance, and waste, A. CHAUVEAU (*Compt. Rend. Acad. Sci. Paris, 132 (1901), No. 3, pp. 110–114*).—The experiments which were made with a dog led to the following conclusions: When an isodynamic quantity of alcohol was fed in place of a part of the sugar in the ration of a working subject a short time before the performance of the work, unfavorable results were obtained.

Concerning metabolism in adult man with special reference to the amount of protein required, V. O. Sivén (*Skand. Arch. Physiol., 11 (1901), No. 5–6, pp. 308–332*).—Continuing previous work (E. S. R., 11, p. 1067) the author reports a number of experiments, in which he was himself the subject, to determine the possibility of bringing the body into nitrogen equilibrum with a diet containing a very small amount of protein. The experiments led to the following conclusions: It is possible to bring the body, at least for a short time, into nitrogen equilibrium when the diet contains, per kilogram body weight, from 0.7 to 0.8 gm. nitrogen, of which only some 0.3 gm. is necessarily albuminoid nitrogen. When the amount of nitrogen consumed is so low the energy requirement of the body is not increased, but is as great as under ordinary conditions with a diet rich in protein. When the protein in the diet is increased, after the body has lost a large amount of nitrogen, there is at once an effort to attain nitrogen equilibrium and it appears that any gain of nitrogenous material is a comparatively slow process. This apparently indicates that living substance must be slowly formed from the protein supplied in the diet. The data are also recorded for the sulphur and phosphorus balance, and results obtained are discussed at some length.

Concerning the utilization of protein in the food, H. Lichtenfelt (*Arch. Physiol.* [*Pflüger*], *86 (1901), No. 3–4, pp. 185–193*).—A summary of experiments on the digestibility of animal and vegetable protein led to the conclusion that the assimilation of this nutrient must be regarded as a body function and not a property of the protein itseif.

The amount of protein cleavage in fasting, E. Voit (*Ztschr. Biol., 41 (1901), No. 2, pp. 167–195*).—Experiments with fasting subjects are summarized and the conclusion drawn that the cleavage of protein during fasting depends not alone upon the amount of material broken down at a given time, but also upon the relation of protein to fat in the body.

Effects on digestion of food prepared by the use of alum baking powders, E. E. Smith (*New York Med. Jour., 72 (1900), pp. 719–721*).—As a means of judging of the heathfulness of bread made with alum baking powder the author conducted experiments with a healthy man in which bread made with such baking powder was compared with bread leavened with sodium bicarbonate and hydrochloric acid. The alum baking powder had approximately the following combination: Sodium carbonate, 1 part; desiccated soda alum, 1 part; starch, 3 parts. When the stomach contents were examined after eating test meals consisting of the 2 sorts of bread and water no marked differences were observed in total acidity, total, free and combined hydrochloric acid, or the pepsin test. The slight differences, in the author's opinion, were all within the limits of experimental error. The digestibility of the 2 sorts of bread was tested in the usual way with a healthy man. Meat, milk, and butter were eaten in addition to the bread, the amounts being the same in the two cases. Corrections were not made for the metabolic products in the feces, and the digestibility (which the author terms "availability") of the bread made with alum baking powder was as follows. Total solids, 95.9; protein, 90.9; fat, 94.63, and carbohydrates, 98.05 per cent. The digestibility of the control bread was: Total solids, 95.9; protein, 89.9; fat, 94.4, and carbohydrates, 98.4 per cent. As pointed out by the author, the agreement is as close as could be expected even in duplicate experiments. The volume, specific gravity, nitrogen, indican, and combined sulphate in the urine was determined in the tests, practically the same results being obtained in both cases.

"The composition of the urines in the two periods, as regards the constituents indicating the degree of absorption of such aromatic products of putrefaction as are formed in the intestines, are so nearly the same that we must conclude that they do not indicate a greater degree of the putrefactive process in one or the other period. In fact, the evidence of the experiment is that the dietaries in periods 1 and 2 are physiologically identical, and, since the dietary in each instance was composed to the extent of two-thirds of the breads described, the evidence of the experiment is that the two breads are physiologically the same.

"There are certain criticisms of this experiment well worth considering. The point is raised that the metabolic nitrogen is not subtracted from the total nitrogen of the feces, in other words, that the figures obtained represent not the actual digestibility, but rather the availability, of the diet. It would be interesting to subtract the metabolic nitrogen and obtain actual figures of digestibility, but that is not usually attempted in such experiments, since the methods of determining the metabolic nitrogen at present known are quite inaccurate. It is, after all, the gain to the body in each period which we seek to establish, and that is, of course, indicated by the availability, and not by the digestibility.

"The question whether the diet was full and nutritious, including that of whether the subject was in nitrogenous equilibrium, is not to be given the same consideration here as in metabolism experiments in which the question of the balance of income and outgo is all-important. Of course, the diet should contain a fair amount of food, but no effort need be made to establish an equilibrium; on the contrary, to diminish the monotony of a fixed diet, investigators usually administer a little less than sufficient to establish an equilibrium. This does not put the subject in an unhealthy or in any way abnormal state. In fact, individuals vary their diet in this way in everyday life, and even some athletes, in training, for a time do precisely this thing to attain perfect health. The body adapts itself to certain variations that we must recognize as physiological, and the fact that to-day we eat less and to-morrow more is not an evidence of ill health.

"In conclusion, then, the evidence of these experiments is that food prepared by the use of a so-called alum baking powder does not interfere with secretion in the stomach; and, even when it makes up the major part of the diet, it is utilized by the body in the same way and to the same extent as an acceptable control diet. The investigation does not reveal any reason for believing such food at all injurious or unwholesome."

Concerning the digestion of starch in the mouth and stomach of man, Müller (*Med. Woche, 1901, p. 80; Chem. Centbl., 1901, I, p. 637; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), No. 13, p. 605*).—Experiments by a method which is described led to the following conclusions: When flour porridge and bread were eaten, 50 to 100 per cent of the starch was found in the stomach in soluble form, usually a short time after it was consumed. The effect of chewing on digestibility is marked; that of acidity, slight. Saliva is only slightly inferior to pancreatic juice as regards its power to digest starch.

Strength from eating, B. McFadden (*New York: Physical Culture Publishing Co., 1901, pp. 194, fig. 1*).—This book, which is written from a vegetarian standpoint, contains statements of a general character, including some not in accord with the views commonly accepted by phyiologists and physiological chemists.

Investigations on the excretion of carbon dioxid during muscular labor, J. E. Johansson (*Skand. Arch. Physiol., 11 (1901), No. 5–6, pp. 273–307, figs. 6*).—An apparatus of special construction for measuring positive, negative, and "static" work is described, as well as a number of experiments in which the amount of work performed and the carbon dioxid excreted were measured, the author himself being the subject.

The chemical composition of perspiration, W. Camerer (*Ztschr. Biol., 41 (1901), No. 2, pp. 271–274*).—The composition is reported of perspiration induced in a young man by different sorts of baths.

ANIMAL PRODUCTION.

Contribution to the subject of the decomposition of feeding stuffs and foods by micro-organisms which attack fat, J. König, A. Spieckermann, and W. Bremer (*Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), Nos. 16, pp. 721–744, fig. 1; 17, pp. 769–780*).—The authors summarize their investigations as follows: The 3 sorts of cotton-seed meal examined generally contained in considerable quantity the mycelium of different molds and different hay and potato bacteria. The molds increased when the water content was over 14 per cent. With a water content of from 14 to 30 per cent the molds predominated. When over 30 per cent was present the bacteria were more numerous. The sorts of molds varied with increased moisture content. The first mold noticed was *Eurotium repens* and this was soon followed by *E. rubrum.* When the moisture content was about 20 per cent, different species of Oidium were found, and when 25 per cent water was present, *Penicillium glaucum.* The growth of the molds is always accompanied by a loss of organic material and an increase in water content, the latter, without doubt, due to their respiration. In the first stages of molding, when the water content is about 20 per cent or less, the loss is chiefly fat in the case of cotton-seed meal, which is rich in this constituent. With a higher moisture content, especially when *Penicillium glaucum* is present, fat and nitrogen-free extractives (raffinose, etc.), are violently attacked and the pentosans in lesser degree. Proteids are broken down only in small quantity to nitrogenous compounds soluble in water but are not broken down to ammonia. A small part of the nitrogenous material present is apparently decomposed with the formation of free nitrogen.

The bacteria obtain the necessary carbon generally from nitrogen-free extractives (raffinose, etc.) and pentosans, and in a small measure from fat. On the other hand, they induce a deep-seated cleavage of proteids, which sometimes results in the production of ammonia. Experiments with pure cultures of the molds on cotton-seed meal and of other sorts on sterile cotton-seed meal, as well as on artificial culture media containing fat, have shown that these micro-organisms readily derive the necessary carbon from fat and the higher fatty acids, both liquid and solid. The growth of molds on fatty substances is always accompanied by a cleavage of fat, which varies in intensity with the species present. From the cultures of *Aspergillus flavus* and *Eurotium repens* on sterile cotton-seed meal, enzyms can be separated which produce butyric acid from monobutyrin. According to the authors' investigations this is not the case with cotton-seed oil. Such a cleavage necessitates a previous cleavage of the higher glycerids, and numerous investigations with adipolytic enzyms show that the quantity of free fatty acids produced increases with the amount of fat involved. Apparently the greater part of the fat is broken down directly to carbon dioxid and water.

The preservation and value of mixed molasses feeds, B. Schulze (*Arb. Deut. Landw. Gesell., 1901, No. 59, pp. 26*).—The composition of a number of maize germ molasses feeds and peat molasses feeds is reported. According to the author the keeping quality of molasses concentrated feed diminished with increased water content. Such changes progress more rapidly in summer than in winter. The feeds undergo a loss of sugar and much cane sugar is tranformed into invert sugar. Peat molasses changes little on keeping and has much the same digestibility as molasses itself.

The agricultural value of beet leaves, Hoppenstedt (*Fühling's Landw. Ztg., 50 (1901), Nos. 11, pp. 393–399; 12, pp. 431–438*).—Drying beet forage with special apparatus is recommended as superior to any other method of utilizing this by-product as a feeding stuff. The composition of the dry fodder is given.

Beef making with corn, Kafir corn, and alfalfa, F. C. Burtis (*Oklahoma Sta. Rpt. 1901, pp. 98–101*).—In continuation of previous work (E. S. R., 12, p. 670), the comparative value of corn meal and Kafir corn meal, fed with alfalfa hay and Kafir corn stover, was tested for 151 days with 4 lots containing 5 native grade steers each, averaging 1,026 lbs. in weight. Lots 1 and 2 were fed alfalfa hay, the former receiving Kafir corn meal and the latter, corn meal in addition. Lots 3 and 4 were fed Kafir corn stover, the grain ration of lot 3 being made up of Kafir corn meal and of lot 4, corn meal. The coarse fodder fed to the 4 lots per bushel of grain averaged 6.89, 6.58, 10.15, and 9.90 lbs., respectively. The average daily gain per steer of the 4 lots was 2.72, 2.73, 2.33, and 2.36 lbs., the grain eaten per pound of gain being 7.63, 6.63, 9.95, and 9.50 lbs. The steers were sold for slaughtering, the dressed weight being some 60 per cent of the live weight in every case. The shrinkage per head ranged from 33 lbs. in the case of lot 2 to 51 lbs. in the case of lot 3. The author notes that on an average, in the above test, "a bushel of corn meal produced, when fed to steers, about three-quarters of a pound more beef than did a bushel of Kafir meal. In addition to requiring from a fourth to a third less grain to produce a pound of beef, the alfalfa fed steers made about 16 per cent faster gains than did the Kafir stover fed steers."

Four pigs, averaging 125 lbs. in weight followed each lot of steers. In addition to the food gathered, each lot was fed 360 lbs. of the same kind of grain as the steers followed. The total gains made by the 4 lots of pigs were 272, 183, 410, and 226 lbs.; the grain fed per pound of gain, 1.32, 1.97, 0.87, and 1.58 lbs. respectively.

"Undoubtedly better gains could have been obtained with these pigs if more grain had been fed, but the pigs would not have picked the manure over so closely, and it is a question if it would pay to feed more grain.

"The difference in gains made by the lots can be accounted for largely by the fact that a much larger percentage of the grain passed through the steers getting Kafir stover than those getting alfalfa. Again, a much larger percentage of the Kafir meal passed through the steers than did the corn meal."

Cattle food (*Bul. Bot. Dept. Jamaica, n. ser., 8* (*1901*), *No. 10, pp. 153, 154*).—An analysis of gungo bean or saman pods and seeds (*Pithecolobium saman*) is quoted and its value as cattle feed discussed.

Concerning "kalf room" [calf cream], F. W. J. Boekhout (*Ztschr. Untersuch. Nahr. u. Genussmtl., 4* (*1901*), *No. 17, pp. 781, 782*).—The author believes it probable that this calf food is made from peanut oil and sugar. The opinion has been previously advanced that this material was made up of cotton-seed oil, freshly precipitated casein, and sugar.

Breeding for beef in Trinidad, C. W. Meaden (*West Indian Bul., 2* (*1901*), *No. 2, pp. 169, 170*).—A brief discussion of the industry as affected by local conditions.

Zebu cattle in Trinidad, C. W. Meaden and J. H. Hart (*West Indian Bul., 2* (*1901*), *No. 2, pp. 166–169*).—A history of the introduction of Zebu cattle from India into Trinidad and neighboring colonies for crossing with native cattle.

Lamb feeding experiment, L. Foster (*Wyoming Sta. Bul. 47, pp. 47, pls. 4*).—Lamb feeding in general is discussed, and a test reported of the comparative value of alfalfa and native hay, combined with a grain ration for fattening lambs for market, the special object being to determine whether lambs can be profitably fattened under local conditions. One hundred grade lambs of rather inferior quality were divided into 2 lots of 50 each. After a preliminary period of 1 week the test began December 28 and continued 95 days. Lot 1 was fed native hay of medium quality and lot 2, first and second crop alfalfa hay. In addition, both lots were fed corn and oil cake, the amount of grain being increased as the experiment progressed. The average daily gain in the 2 lots was 0.253 and 0.324 lb., respectively. The sheep in lot 1 consumed per head daily, on an average, 1.07 lbs. native hay, while those in lot 2 consumed 1.47 lbs. alfalfa hay, both lots receiving in addition 0.76 lb. grain and 0.04 lb. oil cake. The cost of food per pound of gain was 4.48 cts. in the case of lot 1, and 3.89 cts. in the case of lot 2. It was observed that the lambs fed alfalfa consumed more water than those fed native hay. A record covering 1 month showed that the former drank 17 per cent more than the latter. The sheep were slaughtered at the end of the trial. The principal conclusions follow:

"Taking the experiment as a whole, the results show a small [pecuniary] loss but the actual gains were made at a fair profit on both the alfalfa and the hay. The indications are that under ordinary conditions lambs will give good returns per ton for either native hay or alfalfa fed in connection with a light grain ration. To produce the quality of mutton in greatest demand by consumers, the feeding period need not include more than 90 days.

"For lamb feeding it is advisable to grow alfalfa in preference to native hay on all lands under irrigation where it can be successfully produced."

Cotton-seed meal as pig feed, F. C. Burtis (*Oklahoma Sta. Rpt. 1901, pp. 102–107*).—Cotton-seed meal is generally regarded as a dangerous feed for pigs. The author had found that a mixture of cotton-seed meal and corn or Kafir corn meal, 1:4, gave excellent results, and few pigs died if the meal was not fed for more than 4 weeks. He also observed that when the pigs had a wide range and green feed unfavorable results did not follow its use. Good results followed the feeding of cotton-seed fed for short periods separated by periods in which none was fed. These points were tested in 2 trials. In the first, 17 pigs averaging 80 lbs. each were fed for 67 days. From the first to the twenty-seventh day, the forty-first to the fifty-fifth day, and the sixty-second to the sixty-seventh day, inclusive, the grain ration consisted of cotton-seed meal with Kafir corn meal (or Kafir corn meal and corn meal), 1:4. At the other times the grain ration consisted of a mixture of Kafir corn meal and corn meal. During the whole test the pigs had the run of a large paddock where they could procure some green food. In the first period on cotton-seed meal the average daily gain per pig was 1.28 lbs., the grain required to produce a pound of gain 3.19 lbs., and the cost of food per pound of gain 1.72 cts. In the second cotton-seed meal period the corresponding figures were 1.21 and 4.39 lbs. and 2.37 cts. In the first period without cotton-seed meal the average daily gain per pig was 1.04 lbs., the grain required to produce a pound of gain 5.71 lbs., and the cost of food per pound of gain 2.55 cts. The data are not recorded for the other periods. The author observes that although the periods are not directly comparable it can be plainly seen that "the pigs made much better gains while receiving the cotton-seed meal, and required much less grain to produce a pound of pork. None of the pigs died, although they had received cotton-seed meal as a part of their ration for 46 days, 27 of which were consecutive."

At the close of the test 13 of the pigs were sold. The remainder were continued on the cotton-seed meal ration for 47 days longer. One of the pigs died on the twenty-first day of the supplementary period; the others were sold at its close as fat hogs.

In the second test, 16 pigs about a year old, in poor condition (averaging 79 lbs. each in weight), were hurdled on wheat and fed a light ration of cotton-seed meal and Kafir corn meal (1:4) for 26 days. They were then shut in a lot and fed the same grain ration for 21 days longer. While hurdled on the wheat the average daily gain per pig was 0.96 lb.; the grain fed per pound of gain, 3.11 lbs. When fed in the lot, the average daily gain per pig was 1.71 lbs.; the grain eaten per pound of gain 3.07 lbs. Five of the pigs were sold. The cotton-seed meal ration was fed to the remainder for 47 days longer. All the pigs lived and were sold as fat hogs.

"Our work has gone far enough to enable us to state that excellent gains may be obtained by adding 1.5 [lbs.] cotton-seed meal to a pig ration, and that it may be so fed that there is but a small chance of any of the pigs dying from the effects of it. We are not ready yet to say exactly how or under what conditions this should be, but under our methods the death rate was so small that the gain from feeding the cotton-seed meal greatly overbalanced it.

Cowpea hay for swine, F. C. BURTIS (*Oklahoma Sta. Rpt. 1901, pp. 108–111*).—Two tests on the value of cowpea hay for pigs are reported. The first was made with 2 lots of 4 pigs each, about 8 months old. Both lots were fed in pens, receiving a grain ration of corn meal and Kafir corn meal, 1:1. In addition, lot 1 was fed cowpea hay. In the 10 weeks of the test the average daily gain in the 2 lots was 1.09 and 0.43 lbs., the grain eaten per pound of gain being 4.46 and 6.95 lbs., respectively. The amount of cowpea hay eaten by lot 1 averaged 2.18 lbs. per pound of gain. The author notes that at the close of the test lot 1 was in a fairly marketable condition while the condition of lot 2 was not so satisfactory.

The second test was made with 2 lots of pigs each about 4 months old. They were fed the same rations and under the same conditions as in the preceding test. The average daily gain per pig in the 2 lots was 0.46 and 0.24 lb., respectively, the grain eaten per pound of gain being 7.1 and 9.8 lbs., respectively. In addition to grain, the pigs in lot 1 ate 1.87 lbs. cowpea hay per pound of gain. In this test also, the best results were obtained with the ration containing cowpea hay.

Pig farming on the paddock system, W. H. CLARKE (*Agr. Gaz. New South Wales, 11 (1900), Nos. 9, pp. 788–792, pl. 1; 11, pp. 993–1000*).—Raising pigs by grazing them on a succession of crops is discussed with reference to local conditions.

The value of barley and pumpkins as horse feed (*Queensland Agr. Jour., 9 (1901), No. 2, p. 187*).—The value of barley and pumpkins is pointed out in a brief note. The latter were found to be especially useful for horses affected with "old man asthma" due to eating corn and chaff.

Improvement of the breeds of horses (*Bul. Agr. [Brussels], 17 (1901), No. 4, pp. 416–465*).—A circular sent to the governors of the different provinces of Belgium regarding an effort to improve breeds of horses.

Points on producing draft horses, W. J. KENNEDY (*Farm Students' Rev., 6 (1901), No. 10, pp. 150, 151*).—Desirable qualities are pointed out and discussed.

Farm poultry keeping (*Oklahoma Sta. Rpt. 1901, pp. 63–85*).—This is practically a reprint of Farmers' Bulletin No. 41 of this Department (E. S. R., 8, p. 428).

Concerning the iron content of hens' eggs and experiments on the increase of iron in the egg when hæmogallol and ferrohæmol are fed, P. HOFFMANN (*Ztschr. Analyt. Chem., 40 (1901), No. 7, pp. 450–459, dgm. 1*).—When hæmogallol and ferrohæmol were fed to hens, the iron content of the eggs produced was increased, the former having more effect than the latter, although it contains less iron. The effect was influenced by outside conditions, for instance, by the diet. When cuprohæmol was fed no copper was found in the eggs.

DAIRY FARMING—DAIRYING.

Feeding trials with cows, J. L. HILLS (*Vermont Sta. Rpt. 1900, pp. 391–443, 461–502, fig. 1*).—Extensive feeding experiments including 48 cows and lasting 28 weeks, in part a continuation of previous work (E. S. R., 12, p. 283), are reported in detail and summarized at some length. The different experiments included from 3 to 11 cows, and covered periods of 4 weeks each.

An experiment was conducted to determine how much grain may be fed with profit. "Four, eight, and twelve pounds of 3 different grain rations were fed at different times with hay and silage to 11 cows, each animal being kept throughout the experiment upon the same grain ration, so far as character is concerned, but a different one as regards its amount. The outcome was essentially as follows: *Quantity.*—The more grain, the more milk, total solids, and fat. *Quality.*—Only slight changes were observed as a result of variation in amounts of grain fed. Such alterations as occurred were in the general direction of better milk on medium than on either low or high feeding. *Economy of production.*—A pound of dry matter produced more on the low than on either the medium or high grain feeding. There was but little difference in this respect between the medium and the high ration. *Live weight.*—Increased feeding usually affected the milk flow only in the first few months of lactation, but from the fourth month on there seemed to be a greater tendency to affect the live weight than to alter the milk flow. *Financial outcome.*—In these trials an increase of grain from 4 lbs. to 8 or 12 lbs. seldom yielded enough more butter to pay the cost of the extra grain. In practically every case, however, there was enough more skim milk and enough better manure made to more than offset the extra expense for grain. . . . The outcome of these trials is in many ways parallel to that of similar experiments lately reported by the Wisconsin Station [E. S. R., 12, p. 81]."

The effect of adding single nutrients—protein, carbohydrates, fat—to standard rations was studied with 9 cows during 3 feeding periods. The results are summarized as follows: "*Protein.*—The addition of about one-fifth more digestible protein to a ration already containing amounts of this nutrient greater than standard requirements was practically without effect as a milk stimulant. *Carbohydrates.*—The addition of about one-fifth more digestible carbohydrates to a ration containing amounts of these nutrients equal to or in excess of standard requirements had little or no effect upon either the quantity or quality of the milk flow. *Fat.*—The addition of a solid fat to a ration already containing digestible ether extract in excess of standard requirements increased its digestible fat content about one-half. It had a slight effect upon the quantity and a pronounced effect upon the quality of the milk flow. The total solid percentage was increased 2 per cent (0.24 per cent) and the fat 7 per cent (0.36 per cent). The increase appears to have been a permanent one."

The feeding value of buckwheat middlings was compared with that of (1) corn meal, wheat bran, cotton-seed meal, and linseed meal, and (2) corn meal and wheat bran. Buckwheat middlings were about equal in value to ration 1 as regards the quantity of milk, total solids, and fat produced, but increased the yield of total solids and fat from 8 to 11 per cent over ration 2. The fat content of the milk was increased about 0.20 per cent when buckwheat middlings were fed in considerable quantities. Buckwheat middlings produced cheaper milk and butter, especially as compared with the corn and bran ration.

A ration containing cotton-seed meal, linseed meal, corn meal, and wheat bran was compared with a ration containing Quaker dairy feed. The nutritive ratios of the 2 rations averaged, respectively, 1:5.3 and 1:7.7. "The medium ration produced 6 per cent more milk, total solids, and fat than did the wide ration. The quality of the milk remained unchanged."

Rations of (1) corn and bran and (2) Quaker dairy feed having practically the same nutritive ratios were compared as in previous years. "The corn and bran and Quaker dairy feed made equal quantities of milk and of butter. If the extra manurial value of the corn and bran ration is reckoned as an offset of its extra cost the outcome was exactly even. If this is not taken into account the dairy feed proved preferable."

In experiments in grooming and watering cows "there was 4 per cent less milk yielded when the cows were groomed than was given when they were left uncarded. The quality of the milk remained unaltered. . . . No more and no better milk was made when the cows drank at will than when they drank twice daily. . . . Warming water from 45 to 70° F. did not avail to improve either the quantity or the quality of the milk yield with cows stabled in barns the average winter temperature of which was 45 to 50° F."

The effect of feed on the quality of butter, J. L. Hills (*Vermont Sta. Rpt. 1900, pp. 443–445*).—The effect of rations made up of hay and silage and different concentrated feeding stuffs upon the quality of butter was studied in connection with the experiments noted above and in continuation of previous work (E. S. R., 12, p. 285). The concentrated feeding stuffs compared were buckwheat middlings and a mixture of wheat bran, corn meal, cotton-seed meal, and linseed meal, alone and with the addition, respectively, of buckwheat middlings, gluten flour, sugar, and palm oil. The average results of analyses of 47 samples of butter are given. Buckwheat middlings made a firmer butter than the ration containing cotton-seed meal and linseed meal, the volatile acid content being higher and the iodin number lower. The addition of sugar increased the volatile acid content of the butter and decreased the iodin number, the melting point remaining practically unchanged. The ration containing palm oil decreased the iodin number and increased the melting point nearly 2° C. without changing the volatile acid content.

Feeding experiments, J. S. MOORE (*Mississippi Sta. Rpt. 1901, pp. 23–26*).—Tests were made to compare cotton-seed meal with wheat bran and Johnson grass hay with cowpea hay for milch cows. Different amounts of cotton-seed meal and wheat bran were fed to 3 lots of 3 cows each in 2 tests of 4 weeks each. The data are tabulated. The results are considered as showing that 4 lbs. of cotton-seed meal are equal to 6 lbs. of wheat bran. Results of feeding cowpea hay and Johnson grass hay in rations otherwise alike to 2 lots of 3 cows each for 4 weeks indicated that the 2 kinds of hay have practically the same feeding value. The results of these and earlier experiments are considered as showing that 1 lb. of cotton-seed meal, 1.71 lbs. of cotton seed, 2 lbs. of corn meal, and 1.5 lbs. of wheat bran have the same feeding value.

A comparative experiment in feeding oil cake to dairy cattle, G. FASCETTI (*Staz. Sper. Agr. Ital., 34 (1901), No 9, pp. 849–864*).

Dairy herd records, G. H. TRUE (*Arizona Sta. Bul. 39, pp. 293–309, figs. 3*).—Introductory notes are given on Arizona as a market for dairy products, cooperative creameries, and on the care of milk. Tabulated records are given of 58 herds in Salt River Valley for the year ended October 31, 1900, and of 43 herds for 6 to 11 months. Of the 58 herds 16 failed to pay what the author estimates as the cost of keeping ($32 a year per cow). The gross returns from the average cow of the best herd was $54.80, and from the average cow of the poorest herd $13.28. The differences in returns from different herds are attributed mainly to differences in the quality of the cows, as methods of feeding are considered practically uniform. Individual records are given of 12 pure-bred Jersey and 30 grade cows belonging to 2 herds ranking among the best for the year. Variations in the fat content of the milk of each cow during the year and between consecutive tests are tabulated. The author believes that the only way of determining the value of a cow involves weighing and testing all of the milk.

Record of dairy herd, J. S. MOORE (*Mississippi Sta. Rpt. 1901, pp. 17–23*).—A record is given of 9 pure-bred Jersey cows for the calendar year 1900. The data are tabulated and summarized as follows: "The record of the herd for the year shows that the average cost of the feed was $33.54, ranging from $30.66 to $36.51. The yield of milk ranged from 3,801 lbs. to 7,045, the average being 5,149 lbs. The average amount of butter was 324.6 lbs., and ranged from 267.6 to 436.2 lbs. The average cost of feed to produce 100 lbs. of milk was 66.4 cts. The cost of producing 1 lb. of butter ranged from 8.37 cts. to 12.29, the average being 10.52 cts."

Records of the station herd for 1898–99 and 1899–1900 (*Vermont Sta. Rpt. 1900, pp. 445–460*).—These records are similar in character to those previously reported (E. S. R., 12, p. 286). The following table summarizes some of the data for 6 years.

Average herd record for 6 years.

Year.	Number of cows.	Yield of milk.	Fat content of milk.	Yield of butter.	Cost of food.	Cost of purchased grain.	Cost of food per pound of butter.	Proceeds from butter sales.
		Pounds.	*Per cent.*	*Pounds.*			*Cents.*	
1895	33	5,633	4.95	325	$50.06	$18.85	16.2	$76.40
1896	37	5,431	5.12	324	42.00	14.22	13.8	74.51
1897	29	5,730	5.06	338	47.45	18.69	15.3	82.04
1898	42	5,296	5.06	313	46.40	15.73	15.6	80.58
1899	47	5,462	5.02	320	45.17	15.57	14.5	83.18
1900	45	5,935	5.15	357	52.43	21.20	15.2	97.15

Lessons from the model dairy tests, E. Van Alstyne (*Amer. Agr.* (*mid. ed.*), *68* (*1901*), *No. 21, p. 518*).—An article from the superintendent of the model dairy tests at the Buffalo Exposition regarding several points brought out.

The sampling of milk, H. Wibbens (*Orgaan Ver. Oudleer. Rijks Landbouwschool, 13* (*1901*), *No. 153, pp. 79, 80*).—The author found that portions taken with a glass tube plunged into a can of milk could not always be depended upon as fair samples for determining the fat content. The two factors that influence the result are the rapidity with which the sampler is plunged into the milk, and the degree to which the cream has risen. The former can be controlled by putting the sampler in carefully, and the latter may be rendered accurate by thoroughly stirring the milk before sampling.

In a series of tests with samples taken from the same can of milk after it had stood for some time and again after stirring, it was found that the percentage of fat was greater in the first case. It is therefore recommended to draw the samples only after the milk has been thoroughly mixed in the can.—H. M. PIETERS.

The influence of high temperatures upon the casein of milk, H. Conradi (*München Med. Wchschr., 48* (*1901*), *pp. 175–177; abs. in Chem. Centbl., 1901, I, No 15, p. 843*).—The author made a study of the effect of sterilization upon the composition of milk, and also the influence of calcium and other salts upon the temperature of coagulation. Milk containing 0.2 to 0.6 per cent of $CaCl_2$ coagulated at a temperature between 45 to 65° C. After heating over 80° the coagulating point fell from 8 to 12°, while milk heated 75 to 80° coagulated at the same temperature as milk not heated. As found by von Freudenreich, no variation was produced by heating one-half hour at 70°. Heating milk containing calcium chlorid above 80° not only lowered the temperature of coagulating, but increased the time required. The results indicate that heating milk above 80° causes chemical and physical changes in its composition.

Treatment of pasteurized milk, Elvira Smeyers (*Lait. Belge, 1901, No. 9, pp. 129–139*).—In a study of pasteurizing milk from 85 to 90° C., cooling one portion rapidly to from 12 to 16°, and preserving both portions at a temperature of from 14 to 20°, it was found that the milk which was gradually cooled kept better than that which was cooled immediatety after pasteurizing and kept under the same conditions of temperature.

Instructions for milk and cream suppliers, G. S. Thomson (*Jour. Agr. and Ind., South Australia, 5* (*1901*), *No. 2, pp. 105–114, figs. 9*).—General instructions, with some rules for the dairy farmer.

An investigation on the value of certain sanitary and other precautionary measures, employed in the protection and marketing of milk, upon the bacterial contents of the milk, D. H. Bergey (*Pennsylvania Dept. Agr. Rpt. 1900, pt. 1, pp. 133–163, figs. 2*).—This investigation was made for the purpose of studying the bacterial content of milk from individual cows and from dairies of different classes, also the estimation of the prevalence of streptococci, and, incidentally, the presence of tubercle bacilli in the milk. The different dairies studied were divided into 3 classes as follows: (1) those in which the utmost care was taken in all details of the management; (2) those in which ordinary precautions were taken in the selection of cows, the nature and variety of food, care and cleanliness of cows, milkers, and utensils, and (3) dairies in which no particular care was observed in the selection and management of the cows, or in the collection, storing, and marketing of the milk. The investigations cover a large number of determinations, which are reported in a series of tables.

From the results the following deductions are drawn: "(1) Milk taken directly from the udder in the ordinary way and collected in sterile test tubes was always found to contain bacteria of the group streptococci. The number in the first milk drawn was usually greater than the latter portion. (2) Where the milk pails were sterilized by steam before and after milking each cow, the number of bacteria was but little higher than when the samples were taken direct from the cows. (3) When the milk pails were not sterilized, the number of bacteria was higher than when the milk was collected directly. The greater the care in milking and the better the hygienic conditions of the cows and surroundings, the lower the bacterial content of the milk. (4) There was an enormous increase in the number of bacteria during shipment. From the large bacterial content of milk collected on depot platforms it is apparent that there is much room for improvement in the methods of collection and shipment. (5) It was found that some bacteria gained access to the milk during the processes of filtering, cooling, and bottling. It is therefore recommended that the apparatus employed for this purpose should be as simple as possible, and so constructed that it can be easily disconnected, cleaned, and sterilized. (6) A few leucocytes were found in practically all the milk examined, and this appears to be an entirely normal condition. (7) The prevalence of pus cells in the milk appeared to be influenced directly by the hygienic condition of the cows. This is also apparently influenced to some extent by other factors, probably by the character of the food. (8) Though no positive evidence was obtained of any pathogenic effect of the streptococci in the milk when inoculated into guinea pigs and rabbits, it is probable that when these organisms are present in large numbers, as in some of the samples, they would be injurious to infants or sick persons when such milk is taken in large quantities."

The presence of tubercle bacilli in market milk, and its diffusion, C. Tonzig (*Arch. Hyg., 41 (1901), No. 1, pp. 46–67*).—A study of the tubercle bacilli content of market milk of Padua, and statistics of various provinces in Italy.

Hydrogen peroxid as a preservative, especially for milk, Jablin-Gonnet (*Ann. Chim. Analyt., 6 (1901), pp. 129–133; abs. in Chem. Centbl., 1901, I, No. 21, p. 1173*).—The author found hydrogen peroxid to be an efficient and harmless preservative for milk. Young dogs and cats thrived upon portions of milk containing 10 to 15 cc. of it. The author himself during 2 months consumed ½ liter of milk daily containing 8 per cent of hydrogen peroxid, without experiencing the least derangement. The hydrogen peroxid employed was neutralized with calcium carbonate; 1 cc. preserved 1 liter of milk 2 days; 2 cc., 4 days; and 3 cc., for 6 days.

Systematic inspection of milk for preservatives, A. E. Leach (*Analyst, 26 (1901), No. 308, pp. 289–291*).—Statements regarding the inspection of milk in Massachusetts, and methods for the detection of preservatives. In 5,169 samples examined, 3.5 per cent were found to contain foreign substances. The most common were formaldehyde, boric acid, and sodium bicarbonate, the former being on the increase and the two latter on the decrease.

Inspection of dairy products (*Chicago Dairy Produce, 8 (1901), No 49, p. 6*).—Rules adopted by this Department covering the inspection and marking of dairy produce for export.

Conditions and methods of making some of the high score butter recently exhibited (*New York Produce Rev. and Amer. Creamery, 1901, Nov. 13, pp. 18–19*).—Statements from different makers of prize-winning butter exhibited at State fairs regarding the methods followed.

Scoring butter, H. E. Alvord (*New York Produce Rev. and Amer. Creamery, 1901, Nov. 6, pp. 12, 13*).—A discussion of improvements in the method of scoring.

Uniformity in Danish butter, M. Mortensen (*Creamery Jour., 12 (1901), No. 146, pp. 8, 9*).—The author states that the position held by the Danish butter in the world's market is due largely to the uniformity of the product. Certain processes prevailing in Danish creameries are cited as being responsible for the uniform high quality of the output.

Butter in China (*U. S. Consular Rpts., 67 (1901), No. 254, p. 454*).—A report from Consul-General Hughes regarding the demands of the Chinese trade in butter, and the form of package best suited for their markets.

The conservation of butter, E. RIGAUD (*Ind. Lait. Belge, 2 (1901), No. 41, pp. 321–323*).—A description of various methods of treatment for the purpose of preserving the quality of butter.

Fishy flavor in butter, H. G. PIFFARD (*New York Produce Rev. and Amer. Creamery, 1901, Nov. 13, p. 20*).—A discussion of the cause of fishy flavor in butter.

A study of butter fat, A. PARTHEIL (*Arch. Pharm., 239 (1901), pp. 358–363; abs. in Chem. Centbl., 1901, II, No. 7, p. 504*).—An investigation of the molecular weight of butter fat and its application in determining the purity of butter.

The determination of margarin in butter, C. ANNATÓ (*Pharm. Ztg., 46 (1901), No. 693, pp. 31–38; abs. in Chem. Centbl., 1901, II, No. 14, p. 836*).—The author made a test to determine the influence of sesame cake upon the butter fat. He fed 3 cows increasing amounts of sesame cake, from 2 to 5 lbs., and examined the resulting milk. In the third period sesame oil was found in the milk by the furfurol reaction. From the results obtained, the conclusion is drawn that the presence of sesame oil in butter from cows fed on sesame cake is not necessarily an adulteration.

Cryoscopic distinction between butter and margarin, W. PESCHGES (*Arch. Pharm., 239 (1901), pp. 358–363; abs. in Jour. Chem. Soc. [London], 80 (1901), No. 468, II, p. 630*).—From his investigations the author found the method of distinguishing between butter and margarin by means of cryoscopic determination of the molecular weight in benzene to be invalid.

Analysis of cheese and butter manufactured at the Queensland Agricultural College, J. C. BRÜNNICH (*Queensland Agr. Jour., 9 (1901), No. 4, pp. 424–428*).

The utilization of skim milk, C. BESANA (*Ann. R. Staz. Spèr. Caseif. Lodi 1900, pp. 19–57*).—A discussion of the various ways in which skim milk is utilized in Italy.

The composition and fertilizing value of the slime from the milk separator, G. FASCETTI (*Ann. R. Staz. Spèr. Caseif. Lodi 1900, pp. 69–71*).

Dairy history of Illinois, A. B. HOSTETTER (*Chicago Dairy Produce, 8 (1901), No. 45, pp. 26, 27*).—A review of the growth of the industry in Illinois and factors that have influenced it.

Report of dairy expert, M. A. O'CALLAGHAN (*Agr. Gaz. New South Wales, 12 (1901), No. 8, pp. 920–923*).—A short report on the progress of the dairy industry in New South Wales during 1900.

Dairy instruction in Alabama (*Chicago Dairy Produce, 8 (1901), No. 49, p. 22*).—Educational work in dairying among the colored people of the institute at Tuskegee.

VETERINARY SCIENCE AND PRACTICE.

Report of the state veterinarian, L. PEARSON (*Pennsylvania Dept. Agr. Rpt. 1900, pt. 1, pp. 118–129*).—During the year 1900 it is reported that glanders and contagious ophthalmia of cattle prevailed to a greater extent than during the past four or five years. The increased prevalence of glanders was directly due to the importation of a carload of infected mules from East St. Louis, Ill. Stringent measures were taken in combating this outbreak, and it is believed that the disease has been exterminated.

A general discussion is given on the prevalence of tuberculosis among cattle in the State, and attention is called to the desirability of continuing strict quarantine regulations against the disease and the thorough application of the tuberculin test. The expense of making this test is considered very small in comparison with the benefits which are derived from it.

Brief notes are also given on rabies, sheep scab, hog cholera, abortion, and forage poisoning.

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The mechanism of agglutination, A. Joos (*Ztschr. Hyg. u. Infectionskrank.*, *36* (*1901*), *No. 3*, *pp. 422–439*).—This paper is concerned with the discussion of results obtained from experiments in agglutination with and without the addition of common salt. The experiments were made with the typhus bacillus. The results of the experiments may be briefly summarized as follows: When an agglutinating serum is brought in contact with a substance which is subject to agglutination, no agglutinating process takes place in the absence of salt. When salt is added, agglutination occurs readily. In the absence of salt the agglutinating serum is entirely sterilized by the action of the bacilli, without producing any change in the vitality of the latter. A close connection exists between the relative quantities of the substances which cooperate to produce agglutination and the substances which are to be agglutinated. The process of agglutination may occur in a solution which is free from salt, provided the bacterial cells contain some of this substance.

Coagulation of the blood and anticoagulation serum, J. Bordet and O. Gengou (*Ann. Inst. Pasteur*, *15* (*1901*), *No. 3*, *pp. 129–144*).—During these experiments it was found that the blood plasma of birds is poor in fibrin ferment and serves as a convenient reagent for checking the action of fibrin ferment in the blood sera of several species of mammals. The blood plasma of rabbits can be preserved without undergoing coagulation in a tube sealed with paraffin, but coagulates rapidly in contact with roughened glass. It was found that when one animal was injected with the blood plasma or serum of a second species, a serum was obtained which had the effect of neutralizing the fibrin ferment of the second species.

Experimental vaccine, A. Calmette and C. Guerin (*Ann. Inst. Pasteur*, *15* (*1901*), *No. 3*, *pp. 161–168*).—During the researches reported in this article it was found that an inoculation of rabbits with vaccine was uniformly followed with eruption of small pustules containing large quantities of lymph. The rabbit proved to be a useful animal in this study, since it is possible to verify readily by inoculations into rabbits the relative degree of virulence of vaccines obtained from different sources. By injecting vaccines into the peritoneal cavity of rabbits, the micro-organisms contained in such material are destroyed by the leucocytes without influencing the virulence of the virus.

A study of Bacillol, F. Paszotta (*Monat. Prakt. Thierh.*, *12* (*1901*), *No. 6–7*, *pp. 241–275*).—A description is given of the general properties of this substance. Numerous experiments were conducted in testing its antiseptic power in the treatment of mange, other skin diseases, surgical wounds, and in determining its toxic action. During these experiments it was found that Bacillol is soluble in water and that the solutions are constant. When used on the skin in a concentrated form it is slightly irritant, like lysol. Its antiseptic and deodorizing properties are pronounced. When administered internally, it causes an increased secretion of saliva, the respiration and pulse are increased, but the temperature is lowered. In large doses it causes a motor paralysis. The fatal internal dose of this substance is so large that all danger in its practical application is avoided. A bibliography of the subject is added.

Therapeutic contributions in veterinary science during the years 1898, 1899, and 1900, E. Bass (*Deut. Thierärztl. Wchnschr.*, *9* (*1901*), *No. 12*, *pp. 120–133*).—The author gives a brief digest of the therapeutic literature along veterinary lines and in connection with bibliographical references.

Antitoxic treatment of tetanus, J. Storie (*Vet. Jour.*, *n. ser.*, *3* (*1901*), *No. 16*, *pp. 201–205*).—Six cases of tetanus were treated by this method with a complete recovery in 5 cases. The cases were all severe, and the author believes the most of the animals would have succumbed without this treatment.

The primary effect of the tubercle bacillus, F. Wechsberg (*Beitr. Path. Anat. u. Allg. Path.*, *29* (*1901*), *No. 2*, *pp. 203–232*, *pls. 2*).—This paper is concerned with a discussion of the question of what cells take part in the formation of the tubercle. An elaborate critical review is given of the literature of the subject and a report is made on experiments upon rabbits which were inoculated intravenously. From these experiments it is concluded that the tubercle bacillus by its toxic action destroys the epithelial cells and connective tissue. At first the newly formed cells are affected only in so far as the connective tissue and vascular tissue fail to be formed. Ultimately these cells are completely destroyed and caseified.

The distribution of the lesions in generalized tuberculosis, J. McFadyean (*Jour. Comp. Path. and Ther., 14 (1901), No. 1, pp. 1–11*).—This paper contains a report on experiments with reference to the agency of the blood circulation in the generalization of tuberculosis. Ten cattle were inoculated intravenously with virulent cultures of tuberculosis and careful post-mortem examinations were made after varying lengths of time. In all cases the lungs contained numerous tubercles, while tubercles were found in the liver and kidneys in only 3 cases and in only 1 case in the spleen. The best evidence of generalization of the disease is believed to be the presence of tubercles of nearly equal sizes scattered throughout the entire substance of the lung. The evidence of generalized tuberculosis from an examination of other organs is usually not reliable. In cases of generalized tuberculosis the kidneys, liver, or spleen may be entirely free from tubercular lesions which can be recognized by the naked eye. The tubercles which are found in the liver, spleen, kidneys, and lymphatic glands are, as a rule, due to lymphatic action and not to the agency of the blood circulation. Tubercle bacilli are readily carried in the lymphatic vessels downward from the center of infection. During the post-mortem examinations abundant evidence was noticed of the process of recovery which was taking place in the older tubercles. An infection of the lymphatic system was noted in 4 of the 10 cases.

Tuberculous meningitis in cows and the infection of the fetus, H. Thon (*Deut. Thierärztl. Wchnschr., 9 (1901), No. 11, pp. 107, 108*).—The author gives details of the clinical symptoms and post-mortem findings in a cow infected with tuberculosis. The symptoms indicated an invasion of the brain by the tubercle bacillus, and the post-mortem examination revealed the presence of pathological changes in the cerebral membranes. Tubercles were also found on the surface of the fetal liver.

Cattle inspection and the tuberculin test, G. B. Jobson (*Jour. Comp. Med. and Vet. Arch., 22 (1901), No. 3, pp. 144–148*).—The author discusses the influence of œstrum, stabling in warm weather, age, and other circumstances, upon the temperature of cattle, with reference to difficulties of diagnosis from the tuberculin test. The temperature of 10 cattle under 1 year of age averaged about 0.4° higher than that of 10 other cattle over 3 years of age. All cattle were free from tuberculosis. The author believes that the absence of a reaction to a second test of tuberculin is not conclusive in showing that the animal is free from tuberculosis. Several cases are noted in which there was a failure to react in animals which were known to be tuberculous. A brief discussion is given of the difficulties in arriving at a satisfactory estimate of the value of condemned animals.

Results of seven years' work in testing with tuberculin, F. G. Meyer (*Maanedsskr. Dyrlæger, 12 (1901), No. 11, pp. 409–418*).—The author reports in detail on the condition of cattle in Norway with reference to the prevalence of tuberculosis. The results of tuberculin tests are brought together in tabular form, from which it appears that from 1893 to 1900, 11,686 cattle were tested in 402 herds, and 20 per cent were found to be tuberculous. Brief notes are also given on the prevalence of tuberculosis among calves.

Tuberculosis of cattle and the Pennsylvania plan for its repression, L. Pearson and M. P. Ravenel (*Pennsylvania Dept. Agr. Bul. 75, pp. 262*).—This is a reprint from Pennsylvania Department of Agriculture Report for 1899 (E. S. R., 12, p. 686).

Bibliography of literature on tuberculosis, from January 1 to November 1, 1900 (*Rev. Tuberculose, Paris, 8 (1901), No. 1, pp. 107–162*).—This extensive bibliography is classified according to the subject-matter of the various articles.

Spore formation of anthrax bacillus under anaerobic conditions, R. WEIL (*Ztschr. Hyg. u. Infectionskrank., 36 (1901), No. 3, pp. 451–458*).—The present article is of a controversial nature and largely concerned with a reply to an article on the subject by Klett (E. S. R., 13, p. 92). The author contends that the formation of spores does not take place under strictly anaerobic conditions upon the ordinary nutrient media, while there are a few special media on which the anthrax bacillus forms spores under the same conditions.

The post-mortem diagnosis of anthrax in cattle, H. C. REEKS (*Jour. Comp. Path. and Ther., 14 (1900), No. 1, pp. 11–16*).—A discussion is given by way of answer to the questions whether an opinion may be safely rendered in suspected cases of anthrax from the outside appearance, whether a post-mortem examination shall be made, whether reliance shall be placed upon a microscopic examination of the blood, and whether a sample of blood or spleen shall be sent to an expert. While the careful practitioner will probably diagnose a large proportion of cases accurately from the mere external appearance of the carcass, it is urged that a microscopic examination of the blood be undertaken, or, if the practitioner is not an expert microscopist, that samples be sent to an expert. The practice of making post-mortem examinations is condemned as useless and criminally dangerous.

The anthrax vaccine of Meloni, A. BARBERIO (*Gior. R. Soc. Accad. Vet. Ital., 50 (1901), No. 13, pp. 306–313*).—A detailed description of this method for preparing the vaccine and for making preventive inoculations.

Symptomatic anthrax or blackleg, L. L. LEWIS (*Oklahoma Sta. Rpt. 1901, pp. 88–97, figs. 2*).—On account of the prevalence of blackleg in Oklahoma the station undertook the manufacture and distribution of vaccine for controlling the disease. The vaccine sent out by the station was what is known as the single vaccine. Since March 1, 1900, it is reported that 58,950 doses have been distributed free to stockmen. A general account is given of the symptoms of blackleg, the methods by which the disease is commonly distributed, and the therapeutic measures which are usually recommended. Directions are given for the use of the hypodermic syringe in vaccinating animals for preventing the development of this disease.

Method of making inoculation for the prevention of blackleg, E. B. GRAVENHORST (*Ann. Med. Vet., 50 (1901), No. 3, pp. 132, 133*).—The author gives brief notes on a convenient method of inoculating animals without the necessity of taking antiseptic precaution and without danger of injury to the animal.

Foot-and-mouth disease and its treatment, E. NOCARD (*Rec. Med. Vet., Paris, 8. ser., 8 (1901), No. 7, pp. 222–233*).—The author gives a general account of the extent and seriousness of this disease, of the symptoms by which it may be recognized, and on the means of its distribution. Brief notes are also presented on methods of curative treatment which have been adopted in combating this disease.

Foot-and-mouth disease, J. PEMBERTHY (*Jour. Comp. Path. and Ther., 14 (1901), No. 1, pp. 16–29*).—This article contains a general discussion of the nature of the disease, statistics on the extent of its distribution and on the more noted outbreaks of the trouble, the means of infection, susceptibility of cattle and other animals, the incubation period, diagnosis, medical prevention, and official regulation of the disease.

Conference on the subject of foot-and-mouth disease, E. PERRONCITO ET AL. (*Gior. R. Soc. Accad. Vet. Ital., 50 (1901), No. 15, pp. 347–353*).—A discussion of problems relating to the means of distribution of this disease, and sanitary and therapeutic methods which should be adopted in combating it.

Potassium iodid treatment of milk fever, KAS (*Wchnschr. Thierheilk. u. Viehzucht, 45 (1901), No. 17, pp. 193, 194*).—Notes are given on 4 cases of milk fever which were treated by this method. The author made use of a concentrated solution of potassium iodid with good success. No complications arose and the milk was in all cases of normal color and taste within 36 hours after the animals were able to stand.

Statistics on the treatment of milk fever with potassium iodid, C. HAAS (*Berlin. Thierärztl. Wchnschr., 1901, No. 13, pp. 201–203*).—Statistics are presented in tabular form on 172 cases of milk fever which were treated by this method. Of this number 123 were considered severe, 18 of medium severity, and 31 mild cases. Of the whole number 129, or 75 per cent, were cured. The disease began in from 3 to 16 hours after calving. In almost all cases 10 gm. of potassium iodid was administered and the dose was sometimes repeated as many as 4 times.

Mammitis, W. L. WILLIAMS (*Vet. Jour., n. ser., 3 (1901), No. 16, pp. 205–213*).—A general account of the nature and symptoms of the noncontagious and contagious forms of this disease, with notes on the methods of treatment and prevention.

Abortion in cattle, G. H. WOOLDRIDGE (*Agr. Students' Gaz., n. ser., 10 (1901), No. 3, pp. 83–90*).—A critical discussion of the various causes which may lead to sporadic or infectious abortion. Notes are given on the symptoms and methods of treatment which have been found most effective in combating this disease.

Treatment for roundworms in sheep, goats, and cattle, C. W. STILES (*U. S. Dept. Agr., Bureau of Animal Industry Circ. 35, pp. 8*).—Good success is reported in the treatment of sheep, goats, and cattle for *Strongylus contortus* with a 1 per cent solution of coal-tar creosote. One ounce of this substance is sufficient for 20 adult sheep and the cost is therefore less than ½ ct. per head. Of the 1 per cent solution 6 oz. may be safely given to a sheep. From 5 to 10 oz. were administered to cows from 3 to 8 months old, 1 pt. to young steers, and 1 qt. to adult cattle. If bowel worms, as well as the stomach worms, were present better results were obtained by adding thymol to the coal-tar creosote. From 30 to 100 grains of the thymol may be added to each dose of the creosote for sheep, the amount of thymol depending upon the size of the sheep. Good results were usually obtained from a single dose, but the treatment may be repeated if necessary after one week.

The use of bluestone in combating stomach worms was found quite effective, but the practice is considered somewhat more dangerous than the administrations of creosote. For preparing this remedy 1 lb. avoirdupois of bluestone may be dissolved in 2.4 qt. of boiling water. When the bluestone is completely dissolved 7.8 gal. of cold water, making altogether 8.4 gal. of water, should be added. If smaller quantities are desired, the solution may be made in the proportion of 1 oz. avoirdupois of bluestone to 4.2 pt. of water. The animals should be allowed to fast about 24 hours before administering this remedy and should not be allowed to drink water for several hours after receiving the dose. This remedy is considered somewhat less effective than creosote.

Gasoline was experimented with as a remedy for stomach worms and was found to be effective. The chief objections to its use are that from 3 to 6 doses are required in order to expel the worms, and that the substance may act injuriously upon the stock, especially in animals which are suffering from pleurisy. If an animal should be overcome by gasoline it may usually be revived by administering aromatic spirits of ammonia as a drench. Preference is indicated for drenching by means of a tube, which is inserted into the mouth. It is believed that better results may be expected in the case of sheep if the animal is given the drench in a standing position. As preventive measures against infestation by stomach worms the author recommends isolation of sick animals, establishment of clean watering places in pastures, selection of high sloping ground for pastures, draining of low pastures, annual burning over of pastures, and allowing animals free access to salt.

The removal of Gastrophilus larvæ from young colts by means of carbon bisulphid, W. WESSER (*Berlin. Thierärztl. Wchnschr., 1901, No. 9, p. 156*).—The author administered 6 gm. of carbon bisulphid in capsules every 2 hours to young colts which gave symptons of being infested with bot flies. In all 48 gm. were given to each animal. The remedy was endured well by the colts, although in a few cases slight poisonous effects were noted. After a period of 3 days the bot-fly larvæ passed away in great numbers and the animals recovered their normal condition rapidly.

The susceptibility of hogs to fowl cholera, V. STANG and F. PFERSDORFF (*Deut. Thierärztl. Wchnschr., 9 (1901), No. 14, pp. 139, 140*).—An investigation was made of an outbreak of a disease among hogs, turkeys, and fowls. A bacteriological study was made of the organism, which was isolated from dead animals, and it was found to be that of fowl cholera. All these animals are apparently susceptible to fatal infection from this organism.

Inoculation against hog cholera, J. WEBSTER (*Tijdschr. Veeartsenijk. Maandblad, 28 (1901), No. 6, pp. 260–265*).—The author reports a comparative test of the Landsberg serum, the method of Lorenz, and Susserin in preventive and curative inoculation for hog cholera.

Treatment of glanders, W. C. LANGDON (*Jour. Comp. Med. and Vet. Arch., 22 (1901), No. 4, pp. 246, 247*).—The author gives a brief supplementary report concerning 25 cases of glanders which were apparently cured by repeated injections of mallein. The majority of the treated horses had been quarantined and put to ordinary farm work and had been used in this way from 1½ to 2½ years, without the development of any symptons of the disease. The curative treatment which the author used required from 5 to 8 weeks and cost from \$10 to \$15 per head.

Experimental diagnosis of glanders by means of inoculations into the peritoneal cavity of guinea pigs, V. GALTIER (*Jour. Méd. Vét. et Zootech., 5. ser., 5 (1901), pp. 129–133*).—In addition to other bacteria which were found associated with the glanders bacillus in the nasal discharge of glanderous horses, a round species was found which when inoculated into the peritoneum of guinea pigs along with the glanders bacillus, multiplied to such an extent as to obscure the presence of the glanders bacillus. The glanders bacillus, however, in the experiments of the author ultimately produced the characteristic reaction in male guinea pigs.

A contagious stomatitis of horses in South Africa, THEILER (*Deut. Thierärztl. Wchnschr., 9 (1901), No. 13, pp. 131, 132*).—A description is given of an outbreak of this disease, together with an account of the symptoms. The majority of cases recovered after a few days. The symptoms were those of acute inflammation of the mucous lining of the mouth and tongue, and a discoloration of the tongue which gave the disease the name of blue tongue. The disease was shown to be highly contagious and in many respects resembled foot-and-mouth disease of cattle; but the latter disease did not exist in South Africa at the time.

Serum therapy in gangrenous septicæmia, E. LECLAINCHE and C. MOREL (*Ann. Inst. Pasteur, 15 (1901), No. 1, pp. 1–16*).—The normal serum of solipeds was found to possess very little immunizing power. Occasionally a horse was found from which a normal immunizing serum was obtained. Cattle, which are naturally refractory to the disease, possess a normal serum of considerable immunizing power. The normal serum from goats and sheep showed little active influence upon the septic vibrio. In order to procure an immunizing serum, the authors made use of intravenous injections of small doses of virus. The ass was chosen as the experimental animal. Subcutaneous injections of septic virus were also made on the same animal. Three series of experiments were conducted, one by subcutaneous injection, the second by intravenous inoculation of blood cultures, and the third by intravenous inoculation of cultures in bouillon. The results of these experiments may be briefly summarized as follows: It is possible to obtain a serum which produces immunity against the septic vibrio. The best method of procedure consists in intravenous inoculations of solipeds in series with cultures of the vibrio in Martin bouillon. The serum thus obtained possesses preventive properties, and under certain conditions a curative action. Inoculations with a mixture of the serum and virus are harmless, but do not confer an immunity of long duration. The serum exercises an antibacterial and antitoxic action at the same time. The protection produced in this way is associated with stimulation of the process of phagocytosis.

The rapid diagnosis of rabies, M. P. Ravenel and J. McCarthy (*Jour. Comp. Path. and Ther., 14 (1901), No. 1, pp. 37–44, figs. 3*).—A study was made of the certainty and reliability of diagnosis of this disease from microscopic changes in the nerve ganglia. It was found that the capsular and cellular changes in the intervertebral ganglia, when taken in connection with clinical symptoms, afforded a trustworthy means of diagnosing rabies. These changes, however, were not always present in cases of rabies, and the absence of such changes therefore is not considered as implying that rabies is not present. It was also found that the rabic tubercle of Babes was present sufficiently often to aid materially in the diagnosis where only the central nervous system was obtainable, without any of the ganglia. It is believed that where the ganglia can be had they offer a simpler and easier method of diagnosis than is to be found in the study of the brain and spinal cord.

The Brunswick disease of chickens and turkeys, Jess (*Berlin. Thierärztl. Wchnschr., 1901, No. 12, pp. 191, 192*).—A description is given of an outbreak of a diesase which persisted for 3 months and spread over considerable territory. The post-mortem examination of fowls dead of the disease exposed a brownish red color of the whole alimentary canal, with occasional diphtheritic patches. The trachea was much reddened and the pericardium was distended to a great size by an accumulation of serum. Bacteriological studies on this disease indicated that the trouble was not due to an organism of ordinary fowl cholera, but that apparently this organism was combined in symbiotic relations with another bacillus which needs to be studied further.

Streptothrix infections in the lower animals, A. G. R. Foulerton and C. P. Jones (*Jour. Comp. Path. and Ther., 14 (1901), No. 1, pp. 45–59, pl. 1*).—The authors discuss the nomenclature, classification, morphology, staining, and cultural characteristics, and pathogenic action of these organisms. Detailed description is given of the more common species, including *Streptothrix bovis communis*, *S. nocardii*, *S. capræ*, *S. cuniculi*, and *S. lacertæ*.

TECHNOLOGY.

Sorghum sirup manufacture, A. A. Denton (*U. S. Dept. Agr., Farmers' Bul. 135, pp. 40, figs. 26*).—A revision of Farmers' Bulletin No. 90 (E. S. R., 11, p. 290), covering the growing of sorghum cane and the manufacture of the sirup.

The clouding of white wine, R. G. Smith (*Proc. Linn. Soc. New South Wales, 25 (1900), pt. 4, pp. 650–658*).—A variety of white wine is made in South Australia under the name of Chablis which has a great tendency to develop a turbidity or cloudiness soon after being bottled. A deposit collects at the bottom of the bottle and, while the flavor and bouquet are not affected, the sale of the wine is injured. The author found the trouble to be due to bacteria. Pasteurizing the wine at 43°C. and above destroyed the organism and overcame the difficulty.

Report of the viticulturist, M. Blunno (*Agr. Gaz. New South Wales, 12 (1901), No. 8, pp. 944–949*).—Among other matters relating to wine making, the author discusses the difficulty in the locality indicated of keeping the temperature down during the fermentation of the must. Picking the grapes in the early morning or late in the evening is recommended as affording some relief. Where plenty of cold water is available, it is sometimes employed by passing through coils in the vats until the fermentation is complete. Another method of cooling the must is carried out by pumping it into a small wooden vat fitted with an ingenious contrivance for stirring. A small disk, revolving at a speed of 500 to 600 revolutions per minute, throws the must against the surface of the vessel, and after a few seconds it streams out through a hose placed in the bottom. Besides lowering the temperature, this process frees the juice of a large amount of albuminous substances. This treatment is recommended for white wines, of grapes grown in rich soils, especially those which make coarse and sharp wines.

The acidity of wines, E. KAYSER and G. BARBA (*Rev. Vit., 15 (1901); abs. in Jour. Soc. Chem. Ind., 20 (1901), No. 9, p. 922*).—The chief point investigated by the authors was the effect of adding tartaric acid to must and wine deficient in acidity. The results show the absence of any definite ratio between the acid added and that ultimately found.

Composition and examination of raisin wines, A. SCHNEEGANS (*Arch. Pharm., 239 (1901), pp. 91–95; abs. in Jour. Soc. Chem. Ind., 20 (1901), No. 6, p. 599*).—A table is presented showing the analyses of several raisin wines made from different fruits, as currants and sultana raisins. The wines were clear, of various tints, from light yellow to pink, of pleasant taste but no bouquet. The lack of the latter was said to be due to the previous drying of the fruit, which prevented the formation of the higher alcohols and acids which produce the bouquet by esterification.

The results of the study of pure natural wines of the year 1899, K. WINDISCH (*Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), No. 14, pp. 625–631*).—The results of the analyses of a large number of different kinds of wines are reported in tables.

Analysis of a native Madeira wine, H. THOMS and C. MANNICH (*Ber. Deut. Pharm. Gesell., 11, pp. 91–93; abs. in Chem. Centbl., 1901, I, No. 14, p. 802*).

Cider, F. RIGAUX (*L'Ing. Agr. Gembloux, 11 (1901), No. 11, pp. 455–480*).—A popular article treating of the manufacture, fermentation, preservation, diseases, and adulteration of cider. Tables of analyses are presented showing the composition of cider and the pomace. The utilization of the latter product is discussed.

The clarifying of ciders, V. H. VINCENT (*Rev. Gén. Chim. Appl., 4 (1901), p. 453; abs. in Chem. Ztg., 25 (1901), No. 80, Repert., p. 284*).—In tests with various substances in clarifying apple and pear ciders the author obtained the best results by the addition of citric acid, the color of the cider being preserved and the working of the oxidases eliminated. The addition of 50 gm. of citric acid and 10 gm. of tannin to each hectoliter of apple juice before the fermentation resulted in the clarification after the second racking. With pear cider it was necessary to add only the citric acid.

Rubber preparation (*Trinidad Bot. Dept. Bul. Misc. Inform., 1901, No. 27, p. 333*).—"In pursuing experiments with the view of ascertaining the most economical method of coagulating rubber fluids, some of these were allowed to stand forgotten in a large receptacle where they had been creamed. When again handled the whole mass was putrid, but the rubber was still on the surface and easily coagulated or 'coalesced' on being handled, and the quality produced is stronger and therefore of a higher quality than rubber prepared in other ways. The specimen was shown to a noted American manufacturer of rubber goods, who readily recognized its quality from among numerous other specimens. There were, however, evident signs of loss of weight in rubber material by the decomposition set up by the fermentation of the proteids."

Approximate value of bagasse as fuel, F. N. G. GILL (*Jour. Soc. Arts, 49 (1901), No. 2530, pp. 517–519; abs. in Jour. Soc. Chem. Ind., 20 (1901), No. 7, pp. 695, 696*).—The author made a study, from the data at hand, of the actual fuel value of bagasse. This substance is usually regarded as being equivalent in fuel value to from $\frac{1}{6}$ to $\frac{1}{5}$ of its weight in coal. In making the estimates reported the values of Stohmann and Langbein are used for the heats of combustion of sucrose, invert sugar, and cellulose, while for the albuminous and gummy matters the same heating value is ascribed as for cellulose. Three samples of bagasse are taken for making estimations as follows: (1) single and simple milling, giving 66.2 per cent of juice, (2) double and simple milling, giving 70 per cent of juice, and (3) double milling and maceration, giving 75 per cent of juice. Then from 100 tons of cane crushed the actual bagasse will contain in (1), 24.8, (2), 21, and (3), 16 tons of juice. If the calorific power of coal be taken as 14,000 thermal units per pound, bagasse is worth from $\frac{1}{3}$ to $\frac{1}{4}$ of its weight in ordinary coal. A correction must be made, however, as bagasse is burned with an average of 150 per cent excess air as compared with 75 per cent in coal, and this difference causes a loss in the heating value of bagasse of nearly 11 per cent. With this correction, bagasse burned after coming straight from the mill has actually only from $\frac{1}{9}$ to $\frac{1}{8}$ of the value of an equal weight of an ordinary quality of coal.

Employment of the bagasse in the fabrication of paper, N. LEVY (*Bul. Assoc. Chim. Sucr. et Distill., 19 (1901), No. 1–2, pp. 215–217*).—A description of the manner of preparing the bagasse for manufacture of paper, as carried out in Louisiana and Texas.

Manufacture of paper from sugar-cane refuse, F. C. THEILE (*Chem. Ztg., 25 (1901), No. 27, pp. 289–290*).—The method employed for making paper from sugar-cane refuse as followed at a plant in Texas is described.

STATISTICS.

Wages of farm labor in the United States, J. H. BLODGETT (*U. S. Dept. Agr., Division of Statistics Bul. 22, misc. ser., pp. 47*).—Statistical investigations at 11 different times during a period of 33 years (1866–1899) of the wages of farm labor at different seasons are reported. The results of the investigations from 1866 to 1892 have already been published (E. S. R., 3, p. 906), the more important data being here reprinted. In the investigation of 1898 and 1899 data were also collected on the proportion and wages of white and colored laborers, the number and wages of overseers or foremen, the cost of board or rations, and the number of hours of labor per working day. In 1870 farm laborers constituted 48.9 per cent of persons engaged in agriculture; in 1880, 43.6 per cent; and in 1890, 35.8 per cent; these with other statistics indicating a tendency of farm laborers to become farm tenants and farm owners.

The following table summarizes some of the statistics obtained since the previous report:

Wages per month without and with board.

Sections.	Without board.					With board.				
	1899.	1898.	1895.	1894.	1893.	1899.	1898.	1895.	1894.	1893.
Eastern States	$28.76	$27.87	$29.00	$27.02	$29.07	$18.21	$17.63	$17.73	$17.15	$18.45
Middle States	23.91	23.15	23.80	23.64	24.82	15.93	15.33	15.73	15.60	16.51
Southern States	13.80	13.49	12.71	13.04	14.07	9.70	9.45	8.68	9.04	9.92
Western States	23.75	22.44	21.82	21.50	23.12	16.70	15.75	15.21	14.96	16.29
Mountain States	35.15	33.95	30.04	29.95	33.97	25.10	23.94	19.87	19.94	23.37
Pacific States	35.69	33.64	31.68	34.15	36.95	24.97	23.30	20.54	22.60	25.63
Average	20.23	19.38	17.69	17.74	19.10	14.07	13.43	12.02	12.16	13.29

"The following may serve as a suggestive summary of influences that affect farm wages: (1) Intrinsic fertility of the soil, (2) products of the locality, (3) market value of land, (4) latitude, (5) elevation, (6) percentage of woodland, (7) rainfall, (8) water supply in springs, streams, and wells, (9) relations to market—(a) time of transportation, (b) cost of transportation, (10) rates of taxation, (11) economy of public administration, (12) the type of social life, influencing dress, housing for man, beast, and crops, organizations for roads, education, religion, or other associated effort." The influences affecting wages in each State are pointed out.

Twenty-fourth Annual Report of Connecticut State Station, 1900 (*Connecticut State Sta. Rpt. 1900, pt. 4, pp. XV*).—These pages include the organization list of the station, a brief announcement relative to the character of the work done by the station, a report of the board of control reviewing briefly the different lines of station work during the year, and a financial statement for the year ended September 30, 1900.

Fourteenth Annual Report of Maryland Station, 1901 (*Maryland Sta. Rpt. 1901, pp. XXIV+206*).—The report proper consists of a rather detailed account by the director of the history, equipment, lines of work, publications, etc., of the station since its organization. Investigations in progress by the different departments are outlined, as are also a number of cooperative experiments. A subject list is given of station publications. Observations on precipitation and temperature are tabulated. A financial statement is given for the fiscal year ended June 30, 1901. Reprints of Bulletins 68–76 of the station on the following subjects are appended: Fertilizer experiments with different sources of phosphoric acid (E. S. R., 12, p. 930), the influence of feed and care on the individuality of cows (E. S. R., 12, p. 1078), the chemical composition of Maryland soils (E. S. R., 13, p. 28), notes on spraying peaches and plums in 1900 (E. S. R., 13, p. 152), peach growing in Maryland (E. S. R., 13, p. 138), suggestions about combating the San José scale (E. S. R., 13, p. 160), notes on celery blight (E. S. R., 13, p. 257), the effect of hydrocyanic-acid gas upon grains and other seeds (E. S. R., 13, p. 462), and parturient paresis—milk fever, calving fever (E. S. R., 13, p. 492).

Fourteenth Annual Report of Mississippi Station, 1901 (*Mississippi Sta. Rpt. 1901, pp. 30*).—This contains a review of the different lines of station work by the director, a financial statement for the fiscal year ended June 30, 1901, and somewhat detailed reports on station work by the heads of departments. Parts of these reports are noted elsewhere.

First Annual Report of Missouri Fruit Station, 1900 (*Missouri Fruit Sta. Rpt. 1900, pp. 20*).—An account of the establishment and work of the station during the year (see p. 552), with a financial statement.

Tenth Annual Report of Oklahoma Station, 1901 (*Oklahoma Sta. Rpt. 1901, pp. 13–159*).—This includes a report of the director reviewing the different lines of station work; a summary of the press bulletins issued during the year on miscellaneous topics; meteorological observations; several articles noted elsewhere, and a financial statement for the fiscal year ended June 30, 1901.

Thirteenth Annual Report of Vermont Station, 1900 (*Vermont Sta. Rpt. 1900, pp. 246–504*).—This includes the organization list of the station; a financial statement for the fiscal year ended June 30, 1900; a report of the director reviewing at some length the work of the station during the year; a subject list of station publications available for distribution; abstracts of Bulletins 72–80 of the station, and departmental reports abstracted elsewhere.

Timely hints for farmers (*Arizona Sta. Bul. 38, pp. 237–296, figs. 9*).—This bulletin is a collection of popular articles issued by the station from October 1, 1900, to July 1, 1901. The following subjects are discussed: The farmer's reading course, stinking smut of wheat and its prevention, the use of chemical preservatives in milk, the open range and the irrigation farmer, the value of a dairy herd record, the use of the Babcock test, plant lice, suggestions concerning date culture, the spring vegetable garden, some trees and plants for barren places, the use of hand separators on the farm, well waters for irrigation, home-made fertilizers, wild barley, the Australian saltbush in Arizona, and millets.

Press bulletins (*Colorado Sta. Bul. 64, pp. 29, charts 5*).—Reprints of press bulletins Nos. 1–11 issued from September, 1899, to April, 1901, on the following subjects: The sugar-beet caterpillar, Colorado sunshine, the beet army worm, the cantaloupe blight, the Russian thistle as forage, a so-called blight cure, the seepage measurements of the experiment station, potato failures, sunshine for 1900, conclusions relative to the culture of sugar beets, and how to fight the codling moth.

Experiment Station Work, XVIII (*U. S. Dept. Agr., Farmers' Bul. 133, pp. 32, figs. 14*).—This number contains articles on the following subjects: The value of stable manure, alfalfa as a fertilizer, effect of lime on different crops on acid soils, celery culture, utilizing the greenhouse in summer, the resistance of strawberries to frost, a fumigator for small orchard trees, foundation in comb building, a device for ridding houses of flies, slop for pigs, profitable crops for pigs, barley as food for horses, water in butter, and losses in the preparation of silage.

Crop Reporter (*U. S. Dept. Agr., Division of Statistics Crop Reporter, Vol. 3, Nos. 4–6, pp. 8 each*).—These numbers contain statistical data on the condition of crops in the different States and Territories on August 1, September 1, and October 1, 1901; trade statistics; and miscellaneous articles of a statistical nature, among which are the following: The crops of France in 1901, Hungarian and Austrian crop conditions, Bureau of Forestry, railway statistics, principal food crops of Denmark, the exportation of cattle and beef, crops of Great Britain in 1901, Hungarian grain crops, estimated wheat crop of the world in 1901, Argentine crop prospects, potatoes in the British Isles, production of spelt and buckwheat in Russia since 1883, and oil seeds crop of India.

List of the publications of the Division of Agrostology (*U. S. Dept. Agr., Division of Agrostology Circ. 36, pp. 8*).

NOTES.

ALABAMA COLLEGE AND STATION.—William Le Roy Broun, president of the college and chairman of the station council, died suddenly January 23, 1902, in his seventy-fifth year. A sketch of Dr. Broun's life and services is given elsewhere in this number.

ALABAMA CANEBRAKE STATION.—H. Benton, director of the station, has resigned and J. M. Richeson has been elected to succeed him.

CALIFORNIA UNIVERSITY AND STATION.—G. W. Shaw, formerly of the Oregon Agricultural College and Station and more recently chemist in the beet-sugar factory at Grand Junction, Colo., has been appointed assistant professor of agricultural chemistry, in charge of beet-sugar industry. F. T. Bioletti, bacteriologist and viticulturist, has resigned to accept a position as instructor in agriculture and viticulture in the Elsenburg School of Agriculture, Cape Colony, South Africa. A. R. Ward, veterinarian of the station, has been appointed instructor in bacteriology. Warren T. Clarke has been appointed assistant entomologist to make a special study of the life history of the peach moth; he entered upon the work January 1 among the orchards of the Foothill region of the State. After ten years' experience the station is now ready to make a final report on the behavior of the northern deciduous fruits at the Southern California Substation near Pomona. These embrace apples (not Russian), pears and plums (European), peaches (Persian), apricots, almonds, and nectarines.

KANSAS COLLEGE AND STATION.—A compromise has been effected with the settlers on the Fort Hays Reservation, ceded to the State of Kansas by the Government for a branch normal school and an experiment station. The compromise gives the settlers leases of from two to five years' duration in exchange for complete relinquishment of claims to the land. This was done in order that work might be commenced there the coming season, and the arrangement renders a considerable tract of land available for experimentation. In the division of the land between the normal school and the agricultural college, the latter obtained about 3,500 acres, including the part most desirable for experimental purposes. The board of regents has made provision for a foreman, who shall carry on the work at Fort Hays under the general supervision of a designated member of the board. The buildings on the reservation are to be repaired so as to make them available for use. The station council has not yet formally decided upon the experiments to be undertaken, but in general there will be tests on a rather large scale with crops and methods, with special reference to the needs of regions having deficient rainfall. As the new station occupies a field different climatically from that of any other station in the country, it is thought that the results obtained there should be applicable to quite a large region.

MAINE STATION.—L. J. Shepard has resigned his position as assistant in agriculture at the station to accept a similar position in the National Farm School at Doylestown, Pa.

MASSACHUSETTS STATION—S. W. Wiley, assistant chemist in the fertilizer control work, has resigned to accept a position in the factory of the Bowker Fertilizer Company at Elizabethport, N. J.

MICHIGAN STATION.—J. D. Towar, agriculturist of the station, has accepted a position as Government professor of agriculture in South Australia. He will be principal of the Agricultural College at Roseworthy, South Australia, and his duties will be (1) to superintend the agricultural college and experimental farm and teach classes thereat, (2) to advise the Government on all points relating to agriculture, and (3) to lecture to agriculturists when required. Professor Towar will assume the duties of this position June 1, 1902.

MINNESOTA COLLEGE AND STATION.—A very attractive class bulletin entitled "Outline of Greenhouse Laboratory Work," by Samuel B. Green and R. S. Mackintosh, has recently been issued by the division of horticulture. The bulletin is intended especially as a guide for the use of the classes in the greenhouse laboratory work of the school of agriculture. It is fully illustrated, and contains plain directions for 47 exercises, arranged in 21 lessons. The range covered is quite broad, including seed testing, propagation, grafting, spraying, pruning, care of orchard stock, etc.

NEBRASKA STATION.—Lawrence Bruner started about February 10 on a trip to Costa Rica, to occupy about three months. He will collect material for his own and other departments in the university and station, and will give some attention to the agriculture of the country. Professor Bruner was accompanied by several young men who have undertaken commissions for a number of other institutions.

NEW MEXICO STATION.—This station has taken up the matter of giving its bulletins wider circulation among its constituents, and of publishing popular bulletins in the Spanish language. The first bulletin of the Spanish edition will be a translation of Bulletin No. 40, entitled "A Southern New Mexico Flower Garden."

OHIO STATION.—A bill has passed the Ohio legislature providing for the reorganization of the board of control of the station. The board is to consist of five members, not more than three of whom shall belong to the same political party, and who shall be appointed by the governor for a term of five years. The duties of the board under this act and of the director of the station are quite clearly defined. The board of control is constituted a body corporate, and to it are assigned the duties of appointing a director, adopting by-laws, rules, and regulations for the government of the station, and fixing the salaries and terms of office of employees, with the power to remove employees at any time for cause sustained by written charges. The director is given control of the affairs of the station in all its departments and made responsible to the board for their efficient management. He is to appoint the chiefs of departments, assistants, and other employees of the station, with the approval of the board, assign them their respective duties, and is given authority to suspend any employee for cause, reporting the matter at once to the board of control for final action. An annual meeting of the board is provided for, with special meetings at the call of the president or upon the written request of two members.

OKLAHOMA COLLEGE AND STATION.—H. G. Beard, of Shawnee, and T. J. Hartman, B. S., of Deer Creek, have been appointed members of the board of regents, *vice* C. J. Benson and J. P. Gandy, resigned. Mr. Hartman, who is a graduate of the college, class of 1898, was elected treasurer of the board at a recent meeting. The short courses in agriculture, horticulture, and mechanic arts are now in progress, and all that can be accommodated are in attendance. Work on the new barn, engineering building, and addition to the library building is progressing, and all will be ready for occupancy by the opening of the fall term.

OREGON COLLEGE AND STATION.—The resignation of President Thomas M. Gatch as director of the station was accepted by the board at its January meeting, and James Withycombe, the vice-director, was appointed to the position. At a previous meeting the chemist, bacteriologist, and entomologist were relieved of all class work in the college in order that they might devote their entire time to station work, and the botanist and horticulturist was relieved to a great extent of station work on account of the heavy teaching duties. Ground has been broken for the erection of a new agricultural hall. The plans provide for a stone building 85 by 125 feet and three stories high. It is to provide laboratories and class rooms for the departments of agriculture, chemistry, zoology and entomology, botany and horticulture, and bacteriology. On the first floor will be a large stock judging room and the dairy department, while the attic is to be finished for the agricultural museum. The building, exclusive of fixtures, is to cost about $40,000.

Porto Rico Station.—The heavy rains and trade winds damaged the experimental crops during the months of December and January. The native crops are doing well, but most northern vegetables are seriously affected by fungus and insect pests. The "changa," a mole cricket, continues to damage all crops in spite of all remedies. It is much more destructive in sandy soils. Among the 80 or 90 experimental crops the following attract considerable attention from visitors: Arrowroot (*Maranta arundinacea*), ginger, llerenes (an excellent root crop), 3 kinds of true yams, tropical varieties of sweet potatoes, 7 varieties of "yautia" (the Hawaiian "taro"), Spanish peanuts, 4 kinds of cassava, the "teyote," teosinte, narcissi, hyacinths, freesias, 5 varieties of Bermuda and Japanese lilies, and palms for the florists' trade.

Annual Report of Office of Experiment Stations.—A new departure has been followed this year with reference to the various Congressional reports of the Office of Experiment Stations. These reports have been combined, and reports of other lines of work added, making an annual report of the Office for the year 1901, which has recently been transmitted to Congress. The volume includes the report of the Office on the work and expenditures of the experiment stations, the separate reports of the stations in Alaska, Hawaii, and Porto Rico, describing the progress of the former and the establishment and inauguration of work at the latter, and reports of the nutrition and the irrigation branches. The report as a whole makes a volume of upward of 400 pages, and is illustrated by 41 plates. It corresponds in a general way to the annual reports of the Bureau of Animal Industry and the Bureau of Soils, and has been suggested by the increased scope and diversity of interests of the Office, which now embrace eight quite distinct lines of work, each in charge of a separate officer. An edition of 6,000 copies has been requested, and it is planned to print separates of the different parts.

Botanisches Centralblatt.—The first number of this journal under the new management has appeared. The *Association Internationale des Botanistes*, organized at Geneva, August 8, 1901, which purchased all rights from the former editors, will issue the *Centralblatt* as formerly—the abstracts in a weekly periodical and original articles in the *Beihefte*. The new editor in chief is Dr. J. P. Lotzy, formerly of Johns Hopkins University, and later connected with the cinchona investigations at Tjibodas, Java. A board of 75 assistant editors from different countries is provided, who are to make especial efforts to abstract all botanical publications appearing in their countries. In this way it is hoped the reviews of literature will be made more complete and appear more promptly. The American editors and their specialties are: Drs. D. H. Campbell, Leland Stanford University, morphology; C. J. Chamberlain, University of Chicago, cytology; D. T. MacDougal, New York Botanic Gorden, physiology; G. T. Moore, U. S. Department of Agriculture, algæ; D. P. Penhallow, McGill University, paleobotany; H. von Schrenk, Shaw School of Botany, fungi and vegetable pathology; and W. Trelease, Missouri Botanic Gardens, systematic phanerogams. In order that delay may be avoided in securing the publication of abstracts of American papers, authors are requested to send marked copies of their publications to the editor in charge of the subject treated, or where separates are not available, to call the appropriate editor's attention to the paper. The place of publication of the *Centralblatt* has been changed from Berlin to Leyden, Holland.

Personal mention.—*Nature*, for January 2, 1902, contains an unsigned article on the life of Sir J. Henry Gilbert. The article mentions the fact that while a school-boy he met with a serious accident which practically cost him the loss of an eye, so that while "his great pluck enabled him to accomplish his life's work with little apparent hindrance, the disadvantage of weak sight was very real." In speaking of his traits the writer says: "He was an indefatigable worker and loved to accumulate an immense mass of results, frequently of a similar kind; and a reader of Rothamsted papers is sometimes so overwhelmed by numerical statements that, to use a familiar simile, 'he finds it difficult to see the wood for the trees.' . . . He enjoyed a very vigorous constitution, and continued actively at work up to the last year of his life. Unfortunately, his disposition forbade his cooperation with any younger colleague, and the institution at Rothamsted is now left without any apparent successor to its historic labors."

Joseph A. Bulkeley, a graduate of the Michigan Agricultural College, and recently experimentalist and assistant professor of agriculture at the Wagga Experimental Farm, New South Wales, has been appointed manager of the experimental farm at Grafton, on the north coast of New South Wales. The farm is in embryo, and Mr. Bulkeley will have charge of organizing and inaugurating the work there. The farm comprises something over 2,000 acres, including soil of poor, medium, and good quality. The lines of work will deal chiefly with grasses and forage plants, with a view to establishing the dairy industry, and with the management and improvement of live stock.

At the recent meeting of the American Society of Bacteriologists Prof. H. W. Conn, of Wesleyan University and the Connecticut Storrs Station, was elected president.

A. P. Bryant, for several years assistant in the nutrition investigations of this Office at Middletown, Conn., has resigned his position to take up work in food chemistry with the Glucose Sugar Refining Company of Chicago. He will enter upon his new duties early in March.

The Paris Academy of Sciences has awarded the Lavoisier medal to Emil Fischer, of Berlin, for his work as a whole and especially that relating to the synthesis of sugars; the Bordin prize to Matruchot and Molliard for their researches on the influence of the external conditions on the protoplasm and nucleus in plants; and the Montagne prize to Mazé for his researches on the mechanism of the fixation of nitrogen by Leguminosæ.

Science notes that Dr. William Somerville, late professor of agriculture at the University of Cambridge, has been appointed assistant secretary of the British Board of Agriculture on the retirement of Sir Jacob Wilson. Dr. Somerville is succeeded by T. H. Middleton, formerly professor of agriculture in the Durham College of Science at Newcastle-on-Tyne.

Prof. U. Kreusler, editor of *Biedermanns Centralblatt für Agrikulturchemie*, retired at the close of the past year, and has been succeeded by Prof. O. Kellner, director of the Möckern Experiment Station, who was one the founders of the journal.

Miscellaneous.—A new feature has been introduced in the *Journal of the Royal Horticultural Society*, which greatly enlarges the usefulness of that publication. It consists of notes on recent research work and short abstracts from current British and foreign periodical literature affecting horticultural and botanical science. The more important articles are reviewed at some length and placed under the heading of "Notes on recent research." In both the notes and the abstracts the material is arranged alphabetically under the name of the plant, insect, disease, etc., as far as the material will lend itself to such arrangement. It is proposed to review 55 of the more prominent horticultural, botanical, and scientific journals of England, Continental Europe, America, and other countries; and 32 members of the society have consented to help in this work. In this first attempt 14 pages of notes on recent research and 50 pages of abstracts are given. Floriculture and ornamental shrubs and plants are given especial attention, as well as the diseases and insect pests of plants.

Articles on irrigation are also abstracted, as well as everything having a bearing on horticulture and botany.

The Royal Agricultural Society of England has discontinued the publication of its *Journal* as a quarterly and will hereafter issue an annual in its place.

The Handbook of Connecticut Agriculture, prepared by T. S. Gold, has been published by the State Board of Agriculture. The pamphlet contains about 100 pages with illustrations. Following a brief statement on the agriculture of the State and its progress are short accounts of the State and Storrs stations, the Connecticut Storrs College, the cattle industry of Connecticut, fruit growing, floriculture, seed growing, tobacco growing, and other industries.

Science for January 17, 1902, prints an abstract of an open letter by B. E. Fernow, replying to severe criticism of the methods practiced by the Cornell College of Forestry in the management of its reserve in the Adirondacks. In his communication Professor Fernow makes it plain that approved forestry methods are being practiced; that thus far 100 trees have been planted for every 4 trees cut, and that the criticisms are due to false rumors and an imperfect understanding of the true condition of the case.

Sir William MacDonald has offered to the Government of Ontario $125,000, to be used in the erection of a building at the Ontario Agricultural College at Guelph, with a view to giving instruction to school-teachers in the elements of nature study and domestic science.

The British Board of Agriculture has appointed a committee to investigate braxy and louping ill of sheep, which are the cause of very great loss to the sheep-farming industry in Scotland. The members of the committee are Professor Hamilton, of Aberdeen University; J. McI. McCall, assistant veterinary officer to the board; E. J. Wheler, and R. B. Greig.

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EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, PH. D., *Assistant Director.*

EDITORIAL DEPARTMENTS.

Chemistry, Dairy Farming, and Dairying—The EDITOR and H. W. LAWSON.
Meteorology, Fertilizers and Soils (including methods of analysis), and Agricultural Engineering—W. H. BEAL.
Botany and Diseases of Plants—WALTER H. EVANS, Ph. D.
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Entomology and Veterinary Science—E. V. WILCOX, Ph. D.
Horticulture—C. B. SMITH.
With the cooperation of the scientific divisions of the Department and the Abstract Committee of the Association of Official Agricultural Chemists.

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EXPERIMENT STATION RECORD.

Vol. XIII. No. 7.

A review of the world's system of institutions for agricultural experimentation and research has been in process of preparation for some time, to meet the demand for more complete and systematic accounts of the various agencies that are in operation in foreign countries. Such a review is at present not furnished by any known publication or series of publications, and much difficulty was experienced in preparing even a complete list of the foreign stations. As a preliminary step in that direction a list of all known stations has been published in the organization lists for the past three years. This has served as a working basis upon which correspondence could be undertaken and additions and corrections made.

As the work has progressed the dearth of literature describing the foreign stations has become more and more apparent, and has emphasized the need of a publication of this kind. In many countries there is no authorized agency for collating and publishing accounts of the organization and work of the stations, and in very many cases the individual stations have no regular method of publication. In spite of the wide search of literature and extensive correspondence, it has been impossible to secure the necessary data to make the review complete, but so much more has been collated than has ever been published before that it has been thought best to issue it at an early date as a bulletin of this Office.

The total number of experiment stations and similar institutions in the world, as far as our information goes, is about 780. This number includes, however, many institutions which in this country would not be reckoned as stations, such as experimental farms and fields, laboratories for miscellaneous analysis, and cooperative enterprises. The most that can be said is that the list includes the various agencies of different kinds and grades for experiment and investigation in agriculture, and for the protection and information of farmers. Purely as a matter of convenience, these agencies may be referred to collectively as "stations."

The list demonstrates the world-wide extent of the station movement at the present time, embracing nearly all the civilized countries of the globe. The most notable exception in Europe is Greece, where, so far as can be learned, there are no stations or similar agencies in operation. In Asia there are a goodly number of stations, located in Russia, Japan, and British India. The Chinese Empire represents a large territory which appears to be entirely without stations, and the same condition applies to Turkey, Persia, Afghanistan, and Beloochistan. Africa has quite a large number of stations in the English, French, and German colonies. There are no stations as yet in Mexico or in Central America, except in British Honduras, where a botanic garden is located; and of the South American countries no trace has been obtained of any stations in Bolivia, Buenos Ayres, Colombia, Ecuador, Patagonia, Peru, Uruguay, or Venezuela. Australia and New Zealand have a large number of stations of various kinds which are actively studying the practical problems suggested by the agriculture of those countries.

Viewed as a world enterprise, the station movement is spreading quite rapidly year by year, and the systems of different countries are being strengthened in many ways, increasing financial aid being the general rule. Well-supported experiment stations are rapidly coming to be looked upon as a necessary requisite of modern agriculture the world over.

The largest number of separate agencies for investigation and experiment in agriculture is found in Russia, in spite of the fact that the movement is comparatively recent there. There are 102 such establishments and 3 experimental forests. Many of them are small demonstration fields, established for the purpose of instructing the peasants or of introducing new agricultural industries; others serve as centers for the production and distribution of improved varieties of seeds and plants, and some are conducted as institutions for research. There are a number of stations for special crops, such as tobacco, beet sugar, silk, cotton, olive, tea, wines, and other products.

If the same class of institutions were designated as experiment stations in the United States as in foreign countries, this country would without doubt show the second largest number of agencies, and probably the largest number of what we commonly regard as experiment stations—that is, eliminating laboratories which are purely for control or analytical work, demonstration fields, etc. As the list stands, however, Germany is second in numerical order, and France third.

The total number of stations in Germany is given as 80, which includes about a dozen control stations and laboratories for miscellaneous analysis, together with a number of stations for special industries. The only real bond of union between the German stations is the Association of Agricultural Experiment Stations in the German Empire, which was organized at Weimar in 1888 for the purpose of securing uniformity in methods for control work; and this does not include all of the stations.

The agricultural stations and laboratories of France, of which there are 70, are under the general direction of an inspector-general, an officer of the Ministry of Agriculture. Prof. L. Grandeau has held this position since its creation in 1882.

Austria has 40 stations, about one-third of which are of the grade of the control station. These are under the general control of the Ministry of Agriculture, which also issues an official publication (*Zeitschrift für das landwirthschaftliche Versuchswesen in Oesterreich*) containing reports and papers on various phases of the station work.

In Great Britain it is difficult to determine what should be listed as stations, as many of the institutions were not established primarily for agricultural experimentation, but have been subsidized by the board of agriculture for that purpose, or have taken up a certain amount of work which has an incidental bearing. The list enumerates about 30 agencies, including 12 institutions that may be regarded as stations, 10 institutions which are subsidized by the board of agriculture, and 7 botanic gardens. In India there are 10 experiment farms and plantations and 21 botanic and municipal gardens, besides a number of other agencies for the benefit of agriculture.

Belgium has a system of 16 stations, 7 of which are analytical laboratories, all under the supervision of the Belgian Ministry of Agriculture. Hungary likewise has 16 stations, under the supervision of the central commission of experiment stations, which provides an organ for the publication of their work; and Italy has 15 stations and laboratories which receive a portion of their appropriation from the Government, many of them also receiving funds from the province or municipality in which they are located and from local agricultural associations and chambers of commerce.

A feature of the system in Australia, which includes 34 institutions, is the state farms. There are 16 of these scattered over the country, devoted for the most part to culture and similar experiments, demonstrations of good farming, the improvement of live stock, and similar work, but having no real scientific work connected with them.

In the Netherlands there are 7 stations, including a seed-control station and a laboratory of vegetable pathology, besides a system of experimental fields, 11 in number, conducted under the auspices of local agricultural and horticultural societies, but subsidized by the Government.

Sweden has 26 stations, controlled and partially supported by the state department of agriculture, most of which are chemical and seed-control stations. In addition there are 10 agricultural chemical stations, maintained by societies, which are in reality laboratories for analysis and control. Norway has 11 stations, including several control stations, all, with one or two exceptions, under the direct control of the department of agriculture; and Denmark has 10 stations, several of them being among the most liberally supported of the European stations.

In Japan there are 15, including 9 branch stations; in Switzerland a system of 10 stations, all under the control of the department of agriculture, except 1 for brewing; and in Spain 9 stations, 6 of which are œnological and viticultural and 1 for sericulture.

These comprise the principal countries in which experiment stations and similar agencies are most active, with the exception of Canada and the United States. The full list, however, includes Algeria, Bosnia and Herzegovina, Bulgaria, Brazil, Egypt, Java, Portugal, Roumania, and many minor countries and dependencies.

The more we study the foreign experiment stations the more apparent it becomes that the American stations represent a distinct type of institutions, which are the product of their environment. Their exact prototype or counterpart is not found in any other country, either in scope, organization and management, or in relation to the farming community and the promotion of agriculture in general. They are an adaptation of the European stations to the conditions and requirements of this country. As such they present many unique features; and familiarity with their general character makes a study of the foreign systems the more interesting.

The various agencies for agricultural experimentation and research in foreign countries may be classified in a general way under six heads, i. e., (1) experiment stations proper, (2) special stations for particular crops or agricultural industries, (3) control stations and agricultural laboratories, (4) botanic stations and gardens, (5) experiment farms and demonstration fields, and (6) agencies for local or cooperative experiments.

Among those of the first class there are but few which correspond to the American stations in the breadth of their work and in their organization. To a quite large extent the foreign stations have developed in the direction of some particular branch of agriculture, as agronomy, animal production, or dairying, although their field of operation is broader than that of the special stations. As a rule they are dominated by the influence of a single man, who is usually the director, and their energies are bent toward the development of his theories of plant nutrition, or some phase of animal nutrition, or the like. With a few notable exceptions the individual stations do not embrace strong departments in plant production, the feeding of animals, injurious insects and diseases, with experts in these several lines. Indeed, where we find these different branches working side by side, they are usually broken up into as many separate stations, each with its own director. This is partly a matter of finances and largely of custom. The union of a number of departments in a single station seems opposed to the ruling system in Europe, and it is admitted that, as far as advanced work goes the European plan has much to commend it.

The special stations are devoted to such subjects as tobacco, flax, and cotton culture, moor culture, forestry, viticulture, wine making, brewing and distilling industries, milling, sugar and starch industries, indigo, sericulture, butter and cheese making, etc. A number of these special stations are found in Austria, France, Germany, Italy, Russia, Spain, and Switzerland. In some cases they are partially supported by government appropriation, while in others they are entirely under the control and maintenance of local organizations.

The work of the control stations is generally understood. Many of these undertake no investigations but confine themselves to the examination of fertilizers, seeds, feeding stuffs, etc. The agricultural laboratories differ from the control stations in being established primarily for the convenience of farmers who desire analyses made, and frequently have no regular control duties. Systems of such agricultural laboratories are maintained in Belgium, France, Italy, and Sweden.

The botanic stations and gardens, while frequently not established for the direct benefit of agriculture, render considerable incidental aid in the introduction and acclimatization of plants, distribution of seeds, etc., and a considerable number of them have experimental fields connected with them, so that they have developed into stations comparable with many of the experiment stations. In Great Britain and France the botanic gardens constitute one of the features of the experiment station system. The Royal Botanic Gardens at Kew, London, have connected or in cooperation with them a system of 102 botanic gardens and stations distributed through Great Britain and its colonies. In a similar way there are affiliated with the Colonial Gardens at Vincennes, France, a system of 15 gardens and stations located in the various French dependencies. In many instances these gardens constitute the only agencies which have been provided in the newer countries, and their work is quite varied and important to agricultural development.

The experiment farms and demonstration fields are found quite extensively in Australia, New Zealand, India, the Netherlands, and Russia. In a number of countries where the station movement is new these farms and fields represent the initial step in agricultural experimentation. For instance, in Bosnia and Herzegovina, in Brazil, Bulgaria, and Paraguay a beginning has been made by the establishment of a few experimental farms or fields, which for the most part are for the purpose of conducting culture and demonstration experiments.

Among the agencies for local and cooperative experiments various agricultural societies and organizations are prominent, which through their efforts alone or with the assistance of government funds provide for local trials or cooperative experiments of a quite simple order. Such experiments are carried on quite extensively under the county-council system of England and under the department of agriculture in Ireland.

The most extensive series of cooperative experiments which have been brought to light, and they do not belong to the class mentioned above, are those in feeding dairy cows in Denmark, which were begun by Professor Fjord in 1872 and are still being carried on by the laboratory of the Royal Veterinary and Agricultural College at Copenhagen. The same institution also has charge of the butter exhibitions, which in a sense are cooperative. These exhibitions entail an annual expenditure of about $47,000, but they have been instrumental in improving the average quality of the butter and developing a large export trade.

The systems of management and sources of revenue of the foreign stations present a great variety of conditions. In the majority of countries there is a central directing or supervisory agency, by which the government funds are administered. This central control is quite general in Austria, Belgium, Bosnia and Herzegovina, British West Indies, France, Hungary, Norway, Sweden, and Switzerland. In these countries the administrative agencies are the state departments or ministries of agriculture. In parts of Australia, notably in New South Wales, and in New Zealand this system also prevails. In Denmark, the Government directs many of the agencies for the promotion of agriculture through the Royal Danish Agricultural Society; in Holland the stations are under the general management of a committee appointed by the Crown, and in Russia they are in part under the supervision of the Ministry of Agriculture. In Great Britain there can not be said to be any centralizing authority further than that exerted by the board of agriculture, which distributes grants, and the Royal Botanic Gardens at Kew. In Germany there is no central authority for the stations of the whole Empire. The Prussian stations are affiliated with the Ministry of Agriculture, Domains, and Forestry, but there can not be said to exist in Germany any central administrative authority in the sense that there is in France, Belgium, Hungary, and other countries.

Taken as a whole the foreign experiment stations are working in the main independently of one another, there being very little cooperation among the stations of any country or with the central department of agriculture. This cooperation, which is becoming so extensive in the United States, may be regarded as one of the characteristic features of our station system.

The information obtained regarding the revenue of the foreign stations is quite fragmentary. A large number of the stations have no fixed or separate revenue. Many of them are operated in connection with other institutions, while others are maintained jointly by government and local appropriations, together with fees for analysis, some agricultural society supplying the deficit. In most of the control stations and laboratories small fees are charged, and in many cases these constitute quite a large proportion of the revenue of the station.

In a large number of instances the total income reported amounts to only a few hundred dollars, but in such cases the station or laboratory is usually connected with some other institution which probably pays the salaries of the employees. A number of the German and Austrian stations have quite liberal funds for maintenance. For example, the station for moor culture at Bremen received about $16,000 in 1900, the experiment station at Vienna over $20,000, and the Halle station over $30,000, while the moor experiment station in Denmark for several years past has expended over $70,000 annually. The latter is conducted by the Danish Heath Society, which carries on two large demonstration fields and about 40 small fields.

While a number of the German stations receive as high as $15,000 a year from various sources, an income of over $5,000 a year is rather the exception than the rule for European stations, and there are large numbers whose income amounts to only $2,000 or $3,000. These stations, however, are usually at no expense for buildings or for printing, the publication of their work in periodicals often being a small source of revenue; and as their fields are quite restricted in area the expense for labor is reduced to a minimum. By the exercise of rigid economy, and confining their efforts to a few specific lines of work, many of these stations have accomplished a surprising amount of high-grade work, which has contributed materially to the sum of human knowledge in the field of agricultural science.

NEW AGRICULTURAL BUILDING AT PURDUE UNIVERSITY.

The new building for the School of Agriculture of Purdue University, as provided for in the legislature of 1901 by an appropriation of $60,000, will be a worthy and substantial addition to the equipment of the institution.

The structure, which is already under roof, is 65 by 165 feet in outside dimensions, and 2 stories in height above a working basement. The materials are Bedford stone and pressed brick of a light terracotta shade. In appearance the building is plain, but dignified. It will contain, with one or two exceptions, all of the offices, class rooms and laboratories of the School of Agriculture.

The construction of the building is of the most substantial character; the heating and ventilation will be provided for by a system of forced circulation, and a very notable feature of the edifice is the provision for well-lighted class rooms and laboratories, made by the large amount of window space. Both gas and electric lights will be used.

One-half of the basement is devoted to the dairy laboratories, including separator, testing, curing, and home-dairy rooms; constant-temperature rooms for cheese curing and storage, and refrigerating apparatus. Laboratories for the study of soil physics and horticulture occupy the remainder of this story.

On the first floor are class rooms for dairy and live-stock husbandry, and laboratories for agricultural physics, economic botany and entomology, together with the offices of the instructors. The second story contains the laboratories, collections, and class rooms for veterinary science, one or two general class rooms, the agricultural museum, and a handsome lecture hall with seating capacity for about three hundred persons.

The plan and general character of the building are generally commended, and it is expected that its completion will contribute very largely to the efficiency and popularity of the school.

NEW AGRICULTURAL BUILDING, PURDUE UNIVERSITY.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

The indirect weighing of quantitative precipitates. A rapid and accurate method for determining the weight of a precipitate without separating it from the liquid from which it was precipitated, R. W. Thatcher (*Jour. Amer. Chem. Soc., 23 (1901), No. 9, pp. 644–668*).—The author discusses at some length the method of determining the weight of a precipitate without separating it from the solution, and cites a number of examples of the application of the method to solutions of chemical salts and reducing sugars. The method is based on the fact that the weight of any substance is equal to its specific gravity multiplied by its volume, and, conversely, that the volume of any substance is equal to its weight divided by its specific gravity. "Briefly stated, the principle upon which this new method for determining the weight of quantitative precipitates is based is that if the weight of a definite volume of a mixture of two substances whose specific gravities are known be determined, the proportion of each which is present in the mixture may be calculated."

While the investigation of this method is not complete, the author believes the results indicate that it is applicable in gravimetric analyses, being of easy manipulation and shortening the time required for the determination.

Simplification of the method of determining phosphoric acid as phosphomolybdic anhydrid according to Meineke-Woy; studies on methods of obtaining a pure precipitate of ammonium phosphomolybdate by means of molybdic solution containing citric acid; the transformation of the molybdic-magnesia method into a strictly molybdic method by the use of the Wagner-Stutzer molybdic solution, A. Seyda (*Chem. Ztg., 25 (1901), No. 72, pp. 759–768*).—This article briefly reviews the work of Meineke (E. S. R., 8, p. 100), Woy (E. S. R., 9, pp. 321, 723), Wagner[1], Stutzer[2], and others, and reports in detail the results of tests of the accuracy of the molybdic method under a variety of conditions. In summing up the results the author states that the only error in the method of determining phosphoric acid by precipitation as phosphomolybdic anhydrid is the simultaneous separation of free molybdic acid, and that this error can not be overcome with absolute certainty by a single precipitation, using an excess of the molybdic reagent. The separation of molybdic acid in case of a single precipitation is best prevented by shaking for one-fourth hour in a rotary apparatus at room temperature and by adding 20 cc. of 10 per cent citric acid. For solutions free from iron compounds the temperature should not exceed 30° C.; for those containing iron, 20° C. In the latter case also, the solution should be filtered within 15 minutes after the shaking. The most practical method of freeing the precipitate from free molybdic acid is to dissolve in ammonia and reprecipitate in hot solution by adding dilute molybdic solution and nitric acid, washing the precipitate with hot solutions (60 to 80° C.). Under some circumstances it may be necessary to repeat this process. The right amounts and concentration of the reagents are of great importance. The transformation of the precipitate into anhydrid is not considered complete until the ignited product is uniformly black and crystalline on both the upper and under surface. Directions for preparing reagents and carrying out the method are given in detail.

The determination of phosphoric acid in superphosphates, mixed fertilizers, and precipitated phosphates by precipitation in the cold as ammonium phosphomolybdate, L. LEDOUX (*Bul. Assoc. Belge Chim., 15 (1901), No. 3, pp. 125–129; abs. in Chem. Centbl., 1901, I, No. 25, p. 1341; Bul. Soc. Chim. Paris, 3. ser., 25 (1901), No. 15, p. 766*).—The author points out that phosphoric acid may be determined in form of phosphomolybdate by the citro-mechanical method provided the solutions contain a sufficient amount of ammonium nitrate and a sufficiently large amount of molybdic solution be added. The solutions must also be heated with nitric acid to convert all of the metaphosphates into orthophosphates. The molybdic reagent used is made up of 150 gm. of molybdic acid, 600 cc. of 0.96 sp. gr. ammonia, and 1,070 cc. of nitric acid of 1.22 sp. gr. The method of procedure recommended is as follows: Treat 2 gm. of superphosphate or 4 gm. of phosphatic fertilizer in the usual way with water and citric acid; make the solution to 250 cc.; heat 50 cc. of this solution for 5 minutes with 15 cc. of nitric acid (1.4 sp. gr.); cool; add 15 cc. of ammonia (0.92 sp. gr.), and shake vigorously for 30 minutes, adding 100 cc. of molybdic solution. Titrate the yellow precipitate according to Pemberton's method or convert into ammonium-magnesium phosphate in the usual way.

Determination of phosphoric acid as ammonium phosphomolybdate, H. PELLET (*Ann. Chim. Analyt., 6 (1901), pp. 248–251; abs. in Chem. Centbl., 1901, II, No. 7, p. 501*).—The author points out the danger of incomplete precipitation of phosphoric acid in the presence of much iron and other impurities when Ledoux's method (see above) of shaking for one-half hour in the cold is followed. He recommends as more accurate the direct weighing of the ammonium phosphomolybdate without converting it into magnesium pyrophosphate. He claims priority over Ledoux as regards discovery and announcement of conditions under which a pure ammonium phosphomolybdate may be obtained.

Determination of phosphoric acid, DE MOLINARI (*Bul. Agr. [Brussels], 17 (1901), No. 2, pp. 154–157*).—Comparisons of the so-called citro-mechanical method and Pemberton's titration method are reported. Tests of the method based upon titration of the ammonium-magnesium phosphate precipitate according to De Koninck are also reported.

Determination of phosphoric acid by titration of ammonium phosphomolybdate, NYSSENS (*Bul. Agr. [Brussels], 17 (1901), No. 2, pp. 142–146*).—Tests of precipitation in the absence of citric acid and in the presence of a large quantity of this substance are reported. The composition of the yellow precipitate was found to vary with the quantity of precipitant and the manner of adding it to the solution. The author precipitates in the cold, using a shaking apparatus making 100 revolutions per minute. By this method 10 minutes suffices for complete precipitation. With more vigorous shaking 5 minutes suffices, but the precipitate is very fine and difficult to retain on the filter. When citric acid is present it is oxidized by means of potassium permanganate before precipitation. The author is attempting to work out a method by which complete precipitation in the cold may be effected without destroying citric acid. This is based on the use of nitro-molybdate of potash as a precipitant instead of nitro-molybdate of ammonia.

The transformation and purification of magnesium pyrophosphate with the object of weighing as magnesium pyrosulphophosphate, H. PELLET (*Ann. Chim. Analyt., 6 (1901), p. 211; abs. in Chem. Centbl., 1901, II, No. 3, p. 233*).—In order to obtain a perfectly white ignition product the author treats the magnesium

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[1] Ztschr. Analyt. Chem., 19 (1880), p. 450; 21 (1882), p. 353.

[2] Ztschr. Angew. Chem., 1890, p. 43.

pyrophosphate with sulphuric acid. By this means a new body is obtained, magnesium pyrosulphophosphate, 0.715 gm. of magnesium pyrophosphate yielding 0.2305 gm. of the body. The content of MgO is calculated by the factor 0.265, of P_2O_5 by the factor 0.47.

The determination of lime, magnesia, and phosphoric acid in the presence of considerable amounts of iron oxid, H. PELLET (*Ann. Chim. Analyt., 6* (*1901*), *p. 163; abs. in Chem. Ztg., 25* (*1901*), *No. 58, Repert., p. 208*).—The methods proposed for the analysis of substances containing from 5 to 10 per cent of iron associated with small percentages of lime, magnesia, and phosphoric acid are as follows: For the determination of lime, neutralize a portion of the nitric or hydrochloric acid solution freed from silica, corresponding to 2 to 5 gm. of the substance, with ammonia to the verge of precipitation, and add a few drops of acetic acid, about 20 times the amount of ammonium oxalate required to precipitate the lime, and a little more ammonia. The operation is completed in the usual way. For the determination of magnesia use an aliquot of the solution corresponding to the same amount of substance, and for each 50 cc. of the solution add 70 cc. of Petermann's ammonium citrate solution, 10 cc. of saturated sodium phosphate solution, and 20 cc. of ammonia, and proceed as usual. For the determination of phosphoric acid use ammonium molybdate to which 20 drops of ammonium citrate solution has been added to prevent the separation of molybdic acid. Dissolve the ammonium phosphomolybdate in ammonia and reprecipitate with dilute nitric acid in a warm solution. Dry at 100° C. and weigh. One hundred parts of the precipitate correspond to 3.75 parts of phosphoric acid.

Estimation of magnesium by organic bases, W. HERZ and K. DRUCKER (*Ztschr. Anorgan. Chem., 26* (*1901*), *pp. 347–349; abs. in Jour. Chem. Soc.* [*London*], *80* (*1901*), *No. 463, II, p. 348*).—The method of estimating zinc by precipitation with dimethylamin is applicable to magnesium, giving accurate results. Magnesium salts are also completely precipitated by a solution of free guanidin. This method is especially recommended in the estimation of magnesium in the presence of alkalis and in the analysis of mixed silicates containing magnesium.

The determination of potash, O. SCHUMM (*Ztschr. Analyt. Chem., 40* (*1901*), *pp. 385–389; abs. in Chem. Centbl., 1901, II, No. 4, p. 321*).—The author recommends Classen's electrolytic method, in which metallic platinum is separated from the potassium platinum chlorid in sulphuric-acid solution and weighed. The factor used in calculating potassium chlorid from the weight of platinum is 0.76689 for less than 0.2 gm. platinum and 0.764595 for 0.2 gm. or more.

The relative value and limits of accuracy of various titration methods for determining caustic soda in the presence of sodium carbonate, R. LUCION and D. DE PAEPE (*Bul. Assoc. Belge Chim., 15* (*1901*), *No. 1, pp. 19–23; abs. in Bul. Soc. Chim. Paris, 3. ser., 25* (*1901*), *No. 12, p. 652*).

On various classic methods for the volumetric determination of small quantities of sodium carbonate in the presence of large amounts of acid sodium carbonate, R. LUCION and D. DE PAEPE (*Bul. Assoc. Belge Chim., 15* (*1901*), *No. 1, pp. 23–25; abs. in Bul. Soc. Chim. Paris, 3. ser., 25* (*1901*), *No. 13, p. 703*).

A method for the determination of the availability of organic nitrogen in commercial fertilizers, J. P. STREET (*Jour. Amer. Chem. Soc., 23* (*1901*), *No. 5, pp. 330–338*).—The following method is proposed: To an amount of substance equivalent to 0.075 gm. of nitrogen in a 300 cc. Erlenmeyer flask add 100 cc. of neutral 1.6 per cent potassium permanganate and digest the mixture on a steam bath for 20 minutes with occasional shaking, filter and wash with 125 to 150 cc. of water, and determine nitrogen in the undissolved residue by the ordinary Kjeldahl process. The results of a large number of tests of widely differing fertilizers show that this method places them in about the same rank as that assigned by vegetation tests and agricultural experience.

On the compounds formed in the process of determining nitrogen according to Kjeldahl, V. ANDRLIK (*Věstník III Sjezdu České. Přír. Lék Praze, 1901, p. 290; abs. in Chem. Ztg., 25 (1901), No. 60, Repert., p. 221*).—It is claimed that in the Kjeldahl method not all of the nitrogen is transformed into ammonia, but a portion remains as amin. This was found to be especially true in case of sugar-beet products which contain betain.

Determination of nitrogen in nitrates by the Schulze-Tiemann method, V. STANĚK (*Böhm. Ztschr. Zuckerind., 25 (1901), No. 7, pp. 356–358; abs. in Jour. Soc. Chem. Ind., 20 (1901), No. 5, p. 506, fig. 1*).—In the Schulze-Tiemann method the nitric oxid is collected in a graduated tube over dilute alkali solution and the tube is then transferred to a tall cylinder filled with recently boiled water and after a time the volume and temperature of the gas are read off. The author has devised an apparatus that avoids the transfer of the measuring tube containing the nitric oxid. This apparatus is figured and described.

On the determination of nitrates in potable waters with brucin and crystallized formic acid, E. CAZENEUVE and H. DEFOURNEL (*Bul. Soc. Chim. Paris, 3. ser., 25 (1901), No. 12, pp. 639, 640*).—The method proposed is as follows: When the water contains only a trace of nitrate evaporate 1 liter to dryness, take up the residue in 20 cc. of distilled water, and evaporate to dryness again with 0.05 gm. of brucin in a small shallow dish, remove the dish from the water bath, and while still hot add a few drops of concentrated formic acid and a little distilled water. A yellow coloration appears, which, after standing 12 hours, is, on the addition of a small quantity of hydrogen peroxid, changed to a rose color. By this means one part of nitrate in 100,000 parts of water may be detected. Quantitative determinations may be made by the colorimetric method.

On the occurrence of free iodin in nitrate of soda, F. W. DAFERT and A. HALLA (*Ztschr. Landw. Versuchsw. Oesterr., 4 (1901), No. 6, pp. 732–734*).—It is stated that free iodin is found in certain samples of sodium nitrate, resulting from the decomposition of iodates present.

A rapid method for the determination of arsenious oxid in Paris green, S. AVERY and H. T. BEANS (*Jour. Amer. Chem. Soc., 23 (1901), No. 7, pp. 485, 486*).—The authors offer the following rapid and accurate method for determining the arsenic in Paris green: The sample is pulverized in an agate mortar and 0.2 to 0.3 gm. placed in a beaker of about 300 cc. capacity. About 25 cc. of water is added, and concentrated hydrochloric acid, drop by drop, with constant stirring until the green suspended is in solution; from 6 to 10 drops are usually sufficient. Sodium carbonate solution is then added until a slight permanent precipitate is formed and at this point 2 to 3 gms. of sodium potassium tartrate in solution added. The tartrate will immediately dissolve the precipitated copper and prevent further precipitation during the subsequent titration. The whole is diluted to about 200 cc., solid sodium bicarbonate and starch solution added, and titrated with iodin in the usual manner. The operation requires about 10 minutes. The end reaction is sharp and is not obscured in the least by the blue color of the solution.

On the elimination and quantitative estimation of water in oils, fats, and waxes, C. B. DAVIS (*Jour. Amer. Chem. Soc., 23 (1901), No. 7, pp. 487, 488*).—In order to avoid loss by foaming and sputtering in drying oils, fats, and waxes, the authors propose the following method: A coil of thick filter paper is placed in a wide-mouthed weighing bottle and dried to constant weight. As much of the oil, fat, or wax is introduced as will be absorbed by the filter paper, the whole weighed, dried to constant weight, and again weighed.

Use of amyl alcohol in the analysis of fats, G. HALPHEN (*Ann. Chim. Analyt. 6 (1901), pp. 133–135; abs. in Jour. Chem. Soc. [London], 80 (1901), No. 463, II, p. 359*).—The following method is given as being rapid and sufficiently accurate for commercial purposes in estimating nonsaponifiable matter in fats: To 5 or 10 gms.

of the fat, dissolved in 10 volumes of carbon bisulphid, twice as much concentrated sulphuric acid as the fat is added drop by drop, with shaking, to avoid rise of temperature. The whole is rinsed into a separatory funnel, the lower layer run out, the upper one shaken with a little animal charcoal to remove tar and traces of acid, then filtered, distilled, and the residue weighed.

A new reaction of saccharin, A. LEYS (*Compt. Rend. Acad. Sci. Paris, 132 (1901), No. 17, pp. 1056–1058; abs. in Jour. Soc. Chem. Ind., 20 (1901), No. 6, p. 622*).—This color reaction with saccharin is given when even very dilute solutions are treated with dilute copper sulphate or ferric chlorid and hydrogen peroxid. Five cc. of the solution containing saccharin, treated with 2 drops of ferric chlorid and 2 cc. of hydrogen peroxid diluted, gives a violet color in 30 or 35 minutes.

This reaction may be used for determining the presence of saccharin in milk and in butter. The milk is treated with potassium bisulphate and absolute alcohol and the clear liquid filtered from the precipitated casein and fat. This liquid is then shaken with ether, evaporated, dried, taken up with boiling water, cooled, and tasted. If sweet, examine for saccharin as above.

Butter is dissolved in equal volumes of chloroform and alcohol, water added, and shaken. The separated chloroform retains the fats; the aqueous-alcoholic solution the saccharin. The latter is tested as described.

Clarification of low-grade molasses for polarization, H. C. LAURENCE (*Beet Sugar Gaz., 3 (1901), No. 5, pp. 109, 110*).—In the laboratory of the Los Alamitos Sugar Company experiments were made of using permanganate of potash in clarifying sugar solutions. After clarifying with lead subacetate the filtrates when dark were treated with a few crystals of permanganate of potash and again filtered, resulting in a bright and much clearer filtrate. In order to test the correctness of this addition 50 cc. portions of the same samples were placed in 200 cc. flasks and treated with a slight excess of lead solution. After 10 minutes 50 cc. of a strong permanganate solution was added, the whole allowed to stand long enough for the air bubbles to escape, brought to the mark, filtered, and polarized. The polarizations were made with ease, and agreed with those obtained with the lead solution alone. The filtrates from the lead alone were dark and hard to read; those from the permanganate were colorless as water.

These results were verified by A. M. Masser, chemist of the Wolverine Company, who also found the method applicable to carmelized sugar.

The action of carbonic acid in sugar solutions saturated with lime, J. WEISBERG (*Bul. Assoc. Chim. Sucr. et Distill., 18 (1901), No. 7, pp. 457–462*).—The products formed in adding carbonic acid to precipitate the lime in the carbonation process in sugar making are described and discussed. In passing carbonic acid into a sugar juice containing lime the alkalinity as denoted by phenolphthalein continues to fall, while the polarization of the filtered juice falls and then rises again to the original value. At the lowest point of polarization there is the greatest thickening of the liquid, the slowest rate of filtering, and this is the point at which the decoloration of the juice begins.

Estimation of sugar in vinous products, A. BERNARD (*Ann. Chim. Analyt., 6 (1901), pp. 89–95; abs. in Jour. Chem. Soc. [London], 80 (1901), No. 463, II, p. 355*).—Ten cc. of the liquid to be examined is diluted in a conical flask, 20 cc. Fehling's solution added, and heated to boiling. The flask is cooled in cold water, the contents filtered, and 15 cc. or more of the filtrate is titrated with a solution of potassium cyanid until colorless. The cyanid solution is made up so that 10 cc. will discolorize 10 cc. of Fehling's solution. The strength of the latter may be determined by means of an accurately made solution of invert sugar.

Estimation of total extract and free acid in wine, F. FREYER (*Oesterr. Chem. Ztg., 4 (1901), p. 129; abs. in Analyst, 26 (1901), No. 303, p. 157*).—Owing to the many sources of probable error in estimating the extract of wine by evaporation, the author proposes getting this figure from the specific gravity of the sample taken before and after distilling, using either the Haas or Windisch tables for making the calculations.

With the "free acid" of wine it is recommended to determine the potassium bitartrate; reduce this (188=75) to free tartaric acid, deduct this value from the total nonvolatile acid obtained by titration, and consider the difference as true free acid. The nonacid extract is then obtained by subtracting both the tartar and true free acid from the total extract.

A new indicator for use in determining total acidity of wines, E. G. RUNYAN (*Jour. Amer. Chem. Soc., 23 (1901), No. 6, pp. 402–405*).—The author employed the mixture of corallin and malachite green, as recommended by Lachaux, in examining dark-colored juices of the sugar beet. Owing to the good results obtained, the mixture is recommended as an indicator in the analysis of wines, vinegars, ciders, and similar products.

A method of determining nicotin in tobacco and tobacco extracts, J. FOTH (*Rev. Internat. Falsif., 14 (1901), No. 1, pp. 12–14*).—A modification of Kissling's method (E. S. R., 5, p. 433). The dried mass is extracted with a mixture of ether and light petroleum. An excess of normal sulphuric acid is added and the liquid titrated with normal sodium hydroxid, 1 cc. of sulphuric acid neutralized being taken as equal to 0.0162 gm. of nicotin.

Three new alkaloids of tobacco, A. PICTET and A. ROTSCHY (*Compt. Rend. Acad. Sci. Paris, 132 (1901), p. 971; abs. in Bul. Soc. Chim. Paris, 3. ser., 25 (1901), No. 13, p. 698*).

Chemistry of tobacco smoke, H. THOMS (*Schweiz. Wchnschr. Pharm., 39 (1901), No. 27; abs. in Pharm. Jour., 66 (1901), No. 1607, p. 459; Jour. Soc. Chem. Ind., 20 (1901), No. 6, p. 626*).—Tobacco smoke was drawn through absorption tubes containing caustic soda, sulphuric acid, etc., and the contents of the tubes afterwards examined. The smoke was found to contain the bases nicotin and pyridin, and ammonia, carbonic and butyric acids, carbon monoxid, and 2 volatile oils, one of which could be steam-distilled from tobacco. In 15,000 gm. of tobacco there was 6 gm. of this oil of dark color and smell resembling camomile oil. The other oil was extremely toxic, of dark color and narcotic odor. About 75 per cent of nicotin in the tobacco passed over through the smoke, being afterwards partly decomposed. The ash amounted to 20.09 per cent of the tobacco burned, and 18.82 per cent of the ash was carbonaceous. The mineral matter consisted chiefly of carbonates of calcium and potassium, the phosphates of calcium and magnesium, potassium chlorid, silicates, and silica.

Official method for analysis of tanning materials (*U. S. Dept. Agr., Bureau of Chemistry Circ. 8, pp. 2*).—A description of the method adopted at the last convention of the Association of Official Agricultural Chemists (E. S. R., 13, p. 412).

On the determination of formaldehyde, A. G. CRAIG (*Jour. Amer. Chem. Soc., 23 (1901), No. 9, pp. 638–643*).—The author has made an extended study of the methods for the determination of formaldehyde. These methods may be divided into 3 groups: (1) depending on a specific reaction, (2) formation of addition products with elimination of the elements of water, and (3) oxidation and reduction. Of the various methods tested, that of Legler was found the most accurate, with certain modifications. The requisites to the determination are a normal solution of sulphuric acid, an approximately normal solution of ammonia, the exact strength being immaterial, and a methyl orange solution; 3 oz. bottles with smooth sides and close-fitting soft-rubber stoppers, and a boiler in which they may be immersed to the neck. Place 25 cc. of the ammonia solution in each bottle and to one-half of them add a sample containing 0.5 gm. of formaldehyde. Stopper tightly, place the bottles in the boiler, fill with water to the neck, and boil for 1 hour. Cool slowly and titrate carefully with sulphuric acid and methyl orange to the first indication of a color change. The differences between the readings for the blanks and the samples represent the ammonia consumed in normal cubic centimeters; 1 cc. equals 0.0601 gm. of formaldehyde.

The errors in the Legler method do not counterbalance one another, the tendency being toward low results. A blank determination is necessary, and in the titration an accurate end-point is very important. Any acid present must be accounted for.

The oxalic acid in organisms, CIPOLLINA (*Berlin. Klin. Wchnschr., 38 (1901), p. 544; abs. in Chem. Ztg., 25 (1901), No. 44, p. 169*).—A study of the oxalic acid in animal and vegetable products, with some reference to its source.

Improvement of Küster's hydrogen sulphid apparatus, G. FRERICHS (*Arch. Pharm., 239 (1901), pp. 118–121; abs. in Jour. Chem. Soc. [London], 80 (1901), No. 463, II, p. 311*).—Küster's apparatus (E. S. R., 5, p. 728) has the disadvantage that a good deal of acid enters before the steady evolution of gas begins. The author obviates this difficulty by placing a small vessel with a valve to admit air between the large reservoir of acid and the bottle of sulphid. This small vessel is filled from the reservoir and then connected with the sulphid bottle.

Areometer for use with the Reichert-Meissl determination, M. J. VANDERPLANCKEN (*Bul. Assoc. Belge Chim., 15 (1901), No. 4–5, pp. 176, 177*).—A description of an instrument to be used in determining the Reichert-Meissl number is given and its advantages are set forth.

A modification of the Landsberger apparatus for determining the boiling point, C. N. RIIBER (*Ber. Deut. Chem. Gesell., 34 (1901), p. 1060; abs. in Chem. Ztg., 25 (1901), No. 46, p. 174, fig. 1*).

Tables for calculating in quantitative chemical analysis, founded on the basis of the atomic weights as recommended by Landolt, Ostwald, and Seubert, A. SARTORI (*Ztschr. Analyt. Chem., 40 (1901), No. 4–5, pp. 202–376*).—Tables of all the elements are given, together with multiples of the same up to 9, and the logarithm.

The improvement of instruction in technical chemistry, A. LACHMANN (*Jour. Soc. Chem. Ind., 20 (1901), No. 6, pp. 546–551*).—A popular article on chemical education.

BOTANY.

On the origin of new species of plants, H. DE VRIES (*Proc. Sec. Sci. Koninkl. Akad. Wetensch. Amsterdam, 1901, III, pp. 245–247*).—A brief account is given of 15 years' experiments with *Œnothera lamarckiana*, in which the author has established new types which are considered of sufficient stability to warrant description as new species. The author believes that plants undergo long periods of constancy alternately with periods in which new species may be produced. He believes that each species has originated from another at such a time. For this it is held that it is not necessary that the mother species be changed in any way, but that it may continue with all its former characteristics unchanged. His observations have been made from plants growing in natural conditions as well as seed collected and sown in gardens. After an extended research, one species was found which was in what he terms a mutation period. The results of observations on many thousands of seedlings are given, and the author has separated forms which have been constant from their first occurrence after several generations of cultivation. At present he has originated from the original wild species 12 distinct forms which come true to seed. The conclusion is drawn that new species originate suddenly without intermediate forms or any other preparation. From the beginning they remain unchanged during the subsequent generations. No reversion, or atavism, was observed in any of these cases. Mutation seems to take place in various directions, and not in any predetermined manner. In many instances the new species are weakened but sometimes appear more adapted to their surroundings than the original.

The plants of western Lake Erie, with observations on their distribution, A. J. PIETERS (*U. S. Fish Com. Bul. 1901, pp. 57–79, pls. 10*).—This is a contribution to the biology of the Great Lakes, made with a view of studying the possibilities of increasing the stock of fish now existing in those waters. A report is given of the various plants found along the shores and extending into the deeper waters. The different life zones are described, and influence of variation in depth of water is shown. The report enumerates the species of phanerogams, charas, and desmids observed during the investigations made in the summer of 1898.

The flora of the Palouse region, C. V. Piper and R. K. Beattie (*Pullman: Washington State Agr. Col., 1901, pp. 208*).—Descriptions are given of all the Spermatophytes and Pteridophytes known to grow wild within a radius of 35 kilometers of Pullman, Wash. The total number of species described is 663, representing 337 genera.

A contribution to the knowledge of the flora of the Red River Valley in Minnesota, W. A. Wheeler (*Minnesota Bot. Studies, 2. ser., 1901, pt. 5, pp. 569–600, pls. 8*).—The results of a study of the flora of this region show the presence of 325 species of flowering plants. The species are enumerated and general views given of the distribution of the flora in different localities.

A preliminary list of Minnesota Uredineæ, E. M. Freeman (*Minnesota Bot. Studies, 2. ser., 1901, pt. 5, pp. 537–560*).—The occurrence and distribution is noted of 165 species of Uredineæ, and critical notes given on a number of species.

Plants reported to be poisonous to stock in Australia, J. H. Maiden (*Agr. Gaz. New South Wales, 12 (1901), No. 6, pp. 637–666*).—A list is given, arranged in their natural orders, of plants which have been reputed poisonous to stock, and notes added briefly describing the plants, symptoms produced, and remedial treatments suggested. The list contains many plants upon which the evidence of poisonous properties is very doubtful, and others which have been shown to be innocuous. Bibliographies are given of a number of plants.

Crossing of varieties, K. Sajo (*Prometheus, 11 (1901), pp. 209–212, 225–231, 244–251, figs. 9; abs. in Jour. Roy. Micros. Soc. [London], 1901, No. 3, pp. 300, 301*).—The results of crossing varieties of grapes and apples are discussed at some length. The author claims that not only the seeds but the pericarp are influenced by such crossing. It is stated that the pollen of the grape never develops tubes greater than 6 to 7 mm. In the apple and pear orchards wind is said to play a very small part in the dissemination of pollen. Bees, flies, and other pollinating insects, as a rule, visit a large number of flowers in succession on the same tree, and therefore do not bring about true cross pollination. In the case of apples and pears only a small proportion of the flowers are habitually fertilized (5 to 6 per cent in the former and about 13 per cent in the latter case).

The vitality of pollen (*Rev. Hort., 73 (1901), No. 14, pp. 323, 324*).—In a brief note it is stated that experiments have shown that the pollen of roses may retain its vitality for 22 days or more; Clivias at least 3 months and some hybrids for over a year, cannas for 15 days or more, and Aucuba for 10 days.

The double fecundation of maize, L. Guignard (*Jour. Bot. [Paris], 15 (1901), No. 2, pp. 37–50*).—A critical review is given of the recently published papers of De Vries, Correns, and Webber, relating to Xenia, or double fecundation of maize (E. S. R., 12, pp. 421, 717).

Influence of wounds on the formation of proteid material in plants, A. Hettlinger (*Rev. Gén. Bot., 13 (1901), No. 150, pp. 248–250*).—The author reports experiments in which onion bulbs were divided into 4 equal parts and the proteid material determined. Two of the portions were subjected to immediate analysis, while the other 2 were cut in small pieces, retained in darkness for 5 days, after which they were analyzed. The results showed that in the bulbs of the onion there is a considerable increase of proteid material due to wounds.

On the comparative poisonous properties of compounds of nickel and cobalt when applied to higher plants, H. Coupin (*Compt. Rend. Soc. Biol. Paris, 53 (1901), No. 17, pp. 489, 490*).—Comparisons of the chlorids, sulphates, and nitrates of nickel and cobalt as shown upon the germination of wheat are reported, from which it appears that the toxicity of the same compound of each metal was very nearly the same, and both are quite high.

On the poisonous properties of compounds of silver, mercury, gold, platinum, and palladium, when applied to higher plants, H. Coupin (*Compt. Rend. Soc. Biol. Paris, 53 (1901), No. 17, pp. 509, 510*).

On the toxic value of mercuric chlorid and its double salts, J. F. Clark (*Jour. Phys. Chem., 5 (1901), No. 5, pp. 289-316*).—The author made an extended study of the influence of various solutions of $HgCl_2$ on fungi. The results are reported in a table and also plotted. The results of the addition of NaCl in varying amounts to the $HgCl_2$ is also noted. In great concentration of these 2 salts, a large increase in the toxic properties of the mixture was obtained by the simple dilution with water to 4 or more volumes. The reason for this would appear from the fact that by the greater dilution the double salts were more readily broken down. Contrary to the usual belief, the addition of NaCl to the mercuric salt lessened, instead of increased the toxic value. This is stated to be because of the fact that the double salts have less affinity for the proteid substances than the pure $HgCl_2$ solution.

Digestive secretion of Nepenthes, Clautrian (*Biol. Centbl., 21 (1901), p. 33; abs. in Jour. Roy. Micros. Soc. [London], 1901, No. 3, p. 290*).—The result of a series of observations on the digestive properties found in the urns of Nepenthes are given. Owing to the comparative scarcity of small insects no great numbers were entrapped. The bodies of those that were captured were found more or less completely digested, and, according to the author's experiments, bacteria had no part in the digestion. The fluid in the urns is ordinarily neutral to reagents, but upon shaking or introducing any foreign substance it becomes acid. The digestive ferment present is considered to be zymase, which is regarded as a pepsin rather than a trypsin.

The oxidases in higher plants, N. Passerini (*Abs. in Ann. Agron., 27 (1901), No. 6, p. 302*).—The author has made a study of the diffusion and localization of oxidases among the higher plants, as shown by the well-known reactions for diastases, such as hydroquinone, pyrogallic acid, and tincture of quaiacum. He found that oxidases are widely distributed among plants, the Solanaceæ, Labiatæ, Compositæ, and Umbelliferæ containing them in considerable abundance. Diastases are most noticeable in the roots of plants, and rarely in the leaves. When present in the leaves it is most often localized along the veins. The pistils and filaments of the stamens are richest in oxidases of the flowering organs. They are also localized in the pericarp of the fruits. Seeds in the process of formation contain oxidases, but they disappear with their ripening. Aquatic plants do not seem to contain oxidases.

Enzyms of fungi, P. Kohnstamm (*Bot. Centbl. Beihefte, 10 (1901), pp. 90-121; abs. in Jour. Roy. Micros. Soc. [London], 1901, No. 3, p. 308*).—An extensive study has been made with enzyms which attack starch, glucosids, proteids, and cellulose in those fungi which are noted for destroying wood, especially in *Agaricus melleus*, *Merulius lachrymans*, and *Polyporus squamosus*. The mode of treatment is described at length and the results summarized. From the 3 fungi enumerated a starch-destroying enzym (amylase) was obtained which apparently is identical with the diastatic enzym of malt. It was found most abundant in *Polyporus squamosus*. Emulsin, a glucosid ferment, was found in *M. lachrymans* and *P. squamosus*, but not in *A. melleus*. A proteolytic enzym was found in small quantity in *A. melleus*, and more abundantly in the others. In *M. lachrymans* a cellulose-decomposing enzym was found, and it was established that these various ferments may act simultaneously. The ferments were found only in the receptacle of *P. squamosus*, while the mycelium of *M. lachrymans* also contained these substances.

Decomposition of glucosids by mold fungi, A. Brunstein (*Bot. Centbl., Beihefte, 10 (1901), pp. 1-50; abs. in Jour. Roy. Micros. Soc. [London], 1901, No. 3, p. 310*).—A series of experiments are reported on the decomposition of different glucosids by species of Aspergillus, Penicillium, and other fungi. It appears that the glucosids employed have very different values for the nutrition of the fungi. In all cases the glucosid is split up into glucose and a benzol derivative. None of the media containing glucosids gave as good growth as those free from them, and some of them produced substances prejudicial to the growth of the organism.

A text-book of plant physiology, D. T. MacDougal (*New York: Longmans, Green & Co., 1901, pp. XIV+352, figs. 159*).—This book, by the director of the laboratories of the New York Botanical Garden, is an important addition to the text-books which have recently appeared for secondary schools and laboratory guides. An attempt is made to place before the student a method whereby a working knowledge of the physiological activities of the plant may be acquired. This entails a study of the functions and properties of the organism in connection with the agencies and forces which influence plant life. The first part of the book is devoted to the consideration of forms of irritability as exhibited by typical organisms, while the second part is taken up with a study of the various phases of plant activity. The discussion of the principles is accompanied with directions for practical demonstrations, the purpose of the author being to present practical directions for the demonstration of the principal physiological phenomena of the plant as well as the details of methods requisite to research work.

Numerous references are given to the literature of the subject, but no attempt is made to make the bibliography exhaustive, only the more important recent publications or those which treat of phases of plant life not touched upon in the present work being cited.

Southern wild flowers and trees, Alice Lounsberry (*New York: Frederick A. Stokes Co., 1901, pp. XV+570, pls. 177, figs. 50*).—This book treats in a popular way of the wild flowers and trees of the Southern States, and is the first work of the kind adapted to that large and interesting region. The text is simply written, and the order of arrangement is that adopted by many of the more recent writers in beginning with those flowers which are structurally simple and progressing to the more complex. In compiling this work the author has given a selected list of more than 1,000 species of plants, the system of names adopted being for the most part that of the so-called Rochester code. Simple keys have been prepared for the plant families and technical terms, so far as consistent with clearness, have been omitted. For such technical terms as are used an illustrated glossary is provided. A special attempt has been made to give something of the history, folk lore, and uses of the southern plants, and their distribution, habits, and surroundings are described in a pleasing style. The illustrations, many of which are colored and all prepared especially for this work, are of a very excellent character, and portray the plants with marked fidelity.

BACTERIOLOGY.

Botanical descriptions of some soil bacteria, O. Gottheil (*Centbl. Bakt. u. Par., 2. Abt., 7 (1901), Nos. 12, pp. 430–435; 13, pp. 449–465; 14, pp. 481–497; 15, pp. 529–544; 16, pp. 582–591; 17–18, pp. 627–637; 19, pp. 680–691; 20, pp. 717–730, pls. 4*).—Attention is called to the difficulty met with in the specific determination of species of soil bacteria, and suggestions are given for a uniform method of description. This embraces not only the morphological characteristics of the organisms, but also their behavior in a large number of media under different conditions. In addition, about a dozen species are described, as follows: *Bacillus ruminatus*, *B. tumescens*, *B. graveolens*, *B. petasites*, *B. ellenbachensis*, *B. mycoides*, *B. subtilis*, *B. pumilus*, *B. simplex*, *B. cohærens*, *B. carotarum*, *B. fusiformis*, and *B. asterosporus*. All of these species were found, probably as saprophytes, upon the underground parts of plants, many of which are of economic importance. A list of about 50 works, relating to the systematic and diagnostic descriptions of species of bacteria, completes the paper.

Notes on Vibrio denitrificans, R. G. SMITH (*Proc. Linn. Soc. New South Wales, 26 (1901), pt. 1, pp. 118–121, pl. 1*).—In studying the bacteria found in the canals used for conveying the Sydney water supply, the author isolated the above-mentioned species and was struck with its resemblance to the organism which produces root tubercles on leguminous plants. In size and character of growth, as well as some other peculiarities, the two are quite similar. The Vibrio, however, differs in its power of growing on ordinary media as well as in media containing little nutriment. Unlike the root tubercle organism, this bacteria is unable to convert free nitrogen into combined forms, but reduces nitrates to gaseous form.

On the value of plating as a means for determining the number of bacteria in drinking water, W. C. C. PAKES (*Centbl. Bakt. u. Par., 2. Abt., 7 (1901), No. 11, pp. 386–391*).—The conclusion is drawn that plating upon ordinary gelatin, whether made with distilled or tap water, is no necessary criterion of the number of bacteria present, and so far as possible gelatin should be made without meat extractives with the water to be examined or with a sample of water of the same mineral constitution.

The soluble ferments or enzyms, E. O. JORDAN (*Pop. Sci. Mo., 59 (1901), No. 5, pp. 497–503*).—The author popularly describes various enzyms, grouping them according to their action upon sugar, proteids, etc.

Agricultural bacteriology, H. W. CONN (*Philadelphia: P. Blakiston's Sons & Co., 1901, pp. 412, figs. 40*).—This new book is a study of the relation of bacteria to agriculture, with special reference to the bacteria in the soil, in water, in the dairy, in miscellaneous farm products, and in plants and animals. Different authors have written upon the subject in a restricted sense, but this is one of the first books in the English language that covers the whole range of the relation of bacteria to agriculture in its broadest sense. After discussing the nature of bacteria and fermentation, the author takes up serially the bacteria in the soil and water, showing the transformations caused by bacteria in the soil, manure, sewage, etc., and means of reclaiming lost nitrogen; the relation of bacteria to dairying and the use of cultures of bacteria in butter and cheese making; the fermentations concerned in the preparation of various products, as in vinegar, silage, sauerkraut, tobacco curing, etc.; the preservation of food products; and parasitic bacteria, in which diseases of animals and plants are discussed at some length, the work closing with a chapter on disinfection. As Professor Conn has given much attention to the bacteria of soils, water, and dairying, those subjects are very fully treated, especially those concerned with the ripening and flavor of dairy products. The book is free from unnecessary technicalities and can be as readily appreciated by the lay reader as by the student. Aside from a few minor particulars the work appears to be a good general treatise on the subject, and will be an important addition to our agricultural literature.

METEOROLOGY.

Monthly Weather Review (*U. S. Dept. Agr., Weather Bureau, Monthly Weather Review, 29 (1901) Nos. 7, pp. 291–340, pls. 2, charts 9, fig. 1; 8, pp. 341–398, pls. 3, charts 8; 9, pp. 399–446, charts 9*).—In addition to the usual reports on forecasts, warnings, weather and crop conditions, meteorological tables and charts for the months of July, August, and September, 1901, recent papers bearing on meteorology, etc., these numbers contain the following articles and notes:

No. 7.—Special contributions on The thunderstorm, a new explanation of one of its phenomena, by B. McFarland; A meteorological balloon ascension at Strasburg, Germany, by A. L. Rotch; Diurnal winds on faint gradient in northwestern New Mexico, by R. E. Dodge; Original memoirs on the general circulation of the atmosphere, by M. Brillouin; Supplementary remarks on the theory of the formation of rain on mountain slopes, by F. Pockels; and Yukon weather (illus.), by U. G. Myers; and notes by the editor on a proposed meteorological commission, university research at Washington, D. C., instructions to the voluntary meteorological observers of the United States Hydrographic Office, lunar influences in meteorology, the red dust of March, 1901, and the Milwaukee, Wis., convention of Weather Bureau officials (illus.).

No. 8.—Special contributions on The island of Porto Rico, by J. L. Cline; The meteorological observatory of Saint Ignatius College, Cleveland, Ohio, by J. Kenealy; The tornado in Hudson County, N. J., on August 24, 1901, by J. H. Eadie; The solar constant, by F. W. Very; Ice caves and frozen wells as meteorological phenomena (illus.), by H. H. Kimball: Our killing heat, by H. L. Abbot; The moon and the weather, by L. W. Meech; and Tornado and waterspout at Norfolk, Va., on August 6, 1901, by J. J. Grey; and notes by the editor on organization of the Philippine Weather Bureau by the United States Philippine Commission, the autumn haze, the moon and the weather, meteorology in Madagascar, popular errors in meteorology and geography, and further explanations desired.

No. 9.—A special contribution on the general circulation of the atmosphere, especially in arctic regions, by H. H. Kimball; and notes by the editor on wind force in tornadoes, a new field for kites in meteorology, climate and crops—a problem with two solutions, seismometers in meteorology, the observation of shooting stars, the south polar expeditions, and answers to correspondents—popular queries about rain, hail, wind, and frost.

Yukon weather, U. G. Myers (*U. S. Dept. Agr., Weather Bureau, Monthly Weather Review, 29 (1901), No. 7, pp. 309–311, fig. 1*).—A discussion based mainly on observations at Eagle from September, 1899, to May, 1901, inclusive. The highest temperatures occurred between June 15 and July 15, sometimes reaching a maximum of 90° F. The lowest temperatures occurred as a rule in January, although not confined to such close limits as the maximum temperature. The minimum temperature recorded at Eagle is −68° F., which occurred in January of 1900 and 1901. A minimum of −70° F. is recorded at Seventymile Creek, 30 miles northwest of Eagle, for February 12, 1901. The mean temperature for March, April, and May, 1900, was 28°; for the same period in 1901, 20°. Rainfall was light, being about 12 in. annually, 75 per cent of which fell during the 6 months April–September. The heaviest rainfall occurred regularly in August. The snow fall was not heavy, averaging between 3 and 3.5 ft. per year. The summers were cloudy. In conclusion, the author says:

"While no one ever expects to see the interior of Alaska become an agricultural country, its possibilities in that line are not so limited as at first supposed. The ground is practically all frozen to a varying depth and covered with soggy moss, and, where level, swamps abound. Almost all localities are capable of furnishing garden spots at least, and the swamps are bountiful sources of native hay which is known to be good fodder for horses and cattle. While the soil is sour and needs cultivation and aeration to render it more productive, hardy vegetables sufficient for all local needs can be grown; radishes, lettuce, turnips, and potatoes do well and are particularly sweet and succulent."

The Island of Porto Rico, J. L. Cline (*U. S. Dept. Agr., Weather Bureau, Monthly Weather Review, 29 (1901), No. 8, pp. 353–355*).—"The climate is not so oppressive as one might expect in the Tropics. A cool, very pleasant, and most welcome breeze generally blows across the island, particularly in the afternoon and at night. . . . Much cloudy weather prevails, with an occasional fog in the mountains. San Juan has an annual mean temperature of 78.5°. The warmest weather prevails from June to October, during which period the normal temperature ranges from 80.4 to 81.4°, with the highest in August, but slightly cooler weather prevails in the mountains. The coolest weather occurs in December, January, and February; during these months the normal temperature ranges from 75.2 to 76.5°, with the lowest in February. . . . Temperatures of 50° or slightly below have been recorded in the mountainous portions, and it is reported that light frost has been noted on some of the highest points, but no meteorological records report frost. The highest temperature recorded at San Juan during the past two years, or since American occupation, was 93.2° on May 2, 1901, and 93° was recorded April 25, 1900; the lowest was 65°, December 26, 1899. The temperatures at San Juan, the only station mentioning continuous self-registers, range generally from 65 to 89° during January, February, March, November, and December, and from 66 to 93° during the other months of the year.

"January, February, and March are the driest months, and during this period the rainfall is less than 3 in. per month. The greatest monthly rainfall occurs in October and November, but the so-called wet season generally commences in April and continues into December. Droughts, very destructive to vegetation, are noted in some years. The average annual rainfall at San Juan is 54.5 in., while at Hacienda Perla, a station in the northeast part of the island, on El Yunque, it is 133.93 in. The greatest annual rainfall at San Juan, from a record of 25 years, was 82.66 in. in 1878, and the least was 36.64 in. in 1893. The greatest monthly rainfall was 17.66 in. in December, 1893, and the least was 0.24 in. in February, 1896."

Guide to the weather, R. Börnstein (*Leitfaden der Wetterkunde. Brunswick: Friederich Vieweg & Son, 1901, pp. VIII+181, pls. 17, figs. 52*).—A popular elementary well-illustrated treatise on meteorology, written, however, almost exclusively from the German standpoint. The general principles involved, the methods and instruments used, and the main facts known are explained. The book also includes a somewhat full explanation of the principles upon which forecasts are made, the results of recent balloon observations, and an account of various weather services of the world. A reference list of 206 works consulted in the preparation of the book is given.

The results obtained in the organized effort to prevent hail in Italy during the years 1899 and 1900, F. Houdaille (*Ann. École Nat. Agr. Montpellier, n. ser., 1 (1901), No. 2, pp. 109–119*).—This is a report of observations made by the author during the summer of 1900 at the direction of the Minister of Agriculture of France. The various stations visited and the apparatus used are described, and the efficiency of the method and the conditions under which it may be applied with advantage in France are discussed. It is stated that the efficiency of the method, despite certain local failures, appears to be established, the principal practical difficulty encountered being that of securing energetic agitation of the air at a sufficient height to reach all hail clouds. The author recommends the establishment of an experiment station in France, like the one already in operation in Italy, to test materials and apparatus and to study the meteorological questions involved.

Weather control, W. S. Franklin (*Science, n. ser., 14 (1901), No. 352, pp. 496, 497*).—The article explains the very small force necessary to cause the falling down or collapsing of unstable states of the atmosphere and how "the trend of the collapse could be controlled, not only by choice of time and place of starting the collapse, but also by starting independent collapses at other times and places. . . . It is hard to think of a better means of starting a collapse of an unstable atmosphere than the smoke ring cannon of Burgomaster Stiger. . . . It seems to be within the range of possibility that Stiger's cannon may be a means for controlling all kinds of storm movements."

Cannonading against hail storms, C. Abbe (*Science, n. ser., 14 (1901), No. 358, p. 738*).—A reply to the article by W. S. Franklin noted above. "The popular faith in cannonading that seems to prevail among the peasantry of southern Europe is a craze that has no scientific basis whatever. . . . Thus far there has not been reported a single case where cannonading has been logically demonstrated to have been effectual.

Modern "weather shooting," J. M. Pernter (*Das moderne Wetterschiessen. Sep.*

from Die Kultur published by Oesterr. Landw. Gesell. Stuttgart and Vienna: J. Roth, 1901, pp. 16).—The history of this method of preventing hail is reviewed, as well as the arguments for and against it. The author concludes that it is possible that cannonading may have an influence in preventing hail.

The third international hail congress (*Grêle, 2 (1901), No. 12, pp. 10–12*).—A brief account is given of the hail congress held at Lyons, November 15, 16, and 17, 1901. It is reported that 1,800 delegates were present at the opening session, representing France, Italy, Switzerland, Spain, Germany, Austria, Greece, Bulgaria, Turkey, Russia, and Argentina, and including government officials, viticulturists, and scientists. The French Ministry of Agriculture was represented by the Subdirector of Agriculture. Resolutions adopted by the congress state that after considering the results obtained during 1901 in Austria, Hungary, Italy, Switzerland, Spain, Russia, and France, it is believed that means of protection against hail merit the attention and study of scientific men and are worthy of trial by agriculturists, and that the method of cannonading has given satisfactory results when properly organized and carried out with sufficient care and vigilance and on not too large a scale. The precautions to be observed to insure success are explained in some detail.

The hail protection congress, J. Dufour (*Chron. Agr. Canton Vaud, 14 (1901), Nos. 22, pp. 559–566; 23, pp. 594–600*).—This is a brief account of the congress held at Lyons in November of the past year and the text of a paper on protection against hail in Switzerland, presented to the congress by the author. It is stated that the results reported to this congress were encouraging in certain cases but doubtful in many others. The cases of unsuccessful trials of the cannonading method have been quite numerous, especially in Italy. Some of these have been ascribed to insufficiency of the cannonading, but others have not been satisfactorily explained.

Storms and hail, I. R. Plumandon (*Les orages et la grêle. Paris: Masson & Co., 1901, pp. 190*).

Clouds and their rôle in the formation of rain, C. Ritter (*Ann. Soc. Météor. France, 49 (1901), pp. 137–141, 203–234*).

Practical experiments in frost protection, J. W. Freeman (*California Cult., 17 (1901), No. 24, p. 374*).—An account is given of an experiment with smudges to protect lemon orchards from frost. The bottoms of the smudge baskets used were covered with dry eucalyptus or palm leaves sprinkled with melted resin mixed with kerosene to the consistency of molasses. A few pieces of kindling were also dipped in this mixture and placed in the basket, followed by untreated kindling. The basket was then filled with coal with the small lumps at the bottom. It is stated that with one basket to 2 trees the temperature of the atmosphere was raised at least 4° in from 4 to 6 hours.

A new field for kites in meteorology, A. L. Rotch (*Science, n. ser., 14 (1901), No. 350, pp. 412, 413*).—This article suggests installing kites on steamships so that observations may be made in calm weather and over the surface of the ocean. A successful trial of this method is reported.

Use of kites in meteorological work (*Jour. Franklin Inst., 152 (1901), No. 4, pp. 313, 314*).—Brief note.

Instructions for voluntary observers (*U. S. Dept. Agr., Weather Bureau Doc. 250, pp. 27, pl. 1, figs. 9*).—This is the second edition of this pamphlet, the object of which is to furnish voluntary observers of the Weather Bureau with "brief instructions for their guidance in taking and recording observations, more especially on temperature and rainfall."

The Blue Hill meteorological observatory, F. Waldo (*Pop. Sci. Mo., 59 (1901), No. 3, pp. 290–304, figs. 11*).—An account of the organization, equipment, and lines of work of this institution, especial attention being given to the subject of the study of the upper atmosphere by means of kites, a line of observation in which this observatory was the pioneer and which "has been pushed with such success that records of atmospheric pressure, temperature, relative humidity, and wind velocity have been secured by means of kites up to a height of 15,800 ft. above the sea."

Work at the station of agricultural climatology of Juvisy during the year 1900, C. FLAMMARION (*Bul. Min. Agr.* [*France*], *20* (*1901*), *No. 3, pp. 497–511, figs. 10*).—This is an account of observations on temperature of the air and of the soil at different depths, the relations between sun spots and temperature, atmospheric pressure, duration of sunshine and solar radiation, rainfall, and underground water in continuation of the work of previous years (E. S. R., 12, p. 918). Summaries covering not only the year 1900, but also long periods prior to that year, are given.

Meteorological observations, J. E. OSTRANDER, C. L. RICE, and H. L. BODFISH (*Massachusetts Sta. Met. Buls. 151, 152, 153, pp. 4 each*).—Summaries of observations on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during July, August, and September. The data are briefly discussed in general notes on the weather of each month.

Meteorology, G. GINESTOUS (*Bul. Dir. Agr. et Com.*, *6* (*1901*), *Nos. 20, pp. 298–301; 21, pp. 407–411*).—These articles record observations on rainfall and temperature during 6 months, March to August, 1901, at a number of places in different parts of Tunis.

Meteorology, P. BONÂME (*Rap. An. Sta. Agron.* [*Mauritius*], *1900, pp. 1–9*).—Summaries of observations on atmospheric pressure, temperature, rainfall, and humidity during 1900 as compared with similar data for previous years are given.

Weather Bureau exhibit, Pan-American Exposition, D. T. MARING (*U. S. Dept. Agr., Weather Bureau Doc. 248, pp. 4, pls. 4*).—This is reprinted from *Monthly Weather Review, June, 1901.*

SOILS.

Alkali and alkali soils, W. H. HEILEMAN (*Washington Sta. Bul. 49, pp. 35, figs. 3*).—The general results of a preliminary study of the alkali conditions in the Kittitas and Yakima valleys are reported. This includes investigation of the origin, nature, and distribution of the alkali, of its effects in the soil, and preventive and remedial measures.

The Kittitas Valley lies a little south of the central part of the State. It "is inclosed almost entirely by basaltic and drift ridges of variable elevation and with rounded general appearance. The ridges along the sides and southern end of the valley are composed largely of basalt rock and débris, while the lower uplifts on the northern side of the valley are composed largely of gravel drift which reach far into the valley southward. Back of these deposits on the north are higher elevations composed of volcanic ash and basalt rock. . . .

"The immediate surface soil of this valley varies somewhat as to texture and origin, though taken generally the soil of the cultivated portions of the valley is composed largely of disintegrated basalt. In some parts of the valley the basalt soil is intermixed with sand and gravel, and again other sections of the surface are covered with sandy or gravelly soils almost entirely. The floor of the valley is of sedimentary origin, as is indicated by the deposits of water-worn gravels and bowlders. These deposits extend many feet in depth in the bed of the valley as has been found by prospects made for artesian water. The presence of lava or volcanic ash soil is perhaps due to the fact that much of such material was deposited during the period in which the other sedimentary deposits were being placed, and also to the fact that the present surroundings of the valley have had an influence upon the immediate surface soil of the valley."

The Yakima River flows through the valley and is the source of supply for irrigation, which is a necessity in this part of the State. Analyses of the water of this river at a time when it was carrying its largest amount of sediment, as compared with similar analyses of the water of the Columbia and Snake rivers, indicate that the water used for irrigating is not the source of the alkali which is found to greater or less extent in the valley, especially where irrigation has been practiced longest. The analyses of the river waters are as follows:

Analyses of sediment in river waters.

[Grains per imperial gallon.]

	Yakima River.	Columbia River.	Snake River.
Sand and silica	4.59	0.72	1.58
Calcium oxid	2.45	3.20	2.08
Magnesium oxid	.82	.68	.66
Ferric and aluminum oxid	3.23	.09	.12
Potassium oxid	.45	.08	.14
Sodium oxid	3.51	.36	.67
Sulphur trioxid	3.59	.28	.86
Chlorin	Trace.	Trace.	.23
Organic solids and carbonates	13.65	3.41	2.37
Undetermined		.18	.29
Total	32.29	8.92	9.00

The analyses of the soluble salts in 56 samples of soil from the region under consideration, generally from fields where alkali is noticeably present, indicate that "the alkali areas in every case have been brought into existence through the action of the soil water on the soluble salts naturally existing in the soil and distributed generally throughout all parts of it; and the position of these areas has been determined by the natural drainage of the land previous to the advent of irrigation, and also largely since irrigation has been introduced." The alkali of the valley is largely of the black variety (sodium carbonate). All of the soils show some alkali, but the smallest amounts are found in the uncultivated and unirrigated soils, and where irrigation was limited there was less surface alkali than where an unlimited amount of irrigation water was obtainable.

"Throughout the whole irrigated section of this valley, and ranging from a few inches to several feet below the surface, is a well-defined layer of hardpan, varying from about 3 in. to 1 ft. in thickness. This hardpan consists of a calcareous layer quite impervious to water, and has much to do with permitting the soil near the surface to become clogged with alkali." The hardpan layer "may be found also above the irrigated sections and the lower bench lands surrounding the valley proper. Below in the valley the stratum is dark gray in color, due perhaps to organic matter and an excessive amount of soil being mixed with it. Those samples found at greater elevations were lighter in color and nearly free from organic matter."

Analyses of hardpan from the valley are given in the following table:

Composition of hardpan from Kittitas Valley.

Numbers of samples.	Calcium carbonate.	Magnesium carbonate.	Water-soluble salts.		
			Total salts.	Black alkali.	White alkali.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
No. 8	21.15	1.72	0.343	0.174	0.018
No. 21	14.93	3.09	.136	.029	.023
No. 43	21.79	2.97	.133	.109	.011
No. 56 *a*	63.22	2.45	.350	.145	.041

a From unirrigated land.

These analyses do not prove the hardpan to be the source of the alkali in the valley, as many suppose. In fact, the water-soluble material from this calcareous stratum is seldom in excess of what is found in the soil overlying it.

A limited study of similar character made in the Yakima Valley and its tributaries, Moxee and Ahtanum, show that the alkali soils of this district "contain both sodium carbonate and sulphate, and often also sodium chlorid. The heavily infected soils show the most sodium carbonate, while in other areas the sulphate is to be found in excess. The greater part of the alkali of the Yakima Valley is sodium sulphate. The soil does not show a high percentage of lime or magnesium carbonates. Other general conditions for this valley are the same as those noted in the Kittitas."

The use of gypsum on black alkali and the introduction of adequate drainage to keep the salts in the soil steadily moving toward water courses are recommended for trial on a small scale. A method of laying wooden drains devised by a farmer of the Kittitas Valley is described. This, "briefly stated, is a process for laying wooden tile in 3 ft. joints by means of a plow so constructed as to draw into the soil after it the wooden tile attached to the heel of the plow by means of a cable." It is stated that the work done by this means is satisfactory.

Tolerance of alkali by various cultures, R. H. LOUGHRIDGE (*California Sta. Bul. 133, pp. 42, figs. 8*).—This is an account of a continuation of investigations of previous years at Tulare and Chico substations (E. S. R., 10, p. 225; 12, p. 221). In previous investigations the examinations of the soil extended, as a rule, only to a depth of 1 ft. "In the past 2 years, however, we have extended the investigations and have endeavored to ascertain, as far as possible, the highest amount of each salt occurring in 4 ft. depth in which the different cultures of all kinds—orchard as well as others—will grow and come to maturity. . . . About 100 varieties of cultures have been studied. These embrace orchard trees, grain and forage crops, grasses, vegetables, and other miscellaneous growths." An improved method used in extracting the alkali from soils is as follows: "A weighed amount [of soil] is mixed with a measured quantity of water and allowed to digest for 24 hours, with frequent shaking. The salts thus dissolved are thoroughly diffused through the liquid, and an aliquot part may be taken for evaporation and examination. If necessary, a portion may be passed through a filter to clear it from sediment, but very often the solution settles perfectly clear."

The data for all of the examinations made are reported in detail and summarized and discussed. The results indicate that "while for the crops in general the maximum tolerance for alkali salts has not yet been definitely found, close approximations are reached with a number, such as the apple, peach, orange, and lemon trees, with respect to carbonate of soda and common salt. In one or two instances alone was the sulphate of soda the apparent cause of distress on the part of a tree. Grapes and olives thus far stand at the head among fruits in their tolerance of each of the alkali salts. Oranges grew in a larger amount of carbonate than did the olive, but that salt was chiefly held below the 2 surface feet. On the other hand, the lemon seems to be the most sensitive to the effects of alkali, especially to common salt, and next to it the orange."

The highest amounts of alkali salts in which apples were found to be unaffected were sodium sulphate 14,240 lbs. per acre (to a depth of 4 ft.), sodium carbonate 640 lbs., sodium chlorid 1,240 lbs., total alkali 16,120 lbs. The limits for peaches were sulphate 9,600 lbs., carbonate 680 lbs., chlorid 1,000 lbs., total alkali 11,280 lbs.; for oranges, sulphate 18,600 lbs., carbonate 3,840 lbs., chlorid 3,360 lbs., total alkali 21,840 lbs.; for lemons, sulphate 4,480 lbs., carbonate 480 lbs., chlorid 800 lbs., total alkali 5,760 lbs.; for grapes, sulphate 40,800 lbs., carbonate 7,550 lbs., chlorid 9,640 lbs., total alkali 45,760 lbs.; for olives, sulphate 30,640 lbs., carbonate 2,880 lbs., chlorid 6,640 lbs., total alkali 45,760 lbs.

"The amount tolerated depends largely upon the distribution of the several salts in the vertical soil-column, the injury being most severe in the surface foot, where under the influence of the unfortunate practice of surface-irrigation the feeding rootlets are usually found. It is therefore important that in alkali regions such methods of culture and irrigation should be followed as to encourage deep rooting on the part of crops.

"The amount tolerated varies with the variety of the same plant, as shown in the grape.

"The amount of alkali tolerated by the various cultures varies with the nature of the soil. It is lowest in heavy clay soils and fine-grained soils, in which the downward movement of plant roots is restricted; and highest in loam and sandy soils, in which the roots have freedom of penetration.

"Some plants, such as the saltbush and alfalfa, are quite susceptible to alkali salts when young, but when the roots penetrate deeply, and the ground is heavily covered with the foliage of the plant, they are immune to a very large extent.

"Lands heavily charged with alkali may often be made productive for certain crops by the application of irrigation water in sufficient amount to leach the salts down to a depth of several (5 or 6) feet, and by preventing their subsequent rise by proper mulching, or cultivation until the foliage of the plant itself will prevent evaporation of the soil moisture from the surface of the ground. Alfalfa culture has thus been made highly profitable in lands once so strongly charged with alkali as to kill all vegetation.

"The reclamation of lands charged with carbonate of soda by neutralization with gypsum often renders possible the profitable planting of such crops as withstand large amounts of common salt or of glauber salt.

"The effects of carbonate of soda are seen in the yellowing of the leaves of the tree caused by its corrosive action on the root-crown, whereby the proper flow of sap and food supply to the leaves is prevented. The effect of common salt is seen in the falling of the leaves from the newer branches, and in the blackening and curling of the leaves of pears.

"Sulphate of soda (glauber salt) is hurtful only when present in very large amounts, most cultures doing well in more than 10,000 lbs. per acre in 4 ft. depth; saltbush, hairy vetch, alfalfa, and sorghum grew well in more than 61,000 lbs.

"Barley is better adapted to alkali land than is wheat, for it will withstand the effects of twice the amount of carbonate of soda and common salt. Of course, the carbonate may be neutralized with gypsum, and in the absence of much common salt will permit of the growth of excellent crops of wheat; but where the amount of common salt exceeds 5,000 lbs. barley should be given the preference over wheat."

The relation of lime and magnesia to plant growth, O. Loew and D. W. May (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 1, pp. 53, pls. 3*).—This bulletin discusses the liming of soils from a physiological standpoint, explaining in detail the physiological rôle of calcium and magnesium in plant growth (E. S. R., 11, p. 1008), and showing the ratio between lime and magnesia in the soils of different countries, and reports water, sand, and soil cultures to determine the proper ratio of lime and magnesia for certain plants, including cowpeas, privet, tobacco, barley, oats, wheat, and beans. The nitrates, sulphates, and carbonates of calcium and magnesium were used in the sand and soil cultures in various combinations and proportions (on the basis of molecular weights). In the water cultures only the more soluble nitrates and sulphates were employed.

The principal results are thus summarized:

"Soil analyses show that lime and magnesia are widely distributed in soils, and generally in sufficient quantities for the direct needs of plants. They are not always in the best proportions to each other, from a physiological standpoint, for favoring plant growth.

"Magnesia in a soil in great excess over lime, in a finely divided or soluble condition, is noxious to the growth of plants. With a great excess of lime over magnesia the physiological action of the plant is hindered, and it exhibits phenomena of starvation. An excess of lime counteracts the poisonous effects of magnesia, while the more favorable proportion of the two bases obviates the poor nutrition of the plant.

"The best proportion of soluble lime to soluble magnesia for the germination and growth of plants is about molecular weight 5 to 4, or actual weight 7 to 4.

"The more soluble forms of magnesia, as nitrate and sulphate, are in excess more injurious to plants than the less soluble, as carbonate, while the more soluble forms of lime, as sulphate and nitrate, are more efficient in overcoming the noxious effects of magnesia than less soluble forms, as carbonate.

"In applying fertilizers containing magnesia, as in the crude potash salts, liming should be carried on in conjunction unless the soil is known to contain an excess of lime. Where the lime content of the soil is about equal to or less than the magnesia content, lime in a finely divided form, as sulphate, should be supplied with the fertilizer in an amount in excess of the magnesia present in the latter.

"In liming soils the amount of lime and magnesia should be first determined in both the soil and the material applied. In this way only can the process be intelligently carried out and the best ratio between the two bases for the promotion of the growth of crops be maintained."

The influence of the moisture of the soil on the growth of plants, D. Prianishnikov (*Zhur. Opuitn. Agron.*, *1* (*1900*), *No. 1*, *pp. 3-20*).—In this article the author gives the results of his experiments with regard to correlation in the development of plant organs. It is usually accepted that with an increase of moisture in the soil the yield of straw increases while the yield of grain diminishes. This is contradicted by the author's experiments with wheat during 2 years, in which there was a steady rise in percentage of grain with an increase in the amount of water in the soil. It has also been claimed that the absolute weight of the grain decreases with an increase of moisture (E. S. R., 7, p. 366), but the experiments of the author show a different result, there being an increase in absolute weight of the grain with the increase of moisture in the soil during 2 years. Similar results were obtained with flax. The absolute yield of straw increased with the moisture of the soil, owing to the increase in both number and size of stems. The author's experiments seem also to corroborate the view of A. Mayer—that the length of the stem has a tendency to reach a maximum sooner than the yield. The length of stem reached its maximum in these experiments with 50 per cent of moisture. Both the length and width of the leaf of beets was found to increase with an increase in the moisture of the soil. It was also observed in the case of beets that there was a decrease of the weight of the dry matter per unit of leaf area and a change of the correlation between the length of the petiole and of the blade, the weight per unit area and the relative length of the petiole decreasing with an increase in moisture. Thus the plant utilizes the same quantity of dry matter in the larger leaf as in the smaller, according as it is obliged to save moisture and lower evaporation, or, on the contrary, has at its disposal an excess of water. The root system in experiments with beets and flax was found not to increase with the increase of humidity in the same proportion as the total yield. Analyses were made of grains of wheat raised with different degrees of moisture, but on the same soil under the same conditions of light and temperature. It was found that with higher degrees of moisture there was a lowering of the nitrogen content in the seed. Analogous results have been obtained by A. Mayer, von Seelhorst, and others. It was found also that the duration of the period of vegetation is somewhat shorter when the moisture is greater.—P. FIREMAN.

Investigations on the temperature and moisture relations of loam soils of various kinds and under different systems of fertilizing, von Seelhorst (*Jour. Landw.*, *49* (*1901*), *No. 3*, *pp. 231-250*, *dgm. 1*).—Observing that plats of soil which had been fertilized with potash appeared to dry out quickest after a rain, while those receiving nitrogen and phosphoric acid dried out more slowly and those receiving no fertililer or only phosphoric acid remained in a moist condition longest, the author undertook to study the relations of these and other fertilizing materials to the moisture of the soil in pot and field experiments. The results of the pot experiments agree with those obtained by Hollrung (E. S. R., 6, p. 60) and Kravkov (E. S. R., 12, p. 620) in showing that the unfertilized soil lost water most rapidly, while the soil fertilized with potash and nitrogen gave off water most slowly, and phosphoric acid generally only slightly retarded evaporation. In the field experiments a large number of determinations were made, not only of the moisture, but of the temperature of the differently fertilized plats which were seeded to spring wheat. The results show that the application of nitrogen resulted in a larger yield and left the soil exhausted to a greater extent of water than the other fertilizers. The deficiency of water under ordinary conditions persisted for a long time. The other fertilizers were apparently without marked effect upon the water content of the soil. The direct influence of the fertilizing on the temperature was apparently of no practical importance.

On nitrate fermentation and its importance in relation to the biological processes of the soil, J. Stoklasa (*Deut. Landw. Presse, 28 (1901), Nos. 79, pp. 666, 667; 81, pp. 683, 684*).—This is a continuation of investigations on denitrification in which the author has attempted to determine (1) the source of carbon most favorable to the denitrifying organisms in the culture media, (2) the nature of the chemical changes which take place, and (3) the importance of denitrification in relation to the soil processes. The results of the first two lines of investigation have been reported elsewhere (E. S. R., 12, pp. 37, 614), and are only briefly reviewed in this article. The author concludes that there are present in soils and in manures two principal groups of bacteria which cause denitrification. The first group contains *Bacterium hartlebii*, *B. fluorescens liquefaciens*, *B. pyocyaneum*, *B. stutzeri*, *B. centropunctatum*, *B. filefaciens*, *B. denitrificans* (*B denitrificans* and *B. coli commune*), *B. nitrovorum*, etc. The characteristic of these organisms is that they reduce nitrates to elementary nitrogen. The second group contains *B. megatherium*, *B. mycoides*, *B. subtilis*, *B. mesentericus vulgatus*, *B. ramosus*, *B. typhi abdominalis*, *B. coli communis*, *Proteus vulgaris* and *P. zenkeri*, *B. radicicola*, *Clostridium gelatinosum*, etc. These organisms as a rule simply reduce nitrates to ammonia without the formation of elementary nitrogen. They also appear to have the power of assimilating the ammonia so formed. This is especially true of *B. radicicola* which is found in the tubercles of leguminous plants and of the alinit bacteria. The nitrogen set free during the process of denitrification appears to be more active than that of normal air and is more readily assimilated by the organisms of the soil.

Pot experiments on the influence of rapid and complete drying of the soil on the growth of sugar beets, J. Vanha (*Oesterr.-Ungar. Ztschr. Zuckerind. u. Landw., 30 (1901), p. 146; abs. in Centbl. Agr. Chem., 30 (1901), No 11, p. 787*).—In connection with experiments in drying the soil to destroy injurious organisms, the author observed the effect of this treatment on the growth and yield of the beets. It was found that neither the total yield nor the quality of the beets was injuriously affected by the drying of the soil.

Is the chemical analysis of soils necessary to determine their fertilizer requirements? (*Deut. Landw. Presse, 28 (1901), No. 93, p. 778*).—An argument to show that chemical analysis is not necessary for this purpose, and is seldom, and only in exceptional cases, a reliable guide to the fertilizer requirements of soils.

The composition of soils as shown by the plant, C. Schreiber (*La composition de nos sols révélée par la plante. Brussels: Louis Vogels, 1901, pp. 52, figs. 19*).

A contribution to the knowledge of marsh soils, J. Struve (*Fühling's Landw. Ztg., 50 (1901), Nos. 21, pp. 758–765; 22, pp. 784–786*).—This is a discussion of the physical and chemical character of different classes of marsh soils found in Germany. The close relation between the productiveness and the proportion of clay and other fine soil particles is pointed out. For the heavier soils marling is stated to be the most effective means of improvement.

Soils, T. S. Dymond and F. Hughes (*Notes on agricultural analyses. Chelmsford: County Technical Laboratories, Essex Technical Instruction Committee, 1901, pp. 5–11*).—

This article gives a description of soils occurring in Essex, their geological and physical characteristics, and their chemical composition. The total amounts of lime, potash, phosphoric acid, organic matter, and nitrogen in 37 samples, and the available lime, potash, phosphoric acid, and nitrogen in 17 samples of soils are reported, with total amounts of lime, potash, phosphoric acid, organic matter, and nitrogen in 5 samples of subsoils.

The banana soils of Jamaica, H. H. Cousins (*Bul. Bot. Dept. Jamaica, n. ser., 8 (1901), No. 10, pp. 145–153*).—Mechanical and chemical analyses of 7 samples of soil are reported. These are preliminary "to a wider survey of the soil conditions of Jamaica and they will receive a more practical interpretation in the light of the field experiments which the board of agriculture has now instituted to cover all the chief cultivations of Jamaica."

Cultivated soils of São Paulo, Brazil, G. D'Utra (*Bol. Agr. São Paulo, 2. ser., 1901, No. 9, pp. 557–562*).—The percentages of moisture, organic matter, and principal fertilizing constituents in a number of samples of soil from different parts of the State analyzed during 1900–1901 are reported.

Exhaustion and abandonment of soils (*U. S. Dept. Agr. Rpt. 70, pp. 48*).—This is the testimony of M. Whitney, Chief of the Division of Soils of this Department, before the Industrial Commission, and deals with the causes of the abandonment of soils and methods of reclamation.

Geological Survey of Canada Report for 1898 (*Ottawa: Government Printing Bureau, 1901, vol. 11, n. ser., pp. 885, pls. 25, maps 7*).—This report contains accounts of studies of the geology and mineral resources of various sections of Canada. The features of special agricultural interest are analyses of natural waters and statistics of the production of salt, gypsum, and phosphate.

FERTILIZERS.

On the fermentation of the nitrogenous matter of manure, P. P. Dehérain and C. Dupont (*Ann. Agron., 27 (1901), No. 9, pp. 401–427*).—In continuation of previous investigations (E. S. R., 12, p. 623) the authors studied the influence of variable amounts of alkaline carbonates on the fermentation of manure, alone and with the addition of liquid manure, the fermentation of urea, uric and hippuric acids, and of various albuminoid substances, including egg albumen, gluten, and legumin from beans. The plan and methods followed were the same as in previous investigations. From the results obtained the conclusion is reached that the nitrogenous substances of manure are of two classes—the amids of the urine and the albuminoids of the litter and animal and vegetable residues. Under the influence of the manure ferments the nitrogen of the urine, uric acid, and hippuric acid are completely transformed into ammonium carbonate, the fermentation of the hippuric acid occurring only in the presence of air, while that of urea and of uric acid takes place in an atmosphere of carbon dioxid. These fermentations, however, are not so rapid that litter impregnated with urine may not be added to the manure each day without danger of loss of ammonia, although the litter so added may not be covered until the following day and does not become charged with carbon dioxid until several days after. In the absence of air the fermentation of the albuminoids was very incomplete and did not occur at all in very alkaline media. During this fermentation the larger part of the nitrogen was transformed into ammonium carbonate, but a small portion escaped in the free state. The nitrogenous substances gave off during decomposition carbon dioxid, hydrogen, methane, and sometimes hydrogen sulphid. It is on account of the fact that the ferments which decompose albuminoids act with difficulty in alkaline media that the larger part of the nitrogen of manure remains in the organic state and only a small fraction is found in form of ammonium carbonate.

Studies on the agricultural value of Damara and Peruvian guano, C. SCHREIBER (*Rev. Gén. Agron.* [*Louvain*], *10* (*1901*), *No. 8–9*, *pp. 373–381*).—Comparative tests of these 2 guanos on different crops grown on clayey and sandy soils are reported. The composition of the guanos used was as follows: Ammoniacal nitrogen—Damara guano, 4.34 per cent, Peruvian guano, 1.62 per cent; nitric nitrogen—Damara guano, 0.26 per cent, Peruvian guano, traces; organic nitrogen—Damara guano, 2.52, Peruvian guano, 0.51; phosphoric acid soluble in water—Damara guano, 5.76, Peruvian guano, 1.21; soluble in alkaline citrate—Damara guano, 3.20, Peruvian guano, 2.82; potash—Damara guano, 3.06, Peruvian guano, 1.05. The results of the experiments show that the Damara guano was a very effective fertilizer and its action in the soil was quite rapid. This was true both of the nitrogen and of the phosphoric acid which it contained, and while it appeared to be suited especially to sandy soils, it also gave good results on clay soils. The Peruvian guano, on the other hand, was almost without effect on the heavy soils, while producing good results on the sandy soils.

Bone products and manures, T. LAMBERT (*London: Scott Greenwood & Co., 1901*, *pp. VIII+162, figs. 17*).—An attempt is made in this book to give "a practical and comprehensive account" of the modern method of fat extraction and the manufacture of glue, size, gelatin, boneblack, manures, etc., from bone. There is also included a discussion of fertilizers in general, with some account of methods of analysis, especial attention being given to bone and its products. Tables of weights and measures, a description of a vacuum pan, and a comparison of French and British gelatins are given in appendixes.

The value of meadow muck, F. W. MORSE (*New Hampshire Sta. Bul. 83, pp. 53–56*).—This bulletin discusses the comparative values of meadow muck and barnyard manure, based on data taken from the work of the experiment stations. Basing this comparison on the fertilizing constituents, it appears that 1 cord (3 tons) of manure is worth $3\frac{1}{2}$ cords of muck, while on the basis of organic matter a cord of manure is equivalent to $1\frac{1}{2}$ cords of muck. The variable character of muck is pointed out and farmers are advised to send samples to the station for examination before undertaking its use.

Green manuring, P. H. GREG (*Jour. Jamaica Agr. Soc.*, *5* (*1901*), *No. 11*, *pp. 436–440*).—In this article the author argues that green manuring is not a profitable practice for the sugar planter in Jamaica.

The agricultural value of the nitrogen in the black substance of the phosphates of the Pyrenees, J. JOFFRE (*Bul. Soc. Chim. Paris*, *3. ser.*, *25* (*1901*), *No. 22*, *pp. 960, 961*).—Pot experiments are reported in which this material (see E. S. R., 10, p. 833) was compared with nitrate of soda, sulphate of ammonia, dried blood, and coal. The phosphate used contained 0.14 per cent of nitrogen. All of the pots received the same amount of potash, and in case of the pots not receiving the Pyrenees phosphate, the proportion of phosphoric acid was made up by the addition of other insoluble phosphates. Under these conditions the nitrogenous organic matter of the Pyrenees phosphate behaved like the coal; that is, there was no increase of crop due to its use.

Fertilizer experiments with 40 per cent potash salts, A. BAUMANN (*Vrtljschr. Bayer. Landw. Rath.*, *6* (*1901*), *No. 2*, *Sup.*, *pp. 461–475*).—Experiments carried out by the Bavarian moor culture station since 1894 on moor soils are reported. In these experiments the concentrated (40 per cent) potash salt was compared with kainit and other potash fertilizers on potatoes. The results are not conclusive.

The use of chemical fertilizers in the Alps, C. DUSSERRE and E. CHUARD (*Chron. Agr. Canton Vaud*, *14* (*1901*), *No. 19*, *pp. 479–484*).—Experiments on hay meadows with Thomas slag alone and mixed with kainit, each 1,000 kg. per hectare, at an altitude of 1,280 meters (4,199.47 ft.) in the Alps are reported. The results indicate the profitableness ot the use of fertilizers under such conditions.

Fertilizing field and garden, F. E. H. W. Krichauff (*Adelaide: Vardon & Pritchard, 1901, pp. 94, figs. 19*).—A summary of the results of scientific experiments and practical experience in different parts of the world on the use of commercial fertilizers for the production of the principal field and garden crops adapted to South Australian conditions.

Practical guide in the use of chemical fertilizers, Maizières (*Guide pratique pour l'emploi des engrais chimiques. Paris, 1901, 3. ed., pp. 185, ill.*).

The use of chemical fertilizers, P. Wagner (*Anwendung künstlicher Düngemittel. Berlin: Paul Parey, 1900, pp. XII+163*).

Manures, T. S. Dymond and F. Hughes (*Notes on agricultural analyses. Chelmsford: County Technical Laboratories, Essex Technical Instruction Committee, 1901, pp. 11–20*).—Analyses of a number of samples of unmixed and mixed fertilizing materials are reported.

Commercial fertilizers, J. T. Anderson (*Alabama College Sta. Bul. 115, pp. 148*).—This is a report of the results of analyses of commercial fertilizers and miscellaneous fertilizing materials collected and examined during the year ended July 1, 1901, with an introduction on the selection and use of fertilizers; the State laws relating to fertilizers; directions for sampling, etc.

Fertilizer inspection, C. D. Woods and J. M. Bartlett (*Maine Sta. Bul. 77, pp. 161–176*).—This bulletin contains the analyses of samples collected by a representative of the station during 1901. A previous bulletin (E. S. R., 13, p. 236) gave the results of analyses of samples furnished by the manufacturers. "A comparison of the results of analyses of the samples collected by the station with the percentage guaranteed by the manufacturers shows that as a rule the fertilizers sold in the State are well up to the guarantee."

The inspection of fertilizers in 1900, F. W. Morse (*New Hampshire Sta. Bul. 80, p. 8*).—Analyses of 60 samples collected by the secretary of the State board of agriculture are reported.

Use of fertilizers in South Australia, W. S. Summers (*Jour. Agr. and Ind. South Australia, 4 (1901), No. 12, pp. 969–971*).—The use of fertilizers in this region practically dates from 1897. It is estimated that 26,400 tons of imported fertilizers and 5,000 tons of fertilizers of local manufacture were used on the wheat crop in 1900. Of this amount 25,500 tons was mineral superphosphate, 2,700 tons bone and guano superphosphate, 1,600 tons Thomas phosphate, and 1,600 tons bone dust and other fertilizers. Of the imported fertilizers Great Britain supplied about 21,500 tons, Germany 2,500 tons, New South Wales 1,300 tons, and Victoria 500 tons.

Mineral resources of the United States (*Ann. Rpt. U. S. Geol. Survey, 21 (1899–1900), pt. 4, pp. 634*).—This contains, among other data relating to mineral resources, statistics of production, consumption, etc., of phosphate rock, salt, and gypsum. The total production of phosphates in the United States in 1899 was 1,515,702 tons, valued at $5,084,076. The statistics show that the phosphate deposits of Pennsylvania were worked during the year to the extent of 2,000 tons.

FIELD CROPS.

Plant breeding, W. M. Hays (*U. S. Dept. Agr., Division of Vegetable Physiology and Pathology Bul. 29, pp. 72, pls. 6, figs. 21*).—This bulletin contains general observations on plant breeding, discussions on methods, and illustrations of work in this line. The work of plant breeding, as practiced by the author at the Minnesota Station, forms the basis of the bulletin. As prominent examples of results of breeding, the Wealthy apple, the Race Horse Messenger, and Minnesota No. 169 wheat are pointed out. Some of the important principles and facts to be observed in improving plants are enumerated as follows:

"The individual plant produced from a seed is the important unit in plant breeding. The 'bud unit,' though of much consequence in case of marked bud variation, is usually of minor importance.

"Heredity, centripetal-like, enables us to produce from certain choice plants many descendants which, on the average, quite resemble their parents.

"Variation, centrifugal-like, causes the production among the descendants, along with very many average plants, of a few very good individuals and a few very poor ones.

"By selecting those best plants which upon trial produce superior progeny, the whole variety may be slightly or considerably improved.

"Since the plants of each succeeding generation also vary, by repeatedly choosing the best, the variety or race is further improved.

"In many cases crossing increases the average vigor of the progeny, but in other cases it decreases the average vigor, size, or other desirable characteristics.

"In all cases crossing increases variation, as a rule, both toward better plants and toward poorer ones, thus giving opportunity for selecting from among the best plants individuals which are superior, as progenitors of varieties, to any individuals which could have been secured without crossing.

"New varieties can best be founded upon one to a dozen superior selected or crossbred seedling plants used as parents.

"Very large numbers of individuals must be used from which to select or breed in order that mother plants may certainly be discovered from which superior varieties will spring.

"In addition to growing large numbers, the breeder of plants should grow all the plants of a given stock under uniform conditions, that they may be accurately compared.

"The testing of the finished variety must include adaptability to the soil and climatic conditions, the quality and value of the resulting crop, and the relative cheapness and practicability of its production."

Under methods of plant breeding the author considers breeding by selection and by hybridization and selection. Discussions on breeding wheat, corn, timothy, potatoes, apples, black walnuts, and flax are presented to illustrate many of the general methods. Views of prominent horticulturists on the subject of hybridizing apples are quoted, and complete descriptions of wheat flowers and the operations of hybridizing are given. The "centgener plats," to which reference is made in the bulletin, are described as follows: "One hundred, more or less, of the seeds, from each of [the selected] . . . plants are planted in separate nursery plats in the wheat-breeding nursery the second season in a manner similar to that under which the seed was grown the first season. These collections of plants are called 'centgeners,' this word having been originated to mean a hundred plants, more or less, springing from the seeds of a single mother plant—that is, a larger number of one generation."

The results so far obtained in breeding wheat at the Minnesota Agricultural Experiment Station are briefly summarized. These results show that the heavy-yielding spikes, as well as the heavy-yielding plants, should be selected. The centgener plan of experimenting has been found expedient in the selection of plants for greater ability to stand erect. "The tendency in the blood of a mother plant to beget a race with stiff straw can not well be judged with the single plant, but it can with the small plat of a hundred or more of the progeny. . . . Recent results from incrosses and outcrosses lead to the belief that hybridizing is of paramount importance to supply the best stocks for the more laborious work of selection. . . . Hybrid wheats vary as to the length of time variation continues under rigid nursery selection, but generally they are reduced to a type in a few generations, this being accomplished with little special effort while selecting for superior yield and other qualities. . . . The selection of large-yielding individual wheat plants is important as a means of securing strong plants to be tested in centgener trials to determine their power of producing plants with large average yield. . . . Extensive trials of new and old wheats show conclusively that wheats must be specially bred for each of several conditions in Minnesota, as well as for each of the several adjoining States. . . . By inspection the choice of 5 per cent of the best-appearing plants nearly always includes the plant which gives the largest weight and superior grade of grain. . . . Records on the rust resistance of 100 progeny of each of numerous parent plants made in percentages promise to aid materially in finding blood lines which resist rust within the standard variety and among the plants of the new hybrid. . . . Wheat hybrids should be grown in quantity during the first 3 to 5 years that variation may have its full opportunity; then the selection of superior plants should be from among large numbers, as from among several thousand in the nursery plats."

The results of crossing and hybridizing further show an increase in variation in numerous characteristics, such as the yield, percentage of protein, etc., and the work as followed out promises to give good results in breeding for strong chaff to prevent easy shelling. Natural crosses have been found to occur, but the percentage is very small. In the work of making a strain or variety of wheat from a single or from several mother plants it has been the experience that numerous strains, each from a single mother plant, and grown for 8 years in field-test plats, have continued to average as much superior to the parent variety as at first, and have so far shown no signs of deterioration. The best of several tried methods of handling the spike in cross-pollinating wheat is described as follows: "Remove the smaller upper and lower spikelets and the smaller florets on the central spikelets, leaving 10 to 20 of the best. Emasculate these early, about the time the first tinge of yellow appears in the anthers. Cover the spike with tissue paper. Twenty-four to forty-eight hours later, when the florets on neighboring spikes of similar age are opening, bring pollen from the plant chosen for the male parent and, removing the covering, apply pollen to each floret."

The fertilizer requirements of cultivated plants and the relation of the composition of the plants to the chemical composition of the soil, E. Godlewski (*Ztschr. Landw. Versuchsw. Oesterr., 4 (1901), No. 4, pp. 479–536*).—This is a report on a series of experiments begun by Czarnomski, extending over a period of several years. The experiments were conducted with wheat, rye, potatoes, and barley in plats 1 acre in size, 6 plats being devoted to each crop. The results of analyses of the soil and the plants produced under different conditions of soil fertility are given and discussed at some length.

Although a 25 per cent solution of sulphuric acid dissolved about equal quantities of potash and phosphoric acid out of the soil, the application of potash fertilizers was very effective, while fertilizers furnishing phosphoric acid were almost without effect. Rye and barley showed a greater requirement of nitrogen and phosphoric acid than potatoes, but this latter crop needed more potash than the cereals. When potash is lacking in the soil, the life of the stems and foliage of the potato is much shorter than when the soil supply of potash is sufficient, and the dying off of these parts takes place still sooner in the presence of large quantities of assimilable nitrogen and phosphoric acid. The application of nitrogen and phosphoric acid when the supply of assimilable potash was insufficient was not only ineffective but in some cases reduced the yield and injured the quality of the potatoes. The use of potassium sulphate in potato fertilizer applied in the spring had a good effect on the quality. It was found that the surplus of assimilable phosphoric acid in the soil sometimes reduces the yield. Rye seemed to require more potash than barley. An insufficient supply of potash retarded the development of the stems of the barley plant, and under these conditions nitrogen fertilization tends to cause lodging. The author states that the chemical composition of plants bears relation to the chemical composition of the soil on which they were grown, and that the proportion of the different food elements contained in the plants is the chief characteristic in this connection. The insufficiency of potash in the soil narrowed the ratio of potash to phosphoric acid and of potash to nitrogen in the tubers. The ratio of potash to nitrogen was lower than 1 in some instances. The inadequate supply of nitrogen manifested itself in the composition of the tubers by widening the ratio of potash to nitrogen and narrowing the ratio of nitrogen to nearly all ash constituents. A ratio of nitrogen to phosphoric acid in potatoes narrower than 100:50 is considered as an indication of nitrogen poverty of the soil. The results indicate further that the relation of potash to nitrogen in potatoes is influenced by factors other than the chemical composition of the soil, and that the relation of potash to magnesia is only slightly affected by the composition of the soil or its content in potash. The composition of the soil was found to affect the composition of barley straw more than that of the grains. A high nitrogen content in barley straw and potato tubers is not regarded as an indication of a soil rich in assimilable nitrogen, but as showing that more than the minimum amount of nitrogen is present. An inadequate supply of potash in the soil reduced the potash content of barley straw to less than 1 per cent in the dry matter, increased the amounts of nitrogen, lime, and magnesia, and narrowed the ratio of potash to phosphoric acid, magnesia, and lime, and of phosphoric acid to magnesia. The normal relation of potash, nitrogen, phosphoric acid, lime, and magnesia in barley straw is given at 100, 50, 30, 40, and 10. A low nitrogen content of the soil narrowed the ratio of nitrogen to phosphoric acid in barley straw without affecting the relation of the nitrogen to other elements, while an insufficient amount of phosphoric acid widened the ratio of nitrogen to phosphoric acid to 5 : 1, and is considered as indicating lack of phosphoric acid in the soil. It is not thought that the results of chemical analyses of plants show definitely the composition of the soil, but that they aid in determining what element of plant food is lacking in quantity.

Experiments with crops and stock (*Dept. Agr. Cambridge Univ. Rpt. 1901, pp. 89*).—This report presents the results of cooperative experiments on manuring meadows and pastures, laying down land to grass, and rotation experiments combined with fertilizer tests. Each experiment is concisely outlined and the results shown graphically and in tables. In some cases the experiments have not yet been completed. In connection with the reports on the seeding of temporary pasture and on a rotation experiment, the results and analysis of the soil and subsoil are recorded. Nitrate of soda at the rate of 1 to 1½ cwt. per acre applied in conjunction with 1 cwt. of muriate of potash or 4 cwt. of basic slag, gave the best results on grass land as compared with other applications. The nitrate was applied in the spring. Manured and unmanured 3-acre plats were compared for pasturing sheep, with the results in the production of live weight decidedly in favor of the manured plats. A plat receiving ½ ton of basic slag per acre carried nearly 2 sheep more than a plat dressed with half the quantity. Phosphoric acid in the form of superphosphate produced a greater live weight than in the form of basic slag. Grass mixtures consisting of perennial red clover, white clover, Italian rye grass, orchard grass, tall oat grass, yellow oat grass, timothy, Kentucky blue grass, and rough meadow grass, gave good results on a light chalky soil. For heavy soils it was found best to add trefoil (*Medicago lupulina*), perennial rye grass, and fescue grass to this mixture and withdraw Italian rye grass and yellow oat grass, and to double the amount of timothy. The behavior of these different grasses and clovers in the various mixtures grown on different soils is noted. On heavy wet land commercial fertilizers were more economical than barnyard manure.

Field work of the Division of Agrostology, C. L. SHEAR (*U. S. Dept. Agr., Division of Agrostology Bul. 25, pp. 67, pls. 28, maps 8*).—This bulletin is a review and summary of the work done since the organization of the Division, July 1, 1895. The territory covered in field work is described and shown on maps. The principal problems and requirements of the work are discussed, and the work itself is reviewed by regions as follows: The Atlantic coast, the Gulf coast, the Great Plains, the Rocky Mountain region, the Northwest (including western Idaho and the portions of Washington and Oregon east of the Cascade Mountains), the Southwest (including western Texas, New Mexico, Arizona and southeastern California), and the Pacific Coast region, or the country lying west of the Cascade and Coast Range mountains. The conditions and problems of each section are briefly considered and in describing the work done in each region the different native and introduced species of grasses and forage plants are enumerated, with brief descriptive notes concerning their growth, management, and value for forage. In summarizing the bulletin, the author discusses forage plants for alkali soils and the plants adapted to sand and soil binding. A brief account is given of the methods of controlling public grazing lands in Australia, Canada, and Texas.

Drought resistant forage experiments at Highmore, South Dakota, for 1900, D. A. Saunders (*South Dakota Sta. Bul. 70, pp. 57–73, figs. 6*).—This bulletin describes in detail the work with drought resistant forage crops carried on in cooperation with the Division of Agrostology of this Department during 1900. The results have been noted from an earlier report (E. S. R., 13, p. 240).

Fertilizer experiments on meadows, Bachmann (*Landw. Wchnbl. Schleswig-Holstein, 51 (1901), No. 24, pp. 361–363*).—In this test, 800 kg. per hectare each of Thomas slag and kainit were applied singly or together on marsh meadows. In one instance, 80 kg. of nitrate of soda per hectare was used. The results favor the use of kainit in conjunction with Thomas slag for an increase in yield and an improvement in the kinds of forage plants. The use of kainit tended to diminish the less desirable grasses and to increase the more valuable kinds, together with the clovers and vetches. The application of Thomas slag and nitrate of soda gave a marked increase in the yield.

Results of fertilizer experiments, F. Hanusch (*Ztschr. Landw. Versuchsw. Oesterr., 4 (1901), No. 4, pp. 417–420*).—Tabulated results of cooperative fertilizer experiments on clover, barley, and oats.

Field experiments with rye, barley, wheat, and oats, P. Wagner (*Hessische Landw. Ztschr., 71 (1901), No. 20, pp. 213–219, figs. 3*).—In every instance the complete fertilizer applications gave the best returns as compared with incomplete applications, but barley without phosphoric acid gave a little better yield than with it.

Oil yielding plants cultivated in Egypt, G. Bonaparte (*Jour. Khediv. Agr. Soc. and School Agr., 3 (1901), No. 1, pp. 14–19*).—Brief notes on flax, sesame, cotton, safflower, and lettuce as the chief oil yielding plants now cultivated in Egypt. The product obtained from these plants is also briefly described.

Tillering as an important factor in breeding grain, Rimpau (*Mitt. Deut. Landw. Gesell., 16 (1901), No. 25, pp. 147, 148*).—A brief note comparing results obtained by the author and by Schribaux.

Report on crops at Wagga Experimental Farm, G. M. McKeown (*Agr. Gaz. New South Wales, 12 (1901), No. 4, pp. 451–456, pls. 2*).—A summary of the farm operations for the past year with brief reports on the results.

Culture and fertilizer tests at the experiment station at Lobositz in 1900, J. Hanamann (*Ztchr. Landw. Versuchsw. Oesterr., 4 (1901), No. 4, pp. 390–394*).—A brief report of work conducted at the station during the year. Hanna and Lobositz barley gave the best results in yield and in quality. Chevalier barley gave good results on good soils and in favorable positions, but it felt the lack of nitrogen in the soil more than other varieties. The results of comparative tests of ammoniacal phosphate and kainit on sugar beets and barley showed that the potash salt had been effective, a fact contrary to the general experience in that region. A cooperative experiment to determine whether clover needs phosphoric acid and potash gave negative results. The author states that under favorable soil and water conditions the clover plant is capable of obtaining these elements from the soil as well as from fertilizer applications. Experiments with Alinit and nitrogen did not show conclusive results.

The effects of sowing barley at different rates, J. Vaňha (*Ztschr. Landw. Versuchsw. Oesterr., 4 (1901), No. 4, pp. 537–546*).—Barley was grown in pot experiments made in triplicate and sown at the rate of 60, 130, 180, and 240 kg. per hectare. The detailed results are here reported in tables and briefly discussed. The influence of the rate of seeding on the stems, heads, grains, composition of the grains, and the stooling of the plants was determined.

A fertilizer experiment with Vicia faba and barley on heavy marsh soils, Lilienthal (*Fühling's Landw. Ztg., 50 (1901), Nos. 2, pp. 80–84, figs. 3; 4, pp. 141–146, fig 1*).—The experiments were conducted to determine the different effects of lime on marsh soils when applied alone and when applied with different combinations of commercial fertilizers.

Results of an investigation of barleys on exhibition at the Bavarian exposition of barleys and hops, Munich, 1900, C. Kraus (*Vrtljschr. Bayer. Landw. Rath., 6 (1901), No. 1, sup. 1, pp. 187–198*).—The protein and starch content of the barleys grown in different Bavarian provinces was determined and the results, with brief explanations concerning the cultural conditions for the different samples, are given in tabular form.

A study of beet plants produced from seed of a single boll, H. Briem (*Oesterr.-Ungar. Ztschr. Zuckerind. u. Landw., 29 (1900), p. 137; abs. in Centbl. Agr. Chem., 30 (1901), No. 8, pp. 544, 545*).—A study is reported of the plants produced by beet seed taken from the same boll. In the author's experiments 5 seeds weighing from 0.0058 to 0.0027 gm. were grown under similar conditions, the plants being weighed at the end of 20, 50, 118, and 191 days. Throughout the entire period the plants produced were almost in direct ratio to the original weight of the seed. At the end of the experiment the beet plants weighed from 765 to 193 gm., the heaviest plant being produced by the heaviest seed.

Note on the cultivation of cotton in Egypt, E. A. Benachi (*Jour. Khediv. Agr. Soc. and School Agr., 3 (1901), No. 2, pp. 68–72*).—This note describes briefly 4 important varieties of cotton grown in Egypt, namely, Mit-afifi, Abbassi, Yannovich, and Upper Egypt, and sums up the results of cotton culture the preceding season.

Culture experiments with flax conducted by the German Agricultural Society in 1900, Kuhnert (*Mitt. Deut. Landw. Gesell., 16 (1901), No. 18, pp. 89–91*).—In these experiments flax was sown at the rate of 150, 180, 210, and 240 kg. per hectare, but as in previous years the results were not conclusive.

Ginseng (*Truck Farmer of Texas, 4 (1901), No. 3, pp. 121–123*).—This article discusses the history and distribution of ginseng culture and points out the uses of the plant.

Hop manuring, Wagner (*Württemburg. Wchnbl. Landw., 1901, No. 17, p. 279*).—This article recommends 3 different fertilizer applications for hop growing.

A study of the lupine plant, A. L. Knisely (*Oregon Sta. Rpt. 1901, pp. 30, 31*).—Determinations are given of the nitrogen content of the leaves, pods, stems, roots, and nodules of the lupine plant at different stages of growth. When the plants were in full bloom the water-free substance of the leaves contained 4.02 per cent of nitrogen, the pods which were just forming 3.07 per cent, the stems 1.15 per cent, the roots 0.92 per cent, and the nodules 5.17 per cent.

Maize, H. V. Jackson (*Agr. Gaz., New South Wales, 12 (1901), No. 5, pp. 552–558, pls. 4*).—This article gives a classification of maize, enumerates a number of varieties under each group, and reports the results of variety and fertilizer tests with this crop at Wollongbar Farm.

An experiment on change of seed, W. RIMPAU (*Mitt. Deut. Landw. Gesell., 16 (1901), No. 13, pp. 70-72*).—Probsteir oats from east Germany, where the period of growth is short, was grown in middle Germany, where the season is longer. The results show that the practice was unprofitable.

Culture and selection experiments with potatoes, M. FISCHER *Fühling's Landw. Ztg., 50 (1901), Nos. 9, p. 331; 10, pp. 361-367*).—A test was made of different sized tubers for seed in connection with different fertilizer applications. From the results obtained the author concludes that under ordinary conditions of culture and fertility large tubers should be used for seed, and on soils where these conditions are less favorable smaller tubers with closer planting are recommendable. Where small tubers are used, however, the author advises that they be taken from a crop grown from large tubers on well-cultivated and fertilized land in order to prevent the degeneration of the variety. On good soils with heavy fertilizer applications small tubers and close planting are also recommended.

The influence of whole tubers and cuttings and the position in which they are planted on the yield of potatoes, G. MARTINET (*Chron. Agr. Canton Vaud, 14 (1901), No. 10, pp. 267-276*).—The results of experiments along these lines here presented indicate that the use of whole tubers and sets was indifferent as to the yield, and that placing the seed piece, whether a whole tuber or a set, with the greater portion of the buds down was the preferable practice.

Report on late potatoes at Chiswick, 1900 (*Jour. Roy. Hort. Soc. [London], 25 (1901), No. 3, pp. 378-380*).—Short descriptions are given of 49 varieties of late potatoes.

Variety tests with potatoes, MÜLLER (*Sächs. Landw. Ztschr., 49 (1901), No. 16, pp. 317-319*).—A report on a test of 14 varieties of potatoes. Silesia, a very late variety, produced the largest yield of tubers and starch.

Artificial propagation of potatoes (*Gard. Illus., 23 (1901), No. 1156, p. 136, fig. 1*).—An article describing a method of intense propagation of the potato.

Potato growing in central Illinois, J. H. BROWN (*Rural New Yorker, 60 (1901), No. 2673, pp. 285, 286, fig. 1*).—A general article on the culture, care, and handling of potatoes.

Correlation and transmission of the form of the head and the color of the grain in rye plants (*Deut. Landw. Presse., 28 (1901), No. 36, pp. 137, 138*).—A brief outline of the results of experiments which form the basis of an inaugural dissertation.

Ramie, P. A. HELGUERO (*Bol. Soc. Nac. Agr. [Lima], 4. ser., 3 (1901), No. 11, pp. 635-646*).—A lecture on ramie culture with special reference to Peru.

The culture of ramie and other fiber plants in Japan, M. SCHANZ (*Tropenpflanzer, 5 (1901), No. 5, pp. 227-231*).—Brief descriptions of the culture of 11 different fiber crops grown in Japan.

Sisal, TRABUT (*Bul. Agr. Algérie et Tunisie, 7 (1901), No. 9, pp. 193-204, figs. 7*).—This article treats of the sisal industry in different parts of the world and gives a description of the sisal agave (*A. sisaliana*) with directions for its culture in Algeria.

Sugar beets, R. H. FORBES and W. W. SKINNER (*Arizona Sta. Rpt. 1901, pp. 340, 341*).—A brief report is given of experimental sugar-beet culture in 1901. The work was carried on at Pima and Safford, and the results obtained at both places are given in a table. The results show an average of 13.48 per cent of sugar in the beets with a purity of 81.9 and a yield per acre of 19.3 tons. These figures are equivalent to a yield of 5,211 lbs. of sugar per acre.

Sugar beets in alkali soil, H. C. MYERS (*Jour. Soc. Chem. Ind., 20 (1901), pp. 445-448; abs. in Jour. Chem. Soc. [London], 90 (1901), No. 465, II, p. 468*).—Analyses of sugar beets grown on alkali soil at Hooper, Utah, as well as of the soils used, are reported. The results show that beets of good quality may be grown on soils containing amounts of alkali which prohibit the successful growth of most other crops.

It appears also that the beets exhibit a tendency to improve such land by taking up the excess of alkali. By analysis of roots of different shapes and character it was found that small roots contain the highest percentage of sugar, and that long roots show the highest coefficients of purity, thus indicating that small slender roots obtained by deep tillage and a limited supply of water are the best.

Results of comparative variety tests with sugar beets conducted by the Agricultural Society of Bohemia, F. SITENSKY (*Ztschr. Landw. Versuchsw. Oesterr., 4 (1901), No. 4, pp. 441–457*).—The results obtained with 29 varieties of sugar beets are presented in tabular form. The average yield of beets per hectare was 412.02 quintals, the extremes being 497.20 and 326.83 quintals. Seventeen varieties gave higher results than the average. Thirteen of the 29 varieties tested and 6 of the 17 best sorts were of Bohemian origin.

Breeding of sugar beets, VON RÜMKER (*Mitt. Deut. Landw. Gesell., 16 (1901), No. 25, pp. 148, 149*).—A brief review of the work, given in a paper read before the German Agricultural Society at their meeting in Halle.

The cultivation of the sugar beet in Egypt, G. P. FOADEN (*Jour. Khediv. Agr. Soc. and School Agr., 3 (1901), No. 2, pp. 56–67, pls. 2*).—This article is a report on the culture of the sugar beet in Upper and Lower Egypt. The conditions indicate that in Upper Egypt sugar beets can be more extensively grown than in Lower Egypt, where cotton occupies the larger portion of the cultivated lands. The results of analyses of 2 samples of beets grown on the experimental farm of the society at Ghizeh, in Lower Egypt, showed an average of 16½ per cent of sugar in the beet and a purity of 85.95. These beets had been sown in July. The use of 2 cantars (about 200 lbs.) of nitrate of soda per feddan (1.03 acres) increased the yield of beets by 50 cantars, or about 5,000 lbs.

Recent progress in sugar-beet culture, HERZFELD (*Mitt. Deut. Landw. Gesell., 16 (1901), No. 25, pp. 144*).—An abstract of a paper presented at a meeting of the German Agricultural Society at Halle.

Tobacco culture in Ireland, M. LECORNET (*Jour. Dept. Agr. and Tech. Instr., 1 (1901), No. 4, pp. 618–622*).—An article describing culture tests with tobacco in 1900.

Tobacco (*Bul. Bot. Dept. Jamaica, n. ser., 8 (1901), No. 3, pp. 33–35*).—A series of brief reviews of work on the fermentation of tobacco and of investigations on tobacco diseases.

Manure experiments with wheat, F. B. GUTHRIE and R. HELMS (*Agr. Gaz. New South Wales, 12 (1901), No. 4, pp. 431–450, pls. 3*).—The method of conducting the experiments is described in detail, the rainfall for the season is given, the results of the analyses of the soils are reported, and the results of the experiments are given in tables and discussed. The work was performed on the government agricultural farms at Wagga and Bathurst. The fertilizer applications used furnished per acre 14 lbs. of nitrogen, 51 lbs. phosphoric acid, and 21 lbs. of potash, the quantity of plant food considered necessary on an average soil for a crop of about 30 bu. of wheat per acre. The results at the 2 farms differed remarkably in some cases. At Wagga superphosphate gave strikingly good results and proved superior to other phosphatic manures. For the soil at Wagga an application of about 3 cwt. of superphosphate, 96 lbs. of nitrate of soda, and 40 lbs. of sulphate of potash per acre are considered effective and economical. At Bathurst the slower acting Thomas slag and rock phosphate gave better results than superphosphate, and the best mixture for that soil seemed to be a combination of sulphate of ammonia with untreated phosphate. At Wagga the use of superphosphate alone nearly doubled the yield of wheat, while at Bathurst it resulted in only a slight increase in yield over the unmanured plats. Both soils, and the Bathurst soil more particularly, are well supplied with humus, and this is considered the cause of the high manurial value shown by the untreated phosphate in these tests. Previous liming produced a healthy growth of the plant and improved the quality of the grain. The authors consider excessive manuring for wheat prejudicial, especially in a dry season.

Manuring wheat crops (*Station, Farm and Dairy, 4 (1901), No. 40, pp. 858, 859*).—This article reviews the results of fertilizer experiments with wheat carried on in different parts of Australia.

Thick and thin seeding of wheat, F. COLEMAN (*Jour. Agr. and Ind., South Australia, 4 (1901), No. 11, pp. 882–884*).—A note on the subject with a report on a test, the results of which favored heavy seeding. The largest quantity of grain sown per acre was 1 bu. 38 lbs. and 7 ozs.

The culture of glutenous wheats, EDLER (*Deut. Landw. Presse, 28 (1901), No. 8, pp. 53, 54*).—A discussion of the culture of glutenous wheat under conditions prevailing in Germany.

Wheats suitable for Queensland, W. SOUTTER (*Queensland Agr. Jour., 8 (1901), Nos. 4, pp. 251–254, pls. 5; 5, pp. 328–331, pls. 5*).—Brief descriptions are given of 26 selected varieties of wheat suitable for Queensland conditions. The list includes a number of hybrid wheats. Illustrations of the heads of the different varieties described are shown.

Notes on wheats at Wagga Farm, W. FARRER (*Agr. Gaz. New South Wales, 12 (1901), No. 5, pp. 548–551*).—White Lammas, Tardent Blue, Nonpareil, Jade, Nutcut and Steinlee wheats are described, and the results obtained with the different varieties reviewed.

Storing seed wheat, VIBRANS (*Mitt. Deut. Landw. Gesell., 16 (1901), No. 19, pp. 96, 97*).—A brief note in which the author recommends leaving the grain in the straw if its germinative power is to be retained for more than one year.

HORTICULTURE.

The book of asparagus, C. ILOTT (*London and New York: John Lane, 1901, pp. 108, figs. 17*).—This is the first of a series of handbooks which it is intended to publish on the different phases of practical gardening. The work takes up the practical details of asparagus culture and describes minutely all the different operations. The use of asparagus as a decorative plant is also treated of. The history of the plant is considered, and recipes given for cooking. In addition to asparagus, the culture, marketing, and cooking of sea kale, celery, celeriac, salsify, and scorzonera are given. While the book is intended primarily for English gardeners, it contains many suggestions which will be of use elsewhere.

Garden beans cultivated as esculents, H. C. IRISH (*Missouri Bot. Gard. Rpt. 1901, pp. 81–165, pls. 10*).—A monograph on this subject, the cultivated garden varieties of Phaseolus, Dolichos, Vigna, Glycines, and Vicia being included. "The classification of varieties is based primarily on the form of seed, which appears as constant as color or plant habit and perhaps more so." General cultural directions for the different sorts are included.

Horticultural monograph on garden peas, DENAIFFE (*Jour. Soc. Nat. Hort. France, 4. ser., 2 (1901), July, pp. 783–803*).—A monograph on the different garden varieties, with cultural directions and notes on composition and food value.

Celery growing (*Florida Agr., 28 (1901), No. 20, pp. 289, 290*).—Suggestions by Northern buyers to Florida celery growers as to desirable varieties for Northern markets and best methods of packing and shipping.

An extremely early corn (*Amer. Gard., 22 (1901), No. 347, pp. 574, 575, fig. 1*).—The variety Peep of Day, planted in the American Gardening trial grounds May 17, gave the first picking of ears July 22, or 66 days after planting. Cory, planted 15 days earlier, did not give a picking of corn until July 25, making a difference in the time of development between these 2 early varieties of 18 days.

The forced culture of cucumbers in the greenhouse, N. SCHNEIDER (*Rev. Hort.*, *73* (*1901*), *No. 14*, *pp. 338–341*, *figs. 2*).—The seed, preparation of the seed bed, cultural care to be given, including pinching, pruning, and training the vines, pollenizing the flowers, choice of varieties, etc., are the subjects popularly considered.

Znaim cucumbers, J. ZAWODNY (*Jour. Soc. Nat. Hort. France*, *4. ser.*, *2* (*1901*), *June*, *pp. 526–540*, *figs. 9*).—An account of the history, development, and importance of the cucumber industry at the town of Znaim, Austria, and of methods of culture and manuring followed by growers in that district. A circular giving similar data upon these cucumbers has been issued by the Department (E. S. R., 12, p. 1043).

Winter muskmelons, S. L. WATKINS (*Amer. Gard.*, *22* (*1901*), *No. 349*, *p. 601*, *fig. 1*).—Brief notes on the value of these melons for late fall and early winter use, with a list of the varieties which the author has successfully grown in California.

Two methods of growing onions, B. C. PITTUCK and S. A. MCHENRY (*Texas Sta. Bul. 60*, *pp. 101–111*, *pls. 5*, *figs. 5*).—The difference in yield, cost of growing, and the profits in cultivating the Red Bermuda and the Creole varieties of onions, by horse cultivation and by hand, and in planting the seed in the field and in beds and transplanting, are here reported upon. Methods of onion culture are also given, some of the finer points upon which success in onion culture in Texas depends being pointed out. The work was carried on by the State station at Beeville without irrigation. The data secured in the test are summarized in the following table:

Yield, cost, and profits per acre in onion growing.

Cultural methods.	Yield of salable onions.	Value at 1 cent per pound.	Cost of growing.	Cost of gathering.	Cost of trimming and sacking.	Total cost of growing and harvesting.	Net profit per acre.
Red Bermuda onions:	*Pounds.*						
Horse culture, seed planted in field	4,551	$45.51	$16.65	$0.38	$3.80	$20.83	$24.68
Horse culture, seed planted in bed and transplanted to field	7,336	73.36	16.00	.61	6.10	22.71	50.65
Hand culture, seed planted in field	13,152	131.52	17.40	1.09	0.95	29.40	102.08
Creole onions:							
Horse culture, seed planted in field	7,842	77.42	16.65	.64	6.47	23.76	53.66
Horse culture, seed planted in bed and transplanted to field	8,257	82.57	16.00	.69	6.90	23.59	58.95
Hand culture, seed planted in field	10,664	106.64	17.40	.89	8.91	26.20	80.44

The table shows but little difference in the cost of growing onions to maturity by horse cultivation whether the seed is sown in the field or in beds and transplanted. The yields and profits, however, from transplanting are nearly double in the case of the Red Bermuda onions, and considerably in excess with the Creole variety. In horse cultivation the onions were grown in rows 30 in. apart and the plants allowed to stand 4½ in. apart in the row. With hand cultivation the rows were but 14 in. apart. The cost of hand cultivation, as seen in the table, was but 75 cts. in excess of cultivating with the horse, while the yield was increased from 36 per cent in the case of the Creole variety to 188 per cent with the Red Bermuda onions. The net profits in hand culture over horse culture are $26.78 with Creole onions and $77.40 with Red Bermuda onions. The opinion frequently expressed that the extra cost of cultivating and handling a crop of onions by hand, as compared with horse cultivation, will offset the increase in yield is shown in this experiment to be groundless.

The securing of good seed is considered one of the most important points in onion culture in Texas. The experiments at the station show that of 23 varieties of onions tested only 2, the Red Bermuda and Creole, can be recommended for extreme south

Texas. Creole seed from either Louisiana or Texas has given good results, but American Bermuda seed has not given nearly as satisfactory results as imported seed. Bermuda onions grown from American seed do not mature well, have a large, soft stem, and keep but a short time after maturing. Imported Bermuda seed grown on the Teneriffe Islands and along the western coast of Africa is considered best.

A study of the markets shows that the best market for Texas onions is just before the Southern crop moves (May), and again after the Southern crop is marketed and before the Northern crop matures (July and August). The Red Bermuda onions are preferable for the early market, while for the late market the longer-keeping Creole is better suited.

Alternation in the varietal characters of the tomato, C. A. White (*Gard. Chron., 3. ser., 30 (1901), No. 763, p. 105*).—The Acme variety of tomato seed was sown by the author in Washington in 1898 and produced plants and fruits similar in character to the authentic Acme variety. Seeds from these were saved and planted the following season, 1899, in the same way. The resulting plants and fruits, while entirely alike as regards each other, differed widely from the original Acme tomatoes of the preceding season. No cross pollination is thought to have taken place. No seed from the plants grown in 1899 was saved, but in 1900, the genuine Acme seed was again obtained from a seed firm and the plants and fruits produced therefrom resembled the true Acme. The seed saved from these, however, and grown in 1901, produced plants and fruits varying much from the mother plants, but entirely similar as regards each other and as regards the tomatoes grown in 1899. From these data the author draws the conclusion that "any lost variety or breed may be reproduced under the same conditions which originally produced it."

Tomatoes on trellis (*Agr. Jour. Cape Good Hope, 18 (1901), No. 11, pp. 784, 785*).—It is especially urged that with tomatoes trained on stakes the fruit clusters should be induced to start fruiting 10 in. or 1 ft. from the surface of the soil instead of higher up. More and better tomatoes are secured.

Nitrate of soda for market garden crops, W. L. Summers (*Jour. Agr. and Ind., South Australia, 4 (1901), No. 12, pp. 972–974*).—Some data are given showing the increase in the yield of cabbages, lettuce, rhubarb, carrots, spinach, and potatoes fertilized with different amounts of nitrate of soda as compared with the yields obtained with these same crops when fertilized with 12½ tons of barnyard manure. In general, the nitrate of soda proved much more effective than the barnyard manure and cost considerably less.

Report of the floriculturist and gardener, G. Coote (*Oregon Sta. Rpt. 1901, pp. 41–45*).—A brief report on culture tests with onions, tomatoes, cabbage, Swiss chard, beans, vegetable marrow, chicory, radishes, lettuce, peas, kale, tobacco, and hops. The author found that onions started in the greenhouse and transplanted to the field gave a more even crop than when the seed was sown in the open field. The onions also kept better. Chicory made an excellent growth at the station, showing that the climate is well adapted to its culture.

Horticulture, E. R. Lake (*Oregon Sta. Rpt. 1901, pp. 36–39*).—The horticultural work of the station for the year is outlined. In the test to ascertain the efficiency of basket veneering and yucca fiber as protecting sheaths for fruit trees only 20 per cent of the veneer sheaths remained intact 4 months after putting in place, while 89 per cent of the yucca sheaths were in place. Temperature observations made inside the sheaths go to show that during the heated term the temperature is slightly higher inside the sheaths and in cooler weather slightly lower than the outside temperature. It is believed that the chief benefits from the sheaths lie in the protection of the trees from the direct rays of the sun, winds, and violent changes in temperature.

As a result of a test of plums it is believed that the Japanese varieties of both pears and plums, and also many of the American hybrids, are unsuited for the Willamette Valley conditions. Tests are being carried on with hardy stocks for both cherries and apples, and varieties of aphis-resistant apples have been imported from Australia. Grapes are practically a failure at the station.

In a test of root pruning orchard trees 24 yearling trees were set out in one row, each alternate tree being root pruned according to the Stringfellow system, while the others were root pruned and the tops cut back 30 in. After 2 years the author states it was impossible to select one set of trees from the other except by taking note of the place of union of new growth. Two trees set out at the same time without either top or root pruning presented a very unthrifty appearance in comparison with the pruned trees.

In the case of whole and piece root grafting with Summer Wafer apples, the whole root and top cut gave considerably better growth than when the scions were grafted on the bottom cut. As between the whole root and top cut there appeared to be a slight advantage in favor of the former.

Quality of nourishment determines flower-bud production, J. M. W. KITCHEN (*Amer. Gard., 22 (1901), No. 338, p. 427*).—The author believes that the flower bud of the apple or any other flower bud has its origin whenever the vegetable cell which starts a new growth receives a sufficient supply of adequately elaborated sap as nourishment. A supply of unelaborated sap tends to wood growth. But when this sap has been elaborated in the leaves and reaches newly starting growths "its special richness in carbonaceous elements and its comparative lack of nitrogenous matter has the effect of modifying the growth from leaf forms to flower forms." The kind and amount of nourishment which a cell receives is governed, among others, by the following conditions: "The location of the embryo cell on the plant; the density and size of the wood tissue conducting sap from the roots; decrease of root absorption following loss of roots and coldness and dryness of the soil; relative high atmospheric temperature conducing superactivity of metabolic processes in the leaves and distance from the roots with intervention of a large area of leafage between the root and the flowering point."

The teaching of orchard fruit culture in the nineteenth century, GUILLOCHON (*Jour. Soc. Nat. Hort. France, 4. ser., 2 (1901), Apr., pp. 348–363*).—A horticultural review of the development of horticultural societies and horticultural literature with reference to fruit-tree culture in France during the nineteenth century. The work includes a bibliography of the publications on orchard fruits, in the French language, since 1850.

Propagating new varieties of tree fruits from seed, C. G. PATTEN (*Amer. Gard., 22 (1901), No. 335, pp. 379, 380; Nat. Nurseryman, 9 (1901), No. 6, pp. 197, 198*).—The author holds that innumerable and serious mistakes have been made all over the Northwest in an endeavor to mingle the little Siberian with our cultivated apple. This he considers a violent cross which is not nearly so likely to result favorably as would be the planting of seeds from the most highly developed fruits that we now have, or by using seed obtained from crosses of these varieties. It is believed that the Concord and Worden grapes, Ben Davis, Winesap, Fameuse, Duchess, Wealthy, and the Patten Greening apples, and the Richmond cherry are the most highly developed forms of fruit we now have. In improving fruits from seed, therefore, it is seed from these varieties rather than from the small, worthless varieties which have not been developed at all that should be used.

Experimental fruit culture at Wye College (*Gard. Chron., 3. ser., 29 (1901), No. 752, pp. 332, 333*).—Experiments were begun at the College in 1897 to test the effect of various fertilizers on apples grown in zinc pots. Complete commercial fertilizers, fertilizers containing but 2 elements, and fertilizers containing normal amounts of 2 elements and the third in excess were used each year from 1897 to 1900, inclusive. The effect of sulphate of iron was also studied in connection with a complete fertilizer. The results in 1900 show especially finely colored apples with an excess of phosphate and a lack of any effect due to either the absence or excess of potash. Sulphate of iron had no effect on the color of the apples.

The commercial value of cider fruits in England since the seventeenth century, A. Truelle (*Mem. Soc. Nat. Agr. France, 139 (1900), pp. 383–431*).—Historical review of prices and varieties.

The date-palm orchard, R. H. Forbes (*Arizona Sta. Rpt. 1901, pp. 315–318, 342*).—Data are given on the condition in July, 1901, of the 405 date palms comprising 27 varieties which were received through this Department in July, 1900, and set out in the station and Tempe orchards. The data show that 71 per cent of the suckers set, including 22 varieties, are now established and for the most part growing vigorously, 11 per cent are still alive but very feeble, while 18 per cent are dead.

Relative to methods of shipping suckers data are given which show "that it is much better to transport the suckers immediately after cutting them from the parent tree than to grow them in tubs or garden before shipment."

Various methods were employed in packing these suckers for shipment from Algiers, and they were 2 months in transit. The author states that "those palms which were shipped with no packing whatever came through as well or better than those carefully bound in wet moss or packed in charcoal. As a precaution, however, against unusual delay in transit it is probably safer to bind coverings of wet moss about the bases of the suckers and provide for renewal of moisture on the road."

Fumigation of the suckers with 0.3 to 0.5 per cent fumigations of hydrocyanic-acid gas was made with scarcely any apparent and no lasting injury, while the scales appeared to be all killed.

Most of the suckers received were planted in the "extremely alkaline" Tempe orchard. These gave about the same percentages of growing and living trees as those which were planted in the fresh soil of the station orchard.

Reliable comparisons could not be made as to the shipping endurance of different varieties, though 82 per cent of the Rhars is now living, as compared with 70 per cent of the Deglet Noor. Some of the largest, as well as some of the smallest, suckers have perished alike during the season. Very small suckers are considered less desirable for field operations. "The main points observed thus far in caring for the suckers have been to plant not deeper than their greatest diameter and to water assiduously after planting."

Date culture, A. J. McClatchie (*Arizona Sta. Rpt. 1901, pp. 321, 322*).—Brief notes are given on the fruiting habits of the date palms at the station, and on packing dates. Full crops are apparently borne only in each alternate season. Dates ripening from September to October could be packed directly from the tree, while those ripening in the cooler and moister weather of late autumn and early winter required some drying before being packed. In order to prevent too rapid drying of the dates after being picked, due to the aridity of the climate, it was found necessary to pack them in boxes surrounded with paraffine paper and keep them well covered. Date seed made the best growth when planted during January or February, though the statement is made that it may be planted any time during winter, spring, or early summer.

Preparation and conservation of dried figs, Trabut (*Bul. Agr. Algérie et Tunisie, 7 (1901), No. 11, pp, 241–249, figs. 8*).—Brief descriptions are given of some of the more common varieties of figs used in the Mediterranean districts for drying, with notes on methods of drying and packing for market.

A new fig for drying, Trabut (*Bul. Agr. Algérie et Tunisie, 7 (1901), No. 15, pp. 353–355, figs. 2*).—A new white fig which the author has named Isly is figured and described. In taste it resembles the Smyrna and is considered by the author well adapted for drying purposes.

Stoneless prunes, L. H. Bailey (*Pacific Coast Fruit World, 11 (1901), No. 22, p. 6*).—The work of Luther Burbank in breeding stoneless prunes is mentioned. Mr. Burbank has succeeded in breeding out the pits of prunes though the soft kernels still remain. These prune trees are not as yet on the market and may not be put there, though it is stated that Mr. Burbank has many trees which bear stoneless prunes in various sizes and forms.

Self-sterility of Compass cherry, R. S. Mackintosh (*Amer. Gard., 22 (1901), No. 340, p. 455*).—The author reports that experiments with this cherry at the Minnesota Agricultural Experiment Station indicate that the Compass cherry is sterile to its own pollen. The Compass cherry is a cross between the Miner plum and Dwarf Rocky Mountain sand cherry. The fruit is considered desirable for jelly making.

Cultivation of oranges (*Agr. Jour. Cape Good Hope, 18 (1901), No. 9, pp. 547–549*).—Notes on methods of culture in the colony.

Notes on citrus trees and also working over worthless old orange and peach trees, W. J. Allen (*Agr. Gaz. New South Wales, 12 (1901), No. 7, pp. 834–836, figs. 15*).—An illustrated account is given of methods of rejuvenating old orange and peach trees by pruning back the main limbs to stubs, and budding or grafting sprouts that arise from them.

Pineapple growing, J. Rose (*Queensland Agr. Jour., 9 (1901), No. 1, pp. 145, 146*).—A paper on pineapple growing in Queensland.

Clove planting, R. N. Lyne (*Shamba [Zanzibar], 1901, No. 23, Sup., pp. 1–3*).—Details of the cost of laying out and planting a clove plantation of 6,550 trees.

Foxy coffee (*Queensland Agr. Jour., 8 (1901), No. 5, pp. 370–371*).—"This term denotes a reddy-brown appearance of the seed caused by the adhesion of the silver skin into which the coloring matter in the outer skin and fruity portion of the cherry has infiltrated." This appearance indicates that the fruit was picked when quite ripe. It does not injure the quality of the coffee, though it is undesirable from the standpoint of appearance. Some precautions which should be taken to prevent foxy coffee are suggested as follows:

"(1) Avoid, as far as possible, allowing the berries to become dead, or purple, ripe on the trees. They should be picked as uniformly red-ripe as possible. A spot of green on the outside pulp will make no difference, the bean being nearly always matured before the pericarp has been fully colored.

"(2) Pulp the coffee as soon after taking in as possible. The operations of pulping and measuring might go on simultaneously. . . .

"(3) Pulp as cleanly as possible. If pulpers are not working satisfactorily, this must be done with the aid of a sieve, the skins and half-pulped cherry being passed through the pulpers a second time.

"(4) Wash the coffee as soon as the mucilage is ready to be acted on by water. This can be determined by experiment."

Coffee culture in Queensland, H. Newport (*Queensland Agr. Jour., 8 (1901), No. 5, pp. 371–375*).—Popular instructions on pitting, filling in, planting, and shading coffee.

Artificial drying of cacao, G. W. Smith (*West Indian Bul., 2 (1901), No. 2, pp. 171–174, fig. 1*).—The general plans of 2 buildings for drying cacao are given. One cost about $500 to erect and the other $1,500.

The horticultural status of the genus Vaccinium, W. M. Munson (*Maine Sta. Bul. 76, pp. 113–160, figs. 9*).—This paper aims to present as concisely as may be the exact status of the genus Vaccinium at the close of the nineteenth century and to give greater publicity to the horticultural worth of blueberries. The distribution of the species is noted, horticultural notes given on the uses of the fruits, the ornamental value of some varieties pointed out, methods of propagation and cultivation detailed, descriptions given of the blueberry industry in Maine and elsewhere in the United States, and a key to the natural groups of species. The future outlook for the blueberry industry is also discussed. A bibliography of 44 references to literature on blueberries, huckleberries, cranberries, etc., completes the bulletin.

The report on the blueberry industry in Maine has been noted earlier (E. S. R., 11, p. 931). The terms "whortleberry" and "bilberry," which are other names for blueberries, are said to be seldom or never heard in this country, while the term "huckleberry" is very common. "In the Central States the term huckleberry is usually applied to *V. corymbosum*, while blueberry is given to the low growing species, like *V. canadense* and *V. pennsylvanicum*. In New England huckleberry is reserved for species of Gaylussacia, while blueberry is applied to the lower growing species, as above, and high-bush blueberry to *V. corymbosum*."

The propagation of blueberries from seed is stated to be comparatively easy. The seed of ripe fruit is washed free from pulp and sown either at once or stratified in sacks and sown the following spring. On good potting soil, to which leaf mold has been added, they are scattered thickly over the surface of the soil, packed down lightly with a board, and covered with a very slight sprinkling of soil. At the station the seed was stratified, being allowed to freeze during the winter, and sown in the spring. The plants were handled once, and later in the summer transferred to a cold frame, where they were simply covered with litter during the winter.

"The following spring they were transplanted into beds, shaded until established, and made a good growth during the summer. . . . The low blueberry (*V. pennsylvanicum*) will usually fruit in from 3 to 4 years from seed, but *V. corymbosum* requires 4 to 6 years."

Blueberries may also be propagated by division or by grafting. The high-bush blueberry (*V. corymbosum*) and its varieties are considered relatively easy to transplant, either from swamps or upland. The berries are of good size and very prolific. "The variety *amœnum* is a rather dwarf form, with very large berries, and grows freely on the upland. *V. vacillans* is the next best species for cultivation as a 'small fruit.'"

Not much attention has as yet been given to the cultivation and improvement of blueberries, but it is thought by the author that in its wild state this fruit is more worthy of notice than was either the blackberry, raspberry, or currant, and that it is probable that within a few years garden blueberries will rival in importance some of the best of the other small fruits.

Some statistics are given on the blueberry industry in Maine and Michigan. There were 7 factories in Maine in 1900 engaged in the blueberry industry, having a valuation of $50,000. The total canned product from these factories was about 50,000 cases, valued at $100,000.

Strawberry growing at the South, O. W. BLACKNALL (*Amer. Gard., 22 (1901), No. 342, pp. 490, 491*).—The Hoffman is considered by the author the ideal Southern shipping berry. Cotton-seed meal, 500 to 700 lbs. per acre drilled in, is recommended as a fertilizer for fall-set plants.

Strawberries in Ohio for 1901, M. CRAWFORD (*Amer. Gard., 22 (1901), No. 350, pp. 617–619*).—The author briefly describes and notes the value of 29 of the better varieties of strawberries grown by himself during the season.

The adaptation, affinity, and pruning of vines, L. ROUGIER (*Prog. Agr. et Vit. (Éd. L'Est), 21 (1900), Nos. 2, pp. 48–50; 4, pp. 109–111*).—The author has studied especially the adaptation of the principal American stocks to the soils of the Loire region of France, and their affinity for French varieties. Fifteen American species and varieties were used as stocks. The soil of the experimental field was of average physical condition, being made up of débris from granite rock and containing a small proportion of basaltic gravel with a clayey subsoil. The vineyard inclined slightly to the south and was well drained. The soil was poor in phosphoric acid and lime. The plat was planted to vines in 1894 and has been manured but once, so that the soil is of only average fertility. A number of French varieties were grafted on each of the American stocks. A few stocks of each variety were not grafted so that their vigor of growth might be studied. Only the results obtained with the French variety Gamay de Montbrison are here reported upon.

The growth in the above soil of all the American varieties when not grafted left nothing to be desired, but their vigor when grafted with the Gamay variety varied considerably. Certain hybrids of Rupestris stood first in vigor, while the least vigorous were those on the Riparia varieties. The following grouping of the varieties with regard to vigor of growth is given for 12 of the stocks used: (1) Aramon-Rupestris Ganzin No. 1, Gamay Couderc; (2) Rupestris du Lot, Rupestris Metallica; (3) Rupestris Martin, Rupestris Ganzin, Rupestris Fortworth; (4) Riparia tomentose, Solonis; and (5) Riparia Gloire de Montpellier, Riparia Grand glabre, Riparia Martineau.

An examination of the different groups showed that the union of the Rupestris with the Gamay was more intimate than Gamay with Riparia, and the difference in size between scion and stock was scarcely noticeable, while between Riparia and Gamay there was a marked difference in size.

Considered from the standpoint of fruit production, the above grouping of varieties might be just reversed. The Gamay on Rupestris grew luxuriantly but produced little fruit, while on Riparia the growth was much less and the fruit production much greater. In order to increase the fruitfulness of Gamay on Rupestris, the branches were pruned to long arms. On an average 4 arms 50 to 60 cm. long were left on each stock, and these were trained recurved in the form of a circle. As a result the first 3 groups on Rupestris, as noted above, produced from 3 to 4 times as much fruit as the fourth and fifth group on Riparia stock, the second group giving the best returns. The experiment is believed to show that in pruning French vines grafted on American stock the arms and number of buds left on each should be proportional to the vigor of the vine. In soils where the Riparia grows fairly well, but Rupestris develops much more vigorously, it is advisable to grow the latter and prune properly rather than the former.

On the adaptation and affinity of Riparia, L. ROUGIER (*Prog. Agr. et Vit. (Éd. L'Est), 22 (1901), No. 35, pp. 266–269*).—The earlier work of the author (E. S. R., 13, p. 649) has shown that grafting French varieties on American stocks diminishes the vigor of the latter, particularly Riparia stocks as compared with Rupestris. This result was reported with the Gamay variety used as scion. Further work in the same vineyard with Syrah and Pinot varieties show like behavior on the American stocks. In order to overcome as much as possible the lack of affinity between Gamay and Riparia, it is urged that the Riparia be planted on soils neither too moist nor too clayey, but that when this stock is used with Gamay it be planted in rich, deep, permeable soil, which does not suffer from either drought or an excess of moisture.

Success in grafting green vines in Roumania, A. SAUGET (*Prog. Agr. et Vit. (Éd. L'Est), 22 (1901), No. 27, pp. 12–14.*)—In the reconstruction of some vineyards in Roumania, the tongue graft or a modified form of the same has been employed successfully with green wood. According to the author, in grafting the green vines, the stock should not be less than 6 mm. in diameter where the graft is made, and the wood should be hard enough so that it can not be easily compressed between the thumb and finger. The scion should also have reached the same stage of maturity. All the precautions necessary to the successful grafting of the dry wood cuttings must be observed in grafting the green vines. The grafts once made and the scion and stock firmly united by growth, they may be handled like cuttings, or roots may be started on the stock below the graft by layering. The advantages claimed for the green grafting of vines are noted as follows: It simplifies operations by doing away with the necessity of stratifying both scions and stocks; the chance element of success in the nursery is reduced to a minimum; it is cheaper and a larger percentage of grafts succeeds; and it is believed that the system will permit of grafting, with more chance of success, varieties which are difficult to unite when grafted dry. An instance is cited in which 325 grafts of different varieties were made; all of these grafts succeeded, 319 being first-class grafts, and only 6 defective.

Study on shield grafting, C. Clarac (*Rev. Vit., 16 (1901), No. 396, pp. 71–74, figs. 3*).—The advantage of shield grafting over other methods and the physiology of the wound and its healing are discussed.

Thinning out grape bunches, P. Pacottet (*Rev. Vit., 16 (1901), No. 397, pp. 99–103, figs. 5*).—The method followed in thinning out and removing defective berries or a too heavy set of berries in the bunches, for the purpose of securing more attractive and perfect bunches for table use, is outlined. Scissors are used to remove the defective berries.

The culture of nuts in the United States, L. Wittmack (*Gartenflora, 50 (1901), No 17, pp. 468–470*).—Brief report of the author on this subject.

On soils suited to the chestnut tree, L. Piccioli (*Staz. Sper. Agr. Ital., 34 (1901), No. 8, pp. 745–766*).—A discussion of this subject, with analyses of soils and of chestnuts, and a bibliography.

The composition of the horse chestnut (Æsculus hippocastanum), E. Laves (*Pharm. Centralhalle, 42 (1901), p. 33; abs. in Chem. Ztg., 25 (1901), No. 46, p. 117*).—The following composition is given: Albumin, 10.63 per cent; dextrin, 1.7; starch, 64.8; ash, 3.16; phosphoric acid, 0.32; sulphuric acid, 0.13. The ash contains about $\frac{2}{3}$ magnesia, $\frac{1}{3}$ lime, and a trace of iron.

Caoutchouc in Soudan, H. Hamet (*Agr. Prat. Pays Chauds, 1 (1901), No. 1, pp. 23–43, figs. 2*).—This article points out the growth of the world's rubber consumption since 1889, enumerates different species of plants from which rubber is obtained, reports a study of the latex of *Landolphia heudelotii*, the most valuable of the rubber plants here considered, gives a few brief notes on the culture and propagation of this plant, and describes different methods of coagulation employed in Soudan.

The culture of the Castilloa rubber, F. Koschny (*Beihefte Tropenpflanzer, 2 (1901), No. 3, pp. 119–172, fig. 1*).—Complete directions for the culture of *Castilloa elastica*, with figures as to the costs and profits in the industry.

The influence of darkness on the development of flowers, N. Beulaygue (*Compt. Rend. Acad. Sci. Paris, 132 (1901), No. 11, pp. 720–722*).—A review is given of a number of experiments conducted along this line, and the author presents the results of his own observations with a large number of flowers. In the author's experiments, 2 branches of the same plant as nearly alike as possible were chosen. One branch was then allowed to develop in a box painted black on the inside and so inclosed that no light could penetrate the interior. The effects of the darkness on the time of blooming, color, form, size, and weight of the flowers were determined. In general, darkness prolonged slightly the blossoming period of the flowers. The violet blue color of such flowers as iris was of somewhat lighter color. Similar results were obtained with yellow and red flowers. The size of the flowers was slightly diminished, as was also the weight and volume.

Tuberous-rooted begonias as bedding plants, J. W. Withers (*Amer. Gard., 22 (1901), No. 336, p. 393*).—In exposed sunny positions begonias require an abundance of water. The author has been most successful when the plants have been set in a position where the sun does not shine until afternoon. Peruvian guano is depended upon as a source of manure. The guano is scattered in a thin coating over the surface before digging, and another thin coating given over the surface when raking down and leveling. Later in the season, after the plants are getting well established, a scattering of guano is placed on the soil surface underneath the plant leaves and watered in. For winter storage the tubers are lifted after the first frost has touched the stems. About 3 in. of stem is left on each tuber and the soil is not shaken off too closely. After curing 4 or 5 days under a shed they are stored in the cellar like potatoes. The author's loss has been but 4 per cent by winter storage in a dry cellar.

Carnations; topping plants in the field, A. M. Herr (*Amer. Florist, 16 (1901), No. 680, p. 1610*).—In place of breaking or carelessly cutting the stems, which may furnish conditions for the development of bacteriosis, the use of a sharp knife in topping is recommended. The first top should be taken out when the stem is in danger of toppling over and growing into a crooked plant, the second when the branch is forming a bud at the end. Late-blooming carnations should be topped very sparingly, so that the plant can be taken in with shoots long enough to produce some early flowers. Early bloomers require more constant attention and should not be carried into the house with buds on, since such buds make only third-rate flowers. Continuous bloomers should be handled the same as the foregoing, according to their habit of earliness or lateness. Carnations that bloom in crops require especial attention to topping in order that they may be made to bloom at the season when they are most wanted. "Quick comers" should be topped once or twice in the house in order to get the crop to come up between December 15 and January 10 and a second crop at Easter time.

Benching carnations, C. W. WARD, L. E. MARQUISEE, and J. HARTSHORNE (*Amer. Florist, 16 (1901), No. 686, pp. 1781–1783*).—The best course to pursue in benching carnations, as regards date of planting indoors, proper compost, details of the operation of moving the plants from the field, etc., are considered independently by each of the authors.

The influence of incandescent lights on carnation culture (*Florida Agr., 28 (1901), No. 1436, p. 503*).—It is stated that in experiments conducted at the Michigan Agricultural College incandescent lights in the greenhouse had the effect of increasing the length of the stem and the size and quantity of the flowers.

Carnation hybrids, AMELUNG (*Gartenflora, 50 (1901), No. 17, pp. 449, 450*).—Brief notes and a colored plate are given showing the result of the artificial crossing of *Dianthus chinensis* as mother plant *D. caryophyllus* as pollen plant. The details of this work were noted in an earlier number (E. S. R., 12, p. 752).

Recent chrysanthemum literature, C. H. PAYNE (*Gard. Chron., 3. ser., 30 (1901), No. 765, p. 145*).—The publications on chrysanthemums since 1897 are briefly noted.

Cineraria stellata (*Amer. Florist, 17 (1901), No. 690, pp. 133, 134*).—Notes on the origin of this flower and on methods of culture.

Horticultural monograph of the lilacs, L. HENRY (*Jour. Soc. Nat. Hort. France, 4. ser., 2 (1901), July, pp. 726–759*).—The various species of the genus Syringa and of the subgenus Ligustrina are monographed.

Newer lilies, J. G. BAKER (*Amer. Gard., 22 (1901), No. 350, pp. 620, 621*).—This is a summary of a paper presented by the author at the London lily conference, in which a number of the newer lilies are briefly noted as to species and character of flowers.

Hybrid stock for grafting roses (*Amer. Gard., 22 (1901), No. 339, p. 440*).—The writer considers Manetti stocks, which are so largely used in growing roses, not at all suited to our climate. Where perfect hardiness is required the writer has substituted Michigan or Prairie rose (*Rosa setigera*), *R. wichuraiana*, and sweetbrier (*R. rubiginosa*) for Manetti stocks with good satisfaction. "All make good, deep roots, and are little affected by dry weather when established, and are not at all disposed to sucker." The best of all stocks, however, has been obtained by crossing Crimson Rambler with Clothilde Soupert, both of which are varieties of *R. multiflora*. These stocks are extraordinarily vigorous, show no inclination to throw up sprouts, and for budding purposes the stocks are easily worked. "In hardiness it seems little inferior to the native species." The roots are easily grafted with the splice graft. The stems are not so satisfactory for grafting. For tree-rose effects the writer prefers to bud high up on strong sweetbrier shoots and trim off all other shoots and branches from the stock as soon as the bud has formed a fair top.

Horticultural monograph on roses, J. GÉROME (*Jour. Soc. Nat. Hort. France, 4. ser., 2 (1901), July, pp. 760–762*.—A botanical and horticultural study of genus.

Tecomas, H. NEHRLING (*Amer. Gard., 22 (1901), No. 351, pp. 634, 635*).—Ten species of Tecoma are described.

Wind-breaks and frost, J. Hoffman (*Pacific Rural Press, 61 (1901), No. 21, pp. 325, 326*).—The advantages and disadvantages of wind-breaks as a protection against frosts in lemon orchards are considered.

Growing evergreens from seed, C. Wedge (*Amer. Gard., 22 (1901), No. 351, p. 636; reprint from Minnesota Hort.*).—Detailed cultural directions are given for the growing of evergreens from seed.

Henderson's picturesque gardens and ornamental gardening illustrated, C. Henderson (*New York: Peter Henderson & Co., 1901, pp. 158, figs. 317*).—The effects produced by different methods of landscape gardening, ranging in character from the more natural to the formal gardens of the Italian and French schools, are brought out in an extended series of illustrations. The illustrations give views of gateways and entrances, lawns and decorated parks, fountains and statuary, floral sundials, water pieces, artistic flower beds, topiary work, cactus gardens, subtropical gardens, hedges, and the hardy shrubs, flowers, etc., in landscape gardening.

Gardens old and new—the country house and its garden environment (*London: Country Life [1901], pp. XXIV+295, figs. 470*).—A presentation of methods of English gardening and of garden architecture by the aid of an elaborate series of half-tone reproductions of famous English manors, abbeys, country houses, etc., and the ground attached thereto. The text consists in a large measure of historical and descriptive notes in explanation of the illustrations.

FORESTRY.

Observations on forest meteorology, R. de Drouin de Bouville (*Bul. Min. Agr. [France], 20 (1901), No. 2, pp. 240–270, pls. 9*).—At the National School of Forestry since 1867 observations have continually been made to ascertain the effect exerted by forests upon rainfall and upon a supply of subterranean water. Three stations were maintained, one of which was selected to represent a dense forest of deciduous trees, the second a less heavily timbered region, while the third was an agricultural region of considerable extent which was taken to represent the meteorology of an area free from the influence of forests. The influence of wooded areas on the total rainfall is shown for the three stations. While there was considerable variation from year to year, the relative proportion measured at the different stations was about the same. For the 33 years the relative proportion of water on the 3 different areas above described was 100, 93.9, and 76.7, showing that in general forests increase the amount of rainfall over a given area, and this increase seems to be about in proportion to the extent and density of the forest.

In order to ascertain whether winds exerted any appreciable effect on the amount of rain falling at these different regions, a tabular statement is given showing the rainfall for 11 years under the influence of winds from different directions. The results show that practically the same proportion stated above is shown for the rainfall of the different stations, no matter what the direction of the wind.

The effects of cold and hot seasons and seasons of great and small rainfall are shown by tabular statements, but practically the same relative quantity of water fell at the different places. With slight variation there was no appreciable difference in the action of the forest in winter or summer, the average precipitation being about the same for each season. In dry seasons the relative precipitation over forested areas was little, if any, greater than during periods of heavy rain.

Investigations were conducted to determine the amount of rain water intercepted by the forest cover. These observations were begun in 1867 and continued for 32 years. In the densely covered forest, small areas were cleared of trees and comparisons made between the amount of water reaching the soil in these areas and those where the timber was not removed. In the dense forest the amount of water intercepted by the trees varied from the minimum in winter to a maximum of 14.3 per cent of the total rainfall. At the second station the amount of water intercepted attained a maximum of 16.6 per cent.

The evaporation taking place from the soil in wooded and cleared areas was investigated by means of atmidometers, by which it was found that the evaporation was considerably greater in the open areas than those under forest cover. No estimation appears to have been made of the amount of water transpired through the foliage of the growing plants.

Forestry planting for southern Minnesota, H. W. Poole (*Farm Students' Rev., 6 (1901), No. 9, pp. 142, 143*).—On the high prairie soils of the southern part of the State the author recommends the planting of green ash, boxelder, white willow, white spruce, red cedar, Norway and Scotch pines. For the more moist soils, black walnut, green ash, hard maple, white willow, basswood, soft maple, Norway spruce, Douglas fir, and white pine are more suitable.

Forestry at Coteau Substation in southwestern Minnesota (*Farm Students' Rev., 6 (1901), No. 9, pp. 131–133*).—A review is given of the forestry conditions at the substation, and the necessity for the planting of wind-breaks is shown. For wind-breaks the author recommends the planting of willows, of which the golden willow is considered one of the best. The caragana and buckthorn are both considered good hedge plants for wind-breaks, but are of less rapid growth. After a windbreak is started the permanent trees may then be planted, and in this section boxelder, ash, and elm give the best results, although some of the oaks, particularly bur oak, make considerable growth while young. The presence of underbrush, such as dogwood and buckthorn, is recommended in the planting as a protective measure. After the forest trees become established this undergrowth can be cut out when the plantation is thinned.

Investigations conducted by the Bureau of Forestry in Nebraska, W. L. Hall (*Forester, 7 (1901), No. 8, pp. 188–193, figs. 4*).—Forest investigations are being conducted in Nebraska, in which an attempt is made to study the planted and natural timber. The planted timber is studied to find not only what thrives best in different sections of the State, but also what is most valuable for different purposes. The natural timber is investigated to find what species occur, to what extent timber is increasing, and the conditions under which the increase takes place. In 1890 this Department had a large number of pines planted in the Sandhill region of southwestern Nebraska. The plantation consisted of Scotch, Austrian, Rock, and Banksian pine. The land was very sandy, and the trees were set in furrows run through the sod. Since planting no cultivation has been given. The Scotch and Austrian pines now average 6 to 8 ft. in height, the Rock pine from 4 to 6, and the Banksian pine 12 to 18 ft. This experiment seems to show that they are well adapted to the location and similar regions. The investigations conducted by the Bureau of Forestry will be in that portion of the State which is not adapted to farming or grazing, and will bring together all available information on its adaptability to forest growth and on means of foresting in case it is adapted to the growth of trees.

The forest and water resources of Washington, A. D. Foster (*Forester, 7 (1901), No. 4, pp. 88–91*).—A summary is given of an address in which the forest and water resources of the State are reviewed. It appears that of a forest area of 15,858 square miles formerly covered with merchantable timber, 22.5 per cent has been destroyed by fire, 22 per cent cut over, and the remaining 57.5 per cent is still covered with standing timber. Thus in less than a generation of time about two-fifths of the timber in what is considered the richest merchantable timber region in the world has disappeared.

Tree planting on idle lands in New England, J. D. Lyman (*Forester, 7 (1901), No. 8, pp. 199–201, fig. 1*).—The author states that the great difficulties in the way of forestry are lack of knowledge of the art and science of forestry, and the rate of taxes usually assessed against lands. There is said to be 116,000 acres of idle land in New

Hampshire, much of which is adapted to the growing of forest trees if properly managed. The white pine, spruce, and chestnut will probably be the best trees for culture. An example is cited of a 13-acre plantation of white pine from which, 40 years after planting, the owner cut 40 cords of boxwood logs, valued at $240 per acre. After providing for all expenses there was left a net profit of $128 per acre. If larger timber had been desired, by more prolonged thinnings the production could have been increased still more.

The outlook for forestry in the Philippines (*Forester, 7 (1901), No. 9, pp. 211–215, figs. 5*).—The author quotes Capt. G. P. Ahern, of the Forestry Bureau at Manila, as stating that there are more than 50,000,000 acres of public woodlands in the archipelago. There have been classified up to the present time 665 species of forest trees, and it is believed that the total number will prove to be fully 1,000 after the region has been more thoroughly explored. The plans of the Forestry Bureau of the Philippines are outlined, in which timber testing and forest management are to be given a prominent place. The proceeds derived from the leasing of forest privileges during the first fiscal year amounted to about $200,000, and at the present time the revenues are about $30,000 per month, an increase of about 150 per cent over what they were during the Spanish occupation. The present market for all timber is in Manila. Some of the timber has previously been exported to the Asiatic coast, but at present the demand for timber in Manila and other parts of the island is greater than the ability to supply it.

The forests of New South Wales, J. H. Maiden (*Agr. Gaz. New South Wales, 12 (1901), No. 7, pp. 811–826, map 1*).—The author popularly describes the forests of New South Wales, giving their topography and dividing the forest region into 4 zones, the principal characteristics of which are described. Descriptions and economic notes are given of the principal forest timbers of the country. Statistics are quoted in which the forest area is estimated at 20,000,000 acres, of which in 1900 there had been reserved 6,355,605 acres. These reserves, which are under government control, are mostly occupied under leases for grazing. The forestry operations are described at some length, the annual output of different kinds of timber being shown.

On the improvement and renovation of beech forests in Ardennes, L. Claude (*L'Ing. Agr. Gembloux, 11 (1901), No. 10, pp. 427–446*).—Attention is called to the gradual destruction of the beech forests, and suggestions are given for their restitution. The author recommends the prevention of the removal of the leaves, grass, and other materials constituting the forest floor, protection of the young growth, and the maintenance of plantations from which the trees may be transplanted.

Handbook of German dune protection, P. Gerhardt (*Handbuch des deutschen Dünenbaues. Berlin: Paul Parey, 1900; noted in Bul. Soc. Cent. Forst. Belg., 8 (1901), No. 1, pp. 55, 56*).—This work is a complete treatise on the sand dunes of Germany, and describes the methods that have been adopted for their reclamation, the cost of the improvement, and methods of reforestation. Among the tree species found adapted to planting in such conditions are Scotch pine, *Picea alba*, *P. excelsa*, *Alnus glutinosa* and *Betula verrucosa*, and under certain conditions *Pinus laricio*, *P. rigida*, ash, elm, poplar, etc. For the dunes along the North Sea the author believes it feasible to forest them with mountain pine and black alder, with mixtures of Scotch pine and birch in some places. For the side of dunes next the coast, planting grass and other halophytic plants is recommended to prevent their shifting about.

Durability of timber (*Queensland Agr. Jour., 8 (1901), No. 6, p. 444*).—A discussion is given of the relative durability of seasoned and green timber when used for structural purposes. The application ot coal tar, paint, and other coverings to green timber tends to increase the liability to dry rot, and it is recommended that unseasoned timber should not be painted except at the joints. Where seasoned there will be less shrinkage in timber. It may be finished, tarred, or painted without incurring danger of dry rot, and the timber itself will frequently be found to be stronger.

Wood preserving by painting with or immersing in tar oils, E. P. Schoch (*Trans. Texas Acad. Sci., 4 (1901), No. 1, pp. 88–92*).—Gives results of tests of timbers treated with carbolic acid, high-boiling oils, and tar bases. To protect timber by means of superficial application the best results were obtained with a coal-tar distillate boiling at 270° C. or above, free from low-boiling oils and carbolic acid, and containing a high percentage of tar bases, notably acridine, and free from tarry or insoluble substances that close the pores of the wood.

SEEDS—WEEDS.

On the color and weight of red-clover seed, C. Fruwirth (*Landw. Vers. Stat., 55 (1901), No. 6, pp. 439–452*).—Studies are reported on the color and weight of the different seed found in red-clover heads. The seed in a large number of clover heads were counted and divided according to color, an attempt being made to divide each head as nearly as possible into an upper and lower half. The results are given for 9 heads, showing that the lower half of the head contained 10 dark-violet seed, 30 variegated, 72 deep yellow, and 86 yellow, while the upper half contained 16 dark violet, 54 variegated, 72 deep yellow, and 64 yellow. The total seed production of a number of plants was counted, showing considerable variation as to the color of the seed. Based upon their color, the seed produced by one plant were 160 deep yellow and 445 yellow; a second plant produced 154 violet, 125 variegated, 58 deep yellow, and 11 yellow seed; a third, 177 deep yellow and 366 yellow seed; while still another bore 131 variegated and 47 deep-yellow seed. From these and other investigations reported the author seems to believe there is a predisposition in color of seed found in the red-clover heads. This is particularly true of the yellow seed or the violet. For the variegated seed and those approaching that color there seems to be greater predisposition to the production of dark-violet seed than to variegated. Numerous weighings were made of different classes of seed, and the averages showed that the dark-violet seed were the heaviest, followed by the variegated, and the average of these was still heavier than the lighter-colored seeds.

The seed coats of angiosperms and gymnosperms, and their development, J. J. Attema (*De zaadhuid der angiospermæ en gymnospermæ en hare ontwikkeling. Groningen: P. Noordhoff, 1901, pp. 226*).

A chemical and physiological study of the corneous endosperm of some leguminous seed, M. Goret (*Thesis, Lons-le-Saulnier [Declume], 1901, pp. 85*).

The germination of seed plants, A. J. J. Vandevelde (*Dodonaea, 1900, pp. 141–301*).—Treats of the morphology and physiology of the germination of spermaphytes.

On the action of formaldehyde on germination, R. Windisch (*Landw. Vers. Stat., 55 (1901), No. 4–5, pp. 241–252; abs. in Ann. Agron., 27 (1901, No. 8, pp. 388, 389)*).—A study was made of the action of formaldehyde in strengths of 0.02, 0.05, 0.1, 0.2, and 0.4 per cent upon the germination of lupines, peas, horse beans, soy beans, flax, summer rape, alfalfa, clover, and maize. In general the more concentrated the solution, the more the germination was retarded and the less number of seeds germinated, the action of the formaldehyde generally manifesting itself by a diminution of the germinative energy of the seed. The most dilute solution had little or no injurious effect upon the germination of lupines, peas, beans, or maize, while it retarded slightly the flax, summer rape, alfalfa, and clover, although the total germinations were not diminished. More marked effects were noted as the strength of solution was increased, the 0.1 per cent having an injurious effect upon all but the horse beans and maize. The summer rape and flax were killed and the germination of the alfalfa and clover greatly retarded. The 0.2 per cent solution was injurious to all except the maize, retarding those which had previously not been affected, and completely killing the others; while the 0.4 per cent solution destroyed all seeds except the maize.

Germination of wheat treated with copper sulphate, E. DEMOUSSY (*Ann. Agron., 27 (1901), No. 6, pp. 257–261*).—On account of recently published investigations, which showed the injurious action of extreme dilutions of copper and other salts, the author was led to study the effect of fungicides upon plants and to ascertain the reasons for the comparatively slight injury upon foliage and seeds when treated with fungicides containing an amount of copper far in excess of the minimum toxic strength. In the case of fungicides sprayed upon plants, the injurious action is neutralized by the presence of carbonate of lime, or other alkalis. Where seeds are soaked or wetted with strong solutions, the reason for the limited injury is not so evident.

The author conducted a number of experiments in which wheat was soaked in solutions of copper sulphate and determinations afterwards made of the copper adhering to the seed. In ordinary practice the strength of the solution employed is 1 kg. of copper sulphate dissolved in a hectoliter of water, or 0.253 gm. metallic copper per 100 cc. of water. In the first of the author's experiments, 25 gm. of wheat were immersed in 50 cc. of the above solution, and after 15 minutes' immersion the weight of the copper remaining in the solution was practically undiminished. In a second case, the amount of metallic copper in the solution fell from 0.251 to 0.248 gm. After treatment 25 gm. of seed wheat were dried, incinerated, and the amount of copper adhering was found to be 0.011 gm. After washing treated seed three times, the copper still adhering was 0.009 gm. Other investigations showed that the copper was wholly deposited on the outside of the grain, at least none could be detected by potassium ferrocyanid tests within the seed coats. Germination tests were made of 6 lots of wheat, of 5 gm. each, practically 100 seeds each. Two lots were simply dipped into the copper solution; 2 soaked for 15 minutes; and 2 soaked for the same length of time, after which the grain was washed in 3 waters; and all germinated under similar conditions, with a check lot untreated. A retarding action was noted for all treated lots. If the treated seeds were germinated upon filter paper no injurious action was noted, and similar results were obtained for 6 lots of seed germinated in pots containing soils, some of which contained lime and others without. In explaining this lack of injury, the author claims the capillary action of the filter paper and soils drained the copper from the seed, and as a result the tender radicles did not come in contact with a toxic quantity of the metal. The suggestion often given, that seed treated with copper sulphate should afterwards be limed, he believes to be unnecessary in ordinary practice, his experiments having shown equally well for those lots which received no lime. The physical character of the soil seems sufficient to overcome the injurious action of the salt when used in ordinary strengths.

Stimulating the germination of teak seed (*Trop. Agr., 20 (1900–1901), p. 176*).—It is stated that the usual time required for germinating seed of teak varies from 2 to 3 months. Experiments which have been undertaken show that this time may be greatly shortened in different ways. One experiment was carried out in which the seeds were placed in a shallow pit, which was afterwards filled with water, and subsequently the seeds were kept moist by being watered every 4 days. In the second experiment the seeds were soaked for 24 hours in warm water before planting. In both experiments the time of germination was reduced to a few days.

Deciduous tree seeds, G. W. STRAND (*Florists' Exchange, 13 (1901), No. 14, p. 379*).—Directions are given for the collection and management of the seeds of a number of deciduous forest trees. The seeds of willows, soft maples, poplars, and elms—with the exception of the red elm—should be sown on ground that remains reasonably moist, as soon as possible after gathering, as they lose their germinating power very quickly. The depth to which seeds should be covered varies with different varieties. Elm, poplar, birch, and elder should not be covered more than ½ in.; maple, ash, box elder, and basswood, from ¾ to 1 in.; oak, chestnut, walnut, butternut, and hickory, from 1½ to 2 in. in depth. As a rule, seeds which ripen in the fall should be planted at once, except those which can be kept over without danger of spoiling. Those of a dry nature may be kept until spring if stratified in sand or leaves. They have also been preserved by being mixed with leaves and hung in sacks in a cool, dry place. If kept in this manner they must be thoroughly soaked before planting or many of them will not sprout. Locust seeds should be scalded before planting, and only the swollen ones planted. The seeds of thorn apple or wild thorn, mountain ash, red cedar, juniper, and others as a rule do not germinate until the second season. These may be kept either in a stratified condition or planted and the rows mulched. Seeds which have a fleshy covering, such as cherries and plums, should be separated from their pulp and stratified in moist sand until planted.

On the germination of half-ripe dodder seed, W. KINZEL (*Landw. Vers. Stat., 55 (1901), No. 4-5, pp. 255-256; abs. in Ann. Agron., 27 (1901), No. 8, p. 390*).—A study was made of the germination of immature seed of *Cuscuta lupuliformis*. Capsules containing green seeds were collected, some of which were preserved as collected, while others had the seed removed. In testing the germination of the green seed, it was found that 56 per cent of those which had been removed from the capsules germinated, while 73 per cent of those preserved within the seed balls germinated. Those preserved in the capsules, while germinating more slowly at the beginning, finally gave 92.5 per cent germination. Seeds allowed to ripen normally which were germinated for comparison gave but 5 per cent germination at the end of 26 days.

The sprouting of cocklebur seeds, E. E. MASTERMAN (*Ohio Nat., 1 (1901), No. 5, pp. 69, 70*).

Weeds of Montana, J. W. BLANKINSHIP (*Montana Sta. Bul. 30, pp. 70, figs. 21*).—A general study is given of the weed flora of the State and the characteristics of the different weeds are described. The means of distribution and origin of the weed flora are shown. The classification of the weeds into annuals, biennials, and perennials is made and brief notes given regarding their root systems. The different weeds are classified according to their situations, and methods for eradication are discussed at some length. The weed law of the State is quoted, in which it appears that Canada, Scotch, and Russian thistles are proscribed. An annotated list of the weeds growing in Montana is given, the species being arranged in alphabetical order. Those which are especially troublesome are indicated by having their scientific names printed in black-face type. In all 138 species are enumerated.

An experiment on the eradication of weeds in meadows, R. ADERHOLD (*Centbl. Bakt. u. Par., 2. Abt., 7 (1901), No. 17-18, p. 662*).—A brief report is given of experiments conducted with a 15 per cent solution of iron sulphate sprayed upon meadows to destroy weeds. The first application was made on May 11, followed by a second one June 13. The herbicide had but little effect upon such species as Bellis, *Leontodon taraxacum*, Veronica, thistles, or dead nettle. There was some injury done to species of Symphytum and Ægopodium. The second application was made without any injury to the grass, which consisted of a mixture of Lolium and Cynosurus, but the flowering stalks of Leontodon and Bellis and some others were destroyed, thereby preventing the spread of their seeds.

Experiments in the destruction of wild mustard and wild radishes, E. MARRE (*Semaine Agr., 21 (1901), No. 1069, pp. 358, 359*).—In order to popularize the method of weed destruction by means of chemicals, the author arranged, during the summer of 1901, with a number of cultivators in different parts of the department of Aveyron to spray crops with a 5 per cent solution of copper sulphate and a 10 per cent solution of iron sulphate. The results of the experiments are briefly reported. Fields of barley, winter wheat, oats, and maize were sprayed with these herbicides, and where properly applied resulted in the destruction of the wild mustard, the wild radish, and in a number of instances of the field poppy, crowfoot, cardoons, etc. In general, all the treatments were successful, but on account of cheapness the iron sulphate is given the preference. It is believed that by the use of this herbicide it will be possible to destroy these weeds growing in fields of cereals.

DISEASES OF PLANTS.

Notes on fungus diseases of plants, J. RAY (*Rev. Gén. Bot., 13 (1901), No. 148, pp. 145–151*).—The author believes that it is possible, within certain limits, to prevent attacks of fungus parasites through the presence of inimical substances in the tissues of the host plant. Among the external parasites the effect of the host is inappreciable and fungicides must be employed in combating them. For internal parasites a number of alternates are presented. A brief report is given of experiments in which various chemicals were injected into the plants, indicating, the author believes, that the injection of the juices of plants not subject to attacks of a specific organism will secure immunity for the treated plant from attacks of that fungus. The principal part of the paper is taken up with an account of experiments in which immunity to disease was secured by producing a mild form of disease through inoculation with attenuated cultures of the fungi, or by the use of toxins derived from pure cultures of the organisms. The methods of attenuation were those usually employed in such investigations and consisted of heat, light, and cold. Experiments were conducted with wheat, oats, lupines, beans, sunflowers, radishes, and mustard, all of which—with the exception of the mustard—are subject to a bacterial rot caused by *Bacillus putrefaciens.* The experiments with the lupines and beans are reported at considerable length. The bacteria cause a peculiar rotting of the tissues, accompanied by an exudation of viscous gum which has a very characteristic odor. Inoculations with attenuated cultures, or with a solution obtained by dissolving the alcoholic precipitate secured from the cultures, produced a mild form of disease which apparently rendered plants immune to subsequent attack. The author believes that the occasional immunity and resistance of some individuals to disease is largely brought about in this manner.

Result of experiments for the prevention of bunt in wheat, W. FARRER (*Agr. Gaz. New South Wales, 12 (1901), No. 4, pp. 419–430*).—In 1899 and 1900 the author conducted a number of experiments for the prevention of bunt in wheat at Lambrigg, Australia. The results of his experiments in 1899 showed that copper sulphate was not to be depended upon as a fungicide for the prevention of bunt. Repeating his experiments in 1900 the results obtained were much more favorable for the use of fungicides than the previous season. The experiments were conducted by drilling different varieties of wheat in 20-yard rows in which badly infested seed was used or smut balls were broken and mixed with the seed before treatment. The experiments show that formalin was efficient in destroying a considerable portion of the fungus spores, and from the tabular statement but few plants produced any smutty heads which had been treated either with formalin or copper sulphate. The fungicides, however, were in some instances decidedly injurious to the seed. Considerable difference in the susceptibility of varieties to smut is reported. A series of experiments was conducted in which the seed was soaked in hot water and other lots subjected to dry heat, the temperatures ranging from 130 to 180° F., but negative results were obtained. An experiment was attempted in which it was sought to infest wheat through the soil by stirring smut balls in the soil. The seed wheat sown was from plants which showed no indication of disease, and of the plants which grew and came to maturity every one was found to be free of bunt. In a somewhat similar experiment it was shown that plants grown from seed which had been produced on noninfested plants did not show any disease.

Observations on the propagation of apple-tree canker, DESCOURS-DESACRES (*Compt. Rend. Acad. Sci. Paris, 132 (1901), No. 7, pp. 438, 439; abs. in Gard. Chron., 3. ser., 29 (1901), No. 745, p. 227*).—The author reports on observations made on the apple-tree canker in nurseries containing several thousand trees, and prolonged for a considerable period. He asserts that the appearance of canker, caused by *Nectria ditissima*, is almost invariably preceded by the occurrence of a woolly aphis on the branches or roots of the trees. The presence of the woolly aphis is almost invariably followed by the appearance of canker, if diseased trees are in the immediate vicinity, otherwise there is no canker. The appearance of canker followed punctures of the aphis when the insect had been transferred from a contaminated region, and all the cankers examined on the apple tree contained the fungus *N. ditissima*. Experiments were conducted in which colonies of woolly aphis were transferred from a diseased tree and placed upon a sound one near wounds which had been intentionally made, and soon after the canker growth was observed in these wounds; while colonies taken from sound trees and transferred to other trees, under identical conditions, seldom developed any cankerous growth. These experiments were repeated a number of times with similar results. It seems that the woolly aphis is an active agent in the transmission of apple canker, not only in preparing the way for the fungus, but in actually transporting the mycelium and spores to wounds which had been accidentally made. As means for preventing the occurrence of this disease, nicotin, tannin, and tannic acid have been found very efficient, the solution being employed after thorough cleansing of the diseased part and cutting away the cankerous growth. The use of tannic acid gave particularly favorable results.

The canker fungus (*Jour. Bd. Agr. [London], 8 (1901), No. 1, pp. 12-16, pl. 1*).—A popular description is given of the apple-tree canker of Europe (*Nectria ditissima*). In addition to attacking apple trees, some varieties of which are more susceptible than others, this fungus has also been noted on pear, plum, oak, beech, ash, hazel, alder, maple, and linden. Young branches of trees which are attacked should be cut off as soon as the fungus shows itself, and older branches may have the wounded parts cut away and the cut surface coated with gas tar or some similar substance. If the disease spreads from the original point of infection the branch should be cut off. The fungus may be held in check by applying a strong solution of sulphate of iron to the diseased parts of the trees.

Root rot of peaches, sugar prunes, and apricots, H. VON SCHRENK (*Pacific Rural Press, 61 (1901), No. 21, p. 324*).—A brief account is given of a disease which attacks the roots of peaches, prunes, and apricots. The fungus attacks the younger roots, growing through the bark into the inner bark and the cambium layer. As the disease progresses the newer wood becomes affected, and pockets filled with gum appear here and there. At first these pockets are very small, but rapidly increasing in size and fusing form large cavities separated only by thin layers of pith rays. The gum exudes from the bark, where it can be readily detected in roots still alive. With continued growth of the fungus the cambium layer and inner bark are killed near the point of infection, and the fungus spreads toward the base of the tree. In trees which are in a dying condition the bark readily separates from the diseased roots. In the specimens submitted to the author there were no signs of fruiting bodies, so that the nature of the fungus could not be definitely determined. Root diseases, caused by *Agaricus melleus* and *Peniophora parasitica*, which destroy many fruit trees, are described; and based upon other investigations the author recommends combating the diseases by trenching about diseased trees, sterilizing the soil where possible, and planting resistant varieties.

Pear blight on the Pacific coast, N. B. PIERCE (*California Fruit Grower, 26 (1901), No. 675, p. 4*).—The occurrence of pear blight among the orchards of pomaceous fruits is noted, and the cause of the disease and methods of infection are described, being essentially those given by Waite (E. S. R., 8, p. 796).

A cherry disease, F. CORBOZ (*Chron. Agr. Canton Vaud, 14 (1901), No. 15, pp. 387–389*).—Notes the occasional occurrence of *Gnomonia erythrostoma* upon cherries in Switzerland. The fungus attacks the leaves, sometimes very severely, but is seldom found upon trees where light and air are sufficient.

Fungus and insect enemies of citrus fruits and means for their prevention, G. D'UTRA (*Bol. Agr. São Paulo, 2. ser., 1901, No. 6, pp. 351–363*).—Brief descriptions are given of a number of fungus and insect enemies of the orange, with directions for their prevention. Among the diseases described are gummosis, which it is claimed is caused by *Mycosphærella lœfgreni*, as well as a second form caused by *Aphionectria coccicola*, *Didymella citri*, *Colletotrichum glœosporioides*, *Glœosporium spegazzini*, and *Fumago citri*. Of the insects described most of them belong to the group commonly known as scale insects.

Collar rot in citrus trees, W. J. ALLEN (*Agr. Gaz. New South Wales, 12 (1901), No. 6, p. 728*).—The occurrence of mal-di-goma or collar rot is mentioned and the removal of the diseased bark, after which the wound is treated with carbolic acid, is recommended as a treatment.

A cure for orange root rot (*Agr. Jour. Cape Good Hope, 19 (1901), No. 3, pp. 185, 186*).—Recommends digging up diseased trees, cleaning off all adhering dirt, and exposing the roots for a week or 10 days to the air under shade, after which cut the tree back severely and replant. This method, it is said, has been repeatedly followed with success.

Diseases of pineapples, C. W. MALLY (*Agr. Jour. Cape Good Hope, 19 (1901), No. 3, pp. 171–180*).—The author agrees with Schönland that the mealy bug is neither the originating cause nor an important factor in pineapple diseases.

Report of the agricultural chemical experiment station in Spalato, F. GUOZDENOVIĆ (*Ztschr. Landw. Versuchsw. Oesterr., 4 (1901), No. 3, pp. 254–272*).—Among the investigations pursued were experiments on the prevention of a number of plant diseases. Grape peronospora, oïdium, and white rot are described, and experiments reported in the use of various fungicides for their prevention. Among the substances used were solutions of various compounds of zinc, cadmium, nickel, and copper. The Bordeaux mixture proved the best suited to use in combating disease. Experiments on the efficiency of sea water as a fungicide were continued and indicated that the use of this substance is not to be recommended, as it has a decidedly injurious effect. A disease of olives, due to *Cycloconium oleaginum*, was decidedly injurious, but experiments with a 1 per cent solution of Bordeaux mixture or with a potassium permanganate solution showed that the disease could be readily controlled. Analyses of a large number of samples of wine are reported, as well as investigations in fertilizers, minerals, oils, etc.

Comparative effects of lightning and gélivure on grapevines, L. RAVAZ and A. BONNET (*Compt. Rend. Acad. Sci. Paris, 132 (1901), No. 12, pp. 805–807*).—The effect of electricity upon plants, as shown by the shattered trunks of trees when struck by lightning, is described at some length. The authors conducted a series of experiments in which growing grapevines were subjected for a short time to powerful electric currents from a dynamo, after which the plants were replaced in the vineyard, where they were subject to the ordinary conditions. The changes produced by the electric currents were compared with those produced by lightning, as well as those produced by the disease known as gélivure, which has been attributed to freezing and to bacterial agencies. The authors found in the plants subjected to electric currents that there was a drying, beginning at the summit of the branches. The bark was broken and crevices formed to various depths. Within the branches the tissues were dried and more or less destroyed. These conditions are identical with those produced by the disease in question, and the authors believe that what has been attributed to the bacterial disease or to freezing is really due to the effect of lightning upon the vines in the vineyard.

Gélivure, gummosis, etc., P. VIALA (*Rev. Vit., 15 (1901), No. 384, pp. 461–464*).—In a controversial article the author takes exception to the statement of Bonnet and Ravaz that gélivure as a bacterial disease should be no longer recognized, claiming this disease was due to the effect of lightning upon the vines. The effect of electricity on vines, as shown by experiments of these authors, is given above. The author of the present paper recounts his experiments and those of a number of others in which inoculation experiments were conducted with bacteria from diseased vines, in which the characteristic lesions were produced without any appreciable difficulty. The same general condition of vines is produced, the author claims, by the bacterial disease which he has described under the name gélivure, by the injury of hail and possibly by lightning. The different diseases which have been attributed to bacterial agencies, the author says, are probably identical, and maintains that the first name published was gélivure and that gummosis, maladie d'Oléron, and possibly mal nero are identical. While not denying that lightning may cause effects that have been confounded with bacterial disease, the author still maintains that there is a distinctive bacterial disease to which grapevines are subject.

Practical treatment for black rot and mildew, G. CAZEAUX-CAZALET (*Rev. Vit., 15 (1901), No. 392, p. 677*).—The relation between moisture, temperature, and growth of fungi is discussed, and the most advantageous time for spraying said to be during periods of low temperature, accompanied by rain. Spraying immediately after a period of hot, rainy weather is said to be useless.

Black rot and mildew, G. CAZEAUX-CAZALET (*Rev. Vit., 16 (1901), No. 396, pp. 68–71*).—Describes the essential characteristics of these diseases as shown upon the leaves, the object being to enable growers to recognize the diseases in their different stages and to know when to apply preventive treatments.

Gray rot of grapes, J. M. GUILLON (*Rev. Vit., 16 (1901), No. 401, pp. 206–208*).—Describes attacks of *Botrytis cinerea*, which the author considers the cause of most of the injury to vineyards in Charentes.

Concerning gray rot, B. DE CHEFDEBIEN (*Rev. Vit., 16 (1901), No. 402, pp. 236–238*).—Gives methods for the preparation and use of sulphosteatite for combating attacks of *Botrytis cinerea*.

Chlorosis of grapes, B. CHAUZIT (*Rev. Vit., 15 (1901), No. 393, pp. 718–719*).—This disease is said to be most injurious on vines grown upon calcareous soils. It may be wholly prevented by washing vines with a solution of iron sulphate, 400 gm. to 100 liters of water. The salt may also be applied to the soil about the base of the vine with advantage.

Sulphuring grapes during flowering, P. PACOTTET (*Rev. Vit., 15 (1901), No. 388, pp. 582, 583*).—The author concludes that the application of sulphur during flowering is not only not injurious to the setting of fruit, but aids in pollination, the blast of air scattering the pollen to a considerable extent. Applications at this time are said to be very beneficial in reducing mildew.

Sulphur and sulphuring, B. CHAUZIT (*Rev. Vit., 15 (1901), No. 388, pp. 580–582*).—Discusses the use of sulphur as a fungicide when applied as a powder or in various chemical compounds.

Copper fungicides and fine wines, P. PACOTTET (*Rev. Vit., 16 (1901), No. 398, pp. 129, 130*).—The author claims that the use of certain fungicides exerts an unfavorable influence upon the quality of some of the fine wines. This is especially true when resin, molasses, soap, etc., are added to increase the adhesive qualities of the fungicide. The use of verdigris or other clear fungicide for the later sprayings is recommended as not being injurious to the quality of the wine. If copper acetate is used, the excess of acetic acid is eliminated in the processes of fermentation.

Rhizophagus populinus, P. A. DANGEARD (*Botaniste, 7. ser., 1901, No. 6, pp. 285–287, pls. 2*).—In 1896 the author gave a preliminary note on a disease of poplar trees which was attributed to the above-named fungus. Since that time he has continued his investigations and affirms his previous conclusion that the fungus belongs to the order Chytridineæ. The parasite attacks the young roots, shutting off their nutrition and accomplishing their destruction. The roots of diseased trees contain but few root hairs, and young roots are very rare, and as a result the nutrition of the tree is impaired. If an examination be made of the roots the cortex will be found invaded by a nonseptate mycelium, which not only invades the tissues, but often completely fills the cells. The fungus does not extend into the woody tissue of the root. The effect on the tree is generally noticed by the destruction of the higher branches, since the roots are unable to furnish the normal amount of nutrition and the lower roots appropriate what is supplied, leaving the tops of the trees to perish. Some of the morphological phenomena of the fungus are described in considerable detail.

Woodiness of the passion fruit, N. A. COBB (*Agr. Gaz. New South Wales, 12 (1901), No. 4, pp. 407–418, pl. 1, figs. 13*).—Attention is called to a diseased condition of the passion vine, the fruit of which is used to a considerable extent in Australia. The disease, which the author designates as "woodiness," has been known for 10 years or more and is of widespread distribution. The name of the disease is derived from the characteristic appearance of the fruit. The affected vines are unhealthy in general appearance, their color being more or less yellowish green. The leaves are smaller, distorted, and spotted, and the branches more or less twisted and crooked. The rind of the fruit develops abnormally, the fruit frequently falling before maturity, and that which remains on the vines is worthless on account of the absence of edible pulp and the woodiness of the rind. The seeds of diseased fruits are invariably smaller and lighter in weight than sound ones. Just before the time for ripening, the diseased fruits assume an unnatural green color and not infrequently crack.

Various causes have been suggested as producing this disease, among which are exposed position, frosts, poor soils, improper fertilizers, and insufficient moisture. Associated with this disease the author has observed a fungus which is as yet not definitely determined. He believes from his investigations that the fungus is the specific cause of the disease, although as yet there is no direct evidence to substantiate this claim. Various remedies are suggested for the prevention of the disease, the principal of which are fertilizer mixtures by the use of which more vigorous vines are secured. It is claimed that the disease can be communicated through the planting of seeds from infected fruit, and the author recommends propagation by cuttings and layering wherever practicable. It is believed—although no experiments have been conducted to ascertain the fact—that the growth of the fungus may be prevented by spraying the vines with Bordeaux mixture.

Violet rusts of North America, J. C. ARTHUR and E. W. D. HOLWAY (*Minnesota Bot. Studies, 2. ser., 1901, pt. 5, pp. 631–641, pl. 1*).—The occurrence, distribution, and host plants are described of *Æcidium pedatatum*, *Puccinia violæ*, and *P. effusa*. The authors point out the distinctive characteristics of these different species, describing their different phases in detail. Four additional species of violet rusts are known to occur in Europe, and it is thought that they may eventually be found in this country.

Chrysanthemum rust, CHIFFLOT (*Gard. Chron., 3. ser., 29 (1901), No. 753, pp. 351, 352*).—In a translated article the author gives directions for the prevention of chrysanthemum rust. This consists of a winter treatment in which the leaves of affected plants should be collected and burned, and the pots and old stems sprayed with a solution of potassium sulphid. In the spring growers should choose buds not infected with the disease, and before using them they should be carefully examined to see that no pustules of rust are present. Before putting them in the frame it is recommended that they should be plunged in a solution of potassium sulphid. The summer treatment consists of the removal and burning of affected leaves and the spraying of plants with potassium sulphid solution.

When to apply Bordeaux mixture, G. Quinn (*Jour. Agr. and Ind. South Australia, 5 (1901), No. 1, pp. 18–22, figs. 5*).—Gives formulas for preparation of Bordeaux mixture, and for spraying peaches, pears, apples, and similar fruit recommends first application before the buds begin to swell. Later sprayings with more dilute mixtures should follow.

A lime and soap fungicide, Mancheron (*Rev. Vit., 16 (1901), No. 401, p. 208*).—Describes the preparation of a dilute Bordeaux mixture to which soap is added. The lime is said to be held in suspension in very fine particles, and the fungicide does not color fruit to any appreciable extent.

Crystallized and powdered copper sulphate, P. Pacottet and A. Lievre (*Rev. Vit., 16 (1901), No. 400, p. 179*).—The difficulty of dissolving the crystallized copper sulphate is pointed out, and it is stated that 2 forms of powdered copper sulphate are on the French market, one which is evidently crushed crystals, the other apparently crystallized from solutions which are agitated continually. Analyses show the latter varies considerably, some specimens containing as much as 10 per cent iron sulphate.

ENTOMOLOGY.

Some miscellaneous results of the work of the Division of Entomology (*U. S. Dept. Agr., Division of Entomology Bul. 30, n. ser., pp. 98, pls. 2, figs. 29*).—*The differential grasshopper in the Mississippi Delta; other common species, H. A. Morgan (pp. 7–33)*.—In Bolivar County, Miss., a large territory was flooded in 1897, and the flood prevented the planting of this area during that season. Weeds flourished in this locality to an unusual extent, and when the area was planted in 1898 grasshoppers were present in considerable numbers and attacked cotton. In 1899 the grasshoppers attacked cultivated plants in this region to an extent which constituted a plague. An investigation of the conditions surrounding this outbreak was made by the author. It was found that the eggs were deposited from July 20 to October 1, the number of eggs in each sac ranging from 103 to 132. The eggs were deposited in ditch banks, plantation roads, upon levees, around stumps and logs, and even in the logs. It was believed by some of the settlers in that locality that areas which had been flooded and left uncultivated were much frequented by the grasshoppers for the purpose of laying eggs. The eggs began hatching about the middle of April, and the entire life history of the grasshoppers, minus the time required for incubation, was 119 days. The young were observed to remain after hatching for several hours close to the egg pod from which they had emerged. Experiments were tried in perfecting remedies for use against this grasshopper. Thorough cultivation was found by laboratory tests and field observations to be an effective method for breaking open the egg pods and exposing the eggs to climatic changes. Winter cultivation of the soil was therefore advised where practicable. Spraying with a 12 per cent kerosene emulsion at least once a day was very effective when applied upon the egg beds at about the time of hatching. Another effective method was found in damming water in ditches, covering the surface with kerosene oil or kerosene emulsion, and driving the grasshoppers into the ditches. Where hopperdozers could not be used successfully it was found that good effects were secured from dragging tarred sheets over infested country. The young were thus captured and destroyed. Experiments with the South African fungus showed that where a solution of this fungus was spread out, diseased grasshoppers were abundant. Another grasshopper (*Schistocerca obscura*) was not affected by this fungus. Experiments in the use of acid phosphate, lime, kainit, and other substances to check the march of the grasshoppers proved the ineffectiveness of these substances. Among the natural enemies of the grasshopper mention may be made of the locust mite, blister beetle, *Helicobia helicis, Sarcophaga* spp., *Scelio hyalinipennis,* and *S. œdipodæ.* Notes are given also on the occurrence and injurious habits of *Schistocerca americana*, *S. obscura*, *Dictyophorus reticulatus*, *Dissosteira carolina*, *Chortophaga viridifasciata*, *Orchelimum agile*, and other related species. With regard to the relation between flooding and rainfall and the presence of grasshoppers, it was observed that where heavy rains occur in May and June, immediately following a flooding of the land, the grasshoppers do not prevail to any great extent. Where, however, dry summers follow flooding the grasshoppers occur in much larger numbers.

Some insecticide experiments, C. L. Marlatt (pp. 33–39).—Plum, apple, and pear trees were sprayed with crude petroleum on March 22 between 2 and 3 p. m. The day was bright and the weather continued fair for 4 days after the application. Another block of trees was sprayed at the same time with kerosene. After the second day the trees which were sprayed with kerosene showed only a very slight discoloration. The crude petroleum was apparent on the trees, however, for 3 weeks. The grass under the trees seemed at first to be badly affected by kerosene, but later it recovered and showed no permanent injury. No bad effects were produced on the trees by either crude petroleum or kerosene, and the San José scale and *Diaspis pentagona* were apparently all killed. A lime, sulphur, and salt wash, made in the proportion of 30 lbs. of lime, 20 lbs. of sulphur, and 15 lbs. of salt to 60 gal. of water, was applied at a boiling temperature to pear and plum trees infested with San José scale and *D. pentagona*. The application was made on March 23 and repeated on March 24. In order to determine whether the heat of the solution had anything to do with its effectiveness, infested trees were sprayed with boiling water with the result that none of the scale seemed to be injured by such application. The San José scale was completely destroyed by the lime, sulphur, and salt wash. The weather following the application was exceedingly favorable, and it is believed that where such is the case this insecticide may prove as effective in the East as on the Pacific Coast. An application of Bordeaux mixture kerosene emulsion, in the proportion of 5 lbs. Bordeaux mixture to 1 gal. of kerosene, churned together until the oil was emulsified, was sprayed on peach trees infected with *D. pentagona* on April 24. The mixture had little effect on the trees, but did not kill the scales. Kerosene-lime emulsion, in the proportion of 4 lbs. fresh lime and 5 gal. of water to 1 gal. of kerosene, applied on April 14 to peach trees infested with *D. pentagona*, had the effect of destroying nearly all of the scales without causing injury to the trees. Whitewash, prepared by slaking 2 lbs. of lime in a gallon of water, and applied in a thick coat on April 14 to a plum tree infested with *D. pentagona*, had little or no effect on adult scales. It appeared to have a slight value in preventing the settling of young scales. Formaldehyde gas produced in a patent generator to a strength 3 or 4 times greater than that which is necessary for germicide purposes was tested on infested stored products. The Angoumois grain moth was killed if not protected, but the bean weevils were apparently not injured. A test was made of this gas by placing a tent over a peach tree infested with *D. pentagona* and generating the gas under the tent. The tree was badly affected and died soon after the application. Scale insects were destroyed.

The carriage of disease by flies, L. O. Howard (pp. 39–45).—The essential parts of this article have been noted from another source (E. S. R., 13, p. 163).

The green clover worm (*Plathypena scabra*), *F. H. Chittenden* (pp. 45–50).—The larva of this moth feeds on leguminous plants, especially clover, and has been observed as attacking beans, peas, soy beans, strawberries, and blackberries. When attacking strawberries the pupal condition was passed in the rolled strawberry leaf. The species is described in its various stages and brief notes are given on its habits and life history. Poisons can of course not be used on infested pasture lands or on clover fields. The attacks of the insects on lawns, however, can be largely prevented by frequent mowing with a lawn mower.

Report upon an investigation of the codling moth in Idaho in 1900, C. B. Simpson (pp. 51–63).—The codling moth is reported as occurring everywhere in Idaho except in certain localities in the mountains. During 1900 about 50 per cent of the apple crop was destroyed and in some places the damage was as high as 75 per cent. Pears were only slightly infested. The codling moth was first known as an apple pest in Idaho in 1887, and probably came into the northern part of the State by way of the Snake River Valley. According to observations on different varieties of apples, the Pewaukee was most infested, while the Winesap was least attacked. Eggs were found throughout the summer either on the fruit or on the upper surface of the leaves. About 60 per cent of the larvæ of the first brood entered the apple at the calyx end. In later broods only a few entered at this point. A number of larvæ may be found in a single apple, 13 burrows being found in one large specimen. In Idaho the broods overlap to a remarkable extent; all stages of the insect except the adult were found in the field from July 7 to September 1, and larvæ were found under bands on the trees every day during this time. Every tree had at least 3 complete broods and a partial fourth brood during the year. A few of the pupæ are parasitized, but the parasites are not identified. The larvæ are attacked by ants and birds, and bats occasionally capture the moths. According to the author's observations, the chief arsenites are all about equally effective as applied against the codling moth. It is recommended that 2 sprayings be applied while the calyx is open, one immediately after the blossoms fall and the other about a week later. The third application should be made when the second brood is entering the fruit. Windfalls should be destroyed, the easiest method being to allow hogs or sheep to run in the orchard. Banding the trees is also very effective. The bands should be placed around the trunk of the tree from about 1½ ft. above the ground upward. If the tree is large it is best to put a band on each of the branches. Two bands on the trunk are recommended as better than one.

Insects and the weather during the season of 1900, F. H. Chittenden (pp. 63–75).—From observations on this subject the author comes to the conclusion that forms introduced into the North from further south show a tendency to produce one or more generations in excess of the number developed by related species which are native to the region of the adopted habitat. These introduced species are frequently observed to remain later in the field than native species. As a result of these habits, in combination with their greater susceptibility to low temperatures, the introduced species are liable to great destruction every year, and their residence in the northern limits of their range can therefore scarcely be considered permanent.

On the habits of Entilia sinuata, L. O. Howard (pp. 75–78).—This species of leaf hopper is found on a number of plants, especially sunflower. The insect is attended by 2 species of ants, *Camponotus pictus* and *Formica subsericea*. The young leaf hoppers are guarded by the ants and kept in close colonies. It is also observed that the adult female broods over the eggs until they are hatched. When the insect occurs in large numbers on cultivated sunflowers it may be destroyed by an application of kerosene emulsion.

Fumigation with carbon bisulphid, W. E. Hinds (pp. 78–82).—A large room belonging to a tobacco establishment containing about 75,000 cu. ft. and infested with *Lasioderma serricorne* was fumigated with carbon bisulphid. About 145 lbs. of this substance was exposed in 50 or more pans, 3 ft. long by 1 ft. wide and 1 in. deep. The pans were distributed through the room as high up as they could be conveniently placed. The building was carefully locked and left for 22 hours, after which it was opened for ventilation. Nearly all of the beetles were destroyed, and the treatment was considered successful. Special caution is urged in the use of this substance in preventing any fire from coming in contact with the gas, and brief notes are given on the effects of the gas upon human beings.

General notes and notes from correspondents occupy the remaining portion of the bulletin (pp. 82–98). These notes cover a great variety of subjects, including habits and life history of various insects and remedies which have been found successful in various parts of the country.

Proceedings of the Entomological Society of Washington (*Proc. Ent. Soc. Washington, 4 (1901), No. 4, pp. 347–527, figs. 21*).—This number of the proceedings of the society contains many papers on entomological subjects of a technical nature, short notes, biographical notes, and reports of trips in various localities for the purpose of collecting and observing the habits of insects. Special mention may be made of a few articles of more or less economic value.

On the insect fauna of the mistletoe, E. A. Schwarz (pp. 392–394).—In Arizona the mistletoe is much infested by *Lecanium phoradendri*. An undescribed species of snout beetle was found boring into the twigs of mistletoe and finally causing the death of the plant. Twigs thus infected may not be killed at once, but serve as favorable places for the development of bark beetles.

Remarks on the spittle insect (Clastoptera xanthocephala), O. Heidemann (pp. 399–402, pl. 1).—This insect is reported as causing some injury to chrysanthemums. Ragweed is considered as being the original food plant of the species. The habits of the immature forms of the insect are briefly described.

The ant decapitating fly, T. Pergande (pp. 497–501).—*Apocephalus pergandei* is described by D. W. Coquillett as a new species. The insect was found parasitic in the head of the carpenter ant (*Camponotus pennsylvanicus*). The fly is described and brief notes are given on its habits.

A season's experience with figs and fig insects in California, E. A. Schwarz (pp. 502–507).—A historical account is given of attempts to raise Smyrna figs in California and to introduce *Blastophaga grossorum* for the purpose of fertilizing the figs. At Fresno, Cal., in 1900, it was estimated that there were enough female fig insects to inhabit 20,000 figs. At Niles, Cal., early in April, winter figs containing fig insects were received from Fresno and established in a fig arboretum containing a number of Italian caprifig trees. This experiment in establishing a second colony of the fig insects was successful. The insect underwent only 2 generations at Niles during the year.

Insect record for 1900, C. M. WEED (*New Hampshire Sta. Bul. 81, pp. 9–22, figs. 11*).—A striking reduction in the number of the forest tent caterpillars is reported and is considered due to unfavorable weather conditions, especially to a frost which occurred on May 11, and during which the minimum temperature of 16° F. was recorded. The caterpillars of the Antiopa butterfly were also much less abundant than usual, and the cause of this partial disappearance is believed to be the attack of parasites, for instance, *Telenomus graptæ*. The American tent caterpillar occurred in large numbers during 1900. Tarnished plant bug was recorded as injurious to sweet peas. Imported currant borer was abundant on currant bushes in Durham. In some parts of the State considerable damage was done by locusts, especially by *Melanoplus atlanis* and *Dissosteira carolina*. Many of the grasshoppers were destroyed by a fungus disease. Brief notes are given on *Cacœcia cerasivorana*. The eggs are said to be laid on the bark of choke cherries near the ground. Brief popular notes are also given on the occurrence and habits of *Bucculatrix canadensisella*, Hunter's butterfly, monarch butterfly, and walking stick.

Entomological work and notes for 1900, W. W. FROGGATT (*Agr. Gaz. New South Wales, 12 (1901), No. 7, pp. 794–805, pls. 2*).—During the season locust plagues of considerable severity occurred in some parts of the country. Formulas are given for the preparation of mixtures of bran and arsenic, and bran and Paris green. A number of parasites of the locust are described, among which mention may be made of *Masicera pachytyli* and several species of Ichneumon flies.

The weed weevil (*Lixus mastersi*) is usually found feeding upon a species of Amaranthus. During the season, however, the author observed it as an orchard pest. The insect was especially injurious to young grapevines on which it devoured the young buds.

Carrot seeds were found infested with *Sitodrepa panicea*. The insect is reported from nearly all parts of the civilized world, and is a well-known pest in herbaria and drug stores. It may be destroyed in infested seed by fumigation. Complaints were made that orange trees were being attacked by *Bostrychopsis jesuita*. It is believed by the author, however, that this beetle did not attack the trees until after they were dead, or nearly dead. Related species of this genus are known to attack forest trees in a living condition in Germany and elsewhere. Descriptive and economic notes are given on *Mecyna polygonalis*, reported as occurring on broom corn; *Teara contraria*, which is reported as especially injurious to eucalyptus; San José scale: and *Halterophora capitata*. The last-named species was observed crawling over oranges and depositing their eggs in the skin of the fruit.

Report of the entomologist, W. W. FROGGATT (*Agr. Gaz. New South Wales, 12 (1901), No. 8, pp. 915–920*).—Mention is made of the various lines of work undertaken by the entomologist, and of the addition in collections and equipment made to the department during the previous year. Special attention is given to the study of the San José scale, *Plusia verticillata*, *Agrotis suffusa*, and various species of fleas.

Insects injurious to staple crops, E. D. SANDERSON (*New York: John Wiley & Sons, 1902, pp. 295, figs. 162*).—This volume contains a compilation of information concerning the chief insect pests of staple agricultural crops, together with observations from the personal experience of the author. Chapters of the book are devoted to insects injurious to the following crops: Grains and grasses, wheat, Indian corn, clover, cotton, tobacco, potato, sugar beet, and hop plant. One chapter is occupied with a discussion of insects injurious to stored grain. A general discussion of insecticides is given at the end of the volume. In connection with the treatment of each crop for insect enemies, special attention is given to a consideration of various cultural methods which are adapted to preventing injury from the insects by which the crop is naturally attacked.

The Colorado potato beetle, F. V. THEOBOLD (*Jour. Bd. Agr. [London], 8 (1901), No. 2, pp. 147–154, pl. 1*).—This insect recently secured a foothold in England and was found breeding in considerable numbers. All stages of the insect were found in one large field of potatoes. The infested locality at Tilbury was burned over with kerosene, the ground was then saturated with kerosene and dressed with gas lime, which later was plowed under. All surrounding herbage was cut and burned, and an examination of the country for a distance of 3½ miles in all directions indicated that the beetle had been exterminated. The life history and habits of the insect are gone over anew from original observations. A list of food plants is given. At Tilbury the beetle is said to have matured on tomatoes. Notes are given on the natural enemies and means of combating the potato beetle. The author considers that the climatic conditions in Great Britain are favorable to the establishment and development of the Colorado potato beetle, and urges the necessity of keeping sharp outlook to prevent its becoming thoroughly established in the country.

The apple sawfly (*Jour. Bd. Agr. [London], 8 (1901), No. 2, pp. 183–187, fig. 1*).—Injuries from *Hoplocampa testudinea* have been reported for 2 years on apples. The attack of the insect resembles somewhat that of the codling moth. The female appears in the spring at the time when the apple blossoms are opening, and deposits its eggs, usually one in each blossom, below the calyx. Under certain conditions there may be 2 broods of the insect each year. It is recommended that infested fruit should be removed from the trees and destroyed. Some help may be expected from thorough cultivation of the soil underlying the trees, but spraying does not promise much good in combating this insect.

Notes on Coccidæ (*Contrib. Biol. Hopkins Seaside Lab. Leland Stanford Jr. Univ., 1901, No. 25, pp. 387–420, 1–14, pls. 6, fig. 1*).—*Notes on Cerococcus, Rose W. Patterson* (pp. 387–398).—The author gives detailed description and biological notes on *C. ehrhorni*, found on live-oaks; *C. quercus*, reported as abundant on oaks in Arizona and southern California; and *C. corticis*. A black fungus is reported to occur in connection with the last-named species.

Notes on new and little known Californian Coccidæ, S. I. Kuwana (pp. 399–408, pls. 2).—Detailed descriptive notes are given in connection with observations on the food plants and habits of *Eriococcus artemisiæ, Ripersia festucæ, Lecanium adenostomæ,* and *Pseudolecanium tokionis.* The first 3 species are described as new.

The redwood mealy bug, G. A. Coleman (pp. 409–420).—The author gives a detailed description of *Dactylopius sequoiæ* in all of its stages. The first specimens of the insect were found on small cultivated redwood trees near Stanford University, and were later found in the university arboretum, as well as through the Sierra Morena Mountains. The species was preyed upon by the larva of a ladybird, and an undetermined parasitic fly was bred from female scales.

The San José scale in Japan, S. I. Kuwana (pp. 14).—The author spent several months in Japan during the season of 1900 for the purpose of studying the distribution, relative abundance, and parasites of the San José scale in that country. The insect was found in all of the islands which were visited. The amount of damage varied from slight attacks in some orchards to complete destruction in others. With few exceptions, however, the insect was nowhere sufficiently abundant to endanger orchards. In some locations pear trees suffered more than apple trees. In one locality the oldest orchard, imported from America about 25 years ago, was not infested. The insect was not found on high elevations, but has been known to be present in Japan for the past 30 years. No native species of trees were infested. The insect is attacked by numerous parasites which almost entirely destroy the female scales in some localities. The food plants, as observed in Japan, include pear, apple, plum, peach, Japanese quince, currant, and willow. Several parasites and ladybirds were observed preying upon the San José scale. The species were not identified. In Japan the best spraying machines and insecticides have not been used for the destruction of the scale and it is, therefore, practically unchecked by artificial methods. Soapsuds, kerosene, and kerosene mixture have been applied with a paint brush in a manner which often causes the death of the trees.

The currant-bud mite or currant-gall mite (Phytoptus ribis), R. NEWSTEAD (*Jour. Roy. Hort. Soc.* [*London*], *25* (*1901*), *No. 3, pp. 286–302, figs. 8*).—The author describes the appearance of the mite in its different stages and of affected buds. The life history of the mite was worked out again in detail. The mites first appeared in newly formed buds during the second and third weeks of July. Previous to that time they were found on the leafstalks. From this date they increased in numbers, until a maximum was reached in March and April. When the infested buds died the mites died with them in great numbers, and a migration to fresh buds was seldom noted. As many as 3,000 mites may be found in a single infested bud. All varieties of black currants are attacked. The author failed to find a mite on the varieties of red currant.

The author gives a review of the literature and means of combating this mite, with notes from original observations. The removal of infested buds proved generally unsuccessful, applied on a large scale. On a single row or small patches of currants the method is sometimes more successful. Cutting all bushes down to the ground is reported as an effective method of combating the mite. Liquid insecticides are not recommended. Experiments in immersing infested branches in hot water for various lengths of time gave fairly satisfactory results. The mites were destroyed by immersion for 1 minute in water at a temperature of 140° F. and for 15 minutes at a temperature of 115° F. While this method is perfectly successful in a laboratory, it can not be managed conveniently on a large scale in the field. Rather contradictory results have been obtained by different experimenters with the fumigation method by means of hydrocyanic-acid gas. The author recommends planting clean healthy stock in single rows between other crops or in isolated areas. Plants should be pruned so as to admit plenty of light and careful watch should be maintained for the first appearance of infestation, when infested patches should be immediately burned.

The fall army worm and variegated cutworm, F. H. Chittenden (*U. S. Dept. Agr., Division of Entomology Bul. 29, n. ser., pp. 64, figs. 11*).—The fall army worm (*Laphygma frugiperda*) feeds normally on grasses, cultivated grains, and a few weeds, and produces 2 or 3 generations per year, according to the location. In 1899 the infested territory comprised large portions of the United States east of the Rocky Mountains. The author gives a description of the insect in its various stages, accompanied with technical descriptions of the egg and larva, by H. G. Dyar. The insect is distributed from Canada to Florida, and west to Colorado and Montana. It also occurs in Jamaica, Brazil, and Cuba. It is considered indigenous to North and South America. Notes are given by the author on the common and scientific names under which the insect has been known and on the various reports which were received concerning its outbreaks in 1899, 1900, and 1901. During 1900 it was reported as injurious on corn, which it attacked in a manner similar to that of the bollworm, and also to the chick-pea, ruta-baga, hollyhock, and lamb's quarter. The insect was described somewhat more than a hundred years ago, but it was not until 1855 that it began to attract attention by its depredations. The food plants include grasses, cereals, cotton, peas, grapes, various fruit trees, and other plants. The egg masses which are deposited in the fall produce larvæ and, as a rule, pupæ before winter. The full-grown larvæ enter the soil to a depth of about an inch and become inclosed in earthen cells. The larvæ of the first generation appear in May and June. The egg period is determined as about 10 days. In the District of Columbia hibernation takes place exclusively in the pupal condition. The natural enemies of this insect include English sparrows, which feed upon the larvæ, blue jays, and a number of parasitic and predaceous insects of which the most important are *Winthemia quadripustulata*, *Frontina frenchii*, and ants.

When the fall army worm assumes the habits of the common army worm it may be combated by the same means which are usually adopted against the latter. Wherever the arsenical poisons can be conveniently and effectively used, this remedy should be adopted. Lawns may be successfully treated by application of kerosene emulsion. In some situations mechanical methods, such as rolling and the use of barriers, may be adopted with success. Clean cultural methods and rotation of crops are always indicated in cases of bad infestation, and fall plowing has the effect of breaking up the earthen cells in which the pupæ are found, and thus exposing them to climatic changes. Infested rice fields may be flooded, and where bad outbreaks of the species are expected wheat and rye should be sown late. In vegetable gardens the use of poisoned baits is recommended. A list is given of the literature relating to this subject.

The variegated cutworm (*Peridroma saucia*) is a common insect in gardens, pasture lands, fields, orchards, and greenhouses, and feeds upon a great variety of cultivated plants. The insect is considered as originally from Asia Minor or southern Europe, and its distribution is cosmopolitan. It occurs practically throughout the United States. A description is given of the insect in its various stages, and notes are presented on outbreaks which have occurred in various parts of the United States and in Canada. These outbreaks include attacks on crops in gardens and fields, and also on greenhouse plants. Extended notes are given on the food plants of the insect, which include a great variety of cultivated plants and weeds. As a rule, this cutworm hibernates in the larval stage, although hibernation takes place to some extent in the pupal and adult conditions. Considerable injury is done in the spring by larvæ which have hibernated. There are at least 2, and perhaps 3, generations in the latitude of the District of Columbia. Hibernated larvæ begin their attacks in May, and a second generation is produced which causes injury in July and August. The duration of the egg stage is about 3 weeks at moderate temperatures, while the pupal stage lasted for from 10 to 21 days. The natural enemies of this species include a number of parasitic insects, among which mention may be made of *Phorocera saun-*

dersii, *Archytas analis*, *Ichneumon capitus*, and *I. maurus*. The cutworm is preyed upon to some extent by the common ground beetle (*Scarites subterraneus*). The insect is also subject to a bacterial disease and to the attacks of a parasitic fungus (*Empusa aulicæ*). Robins, crows, blue jays, chickens, turkeys, and pigs are reported as feeding upon the cutworm.

The artificial remedies which are recommended in combating this insect include the use of poisoned bran mash, poisoned vegetable bait, placing tarred paper or cotton batting around the trees, spraying with Bordeaux mixture, and hand picking.

The army worm (Leucania unipuncta), E. A HOLMBERG (*Bol. Agr. y Ganadería, 1* (*1901*), *No. 2, pp. 3–8, pl. 1*).—An account is given of the geographical distribution, appearance, habits, and means of combating this insect. The remedies which are in common use in this and other countries for army worms are recommended.

Combating army worms, A. L. ARRIBALZAGA (*Bol. Agr. y Ganadería, 1* (*1901*), *No. 5, pp. 52–55*).—The author gives brief notes on the habits, life history, and means of combating *Eurycreon similis*, bollworm, and army worm. Attention is called to the agency of birds in destroying these insects.

Tent caterpillars (*Jour. Bd. Agr.* [*London*], *8* (*1901*), *No. 2, pp. 191–197, pls. 2*).—Brief descriptive biological and economic notes on *Clisiocampa neustria* and *Porthesia chrysorrhœa*.

Killing cankerworms in California, H. G. KEESLING (*Rural New Yorker, 60* (*1901*), *No. 2678, p. 371*).—The use of traps for catching the female moths of cankerworms or for preventing them from climbing the trees proved unsuccessful. The experiment with moth traps was conducted on 200 acres of fruit trees and the traps were given a careful test. Experiments with Paris green, on the other hand, gave good results. Paris green used at the rate of 1 lb. to 200 gal. of water was not sufficient to kill the worms, but when used at the rate of 3 lbs. to 200 gal. the worms were nearly all killed, and the author believes this to be the most successful method for fighting cankerworms. No injury was caused to the foliage by using the Paris green in this strength. Apparently it made no difference in this regard whether a small quantity of lime was mixed with the Paris green or not. During the experiments 3 different brands of Paris green were used without noting any difference in results. It is stated that the same strength of Paris green was used with success on apple trees in destroying the codling moth.

Insect enemies of the spruce in the Northeast, A. D. HOPKINS (*U. S. Dept. Agr., Division of Entomology Bul. 28, n. ser., pp. 48, pls. 16, figs. 2*).—The species of spruce upon which observations were made were *Picea rubens*, *P. canadensis*, and *P. montana*. A study of insect attacks upon these trees was made in Maine, New Hampshire, and Vermont. It was found that dead trees occurred in well defined areas and were not confined to particular conditions of soil, exposure, or altitude. A species of bark-mining beetle, described under the name *Dendroctonus piceaperda*, was found to be the primary cause of the death or unhealthy condition of the spruce. The insect passes the winter in all stages of larva and in adult condition. The beetles which develop from hibernating larvæ begin to emerge about the middle of June. Galleries were excavated and eggs deposited by June 19. Larvæ were found in these galleries during the last few days of July, and adult beetles were observed on October 4. In northwestern Maine there seems to be only 1 brood annually.

The beetle attacks only the spruce and only the larger trees. Entrance is made to the bark of healthy trees from 6 to 10 ft. from the ground, and trees which are weakened from disease may be attacked nearer the ground. A detailed description is given of the primary gallery and the secondary or larval mines. Evidence of infestation is to be recognized in the presence of balls of pitch pushed out by the beetles when excavating, in the pale or grayish green color of the leaves, and by the reddish appearance of the twigs after the leaves have fallen. Only 1 brood of beetles develops on the same tree unless, as sometimes happens, but one side of the tree is attacked one year and the other side the next year. The presence of beetles is suspected also where woodpeckers are noticed working upon the trunks of spruce in unusual numbers. A globular fungus (*Polyporus volvatus*) is usually associated with attacks of the beetle and is observed protruding from the holes made by excavation.

A parasitic insect (*Bracon simplex*) and a predaceous beetle (*Thanasimus nubilus*) were observed preying upon the bark beetle. The most important bird enemies of this forest pest are various species of woodpeckers. A few of the larvæ were found suffering from what appeared to be a fungus disease. Severe freezing or sudden climatic changes may kill the pupæ and young beetles to a slight extent. Among the injurious insects which were found associated with the bark beetle, the two most important were *Polygraphus rufipennis* and *Tetropium cinnamopterum*. Extensive experiments were conducted by Mr. A. Cary on the effect of girdling certain trees which were about to be cut for lumber, for the purpose of attracting the beetles to them. The results are reported in detail, and it appears from these experiments that the best period for girdling spruce trees to attract the bark beetle away from other trees is at the time when the first pupæ of the beetle begin to appear in the bark, and extending from that time until the beetles begin to fly. It was found that the beetles do not remain in dying or dead trees for more than one year. It is estimated that 3 pairs of beetles to the square foot of bark, throughout an extent of from 10 to 15 ft. of the trunk, are sufficient to kill a tree.

The remedial measures which are recommended in controlling this insect include the regulation of winter cutting so that as many of the infested, dying, and dead trees as possible may be cut and placed in the water before June 1; cutting trees which have recently been attacked in summer and removing the bark from their trunks and stumps; and girdling during the first part of June the trees where logging operations will be carried on during the following summer. The best method of girdling is considered to be that of hacking through the bark with an ax around the trunk about 2 or 3 ft. from the base.

Locust extermination (*Agr. Jour. Cape Good Hope, 18* (*1901*), *No. 12, pp. 820–833; 19* (*1901*), *Nos. 2, pp. 99–106; 3, pp. 165–171; 4, pp. 248–262*).—This report contains a summary of the investigations in locust extermination which have been carried out in South America, Africa, and other countries. The so-called North American fungus (*Empusa grylli*) operates most successfully during the warmer, damper part of summer and attacks well-developed insects rather than young ones. Experiments with the Argentina fungus, or Carcarañá, gave good results and indicated that much may be hoped for from this fungus. Less satisfactory results were obtained from the use of the South African fungus. Detailed notes are given on the peculiarities of culture which are favorable to the propagation of fungus epidemics among the locusts, on migrations of locusts, and the various influences which determine the course taken by the armies of locusts. W. Roe reports success in destroying locusts by spraying with a soap solution, to which cyanid of potash was added. A copy is given of the locust law passed by Argentina for the purpose of preventing, so far as possible, the excessive damage from locusts.

The Indian starling (*Acridotheres tristis*) was imported into South Africa for the purpose of testing its value in the destruction of locusts. The birds were found to destroy locusts in considerable numbers, but in some localities form the habit of destroying fruit, which constituted a more or less serious objection to their further importation.

A general report is given by C. Frers on the invasions of locusts in Argentina from 1898 to 1900. This report contains an account of the origin, development, and extent of the different locust plagues which occurred during that time, and the routes followed by the adult and young locusts. The hibernating zone or localities where winter refuge is sought most extensively by the locusts are indicated, as well as the most frequented localities for the deposition of eggs. A classified list is given of natural and artificial agencies which tend to the destruction of locusts.

These include parasites and predaceous insects, as well as other animals, and all of the mechanical and chemical remedies which have been suggested for the destruction of the insects.

Winter washing of fruit trees (*Jour. Bd. Agr. [London], 8 (1901), No. 2, pp. 145, 146; Bd. Agr. [London], Leaflet No. 70, pp. 2*).—A caustic alkali wash, made by dissolving 1 pound of commercial caustic soda in water and 1 pound of crude potash in water; after these substances have become dissolved, they are mixed together, ¾ lb. of treacle added, and then sufficient water is added to make 10 gal. This wash is recommended as efficient in removing moss, lichens, and dead bark from the trunks of trees, and for destroying woolly aphis, codling moth, oyster-shell bark louse, and the eggs of the red spider and plant lice.

Catalogue of the Tabanidæ, C. Kertész (*Extr. from Természet. Füzetek, 23 (1900), pp. 79*).—The author has compiled in this article a complete catalogue of the genera and species of the Tabanidæ which have thus far become known. In cases where the original descriptions were not accessible to the author the species were entered according to the citations in *Zoological Record* and *Archiv für Naturgeschichte*.

Mosquitoes. How they live; how they carry disease; how they are classified; how they may be destroyed, L. O. Howard (*New York: McClure, Phillips & Co., 1901, pp. 241, figs. 50*).—In this volume an account is given of the life history and habits of mosquitoes, their connection with malaria, yellow fever, and filariasis. A classification of genera and species of the North American mosquitoes is given, and the natural and artificial enemies of mosquitoes are discussed. Short chapters are presented containing directions for collecting and preserving mosquitoes, and giving analytical tables for identification of different species. The volume constitutes an elaborated form of bulletins by the author, especially Division of Entomology Bulletin 25 (E. S. R. 12, pp. 768, 769).

The fight against mosquitoes, W. J. Matheson (*Rural New Yorker, 60 (1901), No. 2681, p. 417*).—A brief account is given of the habits and life history of mosquitoes in their various stages. It is believed that no body of water which exists during the summer for as long a period as 3 weeks is free from the liability or even certainty of becoming a breeding place for mosquitoes. The use of kerosene oil, as commonly recommended, is considered a successful remedy.

Dipterous larvæ as occasional parasites of man, E. Peiper (*Fliegenlarven als gelegenliche Parasiten des Menschen. Berlin: Louis Marcus, 1900, pp. 76, figs. 41*).—The author briefly discusses the life history and habits of diptera which have been reported as parasites of man. A considerable number of species are considered and notes are given on the conditions surrounding the various cases of parasitism. A list of the literature on the subject is appended to the pamphlet.

Egg-laying workers, C. Dadant (*Rev. Internat. Apicult., 23 (1901), No. 11, pp. 220–226*).—The author gives a general discussion, with historical references, on the subject of the conditions under which this phenomenon among working bees is observed.

Armature of the prolegs of the silkworm, E. Verson (*Sull' armatura delle zampe spurie nella larva del filugello. Padua: Tipografia Cooperativa, 1901, pp. 27, pl. 1*).—The author describes in detail the anatomical structures of the prolegs of silkworms, with special reference to the development of the claws or bristles connected with these structures. The results of this anatomical study are discussed in connection with a critical review of the literature on the subject.

FOODS—NUTRITION.

Experiments on the digestibility of butter and certain butter substitutes, H. Wibbens and H. E. Huizenga (*Arch. Physiol. [Pflüger], 83 (1901), No. 10–12, pp. 609–618*).—A comparison was made of the digestibility of butter, margarine, and sana, a butter substitute which, according to the manufacturers, contains no milk fat. A number of the experiments were made with dogs; in others the authors themselves were the subjects. In the latter experiment, the butter or butter substitute was consumed as part of a simple mixed diet for periods of 3 days each. The coefficients of digestibility found in the experiments with men follow:

Coefficients of digestibility of rations containing butter and butter substitutes.

	Dry matter.	Protein.	Fat.
	Per cent.	*Per cent.*	*Per cent.*
Subject H:			
Diet containing sana	92.80	80.93	93.79
Diet containing butter	94.31	84.09	96.05
Diet containing margarine	94.22	85.12	96.08
Subject W:			
Diet containing sana	93.08	82.24	95.30
Diet containing butter	96.17	89.71	97.33
Diet containing margarine	94.94	88.65	95.98

The authors point out that there was practically no difference in the digestibility of the rations containing the different sorts of fat. Similar results were obtained in the experiments with dogs.

The comparative digestibility of raw, pasteurized, and cooked milk, C. F. Doane and T. M. Price (*Maryland Sta. Bul. 77, pp. 38, figs. 3*).—The digestibility of milk treated in different ways is discussed in the light of an extended review of the literature of the subject and of opinions which were gathered by interviews and correspondence with physicians in charge of children's hospitals. Digestion experiments with calves are reported on the comparative value of whole milk (raw and pasteurized at different degrees) and skim milk. Special crates were devised to accommodate the calves during the experiments, as well as bags for collecting the feces. The average results follow:

Digestibility of raw, pasteurized, and cooked milk by calves.

	Protein.	Fat.
	Per cent.	*Per cent.*
Whole milk, raw	94.79	96.82
Whole milk, pasteurized at 167° for 10 minutes	92.99	94.27
Whole milk, cooked	87.26	95.40
Skim milk	94.57	....
Whole milk, raw	92.64	96.10
Whole milk, pasteurized at 140° for 30 minutes	92.01	96.61

"It is almost always stated by authorities on such subjects that milk is entirely digestible. Theoretically, perhaps, it is, as it contains none of the material which is recognized as the indigestible part of grains and fodders. In practical work, however, there is found to be a relatively large portion indigestible. In the work recorded in this bulletin the digestibility of the milk fed would average about 93 per cent with the protein and a little higher with the fat, some of the percentages being much lower than this in individual cases. It is likely that had a smaller portion of milk been fed a larger percentage would have been digested, and by reducing the amount to the minimum required to sustain life it is possible that practically all fed would have been utilized in the system. But where sufficient milk is fed to insure substantial growth, nearly one-tenth of the dry substance is undigested."

The following general conclusions were drawn from the tests as a whole:

"Raw milk is more easily digested when fed to calves than either pasteurized or cooked milk. Contrary to theory, cooked milk when fed to the calves used in these experiments caused violent scouring in the majority of trials.

"A majority of physicians in charge of children's hospitals corresponded with favored the use of raw milk for infants when the milk is known to be in perfect condition, but favored pasteurized milk under ordinary conditions. With one exception all the physicians corresponded with discourage the use of cooked or sterilized milk for infant feeding.

"Skim milk was found to be as digestible [by calves] as whole raw milk."

The principles of modern dietetics, and their importance in therapeutics, C. von Noorden (*Internat. Mo., 3 (1901), Nos. 5, pp. 570–589; 6, pp. 679–702*).—The general principles of nutrition are discussed, as well as the progress of this branch of science in recent years and its special application to the treatment of disease.

The value of aroma bacteria for the hygiene of meat, F. Glage (*Ztschr. Fleisch u. Milchhyg., 11 (1901), No. 5, pp. 131–138, fig. 1*).—The occurrence and manner of distribution of aroma bacteria on meat, and related topics, are discussed in the light of the author's investigations.

Meat ration in the Tropics, P. R. Egan (*Sanitarian, 47 (1901), No. 384, pp. 395–399*).—Quoted from the *Boston Medical and Surgical Journal.* The author discusses the amount of meat and fat consumed by the residents of Porto Rico.

Rations during the China relief expedition (*Com. Gen. Subsist. U. S. Army Rpt. 1901, pp. 7–15*).—Considerable information is given regarding the food of the American and foreign troops in the China campaign. Discussing the vegetables available for the troops, the statement is made that the country furnished "a bountiful supply of vegetables, eggplant, green corn, sweet potatoes, beans, lettuce, etc."

The effect of sulphur fumes on flour, F. B. Guthrie (*Agr. Gaz. New South Wales, 11 (1900), No. 7, pp. 588, 589; 12 (1901), No. 6, pp. 715, 716, pls. 2*).—As shown by baking tests, bleaching flour with sulphur fumes injures its quality. In the author's opinion, grain so bleached is unfit for milling.

"It would appear that the action of sulphur fumes on flour is to affect the composition of the gluten. Gluten (moist) exposed similarly to sulphur vapor becomes sticky, forming a soft, gummy mass, which dissolves in water and alcohol to a milky solution. Ordinary gluten is insoluble in water and partly soluble in alcohol, one constituent (glutenin) being insoluble in alcohol, and the second constituent (gliadin) being soluble in alcohol.

"Sulphur fumes apparently attack one of the constituents of gluten—namely, the glutenin—and alter its characteristics. In order to test this, a sample of pure glutenin was exposed in the moist state, under a bell jar, to the fumes of burning sulphur. It very soon lost its coherent nature, became very soft and sticky, and dissolved to a milky solution in water and alcohol, the original gultenin being quite insoluble in either of these liquids."

Composition of flour, R. Hoagland (*Farm Students' Rev., 6 (1901), No. 10, pp. 155, 156*).—The characteristics and composition of the different grades of flour obtained in modern milling are treated of.

Fifteenth Annual Report of the Ohio Dairy and Food Commissioner, J. E. Blackburn (*Ohio Dairy and Food Com. Rpt. 1900, pp. 196*).—This report contains court decisions, prosecutions, and analyses made in accordance with the State Pure Food Law, and related topics. In a number of the analyses the proximate constituents were determined. The materials examined included oleomargarine, milk, vinegar, etc.

Decisions of the department of agriculture on the pure food act of 1895 (*Pennsylvania Dept. Agr. Bul. 80, pp. 19*).—The decisions regarding the State pure-food law are quoted, as well as standards and definitions of food substances.

ANIMAL PRODUCTION.

Concentrated feeding stuffs, L. A. Voorhees and J. P. Street (*New Jersey Stas. Bul. 153, pp. 53*).—In accordance with the State feeding-stuff law, the authors report the results of analyses made during 1901. The feeding stuffs examined include cotton-seed meal, linseed meal, linseed-cake meal, flaxseed meal, Chicago gluten meal, gluten feeds, dried brewers' grains, malt sprouts, wheat bran, ship stuff, hominy meal or feeds, as well as a number of mixed feeds, cereal breakfast food by-products, and condimental feeds. The results are arranged so as to compare the different concentrated feeds, carbohydrate feeds, feeds made from whole grains, and condimental feeds, and are discussed in detail.

The law regulating the sale and analysis of concentrated feeding stuffs in Wisconsin, W. A. Henry (*Wisconsin Sta. Bul. 89, pp. 8*).—The text of the Wisconsin feeding-stuff inspection law is quoted and discussed.

A mechanical ration computer, W. J. Spillman (*Washington Sta. Bul. 48, pp. 7, figs. 2*).—A mechanical device for calculating the amount of nitrogenous and nitrogen-free nutrients in any given ration is described, together with the method of operating it.

Steer feeding, G. H. True (*Arizona Sta. Rpt. 1901, pp. 326, 327*).—Continuing previous work (E. S. R., 12, p. 1074) to determine the comparative merits of feeding alfalfa hay alone and in combination with such materials as sorghum hay and hay from cereal grains, 2 lots of 4 steers each were pastured on alfalfa and fed mixed barley and alfalfa hay in addition. They gained 1.49 and 1.21 lbs., respectively, per head daily in a period of 5 weeks' duration. Lot 1 was then fed alfalfa hay and lot 2 wheat hay in addition to alfalfa pasturage for 9 weeks, the average daily gains per head being 1.28 and 0.83 lbs., respectively. This test and the earlier work are briefly discussed.

"During the 33 weeks [of this and previous tests when] alfalfa only was fed against combinations of alfalfa and other forages, the animals having only alfalfa gained 1.55 lbs. per day, while those receiving the combination gained 1.46 lbs. per day."

Report of grazing and feeding tests. Beef cattle and lambs, R. S. Shaw (*Montana Sta. Bul. 31, pp. 20, pls. 6*).—*Experiments with steers* (pp. 3–10).—The value of alsike pasturage was tested with 12 high-grade Shorthorn and Hereford yearling steers and 7 grade Jersey heifers. The animals grazed on an alsike pasture covering 5.04 acres, which was divided into 2 lots irrigated alternately during the early part of the summer. The test closed the first of October, the steers having been pastured 108 days and the heifers 93 days. The average gain of the steers per head per day was 2.75 lbs., and of the heifers 1.69 lbs. Rating the gains at 4 cts. per pound, the author calculates that there was a cash return of $36.19 per acre. The possible danger from bloating is spoken of. As the author notes, it is claimed by many that alsike is less likely to cause bloating than alfalfa or red clover.

A test to study the possibility of profitably feeding cattle under local conditions is also reported. Thirty-one steers (including those in the previous test) were pastured at the station farm from the first of October until November 13, on 112 acres of stubble, 57 of which were clover. They were then divided into 1 lot of 11 steers and 2 lots of 10 steers each. The selections were made so that lot 1 (steers used in the pasture experiment) showed the largest infusion of beef blood; lot 2, very nearly the same amount; while lot 3 was inferior. The 3 lots were fed for 137 days clover and barley meal, the average daily gain per head being 2, 1.75, and 1.71 lbs., respectively, the corresponding cost of food per pound of gain being 4.85, 5.16, and 5.31 cts. The steers were sold for slaughtering. Considering the test as a whole, the author states that there was a net profit of $3.95.

Lamb-feeding experiments (pp. 11–19).—Continuing earlier work (E. S. R., 12, p. 72) 3 feeding tests with lambs are reported. The comparative advantages of feeding marketable grain of good quality and screenings in addition to clover was tested with 3 lots of 53 lambs each. Lot 1 was fed clover with a grain ration of oats and barley of good quality, lot 2, clover hay and screenings, while lot 3 was fed clover hay only. In the 89 days of the test, which closed February 13, the average gains made by the 3 lots were 24.96, 28.08, and 21.15 lbs., respectively. Lot 1 consumed per head daily 2.9 lbs. clover and 0.56 lb. grain. The corresponding amounts for lot 2 were 2.94 lb. clover and 0.55 lb. screenings, while lot 3 consumed 3.32 lbs. clover. The cost of food per pound of gain in the 3 lots was 4.34, 3.34, and 3.53 cts., respectively. The author's conclusion follows: "It is best to use some grain along with alfalfa or clover in preparing lambs for shipping; a large amount is not necessary because of the quality of our coarse foods. Not more than one-half pound of grain per day throughout a feeding period of 90 days, or the equivalent of this if fed only throughout the latter portion of the period. This will of course only apply in those cases where Montana-grown legumes are used as roughage. Where first-class marketable grains are used it makes the ration too expensive. Good results can be secured from screenings or from cheap or unsalable grains."

The comparative value of clover hay and hay from mixed grains (spring wheat, barley, oats, and peas sown in equal amounts) was tested with 2 lots of 53 lambs each. In the 60 days of the test the lambs fed clover hay gained on an average 14 lbs., those fed the mixed hay 10.68 lbs.; the cost of food per pound of gain in the 2 lots being 3.63 and 4.6 cts., respectively. Greater and more economical gains were made on clover than on hay from cereal grains and peas. The author notes that while the results "represent in a practical way the comparative feeding values of clover and grain hay for fattening lambs, still, they may not represent accurately their relative food values for other classes of stock or from a standpoint of composition. While horses and cattle consume these readily there was much waste from the lambs, consisting of grain stems and vines of peas. The results from the use of the grain hay fell far below our expectations."

The effect of water supply during fattening was tested with 17 lambs fed clover hay, and screenings. They were given water once a day and were compared with lot 2 in the test noted above, receiving a similar ration but having access at all times to water. The average gain made by the lambs receiving a limited amount of water was 21.47 lbs., the cost of pound of gain being 4.51 cts. These lambs consumed per head daily on an average 3.08 lbs. clover and 0.55 lb. screenings. As pointed out by the author, smaller and less economical gains were made when the water supply was limited than was the case with the lot receiving an abundance of water. All the lambs used in the 3 tests were sold for slaughter, yielding a net profit of 30 cts. per head.

Sheep-feeding experiments in Nebraska (second experiment), E. A. BURNETT (*Nebraska Sta. Bul. 71, pp. 16*).—Continuing previous work (E. S. R., 12, p. 875) alfalfa hay and sorghum hay were compared with seven lots of 12 lambs each and three lots of 14. Lots 1 to 6 were fed corn alone or combined with oats or bran in different proportion in addition to alfalfa hay; lots 1 to 3 having shelter and lots 4 to 6 having no shelter. Lots 7 to 9 were fed corn alone, or with oats or bran with sorghum hay in addition. These lots and lot 10, which was fed corn and linseed meal in addition to sorghum hay, had no shelter. After some preliminary feeding with most of the lambs, the test proper covered 14 weeks. The average gain of the lambs in the lots fed alfalfa hay was 33.7 lbs. Of those fed sorghum hay and corn alone or with oats or bran, 20.7 lbs. The average gain of the lot fed sorghum hay, corn, and linseed meal was 26.7 lbs.

The profit per lamb on alfalfa hay was 72 cts. per head and on sorghum 32.8. Lot 1, fed on shelled corn and hay, made the largest total gain, 36.3 lbs. per lamb, and the cheapest gain (costing 3.25 cts. per pound), and ate the least food per pound of gain, namely, 3.53 lbs. of grain and 4.54 lbs. of hay. Lot 9, fed shelled corn, wheat bran, and sorghum hay, made the smallest gain, 18.4 lbs. per lamb, at the greatest cost per pound of gain, 5.7 cts. The largest amount of feed per pound of gain (6.99 lbs. of grain and 8.96 lbs. of hay) was eaten by lot 8, fed shelled corn, oats, and sorghum hay. The author notes that some of the lambs might have been profitably marketed before the close of the test, as they became too heavy for profitable feeding.

"In these experiments, as in the previous year, no marked advantage resulted from feeding bran. The total gains produced were slightly larger on corn and oats than on corn, and the gains on corn and bran were a little smaller than on corn.

"The lambs receiving alfalfa, which made the larger gains during the early part of the experiment, continued to make the greater gains during the last weeks of feeding, so that the difference grew more marked as the feeding continued.

"During the last 2 weeks the lots on sorghum ate very poorly, refusing to consume more than 1½ lbs. of corn per head daily, except in the case of the lot receiving 16 per cent linseed meal with its corn. This lot ate well and made good gains. All lots were thrifty and healthy during the entire experiment.

Comparative tests of the effect of beet molasses and molasses preparations in animal feeding, K. Gerland (*Ber. Physiol. Lab. Landw. Inst. Halle, 3 (1901), No. 15, pp. 1–55*).—The digestibility of beet-molasses feeds was tested with sheep. For purposes of comparison, digestion experiments were also made with alfalfa hay and with sugar, sufficient asparagin being added to the ration containing the latter to approximate the nonalbuminoid nitrogen content of the molasses. All the materials were fed with a basal ration of alfalfa hay, barley straw, palm nut meal, wheat bran, and brewers' grains, the ration being so made up that it contained per 1,000 kg. live weight, about 28 kg. dry matter, 2.4 kg. digestible protein, 0.8 kg. digestible fat, and 13 kg. nitrogen-free extract. The digestibility of the basal ration was also determined. The digestion experiments each covered a period of 10 days and were preceded by a preliminary period of like duration. The food, urine, and feces were analyzed. On the basis of the values obtained for the basil ration and the assumption that molasses being liquid is entirely digested, the author calculated the digestibility of the basal portion of the ration when fed with molasses and sugar to determine whether the digestibility of other feeding stuffs was increased or diminished by adding molasses to the ration. The coefficients of digestibility and these calculated results follow:

Digestibility of molasses and molasses feeds by sheep.

Kind of ration.	Digestibility of entire ration.						Calculated digestibility of basal ration.			
	Dry matter.	Protein.	Fat.	Nitrogen-free extract.	Crude fiber.	Ash.	Protein.	Fat.	Nitrogen-free extract.	Crude fiber.
	P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Alfalfa hay	65.01	73.13	68.27	74.51	56.38	43.45	......	......	......	......
Basal ration	59.58	70.66	75.36	58.35	57.93	42.29	......	......	......	......
Molasses	62.29	70.57	74.24	65.83	52.47	53.70	73.74	75.36	65.83	57.93
Palm-nut meal molasses	61.79	72.45	71.27	68.70	45.06	53.98	73.74	75.36	65.83	57.93
Bran molasses	60.92	72.48	72.25	67.50	44.26	52.24	73.74	75.36	65.83	57.93
Brewers' grains molasses	62.22	73.23	74.34	68.68	44.38	55.23	73.74	75.36	65.83	57.93
Peat meal molasses	......	70.72	75.31	72.55	46.72	......	73.74	75.36	65.83	57.93
Beet chip molasses	61.65	68.24	77.66	73.31	39.02	48.86	71.34	74.39	69.06	56.63
Cocoa shell molasses	61.20	62.64	79.92	70.06	39.58	58.31	71.61	75.56	65.37	45.12
Maize germ molasses	64.41	67.71	78.58	72.62	45.52	62.25	71.09	74.89	66.57	56.00
Sugar	62.22	70.50	73.81	70.58	44.77	47.61	73.74	75.36	65.83	57.93
Maize germ molasses, No. 2 [a]	65.91	72.26	79.70	74.26	47.03	57.48	83.07	75.92	76.90	56.84

[a] Figures for one animal only.

The data for the study of the metabolism of nitrogen are reported. As shown by the average results, there was a gain of nitrogen in every experiment, ranging from 0.034 gm. on the basal ration to 0.206 gm. on the molasses-maize germ ration. The gains in weight ranged from 0.3 kg. per day on the basal ration to 0.8 kg. per day on the sugar ration.

The principal conclusions reached follow: With the exception of the cocoa-shell mixture, the molasses and molasses feeds were readily eaten. Unfavorable results were not observed when 4 kg. molasses per 1,000 kg. live weight was fed, but were noticed if the amount was increased to 4.8 to 5 kg. Feeding molasses, as in the above experiments, is profitable when the molasses is worth 87½ cts. per 100 kg. When molasses was fed a depression in the digestibility of the other feeding stuffs was noticed, which was about the same in all the tests. As regards cost, the ration containing the unmixed molasses was the cheapest; that containing beet-chip molasses the most expensive. The results obtained when sugar was fed were practically the same as with the rations containing molasses. It may be said, therefore, that the molasses did not have a specific effect. As regards cost, the sugar ration was more expensive than the molasses rations.

Sheep-feeding experiments, J. WITHYCOMBE (*Oregon Sta. Rpt. 1901, p. 22*).—The comparative merits of feeding sheep under shelter and in the open were tested with 2 lots of 6 lambs each. The rations, which are not described, were the same for both lots, and, the author states, were practically equal in quantity, except that somewhat more was wasted by the lot having shelter. In 11 weeks the lot fed in the open gained 155 lbs. and the lot fed under shelter 149 lbs. The 2 lots were then shorn, producing 21 and 27.75 lbs. wool, respectively. Ten lbs. of wool from each lot was tub-washed and dried, yielding 7.75 and 8 lbs., respectively. Brief notes are also made regarding a feeding experiment with steers which was regarded as unsatisfactory.

Spelt vs. barley, E. C. CHILCOTT and W. T. THORNBER (*South Dakota Sta. Bul. 71, pp. 94*).—During a 2 weeks' preliminary period, 24 lambs fed brome-grass hay and spelt and barley (1:1) *ad libitum*, made a total gain of 53 lbs., consuming 2 lbs. of grain per pound of gain. The lambs were then divided into 2 lots of 12 each. For 15 weeks lot 1 was fed unground spelt, and lot 2 unground barley, in addition to brome-grass hay. The average daily gain per head per week was 1.67 and 2.53 lbs., respectively, the grain consumed per pound of gain being 7.47 and 5.09 lbs. There was a calculated profit per lamb in the 2 lots of 44 and 92 cts., respectively. According to the authors' calculation, spelt was worth for feeding 40.68 cts. per bu. and barley 54.72 cts.

"It should be constantly borne in mind that the results obtained in this experiment apply to these grains only when fed as a single grain ration and fed whole, and should not be used without modification in determining the value of these grains when used as a part of the ration together with other grains. Nor can we predict what the results would have been if both grains had been ground. We believe, however, that it is perfectly safe to assume that in no case will spelt be found superior to barley, even when fed with other grains."

At the close of the test proper the rations previously fed were continued for 5 weeks, with the object of determining whether, as is sometimes claimed, unshorn sheep fed to about the limit of profitable gain may be shorn and fed longer to advantage. Shortly after the beginning of the supplementary period the sheep were shorn, the total fleece of the 2 lots weighing 79 and 80½ lbs., respectively. The total gains made by the 2 lots in the supplementary period were 7.5 and 6 lbs., respectively, the total grain fed 487 and 526 lbs.

"These sheep had undoubtedly been fed up to the limit before they were shorn, and the effect of the shearing . . . was entirely insufficient to materially effect their ability to lay on more flesh at a profit, or in some instances to retain what they had already acquired. What the effect would have been had this shearing been done earlier, before they had reached the limit of profitable feeding, we can not of course determine from this experiment, nor can we say what the effect would have been had the grain ration been changed. Enough has been learned from this experiment to show that feeders should be very cautious about attempting to get profitable gains from sheep that have nearly quite reached the limit of profitable feeding, or are 'finished' by simply taking their fleeces off, believing, as some feeders claim, that this will give them a new lease of life."

Pig-feeding experiments, J. WITHYCOMBE (*Oregon Sta. Rpt. 1901, pp. 22, 23*).—Three feeding tests with pigs are briefly reported. In 3 months 12 pigs having access to 0.16 acre of clover and fed in addition 317 lbs. of shorts and 1,276 lbs. of skim milk, made a gain of 253 lbs. In 6 weeks, 10 pigs on an acre of June-sown rape and receiving no grain ration gained 154 lbs.

A comparison of boiled clover and clover silage was made with 2 lots of 3 pigs each, all from the same litter. In 122 days lot 1 consumed 619 lbs. boiled clover, equivalent to 551 lbs. dry matter, and lot 2 consumed 2,032 lbs. clover silage, equivalent to 488 lbs. dry matter. In addition, each lot was given 488 lbs. of wheat and barley chop, 1:1. The gains made by the 2 lots were 154.5 and 128 lbs., respectively. The pigs were then rearranged to form 2 uniform lots of 3 animals each. Lot 1 was fed cooked wheat and barley chop and lot 2 the same materials dry. In 3 months each lot ate 1,834 lbs. of chop and 1,800 lbs. skim milk. The total gains were 328 and 470 lbs., respectively.

Soft pork; an investigation into its character and causes, F. T. SHUTT (*Canada Cent. Expt. Farm Bul. 38, pp. 47, pls. 3*).—The nature of soft pork is discussed and analytical data, noted from another source (E. S. R., 12, p. 581) are quoted. Chemical studies were also made of immature or unripe pork from pigs recently weaned. This pork contained a higher percentage of olein than firm pork.

"It seems probable that the fat of all young pigs contains a large amount of olein, and is consequently more or less soft. From this and subsequent work we are inclined to think that age and maturity or ripeness are factors of importance toward a 'firm' fat. [When the same ration was fed to mature and immature pigs] the fat of [the latter] invariably possesses a larger percentage of olein than that of the remainder of the pigs on the same ration, which were not slaughtered until they had reached a live weight of 180 to 200 lbs."

The author believes that the olein content furnishes the most reliable indication of relative firmness. Pork containing 68 per cent of olein or less is rated as "very firm;" that containing between 68 and 71 per cent, "firm;" between 71 and 73 per cent, "moderately firm;" between 73 and 75 per cent, "soft," and over 75 per cent, "very soft." These ratings correspond to the following factory ratings: Very firm, from 85 to 100 points; firm, 75 to 85; moderately firm, 70 to 75; soft, 50 to 70; and very soft, less than 50 points.

Two series of feeding tests are reported. In the first series the feeding stuffs used were corn, oats, barley, shorts, beans, peas, clover, and mangels, alone or in combination. The grains were fed whole or ground and the feeds dry, soaked or cooked. In one test the pigs were pastured on clover. The pork rating highest was produced on a ration of soaked oats, peas, and barley (1:1:1), the olein content being 67.2 per cent and the melting point 35.6°. The pork rated lowest was produced on a soaked corn-meal ration. Its olein content was 92.4 per cent and the melting point 27.7°. The more important conclusions follow:

"Of all the grain rations employed, that consisting of equal parts of oats, peas, and barley gave the firmest pork. It may further be added that the fat was deposited evenly and not too thickly, and that this ration gave a very thrifty growth. . . . When half the grain ration . . . consists of corn meal, the resulting pork shows an increased percentage in olein; in other words, a tendency to softness.

"In this ration (half corn meal, half oats, peas, and barley in equal parts) the feeding of it boiled gave a slightly higher olein content, but this is only apparent when the average from the four pens is taken into consideration.

"Considering the effect of feeding the ration of oats, peas, and barley during the first period (to a live weight of 100 lbs.) and corn meal during the finishing period, compared with the reverse of this plan—that is, corn first, followed with oats, peas, and barley—we may conclude that the former gives a firmer pork.

"In both methods mentioned in the preceding paragraph, no marked difference was to be observed from the ration fed dry or previously soaked, though taking an average of the 2 groups on each ration the 'dry' feed gave a somewhat higher olein content.

"When . . . corn meal formed half the first period ration, and the whole of the second period ration, the resulting pork was somewhat softer than from that of any of the rations already discussed. We conclude that the longer the period during which the corn is fed as a large proportion of the ration, the softer will be the pork.

"Beans produce a soft and inferior pork. The growth of the pigs so fed was poor and miserable and the deposition of the fat meager.

"Corn meal fed exclusively as the grain ration, either dry or previously soaked, results in an extremely soft fat, the percentage of olein being considerably higher than from any other ration tested. The pork was of an inferior quality. Here also we noted the miserable growth of the animals, the ration in no sense being an economical one."

In the second series the rations were similar to those in the first, including in addition, skim milk, rape, artichokes, and pumpkins. The pork rating the highest was produced on a ration of corn meal, oats, peas and barley, skim milk, and sugar beets. Its olein content was 66.9, and its melting point 32.3°. The least satisfactory pork was produced on beans, the olein content being 84.9 per cent and the melting point 29.5°.

The author's conclusions follow:

"One great controlling factor in the quality of the pork of finished pigs lies in the character of the food employed. Indian corn and beans tend to softness, *i. e.*, to increase the percentage of olein in the fat. If these grains are used they must be fed judiciously if first-class firm pork is to be produced. If fed in conjunction with skim milk it has been shown that a considerable proportion of Indian corn may be used in the grain ration without injuring the quality of the pork.

"A grain ration consisting of a mixture of oats, peas, and barley, in equal parts, gives a firm pork of excellent quality. Skim milk not only tends to thriftiness and rapid growth, but counteracts in a very marked manner any tendency to softness.

"Rape, pumpkins, artichokes, sugar beets, turnips, and mangels can be fed in conjunction with a good ration without injuring the quality of the pork.

"The fat of very young pigs and animals of unthrifty growth is softer than that of finished pigs that have increased steadily to the finishing weight."

Comparative experiments on the chemical composition of animal fat, V. HENRIQUES and C. HANSEN (*Skand. Arch. Physiol., 11 (1901), No. 3-4, pp. 151-165, figs. 3*).—A chemical examination of the fats of different animals showed a difference between the layer of fat on the surface and that in the interior of the body. The interior of the body is warmer than the surface, and it seemed possible that the temperature at which the fat was stored in the body had an effect on its chemical composition. A test was made with pigs to obtain information on this point. One was kept in a warm room. A second animal was kept in a cold room, but the body was sewed up in a sheepskin to protect it. A third animal was also kept in a cold room, but the body was not protected. The animals were fed for three months a similar ration and the fat then examined. The surface fat of pig No. 3 differed as regards iodin number and solidifying point from that from the other animals. The low temperature, according to the author, caused the formation of surface fat which melted readily and had a comparatively high olein content. On the other hand, the solidifying point of the internal fat of the 3 pigs did not differ greatly. A chemical examination was also made of the fat from different parts of the body of pigs fed barley and maize.

Feeding farm horses, C. W. BURKETT (*New Hampshire Sta. Bul. 82, pp. 27-52*).—Investigations on the proper feeding of farm horses, on the amount of water consumed, and on the cost of feeding are reported, the work covering some 2 years.

In the first series the following five rations were tested: Hay, bran, corn, gluten feed, 5:1:3:3; hay, bran, corn, oats, 5:1:3:4; hay, corn, and bran, 10:8:7; hay, corn, linseed-oil meal, 5:4:2; and hay, cotton-seed meal, bran, and corn, 10:1:2:8. Each of the 5 horses included in the investigation received one of the rations for 1 month, the rations being rotated, so that during the 5 months of the test each horse was fed all the rations. Ration No. 1, which cost on an average 19.3 cts. per day, was regarded as quite satisfactory. It was eaten with relish. One horse lost weight on it, while 2 gained somewhat and 2 remained in equilibrium. Ration No. 2, costing 22.5 cts. per day, was the most expensive of those tested. Three of the horses lost in weight on it, 1 gained, and 1 remained in equilibrium. The oats in the ration proved no more satisfactory than the other concentrated feeding stuffs, either in respect to the animal or the efficiency of the work. Had more been fed to keep the weight constant, it would have materially affected the price of the ration. Ration No. 3, costing 20.4 cts. per day, was relished more than the others. Two of the horses gained, 1 lost, and 2 remained in equilibrium. In the author's opinion this ration was healthful, palatable, and at the same time moderate in cost. Ration No. 4 cost 20 cts. per day. Two of the horses lost somewhat in weight. The others made slight gains or remained in equilibrium. Although the amount of oil meal fed per day was quite large, no bad effects were noticed. Ration No. 5 was the least expensive, costing 17.4 cts. per day. It was also the least bulky of the rations tested. Four of the horses remained in equilibrium or made slight gains, while 1 lost a little in weight. The author regards this ration as the least satisfactory, since none of the animals relished it at first on account of the cotton-seed meal. In this series of tests the amount of work varied from 103 to 240 hours per month.

To further test these rations under similar conditions of climate and work, each was fed to 1 horse for 1 month. The amount of work ranged from 209 to 314 hours. In every case there was a gain in weight, showing, the author believes, that all the rations were satisfactory and suited to the amount of work performed. At the close of this period all the horses were fed the linseed-meal ration for some 6 weeks. For about 9 weeks 3 of the horses were then fed rations Nos. 2, 3, and 5. During about 2 weeks the remaining 2 horses were fed rations Nos. 1 and 4. Their rations were then reversed until the end of the period. In every case the conditions of work were uniform. No marked variations in weight were observed. This, in the author's opinion, shows that abrupt changes in the ration may be made without bad effects, and that "there is no so-called single ration for horses. Any food stuff or combination of food stuffs that furnishes desirable nutrients at least cost should be considered in the preparation of rations."

The comparative value of corn stover and timothy hay and of corn, oats, and bran as part of a ration was tested from January 26 to April 9. The rations fed consisted of 12 lbs. of hay or corn stover alone, or with 14 lbs. of corn, oats, and bran in different mixtures, the most usual one being made up of equal parts of 2 of the grains. Four of the horses gained in weight and 1 remained practically in equilibrium. Although corn stover costs one-third as much as timothy hay, the author believes that it "has a feeding value, when fed either with corn and oats or corn and bran in the proportions it has been here, equal to timothy hay, and also when corn stover or timothy hay furnish the roughage of a ration, oats and corn half and half, and bran and corn half and half, have, generally speaking, equivalent feeding values."

To learn whether it was possible to substitute other grains for oats during a long period in summer feeding, the horses were continued on the grain rations mentioned in the preceding paragraph until October 8, being fed in every case 12 lbs. of timothy hay per head daily. Three of the horses remained practically in equilibrium as regards weight, while 2 gained somewhat. The results show, according to the author, that bran, which is much the cheaper of the two, may be substituted for oats. To test the value of bran and oats for winter feeding, the horses were continued on the same ration until April 29. One horse lost a little; the other gained. "These long periods of both summer and winter feeding show the value of the corn and bran ration for horses. The results evident from these experiments are fully consistent with all that has preceded."

The amount of water consumed was recorded in all these tests. Both the ration consumed and the amount of work performed influence the quantity of water drunk by work horses, although the individuality of the horse has the most marked effect. In the present investigation the quantity of water varied from 25,895 to 32,997 lbs. per year. Following are principal conclusions drawn by the author:

"Any food stuff or combination of food stuffs furnishing the desirable nutriment at least cost should be considered in preparing rations for horses.

"A mixture of bran and corn, half and half, is a good substitute for corn and oats for feeding work horses.

"Corn stover is a good substitute for timothy hay for winter feeding of horses because of its feeding value, the yield per acre, and commercial value.

"A change from a grain mixture, consisting partially of linseed-oil meal, slowly or abruptly, does not cause a decrease in weight in horses if a proper substitute ration is fed.

"The average total cost per year for actual food supply per horse was $74.32.

"The average cost for feed per hour's work done during 2 years was 3.4 cents."

Saturated limewater for the preservation of eggs, F. T. Shutt (*Agr. Jour. Cape Good Hope, 19 (1901), No. 1, pp. 55, 56*).—Directions are given for the use of limewater for preserving eggs.

DAIRY FARMING—DAIRYING.

Investigation in milk production, T. L. Haecker and E. W. Major (*Minnesota Sta. Bul. 71, pp. 265–300*).—Two experiments with dairy cows, previously reported (E. S. R., 12, p. 479), are reviewed with reference to protein consumption. In one experiment of 84 days' duration wheat was compared with barley and corn. The 12 cows used weighed on an average 954 lbs. The amount of dry matter consumed daily per head averaged 24.30 lbs., the nutrients being 2.01 lbs. of protein, 12.03 lbs. of carbohydrates, and 0.53 lb. of fat. Of the protein provided, 0.66 lb. was calculated as the amount needed for maintenance of body, leaving 1.35 lbs. available for milk production. The average daily yield of milk was 26.96 lbs., containing 4.1 per cent of fat. On an average 0.05 lb. of protein (exclusive of that for maintenance) was consumed per pound of milk produced. In the other experiment, which lasted 70 days, prairie hay was compared with timothy hay. The average weight of the 12 cows was 958 lbs. The dry matter consumed daily was 24.51 lbs., the nutrients being 2 lbs. of protein (0.67 lb. for maintenance and 1.33 lbs. for milk production), 12.90 lbs. of carbohydrates, and 0.60 lb. of fat. The yield of milk was 25.23 lbs. and the fat content 4.07 per cent. The protein (exclusive of that for maintenance) consumed per 1 lb. of milk was 0.048 lb.

"Taking the average amount of available protein charged to the cows in the 2 experiments reviewed as a basis, it suggests that an allowance of 0.046 lb. of available protein to a pound of milk of average quality yielded is sufficient to maintain the flow, and by increasing or decreasing this allowance by 0.004 lb. of protein for every 0.5 per cent of increase or decrease in the test of the milk, the ration will be adjusted to the needs of cows giving the various grades of milk. Milk testing 3.85 per cent fat is fixed as the standard average, and a cow giving that grade needs 0.046 lb. of available protein to each pound of milk she yields."

[The author uses the term "available" protein to mean that which he calculates was left for milk production after deducting that necessary for maintenance.—Ed.]

In another series of experiments, here reported for the first time, 4 lots of 4 cows each were fed several different rations during an experiment covering 3 four-week periods. The feeding stuffs, of which analyses are given, were bran, corn meal, gluten meal, oats, barley, fodder corn, silage, and prairie hay. The following table summarizes some of the data:

Summary of results of a feeding experiment with dairy cows.

	Average weight of cows.	Dry matter consumed.	Digestible matter consumed.			Yield of milk.	Fat content of milk.	Protein available for milk production.	Protein for 1 lb. milk.
			Protein.	Carbohydrates.	Fat.				
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lb.*	*Lbs.*	*Per ct.*	*Lbs.*	*Lb.*
Period I:									
Lot 1	769	16.613	1.744	9.154	0.501	16.86	5.53	1.236	0.0733
Lot 2	725	15.090	1.605	8.329	.452	14.86	5.17	1.098	.0739
Lot 3	881	17.334	1.845	9.607	.518	16.75	4.70	1.228	.0733
Lot 4	669	14.631	1.594	8.069	.448	17.51	4.78	1.126	.0643
Average	761	15.917	1.704	8.790	.480	16.49	5.04	1.171	.0710
Period II:									
Lot 1	794	20.213	2.037	10.560	.500	15.82	5.64	1.481	.0936
Lot 2	746	18.516	1.811	9.851	.437	15.18	5.15	1.289	.0849
Lot 3	902	21.110	1.739	11.079	.532	16.27	4.63	1.108	.0681
Lot 4	681	19.185	1.491	10.664	.446	17.66	4.56	1.014	.0574
Average	781	19.756	1.769	10.538	.479	16.23	4.98	1.222	.0753
Period III:									
Lot 1	812	20.749	1.844	10.791	.537	15.18	5.72	1.276	.0840
Lot 2	778	19.063	1.694	9.914	.494	14.29	5.02	1.149	.0804
Lot 3	938	21.790	1.937	11.332	.564	15.96	4.61	1.280	.0802
Lot 4	744	20.269	1.802	10.541	.525	17.07	4.66	1.281	.0750
Average	818	20.468	1.819	10.644	.530	15.62	4.99	1.246	.0798

The results are considered as indicating that –

"Cows giving ordinary yields of milk and butter fat do not require the amount of protein called for in the standard rations.

"The amount of milk a cow gives daily and its fat content measures the amount of protein the animal requires over and above what is needed for maintenance.

"There is a limit to the milk and butter fat-producing capacity of a cow at any given time. Feeding more protein than she needs for this production and for her own support is of no advantage.

"The excess of protein, with the corresponding excess of the other nutrients, will tend to cause her to lay on flesh and thereby shrink in milk flow.

"Grains ordinarily grown on the farm fed in conjunction with such roughage as fodder corn, corn silage, timothy, and prairie hay provide ample protein for cows doing ordinary dairy work."

Feeding experiments with dairy cows, J. F. DUGGAR and R. W. CLARK (*Alabama College Sta. Bul. 114, pp. 53–80*).—In 2 experiments, including 5 cows and lasting 8 weeks each, the object was to compare purchased and farm-grown feeds. The purchased ration was composed chiefly of cotton-seed meal and hulls and the farm-grown ration of cotton seed and sorghum hay. The average results of the 2 experiments showed a daily production of milk and butter per cow of 24.3 and 1.19 lbs., respectively, on the purchased ration and 17.53 and 0.93 lbs. on the farm-grown ration. The average cost of food per pound of butter on the 2 rations was, respectively, 15.3 and 10.35 cts., and the daily profit per cow 6.45 and 8.75 cts. The purchased ration was better eaten and more milk and butter were produced, but the profit was much less.

"On account of the larger amounts of food consumed, the cows while receiving the cotton-seed meal ration gained nearly half a pound a day in weight, while the cows eating cotton seed in smaller amounts lost 0.8 lb. per day."

The manure produced during the 16 hours of each day which the cows passed in the barn averaged 48.3 lbs., containing 16.6 lbs. of nitrogen per ton, when the cotton-seed meal ration was fed, and 33.9 lbs., containing 10.7 lbs. of nitrogen per ton, when the cotton-seed ration was fed. The percentages of phosphoric acid and potash in the 2 manures were practically the same. When stabled for the entire 24 hours the amount of manure secured was about double that obtained when the cows were stabled 16 hours per day.

In a test lasting 3 weeks green rye was substituted for the cotton-seed hulls and sorghum used in the above rations, with the result of increasing the yield and decreasing the fat content of the milk, the yield of butter remaining practically the same. Soiling is therefore pointed out as an effective means of reducing the bill for purchased feeds.

A pasture consisting of cowpeas and of corn from which the ears had been harvested was compared with an ordinary pasture of Bermuda grass, carpet grass, Japan clover, etc. When grazed on cowpeas the yield of milk was 15.8 per cent and the yield of butter 9.5 per cent greater than when the cows ran on the mixed pasture. "The value of the product of butter and of the increase in live weight of the cows averaged $4.47 per acre of corn and pea field grazed, after deducting the cost of the cotton-seed meal fed at the same time."

A contribution to the question of the profitability of dairy farming, C. Steinbruck (*Ber. Physiol. Lab. Landw. Inst. Halle, 3 (1901), No. 15, pp. 104–168*).—The author made an extended study of several points bearing upon the feeding of dairy cattle. The principal point investigated was the effect of increased amounts of protein in the ration upon the yield and composition of the milk. The experiments were carried on with 4 cows and covered a number of periods of 10 days each. Besides the amount and the composition of the food, the live weights of the animals were noted and determinations made of the amount and composition of the milk and the resulting manure. A large amount of tabulated data is given, and these are discussed at length, many similar pieces of work being cited. From his experiments and his review of the literature the author draws the following conclusions:

The individual productiveness of cows is the controlling factor in milk production, in comparison with which changes in the feed, within certain limits, are sometimes very inferior. The inferiority of the latter factor naturally varies greatly and can only be determined quantitatively by means of studies on a large number of individuals.

The food when given in amounts in excess of that necessary for the bodily functions and to maintain live weight has but small influence over the milk yield. While such feeding is reflected in the increased richness of the manure, the value of this increase is disproportionate to the cost.

As cows differ in their ability to respond to heavy feeding, this ability must be determined for each individual animal. In this respect adherence to fixed standards may lead to gross error.

The dairy herd, G. H. True (*Arizona Sta. Rpt. 1901, pp. 327–332, figs. 2*).—A monthly record of 6 cows for one year is given, with notes on the management of the herd. Weather conditions interfered with a feeding experiment with sugar beets. Exposure to storm greatly lessened the yield of butter fat, the decrease, however, being much less in the case of cows fed sugar beets on pasture.

Hygiene of cows during gestation, C. Bruner (*Jour. Agricole [Paris], 12 (1901), No. 140, pp. 194, 195*).—The author discusses briefly the feeding and general management of cows during gestation.

Composition of the milk of cows at different stages of the milking, P. Hardy (*Bul. Assoc. Belge Chim., 15 (1901), No. 6, pp. 228, 229; abs. in Bul. Soc. Chim. Paris, 3. ser., 25 (1901), No. 22, p. 992*).—The fat increases from the beginning to the end of the milking, but, as pointed out by other investigators, the composition of the serum remains constant.

Purification of milk by centrifugal separation, C. H. ECKLES and S. E. BARNES (*Iowa Sta. Bul. 59, pp. 55–59*).—The results of experiments made at different times during the year to determine to what extent the bacterial content of milk is reduced by centrifugal separation, the distribution of bacteria in the skim milk, cream, and separator slime, and the effect of centrifugal separation upon the keeping qualities of the milk are briefly summarized. In 7 experiments determinations were made of the number of bacteria present in milk before separation and in the mixed skim milk and cream after separation. There was an average reduction of about 36 per cent. At the end of 24 hours milk which had been separated contained on an average 0.03 per cent less acid than nonseparated milk. In 8 other experiments the skim milk contained on an average 29 per cent of the number of germs present in the whole milk, the cream 24 per cent, and the separator slime 47 per cent. It is considered that centrifugal separation removes practically all the solid impurities from milk, but improves the keeping qualities of the milk little if any.

Sterilization of milk with hydrogen peroxid, HARRIETTE CHICK (*Centbl. Bakt. u. Par., 2. Abt., 7 (1901), No. 20, pp. 705–717*).—A series of experiments were made on this subject, using a 3 per cent solution of the hydrogen peroxid. It was found that 0.2 per cent of the peroxid was sufficient for the complete sterilization of milk, and that the addition of 0.1 per cent sufficed to keep milk sweet for a week or so. It appeared to make no difference with sterilization whether the milk was freshly drawn or whether it had been allowed to stand some time so that fermentation had commenced. The peroxid, however, imparted a disagreeable, stinging taste to the milk, this being noticeable even in as dilute solutions as 1 part of peroxid to 10,000 of milk. The results, therefore, are considered unfavorable to the use of this material in milk for drinking. Small quantities of the superoxid which were decomposed in a short time did not sterilize the milk or preserve it sufficiently for practical purposes. Furthermore, the peroxid seemed to be quite stable in milk, especially in weak solutions, the proportion being a little changed by heating. The material is recommended, however, for the preservation of samples of milk for analysis, since it sterilizes the milk completely and causes no change in any of its constituents. For this purpose about 20 cc. of a 10 per cent solution of the peroxid is recommended per liter of milk, which amount is said to preserve the sample indefinitely.

Further observations upon ropiness in milk and cream, A. R. WARD (*New York Cornell Sta. Bul. 195, pp. 25–39, figs. 2*).—The so-called ropy milk from cows affected with garget is pointed out as entirely different in appearance and causation from ropy milk due to *Bacillus lactis viscosus*. The latter trouble is caused by a species of water bacteria with which the milk becomes infected after it is drawn, and does not make its appearance for 12 hours or more after milking. Reference is made to an earlier investigation of this subject by the author (E. S. R., 11, p. 282), and additional observations on the conditions under which ropiness occurs and means of prevention are reported.

In an investigation of an outbreak occurring during the summer of 1899 it was found by experiments that the utensils, the water in the cooling tank, and the dust in the air of infected rooms were means of disseminating the ropy milk bacteria. While the bacteria were not detected in the ice, this is considered as a possible source of contamination, especially as the bacteria show marked toleration toward cold.

In 1900 another creamery in the locality where the first outbreak was observed in 1898 encountered severe trouble from ropy milk. The utensils were thoroughly sterilized, the floor of the milk room was disinfected with a 5 per cent solution of sulphuric acid, and the water tank was disinfected by the addition of 1 oz. of potassium bichromate to each cubic foot of water. This method was effectual in getting rid of the trouble. The conclusion is drawn that with proper cleanliness of utensils, disinfection of the floor, and extra care to prevent contamination by water, ropy milk may be prevented.

Ropiness in milk and cream, A. R. Ward (*Dairy and Produce Rev., 1 (1902), No. 30, pp. 8, 9*).—This is essentially the article noted above.

A bacteriological study of the college creamery milk supply, C. H. Eckles (*Iowa Sta. Bul. 59, pp. 37–49*).—Samples of the mixed milk supplied to the college creamery were taken once a week during one year and subjected to fermentation tests and bacteriological examinations. The results are tabulated and discussed, and summarized as follows:

"The fermentation test shows when milk is in suitable condition for making good butter and cheese.

"This test applied to the milk from the patrons of the college creamery shows a great variation in quality during a year.

"This difference in fermentations is probably due to the conditions under which milk is handled during the different seasons of the year.

"The average quality of butter made under natural conditions corresponds with the quality of milk as shown by these tests and is dependent upon the condition of the milk. The principal reason for the fine quality of butter made in the summer and the poorer quality in winter is this difference in the fermentations in the milk.

"The number of bacteria found in milk as brought to the creamery varies with the temperature, season of the year, etc. In the winter on an average each cubic centimeter contains from 1,000,000 to 5,000,000. In the summer from 15,000,000 to 30,000,000, although these limits may be passed either way. The few bacteria found in milk during the winter makes it possible to control the fermentation to a large extent by the use of starters.

"The acid-producing bacteria are always present in quite large numbers and make up from 25 to 85 per cent and average for the year about 58 per cent of the total number. This class is present in smallest numbers when the quality of the milk is the poorest and in greatest numbers when the milk is the best.

"The class of bacteria (enzym producing) which coagulate milk sweet or dissolve the curd contains most of those injurious to butter making. They are present at all times of the year, but in far greater proportion when the milk is of the poorest quality.

"Bacteria having no visible effect on milk are always present in large numbers and make up from 20 to 55 per cent of the entire number.

"Gelatin liquefiers are almost always present in milk, and in the largest numbers in milk of a poor quality, especially during the winter months.

"Gas-producing germs belong mostly to the *Bacterium ærogenes* type and are found in milk at all seasons, but in far greater number during the hottest weather of summer.

"Milk brought to a factory once in 2 days is not necessarily injured in quality for butter making, and this can not be considered as the chief cause of bad milk and poor butter in winter."

The source of milk supply for towns and cities, A. W. Bitting (*Indiana Sta. Bul. 89, pp, 39–69*).—In a study of the milk supply of the city of Lafayette, Ind., covering one year, the author tested some 700 samples of milk and inspected the various dairy farms in the vicinity. The results of the study are embodied in a general discussion of the production and delivery of milk in cities and descriptions of 29 of the dairies furnishing milk to Lafayette. Topics considered in the discussion include the food value of milk, bacteria in milk, dairy herds, stables, food, water supply, milking, and the cooling and delivery of milk. In comparing methods of delivery it was found that the fat content of the milk delivered by drawing from the bottom of the can varied from 1 to 4.4 per cent, while that delivered by dipping remained uniform at 3.6 per cent. The number of cows in the different herds described varied from 4 to 70 and averaged about 21. The fat content of the milk as determined by from 1 to 9 tests in each case ranged from about 3.1 to 4.3 per cent, and averaged about 3.7 per cent.

New York milk supply, H. D. CHAPIN (*Sanitarian, 47 (1901), No. 385, pp. 481–491*).—A report of the efforts of the commission appointed by the Medical Society of the County of New York in improving the milk supply of the city.

Pasteurized bottle milk, C. KNOCH (*Molk. Ztg., 15 (1901), Nos. 38, pp. 677, 678; 39, pp. 697–699, figs. 13*).—A description of methods of pasteurizing milk in bottles, together with illlustrations of apparatus and buildings.

The milk "thermophore," L. VERNEY (*Centbl. Bakt. u. Par., 2. Abt., 7 (1901), Nos. 17–18, pp. 646–653*).—The milk thermophore is an apparatus for keeping milk warm which is intended for infant's use, either pasteurized, sterilized, or in its original condition. It consists of a double-walled metal vessel, with a rack for the bottles in the central chamber, and the space between the walls filled with crystallized sodium acetate or similar material. The apparatus is of German manufacture, and has been tested by a number of investigators with somewhat contradictory results. In theory the practice is contrary to the usual rules for pasteurizing milk, which call for the rapid cooling of the milk after pasteurization.

According to the results obtained by the author in the case of raw milk the number of bacteria in the milk decreased in the first 2 to 5 hours of keeping in the thermophore, but increased after 8 or 9 hours to practically the same content as in milk which was not warmed. The bacterial flora of milk was changed by treatment in the thermophore, certain species, among others the peptonizing bacteria, decreasing very noticeably in number. Pathogenic micro-organisms in milk were not killed with certainty after several hours' treatment in a thermophore. The author concludes that there is considerable difference in the efficiency of the apparatus put out by the same company, and that the use of the milk thermophore for children's milk can not be recommended.

The action of the milk thermophore, C. HAGEMANN (*Centbl. Bakt. u. Par., 2. Abt., 7 (1901), Nos. 17–18, pp. 640–645*).—A series of experiments by the author with raw, pasteurized, and boiled milk, and with sterilized milk inoculated with a number of pathogenic germs in general corroborated the antibacterial action of the thermophore as reported by a number of others. He concludes that infant's milk should not be kept in the apparatus beyond about 5 hours, and finds that the apparatus on the market varies considerably in efficiency.

Calculation of creaming and watering in the analysis of milk, LOUÏSE and RIGUIER (*Compt. Rend. Acad. Sci. Paris, 132 (1901), No. 16, pp. 992–995*).—A series of formulas for calculating the extent to which fat has been removed from milk and water has been added.

The ripening of cream, H. W. CONN and W. M. ESTEN (*Centbl. Bakt. u. Par., 2. Abt., 7 (1901), Nos. 21, pp. 743–752; 22, pp. 769–775*).—The authors here record a series of investigations which have been in progress for 3 years, in which a bacteriological examination was made of the unripened and ripened cream from 2 creameries and 4 private dairies. The object of the work was to determine the types of bacteria which produce the ripening of cream under the normal conditions of a Connecticut dairy. The number of bacteria in the cream collected at different times was determined by count, and an attempt was made to determine the species of bacteria in the ripened cream. The conclusions of the authors in regard to the bacteriological development that occurs during the normal ripening of cream are as follows:

"(1) Milk as it is drawn from the cow contains great quantities of bacteria; most of these are miscellaneous forms of liquefying bacteria and other nonacid species. At the outset the number of acid bacteria is very small.

"(2) All species of bacteria increase during the setting of the milk for the separation of the cream.

"(3) For a few hours the alkaline bacteria, and the others which have here been included under the head of miscellaneous, increase quite rapidly, while the lactic bacteria are hardly evident.

"(4) After about 12 hours the lactic bacteria have increased so much as to be as numerous as the others, and from this time on they continue to increase with great rapidity until a maximum is reached at about 48 hours; after this the number gradually decrease and they finally practically disappear.

"(5) The ripened cream contains prodigious numbers of bacteria, larger numbers than are known in any other natural medium. They are, however, nearly all lactic bacteria.

"(6) After the first 12 hours all species of bacteria, except the two lactic species, decrease in relative numbers and finally absolutely disappear.

"(7) The 2 common species, Nos. 206 [*B. acidi lactici*] and 202 [an extremely minute colony intensely acid], increase regularly from the beginning of experiments until the maximum. No. 208 [*B. lactis ærogenes*] is always present in considerable quantity and during the ripening increases in numbers though not increasing in proportion.

"(8) The cream which is received by a creamery is already half ripened, as indicated by the immense numbers of bacteria it contains. All of the changes which occur in the cream under the influence of the miscellaneous bacteria have already occurred, and the ripening that takes place in the creamery is due wholly, or almost wholly, to the growth of the lactic bacteria.

"(9) A ripened cream is almost a pure culture of acid bacteria, but this does not mean that ripening has been produced by these acid bacteria alone.

"(10) That the lactic bacteria play an important part in the ripening is perfectly evident; that they are the sole cause of the changes occurring in the ripening is not so evident.

"(11) The peculiar flavor of June butter, which is so much desired by the butter maker, is not due to the development of the common lactic bacteria. Butter ripened during the winter months develops the 2 species of lactic bacteria as abundantly and as quickly as does that ripened in June, but the flavor does not make its appearance. In the last 3 experiments recorded the June flavor was very noticeable in the cream, but the development of the acid bacteria, or the 2 species referred to, was practically the same as in all of the previous experiments. The June flavor, therefore, can not be due to these common lactic bacteria.

"(12) To what this June flavor is due we are not as yet satisfied. Whether it will prove to be due to the large growth of miscellaneous bacteria during the first few hours of ripening, or whether it is due to a difference in the chemical nature of the cream, remains for further experiments to decide."

A case of putrid butter, C. H. ECKLES (*Iowa Sta. Bul. 59, pp. 50–54, figs. 2*).—Samples of butter having a strong disagreeable taste and a putrid odor were brought to the station by the manager of a creamery in which the butter was made. In an examination of the butter 3 kinds of bacteria were isolated which produced very bad effects upon milk and were thought to be the cause of the fault. "The principal difference between the spoiled butter and good creamery butter in regard to the bacteria contained was an abnormal number of gelatin liquefiers in the former, which included some forms found to have a very injurious effect on butter." The conclusion was reached that the milk was contaminated in some way before delivery at the factory. The trouble disappeared from the factory after suggestions made by the station as regards cleanliness and pasteurization were followed and after a dry period which was broken by heavy rains about the same time.

Analyses of buttermilk, B. BÖGGILD (*Mälkeritid., 14 (1901), No. 30, pp. 457–463*).—Twenty-seven samples of buttermilk from 12 Danish creameries were analyzed in studying the value of buttermilk for human consumption. A number of the samples had been mixed with water in the churn, some containing nearly 20 per cent extra water. The fat content of the samples ranged from 0.12 to 0.44 per cent, the total solids from 5.66 to 8.88 per cent, albuminoids from 2.03 to 3.16 per cent, and lactic acid from 0.51 to 0.88 per cent. Comparing skim milk and buttermilk, the author concludes that they have about the same food value when the latter has not been diluted with water. Pure buttermilk should contain about 8.5 per cent of solids, 0.2 to 0.3 per cent of fat, and not less than 3 per cent of albuminoids. In good buttermilk a low fat content is accompanied by a high content of total solids.—F. W. WOLL.

An experiment with Tyrogen (Bacillus nobilis), E. VON FREUDENREICH (*Milch Ztg., 30 (1901), Nos. 32, pp. 497–499; 34, pp. 531–533*).—The author made an extended study of the influence of the *Bacillus nobilis* of Adametz in the ripening of cheese. Small cheeses were made from 10 liters of milk, portions of which had been inoculated with pure cultures of various bacteria; some were made without inoculations, and some from pasteurized milk. From a large number of experiments the author regards the *Bacillus nobilis* an undesirable species of bacteria for the ripening of cheese. The cheeses made with this micro-organism were in a great many instances of bitter flavor and undesirable aroma.

Dairy industry in Wisconsin, H. L. RUSSELL (*Wisconsin Sta. Bul. 88, pp. 11*).—The adaptability of different sections of the State to dairying is discussed, and statistics are given showing the total production of butter and cheese, the number of cheese factories, creameries, and combined factories, in each county of the State in 1901, and for comparison the number of factories in various counties of the State in 1896. The total number of cheese factories in 1901 was 1,540, creameries 1,086, and combined factories 71. The data show that "the most rapid development in the dairy industry is now taking place in the north-central and northwestern counties, rather than in the older settled regions to the south. The distinctively dairy belt that was marked in the State 5 years ago is now spreading rapidly to the northward and the westward, and it seems quite probable that the industry will reach as marked development in these portions as it has in the east and south." A wall map showing the distribution of the creameries and cheese factories in the State accompanies the bulletin.

Swedish dairying, 1800–1900, G. LILJHAGEN (*Meddel. K. Landtbr. Styr., 1901, No. 77, pp. 57*).—The report gives an account of the development of the Swedish dairy industry during the past century. Included in the report are methods of cream separation and of butter and cheese making; state and other measures for the advancement of dairying in Sweden; dairy statistics of production, exports, and imports; and a list of Swedish creameries and cheese factories. In 1900 the total number of butter and cheese factories in Sweden was 1,688. Of these, 1,215 were creameries, 287 cheese factories, and 186 combined creameries and cheese factories. The total quantity of milk handled by the factories was 842,280,576 kg. The creameries manufactured 26,114,018 kg. butter, 3,265,734 kg. full-cream cheese, 1,463,370 kg. half-cream, 182,809 kg. quarter-cream, and 2,523,542 kg. skim cheese. The number of butter or cheese factory patrons was 68,947.—F. W. WOLL.

Dairying in France, H. E. ALVORD (*Amer. Agr. (mid. ed.), 68 (1901), No. 24, p. 615.*)

Trade in dairy produce in the British West Indies, W. K. MORRISON (*Chicago Dairy Produce, 8 (1901), No. 55, p. 14*).—A popular discussion of market demands and supplies in the region indicated.

Bibliography of milk, first supplement, 1900, H. DE ROTHSCHILD (*Bibliographia lactaria, premier supplément, 1900. Paris: Octave Doin, 1901, pp. 98*).—This is the first supplement to the very extensive bibliography of milk issued by the author last year (E. S. R., 12, p. 786). The supplement covers the year 1900, and contains a classified list of 1,324 titles.

VETERINARY SCIENCE AND PRACTICE.

Investigations on the theory of bacterial infection, A. RADZIEWSKY (*Ztschr. Hyg. u. Infectionskrank., 37 (1901), No. 1, pp. 1–51, pl. 1*).—The literature on the subject is critically reviewed and especial attention is given in experiments to cholera vibrio, typhus bacillus, *Streptococcus pyogenes*, and the anthrax bacillus. From the experiments recorded in this paper the conclusion is drawn that a fatal bacterial infection involves 2 antagonistic processes—the rapid multiplication of the bacteria and their destruction. The author had already come to a similar conclusion regarding *Bacillus coli*, and believes that the same processes are characteristic of infections by other bacterial organisms. It is believed that the number of bacteria which are produced during the fatal infection is greatly in excess of the estimates which are commonly made. The number of bacteria which are found at any stage of the disease or at the time of death, in the diseased tissues, represents only the few which have escaped destruction during the progress of the disease. The pathogenic bacteria are destroyed in the serum of the infected animal and the organism in nearly every instance is able to immunize itself to some extent against the bacteria. The difference between the fatal and nonfatal infection, in so far as the reaction of the animal organism is concerned, appears in a comparatively late period of the disease and is not to be observed at the beginning of the infection. This difference consists largely in the more pronounced toxic effects which appear in cases of fatal infection.

The physiology of the leucocytes, A. LOMBARD (*Compt. Rend. Soc. Biol. Paris, 53 (1901), No. 15, pp. 438, 439*).—From previous experiments it was believed to have been demonstrated that the toxic substance in refractory animals was located in the leucocytes. Further experiments were made to determine the influence of atropin and strychnin upon the leucocytes. From these tests it is concluded that hyperleucocytosis is a constant phenomenon after injection with atropin or strychnin. Within certain limits the more refractory the animal and the larger the dose the more pronounced is the process. The experiments were conducted on guinea pigs.

The leucocyte formula in certain experimental infections, C. ACHARD and M. LOEPER (*Compt. Rend. Soc. Biol. Paris, 53 (1901), No. 16, pp. 486, 487*).—The experiments reported in this article were made on dogs and rabbits which were experimentally inoculated with various pathogenic organisms including glanders, anthrax, and actinomycosis. In all cases a leucocytosis ranging from 15–30 to 1,000 was obtained, during which the polynuclear cells varied from 76 to 94 per 100. This condition was maintained for a time varying from 3 to 6 days, after which the mononuclear elements became more numerous. The leucocyte formula appears to be quite independent of the nature of the pathogenic organism but depends upon the reaction of the animal to the infection.

Immunizing bodies in the organism, J. KLIMOFF (*Ztschr. Hyg. u. Infectionskrank., 37 (1901), No. 1, pp. 120–130*).—A series of experiments was conducted with cultures of anthrax bacillus 6 hours old and of typhus bacillus 24 hours old. The purpose of the experiments was to determine whether the immunity of animals to disease is due to the presence of alexins or similar bodies in the organism, or to osmotic reactions between the animal serum and the pathogenic bacteria. Experiments showed that rabbit serum in a fresh condition exercised a strongly germicide effect upon the anthrax and typhus bacilli. It was also determined by these experiments that the peptone content of the serum was not influenced by heating, and that the presence of peptone could not be assumed to determine the destruction of the bacteria.

The significance of salts for the germicide action of serum, LINGELSHEIM (*Ztschr. Hyg. u. Infectionskrank., 37 (1901), No. 1, pp. 131–172*).—This paper contains a report on an extensive series of experiments with anthrax bacillus and other pathogenic organisms. The experiments indicate that the influence of salts in increasing the germicidal action of animal serum has been much overestimated. It is believed that the germicidal action of serum does not rest upon an osmotic basis and can not be explained in a quantitative manner. The osmotic pressure of the serum is too small to account for the destruction of bacteria by its action, and when the osmotic pressure of such serum is artificially increased the germicidal action is not influenced proportionately.

The action of the essence of turpentine on virus, V. GALTIER (*Jour. Méd. Vét. et Zootech., 5. ser., 5 (1901), pp. 193–202*).—The author conducted a series of experiments with this substance upon the virus of glanders, tuberculosis, and anthrax. Glanders virus taken from lesions of this disease was sterilized by contact with pure essence of turpentine for a period of 30 hours. The glanders bacillus in culture tubes was sterilized in 49 minutes when turpentine was used in the proportion of 1 cc. to 3 cc. of the culture. The author concludes that essence of turpentine can advantageously be used in treating objects which have become infected with the glanders bacillus.

The tubercle bacillus emulsified in water, was sterilized in 18 hours by the addition of $1\frac{1}{2}$ cc. to 2 cc. of the emulsion. Fresh tubercle bacillus taken from tuberculous lesions in guinea pigs and emulsified in turpentine, was quite rapidly attenuated.

Spore-bearing anthrax cultures, to which turpentine was added at the rate of 6 cc. to 30 cc. of the culture, were considerably attenuated, but not completely sterilized at the end of 6 hours and 30 minutes. Emulsions of fresh anthrax virus treated with turpentine retained their virulence for a considerable time. Experiments showed that when fresh virus or spore-bearing culture was mixed with turpentine before inoculation into experimental animals, the turpentine seemed to have the effect of increasing the resistance of the animal to infection.

A report on the more important Italian publications in general pathology and pathological anatomy during the year 1900, O. BARBACCI (*Centbl. Allg. Path. u. Path. Anat., 12 (1901), No. 8–9, pp. 321–393*).—Italian literature on pathology of man and animals for the year 1900 is classified and briefly abstracted.

Serum diagnosis in tuberculosis, E. ROMBERG (*Deut. Med. Wchnschr., 27 (1901), No. 18, pp. 273–277*).—Experiments were made according to the method proposed by Arloing and Courmant for diagnosing tuberculosis, from the presence of a high agglutinizing power in the serum of suspected animals. The literature of the subject is discussed by the author in a critical manner, and the conclusion is reached that while the method is fairly reliable, there are many serious obstacles in the way of its general application in the manner which was first proposed. The difficulty of obtaining a sufficient amount of cultures is considered very great. In experiments for the purpose of obviating these difficulties the author found that suitable material could be obtained in large quantities and preserved for considerable time by killing tubercle bacilli, pulverizing them and emulsifying them in alkaline water. The best results were obtained when an emulsion was made by maintaining dried pulverized tubercle bacilli at a temperature of 37° C. in a $\frac{1}{2}$ per cent solution of soda lye in the proportion of 1 liter to 10 gm. of the bacilli. In experiments with this material it was found that the serum of tuberculous animals had the same curative action upon the emulsified tubercle bacilli as upon the living bacilli. It was also found that human blood serum would agglutinate the emulsion.

The elimination of tuberculosis from the dairy herd at St. Helena, C. J. POUND (*Queensland Agr. Jour., 8 (1901), No. 4, pp. 303–305, pls. 2*).—When first tested it was found that in the dairy herd at St. Helena 9 out of the 68 animals reacted. Four of the tuberculous cows were later used for breeding purposes and their calves were fed on tuberculous milk after it had been sterilized. When 4 weeks old the calves were tested with tuberculin without a reaction in any case. During 16 months after the first test the cows were subjected to the tuberculin test on four different occasions without responding. A careful post-mortem examination was made on each of these animals with the result that they were found to be tuberculous.

Tuberculosis in horses, Rabe (*Ztschr. Fleisch. u. Milchyg., 11 (1901), No. 8, pp. 242, 243*).—Detailed notes are given on the symptoms and the post-mortem findings in cases of tuberculosis in the horse.

Anthrax infection, L. Heim (*Arch. Hyg., 40 (1901), No. 1, pp. 55–62*).—The author observed that in preparations of anthrax bacilli stained with Löffler's methalyne blue, a capsule or membrane was differentiated in color from the remainder of the bacilli. The color of the capsule when stained by this method was a clear rose. This behavior of the anthrax bacilli was made use of in differential diagnosis between anthrax and other diseases and in making a diagnosis in suspected cases of anthrax. When this method is applied, rose-colored patches are seen in blood and in exudations which do not contain pus. In diseased tissue which contain the organisms of hog cholera, fowl cholera, and bubonic plague the rose color was not observed after the stain had been applied, and the author believes that this staining procedure offers a reliable method for diagnosing anthrax in diseased tissues.

Experiments on the curative action of anthrax serum, A. Sclavo (*Berlin. Klin. Wchnschr., 38 (1901), No. 18, pp. 481–484*.—The author first obtained satisfactory results with a curative anthrax serum from experiments on rabbits and sheep. From the sheep a serum was obtained which completely protected the rabbits against anthrax, although they had been inoculated 12 hours previously with an anthrax culture containing spores. It was found that different sheep reacted very differently to the preliminary treatment designed for the protection of the curative serum. In many cases, even when the doses of attenuated cultures were gradually increased to large size and were continued for a long time, these sheep possessed very weak protective power. The difference in the strength of the serum obtained by this method did not depend on the age, breed, or sex of the sheep, but appeared to be a peculiarity of the individual sheep. In some of the sheep which had been immunized against anthrax the author administered pilocarpin in order to determine whether the protective properties of the serum could be strengthened in that manner.

A study of actinomycosis, V. E. Mertens (*Centbl. Bakt. u. Par., 1. Abt., 29 (1901), No. 16, pp. 649–654*).—Since several authors had classified actinomyces into 2 species, of which one was supposed to be virulent and the other not, and one aerobic and the other anaerobic, a special study of the matter was taken up by the author for the purpose of gaining new evidence on this point. Material containing the actinomyces organism was subjected to different conditions until from the original material which came from one source the 2 suggested species were obtained. The organism at the beginning of the experiments was growing at a temperature of 37° C., and was disposed to be anaerobic, but it was found possible to obtain aerobic actinomyces from this source which developed readily at much lower temperatures. The author made experiments on animals, by which it was determined that both forms of the actinomyces were pathogenic, although the anaerobic form seemed to possess the greater virulence. It is believed from these experiments that there is but one species of actinomyces.

Some results in the treatment of milk fever by the method of Schmidt-Kolding, I. A. Eiler (*Berlin. Tierärztl. Wchnschr., 1901, No. 17, pp. 261, 262*).—In this article statistics are brought together in 803 cases of milk fever which were treated with potassium iodid. Of the 803 cases, 615, or 76.6 per cent, recovered completely, while the others were slaughtered or died. The crisis of the disease in 350 cases came after 24 hours and in 68 cases after the second or third day. The body temperature at the outbreak of the disease was usually between 37 and 38.5° C., but varied from 36.4 to 41.5° C. As a rule but one dose was given, and this varied from 5 to 12 gm.

The treatment of milk fever by intravenous injection of potassium iodid,

W. WESSEL (*Berlin. Thierärztl. Wchnschr., 1901, No. 19, p. 287*).—A solution of potassium iodid was made containing 10 grams in 2 liters of water. This amount was injected into the milk vein or jugular vein, according to the position of the cow, the milk vein being chosen when the cow was unable to stand. Good results are reported from this treatment by the author, and it is believed that it possesses certain advantages over the usual method of making an infusion directly into the udder.

Lungworms in a large herd, N. O. LARSEN (*Maanedsskr. Dyrlæger, 12 (1901), No. 11, pp. 427–430*).—The author reports the outbreak of this disease among a herd of cattle, of which 43 were affected. The disease was due to the presence of *Strongylus micrurus* in the lungs. After post-mortem examinations of calves which had died of the disease, the remaining animals were treated 3 times daily with the fumes from a mixture of turpentine oil and creolin in equal parts. Of the 43 animals which were affected 9 died and the others recovered slowly.

Treatment of lungworm disease of cattle by intratracheal injection of a carbolic-acid solution, W. WESSEL (*Berlin. Thierärztl. Wchnschr., 1901, No. 16, pp. 249–252*).—An outbreak of this disease occurred among a number of young cattle which had been grazing on a low, wet pasture and had begun to show a considerable loss of flesh in August. The symptoms indicated the presence of lungworms and 20 gm. of a 1 per cent solution of carbolic acid was injected into the trachea of each animal. Considerable improvement was noticed in the breathing of the animals after 2 days, and coughing was much less pronounced. Of the 8 animals which were affected, 7 ultimately recovered. Similar results were obtained from an application of the same treatment in other cases of this disease.

Lungworms in sheep and the successful treatment, PETERS (*Ztschr. Fleisch u. Milchyg., 11 (1901), No. 8, pp. 239–241*).—Brief notes are given on a serious outbreak of lung and stomach worms which have been observed in recent years. An outbreak of *Strongylus contortus* occurred in a herd of 400 lambs, and the worms were found in abundance in the first stomach and also in the digestive stomach. As a treatment the author used picro-nitrate of potash. The salt is not easily soluble, and after dissolving 0.2 gm. in 100 gm. of water, ½ of this quantity was given to each lamb as a total dose. On the same estate an outbreak of lungworms occurred later and the author treated the disease by the same method. Five gm. of the solution made by dissolving 0.2 gm. of picro-nitrate of potash in 100 gm. of water was injected into the trachea of each sheep. Very satisfactory results were obtained from the use of this chemical. The owner of the sheep administered the same remedy by way of the mouth for lungworms, with favorable results. The lungworm disease of cattle has also been successfully treated in the same way.

Diagnosis of sheep scab, F. W. GARNETT (*Vet. Jour., 52 (1901), No. 311, pp. 262–265, pl. 1*).—In making inspection for sheep scab it was found necessary to adopt a convenient and reliable method which could be readily applied in all cases. The author believes that external symptoms which may be recognized by the naked eye are not entirely trustworthy, and relies upon microscopic examination in all cases. For this purpose no attention should be given to the tissue in the center of a scabby area, but a small tuft of wool should be cut from the healthy skin on the edge of the scabby area. If living mites are present at all, they will be found in considerable numbers on such wool.

Contributions to the study of Piroplasma equi, LAVARAN (*Compt. Rend. Soc. Biol. Paris, 53 (1901), No. 14, pp. 385–388, figs. 15*).—This blood parasite is closely related to the organism of Texas fever, and is frequently found in the blood of horses in the Transvaal and other parts of South Africa. Its relationship to malaria of horses is not determined. It is believed, however, by the author, to be one, if not the chief, organism concerned in this disease.

Contagious pneumonia, BUTEL (*Rec. Méd. Vet., Paris, 8. ser., 8 (1901), No. 8, pp. 175–177*).—A general discussion of the symptoms and treatment adopted by Guillemain and Cadix in the treatment of 25 cases of this disease in horses.

Intravenous protective inoculation against pneumonia, KRÜGER (*Berlin. Thierärztl. Wchnschr., 1901, No. 16, p. 250*).—An outbreak of this disease occurred among horses, and the animals were inoculated with 100 gm. of serum on March 18 and 21, and again with the same quantity on April 10. The temperature was taken each morning for a number of days, and it was found that the symptoms of the disease began to disappear after 1 or 2 days. In other outbreaks of the disease animals were inoculated intravenously from 3 to 5 days with from 100 to 200 gm. There were no fatal cases during this treatment. Intravenous inoculation is claimed to possess certain advantages over the subcutaneous method, the chief of which is the more rapid and intensive action of the serum.

Mallein injections in Bavaria, KITT (*Wchnschr. Tierheilk. u. Viehzucht, 45 (1901), No. 18, pp. 205–210*).—Since 1892 mallein has been distributed gratis to veterinarians by the Royal Bavarian Veterinary High School. Reports have been forwarded concerning various tests which have been made with mallein in different parts of the country, and the results make a very satisfactory showing for the reliability of mallein as a test for glanders. It appears from these reports that no case of glanders failed to react to the mallein test and that no horse which was free from glanders gave a typical reaction to the test when twice repeated.

Omphalitis of colts, GOTT (*Berlin. Tierärztl. Wchnschr., 1901, No. 21, p 312*).—The author tried various methods in the treatment of this disease, but had best success with a solution of colloidal silver preparation. In one case 80 gm. of a ½ per cent solution was injected into the jugular vein of a colt for 3 days in succession. The beneficial effect of this treatment was shown after the first day, and the animal recovered.

Omphalitis in colts, H. SOHNLE (*Monatsh. Prakt. Thierh., 12 (1901), No. 8, pp. 337–367*).—The author isolated the organism which is concerned in producing this disease and describes its behavior on various culture media. It is described as a coccus with a capsule and is considered a variety of *Staphylococcus pyogenes aureus*. The organism is pathogenic for mice, rabbits, and guinea-pigs. Inoculation experiments were made on 2 horses, with the result that both died of characteristic symptoms of the disease. The author believes that the infection may be carried for a long period by the mother. It is suggested that since the pathogenic organism is now known, considerable improvement may be hoped for in practical methods of treating this disease.

Influence of atmospheric conditions on colic in horses, CHAUVAIN (*Rec. Méd. Vét., Paris, 8. ser., 8 (1901), No. 9, pp. 280–282*).—Observations on large numbers of horses used for military purposes showed quite conclusively that cases of colic are much more frequent during periods of rainy or cloudy weather, with a high temperature.

Filariasis of the suspensory ligaments of the pastern joints in horses, J. PADER (*Arch. Parasit., 4 (1901), No. 1, pp. 58–95, figs. 20*).—The author made a study of affections of the suspensory ligaments in the region of the cannon bone and found that a considerable percentage of these troubles are due to parasitism by *Filaria reticulata*. A detailed account is given of the anatomy of this worm and on the lesions caused by its presence in the tendons. Infested tendons frequently show nodules of various sizes upon their exterior. A change in the color of the tendons is often observed. It is generally believed that infestation by Filaria in these tendons occurs more generally than has previously been suspected. No method of treatment has been devised.

A peculiar skin disease accompanied by internal lesions resembling those of tuberculosis, J. A. W. DOLLAR (*Veterinarian, 74 (1901), No. 881, pp. 219–222, pl. 1*).—A 5-year-old mare, after passing through an attack of pneumonia, was observed to be suffering from a skin disease which was characterized by the development of an extensive swelling on the chest and numerous other tubercles of varying sizes under the skin. The treatment for this affection was ineffectual, and the animal was killed. The post-mortem examination showed numerous white or purple nodules of the size of a pea on the diaphragm and similar nodules in the lungs. A microscopic examination of these nodules revealed the presence of a form of coccus.

The teeth of the horse as affected by age—I, C. McCulloch (*Virginia Sta. Bul. 115, pp. 97–108, figs. 6*).—Brief notes are given on the structure and development of teeth, and on the character of the incisors, canine teeth, and molars.

The teeth of the horse as affected by age—II, C. McCulloch (*Virginia Sta. Bul. 116, pp. 109–126, figs. 17*).—Notes on the appearance of the teeth in horses from time of birth until the age of 5 years.

Animal parasites, J. Withycombe (*Oregon Sta. Rpt. 1901, pp. 23, 24*).—An investigation is made of the extent to which the liver fluke is prevalent in Oregon. From a large flock, nearly all of which was reported as having died from the attacks of this parasite, 7 sheep were secured for examination. Only a few fluke worms were found and it is believed that the loss of sheep was not due to the presence of these parasites. Stomach worms were found in one upon post-mortem examination, and 4 of the animals were given 4 drams of gasoline with 10 drops of carbolic acid in 4 oz. of milk daily for 3 days. As a result they gained rapidly in weight.

The treatment of sarcoptic mange with cresol liniment, Albrecht (*Wchnschr. Thierheilk. u. Viehzucht, 45 (1901), No. 17, pp. 194–198*).—Good success was reported from the use of this liniment in the treatment of mange of dogs and pigs.

AGRICULTURAL ENGINEERING.

Irrigation in India and America, E. H. Pargiter (*Irrig. Age, 15 (1901), Nos. 11, pp. 355–362; 12, pp. 393–400; 16 (1901), Nos. 1, pp. 6–12; 2, pp. 43–48; 3, pp. 79–82*).—The system of irrigation control in India is very clearly explained and compared with that in force in the United States. The management of land and water and the control of colonization are entirely in the hands of the government. The canals are practically all public. The application of irrigation water is regulated by the level of the ground water. The conditions of water supply are peculiarly fortunate in India. Even in dry seasons on the plains the rainfall in the mountains is sufficient to maintain a flow in the streams. This, with the melting of snows at the higher altitudes, gives a continuous and reliable supply. Rotation in the use of water is practiced in times of scarcity. In conclusion, it is claimed that while agricultural development in India under absolute government control has been slow it has been safe, while under private ownership in the United States it has been rapid, but accompanied by conflicts of interest, expensive litigation, and uncertainty of rights.

Irrigation in the West, W. E. Smythe (*Amer. Mo. Rev. of Reviews, 25 (1902), No. 1, pp. 75–80*).—This article discusses a plan of action for the National Government with regard to irrigation.

Current meter and weir discharge comparisons, E. C. Murphy (*Proc. Amer. Soc. Civ. Eng., 27 (1901), No. 7, pp. 798–806, pl. 1, figs. 2*).—This paper gives the results of a series of experiments made at the hydraulic laboratory of Cornell University to test the accuracy of velocity measurements obtained with the current meter used by different methods. The results bring out quite clearly the fact "that the accuracy of the current-meter discharge measurements plays only a comparatively small part in the accuracy of the measurements of stream flow. . . .

"In river gaging it is the accurate measurement of the volume flowing per day and per month that is desired. Single discharge measurement is only one of the factors on which this depends. Daily flow is found from a discharge curve giving the relation between discharge and river stage, and on the daily fluctuations in the stage.

The accuracy of the discharge curve depends on the accuracy of the individual discharge measurements, the permanence of the river bed, the position of the gage, and the accuracy of the gage readings. The accuracy of river-stage fluctuation measurements depends on the kind of instrument used for this purpose, its position, and the frequency and accuracy of the observations."

Hydraulic diagrams for the discharge of conduits and canals, based upon the formula of Ganguillet and Kutter, C. H. SWAN and T. HORTON (*New York: Engineering News Publishing Co., 1899, pp. 43*).

Profiles of rivers in the United States, H. GANNETT (*Water Supply and Irrig. Papers, U. S. Geol. Survey, No. 44, pp. 100, pls. 11*).

Tests of agricultural machines, M. RINGELMANN (*Mem. Soc. Nat. Agr. France, 139 (1900), pp. 339–365, figs. 10*).—This article discusses the general subject of machine testing and gives descriptions of the machine-testing station at Paris and at the Universal Exposition.

Economics of road construction, H. P. GILLETTE (*New York: Engineering News Publishing Co., 1901, pp. 41, figs. 9*).

Machinery for refrigeration, N. SELFE (*Chicago: H. S. Rich & Co., 1900, pp. 416, figs. 213*).

Refrigerating machinery—its principles and management, A. R. LEASK (*London, 1901, rev. ed., pp. 296, ill.*).

MISCELLANEOUS.

Twelfth Annual Report of Arizona Station, 1901 (*Arizona Sta. Rpt. 1901, pp. 305–342*).—This includes a report of the director containing a general review of the work and publications of the station during the year, notes on the educational value of station work, an account of the date-palm orchard, and a financial statement for the fiscal year ended June 30, 1901; a report of the agriculturist and horticulturist giving brief notes on date-palm culture, tests of field crops, and irrigation and evaporation experiments; an account of experiments in animal industry noted elsewhere; a report of the botanist containing an account of work in range improvement and brief notes on the Australian saltbush, parasitic fungi, economic cacti, etc., and a report of the chemists containing notes on the examination of irrigation waters and analyses of sugar beets.

Annual Report of Oregon Station, 1901 (*Oregon Sta. Rpt. 1901, pp. 19–47*).—This contains a brief report of the director, a financial statement for the fiscal year ended June 30, 1901, and departmental reports reviewing at some length the different lines of station work and giving some of the results obtained during the year.

Annual Report of South Dakota Station, 1901 (*South Dakota Sta. Rpt. 1901, pp. 27–36*).—A brief review of station work during the year by the heads of departments and a financial statement for the fiscal year ended June 30, 1901.

Agriculture in China, C. DENBY (*Forum, 32 (1901), No. 3, pp. 328–340*).—This article is a general discussion on Chinese agriculture. The different crops are briefly treated.

Agriculture in New Zealand, M. MURPHY (*New Zealand Offic. Yearbook 1899, pp. 439–470*).—A statement of the agricultural and pastoral conditions of New Zealand. The production of cereals, root crops, flax, sugar beets, grasses, and leguminous forage crops is noted.

Agricultural education in the higher institutions of France and Algeria (*Bul. Agr. Algérie et Tunisie, 7 (1901), No. 21, pp. 517–520*).—The article gives a plan of agricultural instruction recently adopted at the School of Sciences, Algiers.

The national school of agriculture at Grignon, P. DECHAMBRE (*Monde Mod., 1901, No. 74, pp. 196–204, figs. 7*).—The history of this institution is given and the course of instruction and the management of the school are described.

NOTES.

Alabama Canebrake Station.—The work of the station during the present year under the new director will be along the same lines as heretofore, including investigations for the improvement of the impoverished soils of the prairie region; field experiments with cotton, corn, forage crops, fruits, and vegetables; experiments in floriculture, and studies of diseases of plants and animals.

Connecticut State Station.—C. J. Rice, for 18 years in charge of buildings and grounds, has resigned, and William Vietch has been appointed to fill his place.

Connecticut College.—E. H. Lehnert, B. S., D. V. S., has been appointed to the chair of physiology and veterinary science, *vice* N. S. Mayo.

Iowa Station.—The station has inaugurated an interesting and extremely important investigation in the breeding and feeding of cattle, through the financial aid and cooperation of the Union Stock Yards and Transit Company of Chicago. Fifty head of pure-bred and high-grade Galloway heifers have been purchased and are being bred to the Shorthorn bulls Scotland's Crown and Doctor White. Scotland's Crown is a roan Shorthorn bull imported by the college three years ago, and now conceded to be one of the best Shorthorn sires in America. Doctor White is a pure white Shorthorn bull purchased by the station at the recent International Live-stock Exposition at Chicago. This bull has been a prize winner at a number of leading live-stock shows during the past year. The pure-bred Galloway heifers are from such breeders as E. H. White, of Estherville, Iowa; David McCrae, of Guelph, Ontario, and O. H. Swigart, of Champaign, Ill.; and the grades from prominent breeders in Illinois. Some of these cattle were exhibited at the last International Live-stock Exposition at Chicago. In addition to the breeding features of the experiment, a careful record of the cost of production will be kept from birth until the cattle are finished for market, and various methods of feeding will be tested. Some of the cattle produced by this experiment will be retained for further investigation in breeding and feeding. A few pure white Shorthorn heifers are being purchased to be bred to Galloway bulls. This method of breeding is designed to produce steers of the famous blue-gray type and quality, which have been so popular in the leading markets and fat stock shows of Great Britain. It is conceded that this cross produces cattle that have no superiors for the block and for profitable feeding. The cattle produced in this way mature early and are of good form and make a high percentage of edible beef of an exceptionally fine grain and flavor, with an even distribution of fat.

Maine Station.—C. D. Holley, assistant chemist, has resigned to become chemist of the condensed milk company.

Michigan College and Station.—A. C. Bird, secretary of the State board of agriculture and of the college and station, has resigned to take effect May 31. T. A. Farrand has been appointed superintendent of the South Haven substation for fruit. The board has accepted bids and authorized the closing of contracts for the construction of a bacteriological laboratory and a bacteriological stable, to cost about $23,600. The new buildings will be used by both college and station. F. W. Robison has been elected assistant chemist of the station, *vice* L. H. Van Wormer, who resigned to accept the position of assistant analyst in the laboratory of the State Dairy and Food Department, at Lansing.

MINNESOTA COLLEGE AND STATION.—F. L. Washburn, formerly of the Oregon College and Station, and more recently connected with the University of Oregon, has been elected entomologist in the college and station. He will enter upon his new duties in June.

MISSISSIPPI COLLEGE AND STATION.—The recent appropriation of the State legislature is by far the most liberal ever made for the institution. Besides making provision for chairs of geology and mining and of civil and rural engineering, both of which are new, the appropriation carries the following provision for improvements and work: A new building for agriculture and horticulture, scientific departments, library, and museum, $40,000; infirmary building, $10,000; additional equipment for textile school, $13,030; additional equipment for mechanic arts department, $8,300; enlarging capacity of mechanic arts building, $5,000; residence for director of textile school, $1,500; equipment for English, veterinary, preparatory, agricultural, horticultural, and biological departments, $1,900; farmers' institutes for 1902–1903, $6,000; and a branch experiment station at McNeill, $13,000 for the biennial period. This is in the pine woods region where fertilizers are not used and do not pay under present conditions. In addition to fertilizer tests the aim will be to make a thorough test of a great variety of crops, giving much attention to orchard and garden crops. Work with live stock will probably be made a feature. The action of the legislature in appropriating for this branch station is the first substantial recognition on the part of the State of the importance of the work of the experiment station and the value of investigation as a basis for improving agricultural practice.

MISSOURI STATE FRUIT STATION.—T. M. Culver, of Koshkonong, Mo., has been appointed a member of the board of trustees, in place of L. O. Hailey, whose term has expired.

CORNELL UNIVERSITY.—The college of agriculture has announced the following cooperative experiments for the season 1902: Fertilizers—a soil test with nitrogen, phosphoric acid, and potash, singly and in combinations; wheat—tests of fly-resisting varieties, started last fall; beans—tests of standard field sorts; sugar beets—test of varieties and the adaptation of soils; potatoes—tests of varieties and methods of culture; buckwheat—varieties and methods of treating the crop, and alfalfa—a study of the adaptation of the different soils and methods of securing best results. A bill is now before the State legislature appropriating $200,000 for new buildings for the college of agriculture.

NORTH CAROLINA COLLEGE AND STATION.—Alexander Rhodes, assistant horticulturist, has resigned to accept the position of horticulturist at the State Normal School of Georgia, at Athens. B. F. Walton, a former graduate of the college, has been appointed superintendent of the agricultural experimental work of the station.

OHIO UNIVERSITY AND STATION.—Merritt F. Miller, a graduate of the agricultural college of the university, and recently connected with the Bureau of Soils of this Department, has been elected to succeed W. D. Gibbs. Under the bill which recently passed the State legislature providing for the reorganization of the board of control of the station, the governor has appointed an entirely new board, constituted as follows: F. Whittlesey, of Atwater; Alva Agee, of Cheshire; D. D. White, of Castalia; O. E. Bradfute, of Cedarville, and D. L. Sampson, of Cincinnati. The board has organized by the election of Alva Agee as president, O. E. Bradfute as secretary, and D. L. Sampson as treasurer. At a meeting held March 4, C. E. Thorne was reelected director, and the resignation of F. M. Webster was received, to take effect March 31.

RHODE ISLAND STATION.—J. W. Kellogg, assistant chemist in the department of feeds and feeding at the Massachusetts Station, has been appointed assistant chemist of the station, and entered upon his new duties March 15. L. P. Sprague, of the University of Vermont, has been appointed assistant horticulturist of the station, to take effect April 1. J. V. B. Watson, of Wakefield, R. I., has been reappointed a member of the board of managers for the term of five years. The former officers of the board have been reelected. A small glass house has been erected in connection with the remodeled incubator and brooder house, to supply green food to the young chicks which are reared during the winter season.

South Carolina College and Station.—C. E. Chambliss, entomologist, has been temporarily appointed botanist and bacteriologist in addition to his other duties. The new dormitory, with 80 lodging rooms and three recitation rooms, has been completed.

Texas College and Station.—A station council has been organized, consisting of Jefferson Johnson, of the board of trustees, the president of the college, and the director, chemist, and veterinarian of the station. W. C. Martin, assistant station chemist, has been granted a year's leave of absence to study at the Massachusetts Institute of Technology, and his place has been supplied for the year by N. Fraenckel, of New York City. Wilmon Newell, M. S., assistant entomologist at the Ohio Station, has been appointed to a similar position at this station. Plans have been accepted for the chemical and veterinary laboratory building provided for by the last legislature. It will be a two-story brick structure, and provided with the modern conveniences for instruction and laboratory work. A greenhouse, 16 by 42 feet, for the horticultural department of the college and station has been completed.

Utah Station.—The new cattle and sheep barns have been completed at a cost of about $12,000. Experiments with sheep are now under way, and a herd of pure-bred cattle is being purchased at a cost of $4,000.

West Virginia Station.—Gilbert M. John has been appointed assistant horticulturist of the station.

Wyoming Station.—A. C. Jones, of Laramie, has been elected a member of the board of trustees in place of Daniel C. Bacon, deceased. Cooperative work has been planned between the chemical and agricultural divisions of the station, in which digestion experiments will be undertaken with (1) the range grasses as they are found, gathered three or four times a year; (2) grasses growing on fenced area, to determine the yield and digestibility of the growth on the Laramie plains, and (3) grasses and other forage plants grown on the experiment farm with and without irrigation. The effects of small and large amounts of water used in irrigation on the character and value of the grasses will also be studied. Feeding experiments are in progress to compare alfalfa with native hay for sheep, to determine how much alfalfa and straw are needed to maintain horses through the winter, and in substituting alfalfa for wheat bran and native hay for a milch cow. Efforts are being made to provide suitable accommodations for sheep and cattle.

Statistics of Experiment Stations in the United States.—The latest statistics, contained in the annual report to Congress of the Office of Experiment Stations, show that there are now 60 experiment stations in the United States, exclusive of the substations. Of these, 54 receive Federal aid. The total income of the stations during 1901 was $1,231,881.55, of which $720,000 was received from the National Government. The remaining $511,881.55 represents the largest amount ever supplemented by State appropriations, analysis fees, sales of products, etc. To the Federal appropriation should be added $12,000 for the Alaska stations, $10,000 for Hawaii, and $5,000 for Porto Rico, besides the other appropriations to the Office of Experiment Stations for its work in general and the nutrition and irrigation investigations conducted under its supervision. The value of the additions to equipment of the stations during the year was unusually large, over $230,000, in comparison with $167,475 the previous year. These additions were distributed as follows: Buildings, $133,420.77; libraries, $26,303.49; apparatus, $15,309.48; farm implements, $13,085.45; live stock, $18,220.29, and miscellaneous, $25,025.10.

The stations now employ 688 persons in the work of administration and inquiry, as compared with 693 the previous year. There are 52 directors, 146 chemists, 62 agriculturists, 14 animal husbandmen, 78 horticulturists, 21 farm foremen, 31 dairymen, 49 botanists, 48 entomologists, 6 zoologists, 29 veterinarians, 14 meteorologists, 7 biologists, 5 physicists, 5 geologists, 21 mycologists and bacteriologists, 8 irrigation engineers, 12 officers in charge of substations, 29 secretaries and treasurers, 11 librarians, and 40 clerks. Besides these there are 77 persons unclassified, including superintendents of gardens, grounds, and buildings, apiarists, herdsmen, poultrymen, etc. During the year the stations published 445 annual reports and bulletins, as compared with 386 the previous year, which were supplied to over half a million addresses on the regular mailing lists. A larger number of stations than formerly supplemented their regular publications with press bulletins or circulars, issued at irregular intervals.

State appropriations for substations have been made as follows: In Kansas, $3,000 a year for the establishment and maintenance of a substation at the Fort Hays Reservation; in Michigan, $2,000 for the South Haven Fruit Substation and $3,000 for the Chatham Substation; in Minnesota, $11,200 for improvements at the substations, which are maintained by State appropriation; in Texas, an increase of the appropriation for the Beeville Substation from $5,000 to $7,500 for two years and $5,000 per annum for a new substation, which has been located at Troup; in Oregon, $5,000 a year for two years for a substation in eastern Oregon; in Utah, $6,000 for two years to establish a fruit experiment station in southern Utah; in Washington, $11,200 for the substation at Puyallup, including $2,000 for improvements. Alabama has continued State aid to the Canebrake Station, $2,500, and to the Tuskegee Station, $1,500; and Missouri has appropriated $26,525 for buildings and maintenance for the new State Fruit Experiment Station.

With the aid of funds given by the States, buildings have been erected during the past year at a number of the agricultural colleges, which will be used in whole or in part by the experiment stations. Wyoming has just completed a new science hall at a cost of $35,000. The New York State Station has erected a residence for the director and is now expending about $8,500 in remodeling the old residence into an administration building. North Dakota has erected two barns at a cost of $18,000 to replace the barn burned last year. Pennsylvania has finally completed and equipped its calorimeter building. Oregon has a new $3,000 station building; Storrs Agricultural College, a new dairy building; Alabama, a veterinary dissecting building and a new chemical laboratory; Colorado, an insectary; Washington, a greenhouse and insectary; Virginia, a new main barn and a piggery and abattoir; the Missouri State Fruit Experiment Station, a new station building; Kentucky, a barn for curing tobacco; New Jersey, a new barn, and Idaho, a piggery.

Referees of Association of Official Agricultural Chemists.—The executive committee has announced the following list of referees and associates for the year 1902: *Phosphoric acid:* Referee, C. H. Jones, Burlington, Vt.; associate, B. H. Hite, Morgantown, W. Va.—*Potash:* Referee, H. B. McDonnell, College Park, Md.; associate, Charles B. Beistle, State College, Pa.—*Nitrogen, determination of nitrogen:* Referee, Fred W. Morse, Durham, N. H.; associate, Edward B. Holland, Amherst, Mass.—*Separation of nitrogenous bodies:* Referee, L. L. Van Slyke, Geneva, N. Y.; associate, R. Harcourt, Guelph, Ontario.—*Soils:* Referee, F. P. Veitch, Washington, D. C.; associate, C. C. Moore, Washington, D. C.—*Dairy products:* Referee, George W. Cavanaugh, Ithaca, N. Y.; associate, C. A. Browne, jr., State College, Pa.—*Foods and feeding stuffs:* Referee, C. A. Browne, jr., State College, Pa.; associate, F. D. Fuller, Geneva, N. Y.—*Food adulteration:* Referee, W. D. Bigelow, Washington, D. C. (meat and fish, fermented and distilled liquors); associates, L. M. Tolman, Washington, D. C. (fats and oils, dyes); A. McGill, Ottawa, Canada (cereal products); H. W. Wiley, Washington, D. C. (infant and invalid foods); A. E. Leach, Boston, Mass. (saccharine products); L. S. Munson, Washington, D. C. (vegetables—

canned, dried, or otherwise preserved); W. H. Ellis, Toronto, Ontario (tea and coffee); F. T. Harrison, London, Ontario (cocoa); A. L. Winton, New Haven, Conn. (spices and condiments, baking powders and baking-powder chemicals); William Frear, State College, Pa. (vinegar); A. S. Mitchell, Milwaukee, Wis. (flavoring extracts); L. M. Tolman and L. S. Munson, Washington, D. C. (fruit products); W. M. Allen, Raleigh, N. C. (preservatives).—*Tannin:* Referee, William H. Teas, Ridgway, Pa.; associate, George A. Kerr, Damascus, Va.—*Insecticides:* Referee, J. K. Haywood, Washington, D. C.; associate, James Emory, Washington, D. C.—*Sugar:* Referee, G. L. Spencer, Washington, D. C.; associates, L. M. Tolman, Washington, D. C. (optical methods); L. S. Munson, Washington, D. C. (chemical methods); D. S. Davol, Caro, Mich. (special analytical methods used in sugar industry).—*Ash:* Referee, G. S. Fraps, Raleigh, N. C.; associate, F. T. Shutt, Ottawa, Canada.

Rice Experiment Station for Louisiana.—According to a note in *The Tradesman*, the rice convention recently held at Crowley, La., took preliminary steps looking to the establishment of a rice experiment station for southwestern Louisiana. Resolutions were adopted calling attention to the fact that when the experiment stations in Louisiana were established the rice industry was confined to planting along the banks of the Mississippi River, and that the three stations in the State each have their special fields of work and are "none of them favorably located for experiments on rice, especially for prairie rice growing, the development of which has taken gigantic proportions since the establishment of these stations." The present importance of the rice industry is held to make it imperative that scientific research be brought to bear on the many unsolved problems that confront the rice planter—such as irrigation, fertilizing, cultivation, and marketing of the crop, the merits of varieties, acclimation of varieties and improvement by breeding and selection, the diseases and insects affecting the crop, rice weeds and means of exterminating them, rotation of crops, etc. A committee of five persons was appointed to appeal to the next legislature for funds with which to establish and maintain a rice experiment station at some point in the rice belt in southwestern Louisiana.

Personal Mention.—Elwood Mead, irrigation expert in this Office, has gone to California, where he will deliver a course of lectures on irrigation laws and practice. On his return he will visit a number of places along the route to make final arrangements for the field work of the coming season.

C. T. Johnston, assistant in irrigation, has returned from a trip to Egypt, where he has made a study of the irrigation works and management in that country. His trip was a most profitable one, and in addition to securing extensive information on irrigation management and practice he obtained many excellent photographs of irrigation works and typical scenes. Incidentally he visited the Twfikieh School of Agriculture at Gizeh, near Cairo. The school has about 60 pupils, who are natives of the higher classes, and is conducted on a very practical basis. Each pupil has allotted to him a plat of about one-quarter of an acre of land which he carries on himself under supervision, receiving his share of the profit. The instruction is entirely in English. There is a great demand for the graduates of this school as managers of large sugar and cotton plantations, and difficulty is experienced in holding the pupils long enough to complete their course on account of this inducement. The school is maintained by the Egyptian Government, which is now erecting a fine large building and several smaller ones. It is now using an annex to one of Ishmael Pasha's palaces. The school has a farm of about 160 acres which is rented land. A rental of £12 an acre annually, or about $60, is paid for this land, but as it is supplied with water the year round and 3 crops are raised a profit is realized even at this high rental. The water used is all pumped from the Nile by steam and distributed in canals. In addition to the experimental work which the school is carrying on in various phases of cotton and sugar-cane culture, a large number of new fruits, mostly tropical and semitropical, are being tried and considerable work done with forage plants.

Prof. F. Lamson-Scribner, chief of the new bureau of agriculture in the Philippine Islands, sailed for Manila on the transport *McClellan* February 22. He was accompanied by E. D. Merrill, a former assistant in the Division of Agrostology, who has accepted the position of botanist in the new bureau.

Dr. F. A. F. C. Went, professor of botany in the university and director of the Botanic Garden at Utrecht, Holland, recently spent several days at the Agricultural Department at Washington on his return from a six months' trip to the Dutch colonies in the West Indies in the interest of his Government, which is making an effort to improve the agricultural and horticultural conditions of these colonies.

The Royal Bavarian Academy of Science has awarded the Liebig gold medal to Dr. O. Kellner, director of the Möckern Experiment Station, in recognition of his scientific investigations in the nutrition of farm animals and especially the requirements and metabolism of nutrients and energy.

Dr. L. Liebermann, director of the chemical experiment station at Budapest, has been appointed professor of hygiene and director of the hygienic institute in the University of Budapest, *vice* Dr. Josef Fodor, deceased.

Dr. E. Wein, adjunct in the central agricultural experiment station at Munich, has been appointed professor of agricultural chemistry at the Royal Bavarian Academy for Agriculture and Brewing in Weihenstephan, *vice* Professor Stellwaag, deceased. Presumably he will also succeed the latter in charge of the agricultural division of the station at that place. Dr. Henkel succeeds Professor Stellwaag as director of the dairy school.

Prof. C. Kraus, director of the Academy for Agriculture and Brewing at Weihenstephan, has been elected to succeed Prof. E. Wollny at the Technical High School at Munich.

Dr. W. Schneidewind, assistant in the Halle Station, has been selected to succeed the late Dr. Maercker as director of the agricultural chemical station, and Dr. L. Bühring as director of the control station.

Miscellaneous.—The prospectus has been issued of the first session of the Graduate School of Agriculture, to be held at the Ohio State University the coming summer. As previously announced, instruction will be given in three main lines—agronomy, zootechny, and dairying, and a special course will be given in plant and animal breeding. "The course in agronomy will include climatology and soil physics, vegetable physiology, fertilizers, and the culture and management of field crops. The course in zootechny will include the principles of animal form, the breeding and nutrition of domestic animals, and the application of these principles to the choice and management of beef and dairy cattle, sheep, swine, and horses. The course in dairying will include the science of dairying, especially its chemistry and bacteriology, the application of the science in practice, and demonstrations of improved methods of butter and cheese making. The course in plant and animal breeding will deal chiefly with methods of investigation and instruction in this subject and will be so arranged that it can be taken by students in any of the other courses." Instructions will be given by lectures, seminars, and laboratory demonstrations.

The faculty is comprised as follows: President, W. O. Thompson, Ohio State University; dean, A. C. True, Office of Experiment Stations; registrar, T. F. Hunt, Ohio State University, and a corps of thirty experts, selected from the various agricultural colleges and experiment stations, who will act as instructors.

The school is limited to persons who have completed a college course and taken a bachelor's degree, except that admission may be granted to nongraduates who are recommended by the faculties of their colleges as properly qualified. The school will open with inaugural exercises July 7, addresses being delivered by Hon. James Wilson, Secretary of Agriculture; W. M. Liggett, of Minnesota; H. C. White, of Georgia; W. O. Thompson, of Ohio, and A. C. True, dean of the Graduate School of Agriculture. The school will be in session four weeks, closing August 1.

A summer term has been added to the instruction given at the Wisconsin Dairy School. Students are admitted to this course at any time during the spring and summer after March 1, 1902. They are expected to remain at least ten weeks, although they may continue the work longer if desired. No previous experience in dairy work is required for admission to this course, which is intended for beginners or for persons with little practical knowledge of creamery or dairy work. While some lectures will be given, nearly all of the students' time will be occupied in the work of the various departments under the supervision of the instructors. Students will assist in the different factory operations, and learn to operate the various machines used in the manufacturing processes. Quizzes and examinations will be held to determine the progress being made.

A summer school of chemistry and biology, to be held at Wesleyan University, Middletown, Conn., during the month of July, has been announced. The program includes a course of lectures by Prof. W. O. Atwater on methods and results of investigations regarding food and nutrition, a short course in food analysis, a practical course in methods of dietary studies; lectures by Prof. H. W. Conn on bacteria with special reference to hygiene of the house, the dairy, and the farm, and a laboratory course in bacteriology by W. M. Esten. Other laboratory courses in chemistry will be given, if desired.

We note from *Nature* that a memorial tablet is about to be placed in Harpenden Parish Church, bearing the following inscription: "In affectionate memory of Sir John Bennet Lawes, Bart., F. R. S.; born at Rothamsted, December 28, 1814; died at Rothamsted, August 31, 1900. He used his long life and his great knowledge and experience as an agricultural chemist and as a practical and scientific farmer in the pursuit of truth and for the benefit of his fellow-men in his own country and in all parts of the world. This tablet is erected by the parishioners of Harpenden and others who deeply feel his loss as an example and friend."

Nature states that the late Sir J. Henry Gilbert bequeathed the portrait of himself, by his brother, Joseph Gilbert, to the University of Oxford, to be placed in the library of the Sibthorpian professor of rural economy.

Steps have been taken looking to the establishment of a laboratory for the examination of food materials at Vienna, Austria.

At the annual meeting of the Association of Directors and Organizing Secretaries for Technical Education in England, held the latter part of January, Mr. A. Keen, the president, delivered an address dealing with the question of rural education. Among the institutions needed he mentioned that there should be in every large county and in every group of smaller ones a farm school or an agricultural school or college for boys of 15 to 16 years of age and upward, providing a course of instruction for two or three years of a thoroughly practical character. These schools are intended primarily for boys who are to become farm bailiffs, agents, stewards, farmers, or market gardeners, and especially those who have had no suitable means of acquiring at home an intimate knowledge of farm and garden work and general practical experience.

The following in regard to drying beet leaves for feed in Germany is taken from the Consular Reports for February: "A plant for drying the leaves of the sugar beet has been erected near Göttingen. The factory began to be worked at the opening of the beet season and is proving very satisfactory. The fodder obtained is excellent, contains much nutritive property, is very dry, and is eaten readily by cattle. It has also a pleasant smell, similar to that of fresh sweetbread. The Government and agricultural authorities are taking much interest in this invention, which will notably increase the profits of the beet industry."

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EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Assistant Director.*

EDITORIAL DEPARTMENTS.

Chemistry, Dairy Farming, and Dairying—The Editor and H. W. Lawson.
Meteorology, Fertilizers and Soils (including methods of analysis), and Agricultural Engineering—W. H. Beal.
Botany and Diseases of Plants—Walter H. Evans, Ph. D.
Foods and Animal Production—C. F. Langworthy, Ph. D.
Field Crops—J. I. Schulte.
Entomology and Veterinary Science—E. V. Wilcox, Ph. D.
Horticulture—C. B. Smith.
With the cooperation of the scientific divisions of the Department and the Abstract Committee of the Association of Official Agricultural Chemists.

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An attempt to bring experimental work more closely home to the German farmer and to teach him to help himself is described in a recent article by Dr. T. Pfeiffer, late of the University and Experiment Station of Jena. Dr. Pfeiffer believes that the individual farmer must, to a far greater extent than has been customary in the past, inform himself regarding the fertilizer requirements of his soil and similar questions by means of properly planned and conducted field experiments; and that individual experimenting furnishes the basis for very important advancement in the practice of rational agriculture. The reason that it is comparatively rare among German farmers is stated to be that the difficulties attending the making of field experiments have been much overestimated, and little has been done to counteract this impression. The farmers, lacking confidence in their ability to conduct experiments properly and draw reliable deductions, need encouragement and guidance, and to have their interest in the subject stimulated. To this end Dr. Pfeiffer suggested offering a system of prizes or premiums for the best conducted field experiments with fertilizers, the idea being that these object lessons carried on by the farmers themselves would broaden their understanding of the methods and lead to a greater amount of individual experimentation.

Dr. Pfeiffer first presented his plan before the Association of German Experiment Stations, at the meeting in 1898, in the form of a resolution expressing the approval of the scheme by the association. At that meeting, and the meeting the following year, the advisability of encouraging farmers to conduct fertilizer experiments, and of offering premiums for careful work, was discussed at much length. Dr. Pfeiffer urged that every carefully made experiment represented considerable labor and expense, and that a pecuniary incentive to do superior work should prove as helpful as the offering of prizes for excellence in animal production. He explained that he had not met with much success in securing the cooperation of farmers with the Jena Station, although attempts had been made to elicit their aid in various lines of experiment. His proposition, however, found very little favor in the association. The difficulties and dangers of such experiments and of the premium feature were emphasized by most of the speakers, and very little faith was expressed in the ability of the farmer to conduct experiments of any value, even to himself. Dr. Pfeiffer's proposition was finally rejected by the association, but a commission was appointed to consider the general subject of cooperative field experiments.

A system of premium experiments was, however, organized in Saxe-Weimar by Dr. Pfeiffer and carried out during the year 1900, the results of which are just published. The plan for the experiments was drawn up by a commission, and an agreement was entered into with the experimenters. The experiments were quite simple in plan and were under the supervision of the Jena Station. Nitrate of soda, Thomas slag meal, and potash salts were used in varying amounts. The premiums consisted of 2 first prizes of 300 marks each (about $75), 5 second prizes of 200 marks (about $50), and 8 third prizes of 100 marks (about $25). Each person awarded a prize was also to receive a handsome diploma. The funds for the prizes were secured from the representatives of the nitrate of soda interests in Berlin, the Union of German and Austrian Thomas Phosphate Manufacturers, and the Kali Syndicate. Dr. Pfeiffer refers to the probable objection to the source of the prizes, but explains that means could not be provided from the State, agricultural organizations, or other source to set the scheme on foot. The conduct of the experiments, the results, and the awarding of the prizes were all in the hands of a commission, upon which the donors of the prizes had no representative.

The original plan contemplated experiments with oats and fodder beets, but the proposition met with such favor that 112 farmers signified their intention of joining in the competition, which was beyond the capacity of the station to properly supervise. It was decided, therefore, to limit the experiments in 1900 to those who had selected fodder beets and to postpone those with oats until the following year, the prizes for which were secured from the same sources. This showing of interest among the farmers was especially gratifying to Dr. Pfeiffer, in view of previous attempts to secure the cooperation of farmers with the Jena Station.

The experiments in 1900 were carried out by 39 farmers, all of whom made returns of their observations during the year and the yields. As it was found impracticable, on account of possible delays from bad weather, etc., for a representative of the commission to be present at the harvest of the crop in each case, the agricultural societies in the localities where experiments were conducted were asked to appoint trustworthy persons who should represent and make returns to the commission. This plan proved entirely satisfactory, drew the societies into the scheme, and intensified the local interest in it.

The season was unfortunately dry and did not bring out the full effects of the different kinds and amounts of fertilizers. The experiments were useful, however, as a matter of instruction to the experimenters in the methods of such work and in arousing wider interest in individual experimentation. They also furnished some lessons in regard to the best plan for the conduct of such competitive trials. The results of the first year are held to be entirely satisfactory in demonstrating the practicability and usefulness of Dr. Pfeiffer's plan. Although he has since severed his connection with the Jena institution and gone to Breslau, it was planned to continue the experiments under the supervision of the agronomist, Professor Edler.

It may be questioned whether the premium feature of this plan is essential to the success of cooperative experiments under American conditions. The value of systematic and carefully supervised experiments by farmers, cooperating with some central agency, is quite widely appreciated in this country, both in their benefit to practical agriculture and from the pecuniary and educational standpoints. The results obtained by the Ontario Agricultural and Experimental Union, the New York Cornell Station, and in several other organized attempts at cooperative experimenting have demonstrated their utility. Such experiments are looked upon mainly as an educational agency—an effective means of inculcating sound principles, teaching correct methods, and encouraging and directing that spirit of inquiry and experiment which is essential to the modern farmer's success. They can be made effective, however, only by close and competent supervision.

A recent contribution to the subject of fertilizer experiments, which is interesting more as an example of reversion to generally discarded notions than as promising any material aid in the solution of the scientific and practical problems involved, is the so-called science of "euphorimetry," as expounded in *La Nature* by L. Cornet, a French writer. He defines the term as the art of measuring the fertility of the soil, and states its object to be to place agriculture in the list of exact sciences, to reduce its data to a scientific system, and to fix definite and positive rules for its practice. Sufficient data are thought to be at hand to make at least a beginning in the direction of laying down a mathematical basis for determining the relation between soil fertility and crop production. The first and principal difficulty is the choice of a type of comparison or scale of measurement. To meet this the author suggests experiments with different fertilizing materials and crops, similar to those made by Varembey with manures about 1843. In these experiments a field is divided into 4 equal parts. One part receives no fertilization, the other parts 10, 20, and 30 loads of manure, respectively. From the product of wheat, oats, rye, barley, etc., on the different plats so treated, the productive capacity of a given amount of manure for each crop is said to be readily calculated. Calling the effect produced by 1,000 kilograms of manure per hectare

1 degree of fertility, a "euphorimetric scale" is constructed, each degree of which corresponds to a definite product of crop. It may be objected, says the author, that the inconstancy of the seasons and the variations of the temperature may overthrow all predictions and destroy all calculations. This, he admits, may modify the importance of a given crop, but he holds that it can not weaken in any way the exactness of the theoretical results that are to be compared; and he explains that whatever may happen, the farmer who puts into his ground fertilizing material of any kind can say with assurance: "Since I have added certain degrees of fertility to the soil over and above what it was capable of producing by its unaided resources, I ought to produce so much wheat, oats, etc. Nature will make these for me; the temperature may sometimes interfere with the running of the machine and some irregularities in the annual crop may result; but it is only a question of time, and it is certain that the calculated degree of fertility will be realized entire."

No one doubts the desirability of reducing agricultural practice to a more scientific basis. But as the study of the subject has progressed it has been clearly shown that agricultural investigation can not be expected to furnish definite and positive "rules for farming," and it is especially surprising that in this day, when so much has been learned about soil fertility and the changes in location and condition which fertilizing materials undergo in the soil, such a theory as that of euphorimetry, which might possibly have passed current at the time when Varembey made his experiments, should be brought forward with any degree of seriousness.

The Russian Meteorological Bureau and the system of agricultural-meteorological stations connected with it are described in an official publication of the Department of Agriculture and Imperial Domains, recently received. This system of institutions for the study of agricultural meteorology was established in 1897. Its object is to bring observations on meteorology and on agricultural phenomena into closer relation, with a view to determining more definitely the effect of various meteorological conditions on crop production. Each meteorological station has connected with it a series of plats, not exceeding 1 deciatine (2.7 acres) each in area, on which various crops are grown. Adjacent to the plats are arranged the meteorological apparatus for measuring the temperature and humidity of the air, intensity of the sunlight, direction and velocity of the wind, etc. On the plats are installed a rain gauge, thermometers for determining the temperature of the soil at the surface and at different depths, and likewise apparatus for determining the humidity of the soil and measuring the snow fall. Phenological observations are made systematically on the crops under cultivation, and a record is kept of the different stages in the development of the plant, of all the work done on the plats, any injuries caused by meteorological or other factors, and the final yields of grain and straw. In addition to these observations some stations study the underground waters, the intensity of the sun's energy, the relation of the atmospheric conditions to cultivation of the soil, and similar matters.

The stations differ in their equipment, and on this basis are divided into two classes. Those of the second class have only the more common apparatus, and their studies are therefore of a more limited character.

The agricultural-meteorological stations are for the most part connected with the experiment stations, experimental fields, and agricultural schools, although some are located on private estates. In addition to the stations there are a large number of "observation plats," which are provided with simpler meteorological apparatus, some having, also, apparatus for the determination of soil moisture.

Early in 1901, when the article was prepared, there were 65 of these agricultural-meteorological stations, 21 of which were of the first class and 44 of the second class, and 113 observation plats, 90 of which were provided with apparatus for studying soil moisture in addition to the atmospheric conditions. The Meteorological Bureau, in addition to its work in agricultural meteorology, is elaborating plans for weather forecasting, although little has been done in that direction as yet.

The list of publications of the Meteorological Bureau includes papers on the practical importance of agricultural meteorology, instructions for making the simplest agricultural-meteorological observations, an article on the relation of the cereal crops to sun spots and meteorological factors, and a review of the observations of the agricultural-meteorological stations of Central Russia, together with a number of more popular publications on the relation of meteorological conditions to crop production.

This is evidently the most extensive and systematic series of institutions for the study of agricultural meteorology which has been inaugurated by any country, and its work will be followed with much interest. If nothing more is done than to work out satisfactory methods and a basis for correlating the meteorological and soil conditions with the production of staple crops, the results will be of widespread importance, and will pave the way for similar studies by the experiment stations in various countries.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

Acidimetry of phosphoric acid with the alkaline earths, J. Cavalier (*Bul. Soc. Chim. Paris, 3. ser., 25 (1901), No. 20–21, pp. 903–905*).—The author reports the results of experiments from which he concludes that phosphoric acid may be determined with sufficient accuracy by titrating with solutions of baryta, strontia, or lime, using as indicator either methyl-orange or paranitrophenol, preferably the former. With baryta water the concentration should not exceed 0.1 gram-molecule per liter. If very great accuracy is required baryta water should be used and phenolphthalein should be employed as indicator, the operation being conducted in such a manner as to give a crystalline precipitate. This may be obtained with solutions of various strengths, either hot or cold. With a concentrated solution the operation is more rapid when the liquid is heated. The change of color in this case is produced by the addition of 1 molecule of barium (BaO) to 1 molecule of phosphoric acid (H_3PO_4). For practical purposes baryta may be replaced by strontia, but only in concentrated solution. It can not be replaced by dilute strontia nor by limewater. When the precipitate is not perfectly crystalline the change of color of phenolphthalein is always progressive and uncertain. Under such conditions this indicator can not be used with baryta and strontia, since the results obtained with it are very variable, depending upon the stirring, dilution, and duration of the experiment, the amount of base required to cause change of color varying from 1 to 1.5 molecules. With lime the amount is higher and more constant. In dilute solutions (0.01 gram-molecule per liter) the change of color is produced quite regularly by the addition of about 1.5 molecules of base.

The determination of phosphoric acid in phosphates, J. A. Muller (*Bul. Soc. Chim. Paris, 3. ser., 25 (1901), No. 23, pp. 1000–1002*).—For the standardization of the uranium solution used for the volumetric determination of phosphoric acid the author recommends acid sodium ammonium phosphate ($HNaNH_4PO_4.4H_2O$) as much more stable, and thus giving more accurate results than the ordinary crystallized sodium phosphate, which loses water readily. Crystallized dicalcium phosphate is also recommended for the same purpose, and a method for preparing this substance in pure form is described as follows: To a dilute solution of pure calcium chlorid add little by little a dilute cold solution of disodium phosphate until precipitation is complete, collect on a filter, wash, and dry in thin layers at 70° C. Analyses of the product so obtained by the molybdic and citric acid methods are reported. The first method gave 41.45 and 41.38 per cent, the second 41.55 and 41.29 per cent of phosphoric acid. It is claimed that the ammonium magnesium precipitate obtained by the first method contains a little lime that yielded by the second a little molybdic acid. The removal of these by dissolving and reprecipitating is described.

The artificial preparation of monetite (dicalcium phosphate), A. de Schulten (*Bul. Soc. Min., 24 (1901), p. 323; abs. in Bul. Soc. Chim. Paris, 3. ser., 25 (1901), No. 23, p. 1008*).—This salt in pure and crystalline form is obtained by the slow action of hot nitric acid on a hydrochloric-acid solution of calcium phosphate.

Occlusion of magnesium oxalate by calcium oxalate. Solubility of calcium oxalate, T. W. RICHARDS, C. F. McCAFFREY, and H. BISBEE (*Ztschr. Anorgan. Chem., 28 (1901), pp, 71–89; abs. in Jour. Chem. Soc. [London], 80 (1901), No. 468, II, p. 624; Jour. Amer. Chem. Soc., 23 (1901), No. 12, Rev. Chem., p. 201*).—Investigations are reported which showed that the occlusion of magnesium oxalate was dependent upon the distribution of undissociated magnesium oxalate between the solution and the solid substance, and that as the proportion of undissociated magnesium oxalate in solution was diminished the amount found in the precipitated calcium oxalate was reduced.

"The authors recommend the following process for the separation of calcium from magnesium, in solutions which should not be more than 150 normal with respect to magnesium: To the solution, an amount of ammonium chlorid equivalent to 10 times the amount of magnesium present is added, and sufficient oxalic acid, to which some hydrochloric acid has previously been added, to completely precipitate the calcium. The solution is then boiled, and very dilute ammonia is added in small quantities at a time until the whole is exactly neutral to methyl-orange. A large excess of ammonium oxalate is now added, and the mixture, after standing for 4 hours, is filtered and washed with very dilute ammonium oxalate.

"The solubility of calcium oxalate in pure water (0.0068 gm. per liter at 25°, 0.00955 gm. at 50°, and 0.014 gm. at 95°) is so large as to cause an appreciable error in exact analysis; in ammonium oxalate solution it is very considerably less soluble."

On the determination of perchlorate in nitrate of soda, GRIMM (*Chem. Ind., 24 (1901), p. 476; abs. in Chem. Ztg., 25 (1901), No. 76, p. 275*).—In the method proposed 20 gm. of the nitrate is strongly heated in a platinum, nickel, or iron dish on an asbestos plate, and covered with a large platinum dish, for 1 hour, with 3 gm. of manganese dioxid, the temperature being gradually raised. The difference between the amount of chlorin in the material before and after treatment is taken to represent perchlorate.

Detection of potassium by means of sodium picrate, C. REICHARD (*Ztschr. Analyt. Chem., 40 (1901), pp. 377–384*).—If an excess of a saturated (10 per cent) solution of sodium picrate be added to a solution of potassium chlorid (not weaker than 1 per cent) a precipitate of acicular crystals is formed. Other potassium salts (except carbonate and cyanid) must be of at least a 2 per cent strength. The reaction is not interfered with by sodium salts (except the carbonate), but the solution must be free from ammonium salts and free acids.

Agronometry, A. LONAY (*Bul. Assoc. Belge Chim., 15 (1901), No. 4–5, pp. 186–196; abs. in Bul. Soc. Chim. Paris, 3. ser., 25 (1901), No. 22, p. 991*).—This is an account mainly of methods followed by the author in the analysis of soils.

The determination of biological arsenic, B. GALLI-VALERIO and C. STRZYZOWSKI (*Pharm. Post, 33 (1900), pp. 637–639, 649–651; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), No. 12, pp. 545, 546*).—Methods of determining minute portions of arsenic contained in organic matter.

A modification of the sulphuric acid test for formaldehyde in milk, A. G. LUEBERT (*Jour. Amer. Chem. Soc., 23 (1901), No. 9, pp. 682, 683*).—In estimating nitrogen in milk by the Kjeldahl method the author noted that in the presence of a small quantity of formaldehyde there was a peculiar violet coloration of the potassium sulphate crystals and the sulphuric acid surrounding them. This led to trials from which the following method was devised for detecting formaldehyde in milk: 5 gm. of coarsely powdered potassium sulphate is placed in a 100 cc. flask, 5 cc. of the suspected milk distributed over it with a pipette, and 10 cc. of sulphuric acid (specific gravity 1.84) carefully poured down the side of the flask, and the whole allowed to stand. If formaldehyde is present, the violet coloration of the potassium sulphate takes place in a few minutes, the color gradually diffusing through the liquid. If no formaldehyde is present, the liquid at once becomes brown, rapidly changing to black. The test is sensitive to 1 part formaldehyde in 250,000 parts of milk.

The preservation and analysis of milk samples, M. A. DUBOIS (*Rev. Internat. Falsif., 14 (1901), No. 2, pp. 42, 43*).—A discussion of preservatives and methods of analysis.

Quantitative estimation of the fat in milk by means of water-free sodium sulphate, O. LE COMTE (*Jour. Pharm. et Chim., 6. ser., 13 (1901), No. 2, pp. 58–60; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), No. 19, p. 897*).

The estimation of volatile fatty acids in butter by the Leffmann-Beam method, H. LÜHRIG (*Molk. Ztg., 15 (1901), No. 30, pp. 525–527*).—From a study of the method the author found that the variations in the amount of sulphuric acid added had but little influence upon the Reichert-Meissl number obtained.

The detection of cocoanut oil in oleomargarin and in butter, W. G. INDEMANS (*Rev. Internat. Falsif., 14 (1901), No. 2, pp. 39–41*).

The adulteration of fatty oils with mineral oils and its detection, E. GOLDBERG (*Farmaz. Gourn., 40 (1901), p. 375; abs. in Chem. Ztg., 25 (1901), No. 50, pp. 191, 192*).—The author quotes a series of analyses of 101 olive oils of which only 19 were unadulterated. To 10 there had been added foreign vegetable oils and to 72 mineral oils. Of 130 samples examined by the author in 1900, 22 were adulterated with vegetable oils and 54 with mineral oils. With the latter, some contained as much as 30 to 50 per cent of mineral oil. The adulterant was generally a Russian Baku naphtha of 300°. The determination of the adulteration in this case depends upon the fact that this mineral oil is not saponified with alkali.

Modification of Milliau's reaction for sesame oil, G. ARMANI (*Ann. Lab. Chim. Gabelle, 4 (1900), pp. 237–248; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), No. 10, p. 461*).—The following modification is given for showing the presence of cotton-seed oil in mixtures without giving a coloration with certain kinds of olive and crucifer oils: Ten gm. of the oil is saponified with alcoholic potash, the alcohol evaporated, the soap dissolved in water and shaken in a separating funnel with 100 cc. ether and 30 cc. of 10 per cent hydrochloric acid. The ethereal solution is washed, the ether evaporated, and the residue dissolved in alcohol which has been purified by treating with potassium hydroxid and redistilling. The alcoholic solution is treated with 1 cc. of 5 per cent silver nitrate solution and immersed in a water bath at 80°.

The Hübl iodin solution, M. KITT (*Chem. Ztg., 25 (1901), No. 50, p. 540*).—A study of the Hübl iodin number by the Wijs method.

Results of the heating of vegetable oils and methods of determining the admixture of other oils, M. TORTELLI and R. RUGGERI (*Monit. Sci., 4. ser., 15 (1901), pp. 365–375; abs. in Chem. Centbl., 1901, II, No. 1, pp. 59, 60*).—Results of trials of various methods.

The use of the refractometer in the analysis of waxes, P. PROSIO (*Staz. Sper. Agr. Ital., 34 (1901), p. 122; abs. in Chem. Ztg., 25 (1901), No. 60, p. 221*).—The author employed the Zeiss refractometer in the examination of pure and adulterated waxes, both white and yellow. The temperature of 64° C. was used in all cases. The refractometer number of the pure waxes fell between 30 and 32, mostly between 30.5 and 31.5, while waxes adulterated with stearin or paraffin fell below 30. The addition of 5 per cent of stearin may be detected, but ceresin only when above 15 per cent is present. With the addition of rosin or carnauba the refractometer number ranged above 32.

Comparative analysis of beets by hot-water digestion and instantaneous diffusion methods, L. S. MARSH (*Beet Sugar Gaz., 3 (1901), No. 7, p. 158*).—The comparison of results with 20 samples showed an average 0.43 per cent higher for hot-water digestion.

Analysis of commercial glucose, determination of cane sugar in the presence of levulose, dextrose, and dextrin, H. PELLET (*Bul. Assoc. Chim. Sucr. et Distill., 18 (1901), No. 10, pp. 769-773*).

The determination of salicylic acid in wine, H. MASTBAUM (*Chem. Ztg., 25 (1901), No. 43, pp. 465-467*).—A description and discussion of methods and results.

Chemical division, New Zealand Department of Agriculture, B. C. ASTON (*New Zealand Dept. Agr. Rpt. 1901, pp. 269-288*).—This is a brief report on the work of the year ended March 31, 1901, including tests of Babcock apparatus; analyses of waters, fertilizers, soils, cream, butter, normal and condensed milk, cocoanut cake, arrowroot, fruit of the New Zealand passion flower (*Passiflora tetrandra*), Paris green and other poisons, sorrel seed, limestones, and miscellaneous materials; and a study of the dry distillation of native woods, the resin acid of the red pine or Rimu (*Dacrydium cupressinum*), alkaloids of Pukatea bark and of Tutu (by T. H. Easterfield).

Chemical division, H. J. WHEELER (*Rhode Island Sta. Rpt. 1901, pp. 257-267*).—This reports briefly on the fertilizer and feeding stuff inspection and other work in progress during the year, enumerates the field experiments, and gives analyses of dried blood, nitrate of soda, sulphate of ammonia, air-slaked lime, potassium carbonate, muriate and sulphate of potash, sodium carbonate and chlorid, acid phosphate, floats, and Damaraland guano.

Progress in the field of agricultural chemistry during 1900, H. G. SÖDERBAUM (*K. Landt. Akad. Handl. Tidskr., 40 (1901), No. 2, pp. 92-108*).

Select methods in food analysis, H. LEFFMANN and W. BEAM (*Philadelphia: P. Blakiston's Son & Co., 1901, VIII+383, pls. 4, figs. 53*).—A summary of analytical methods, adapted to the work of advanced students and practical chemists. The first 70 pages are occupied with general matter relative to specific gravity, boiling, melting, and solidifying points, polarimetry, microscopy, extraction, distillation, sublimation, indicators, etc. The detection of poisonous metals, coloring matters, and preservatives is treated in a short chapter, followed by the special methods, which cover all the principal classes of food materials, such as starch, flours, leavening materials, sugar and confections, fats and oils, milk and dairy products, beverages—alcoholic and nonalcoholic, condiments and spices, and flesh foods. An appendix contains useful tables. In addition to the methods of analysis, the origin and general characteristics of the various products are briefly described, and the usual forms of adulteration given. The volume is a comprehensive and convenient compendium on the subject, in the light of present knowledge.

An apparatus for ash estimations, H. WISLICENUS (*Ztschr. Analyt. Chem., 40 (1901), No. 7, pp. 441-449, figs. 3*).—The described apparatus for incinerating consists of the usual platinum crucible with a specially constructed cover. The air drawn through by an inspirator enters at the outer edge of the cover and passes out through a tube fastened at the center. The tube carrying the escaping gases is cooled by a water jacket, and bulbs are connected for collecting volatile portions of the substance given off. The apparatus is similar to that of Tucker. (E. S. R., 11, p. 506.)

An apparatus for determining fat, H. J. WHEELER and B. L. HARTWELL (*Rhode Island Sta. Rpt. 1901, pp. 268-273, pls. 2; Jour. Amer. Chem. Soc., 23 (1901), No. 5, pp. 338-343, figs. 2*).—An apparatus designed to overcome certain difficulties connected with the Knorr apparatus is figured and fully described. Among the improvements attempted, as summarized, are the following: A simple flask which can readily be cleaned and replaced in the apparatus; a rubber cup carrying the mercury for sealing and at the same time binding the flask to the apparatus; the bending of the tube from which the liquid ether drops so that the ether will fall upon the center of the substance undergoing extraction, and the prolongation of the same tube so that it may support the upper end of the extraction thimble; the collection of the ether in one receptacle at the end of the extraction without disconnecting the apparatus; the maintenance of the ether in a dry condition; and the loss of the least possible amount of ether.

A continuous hydrogen sulphid apparatus, H. Koch (*Chem. Ztg.*, *25* (*1901*), *No. 81*, *pp. 873, 874*, *fig. 1*).

An automatic filter washer, J. M. Pickel (*Jour. Amer. Chem. Soc.*, *23* (*1901*), *No. 8*, *pp. 589–593*, *fig. 1*).—A specially devised apparatus for use in washing water-soluble nitrogen out of mixed commercial fertilizers. The writer also believes it adapted for removing the water-soluble phosphoric acid.

On the measurements of high temperatures, H. Wanner (*Chem. Ztg.*, *25* (*1901*), *No. 93*, *pp. 1029–1031*).

BOTANY.

Report on a botanical survey of the Dismal Swamp region, T. H. Kearney (*U. S. Dept. Agr.*, *Division of Botany, Contributions from the U. S. National Herbarium*, *vol. 5*, *No. 6*, *pp. X+321–585*, *pls. 13*, *figs. 40*, *maps 2*).—A report is given of the botanical survey made during the summer of 1898 of the Dismal Swamp region in southeastern Virginia and adjacent parts of Virginia and North Carolina. The objects of the investigation were twofold: In the first place, it was sought to ascertain in what degree the character of the native vegetation of the region may serve as an indication of the quality and value of soil; and secondly, to make a study of the ecological distribution of the vegetation. The report discusses at considerable length the climate, geography and physiography, geology, soils, plant covering of the region, the affinities of the plants of this region to others, and the relation of the native plant growth to the character of the soil. Anatomical notes are also given of a number of species, showing their particular adaptations to their surroundings. The agricultural crops of the region are mentioned and their production described at some length. The influence of drainage, types of soil, native vegetation, etc., on plant growth is shown, and an attempt is made to outline the regions adapted to different forms of cultivation.

The origin and distribution of the cocoa palm, O. F. Cook (*U. S. Dept. Agr.*, *Division of Botany, Contributions from the U. S. National Herbarium*, *vol. 7*, *No. 2*, *pp. 257–293*).—The author traces the distribution of the cocoa palm throughout the world, quoting the current opinions relating to the origin and distribution of that economic plant. Contrary to the general opinion, the author states that the cocoa palm is not confined to the seashore or sea level, but is known to thrive in elevated inland regions where the soil and temperature conditions are favorable. He believes the original habitat of the cocoa palm is in all probability to be found in the alkaline regions of the Andes of Colombia.

The Cupresseæ, P. Mouillefert (*Rev. Hort.*, *73* (*1901*), *No. 10*, *pp. 231–234*, *figs. 14*).—Under this name the author has grouped a number of the genera which are commonly referred to the order Cupressineæ. The genera which he proposes to be included in this new grouping are Cupressus, Biota, Chamæcyparis, Thuya, Thuyopsis, and Libocedrus. The different genera are characterized, their differences and affinities being shown.

Brazilian stink grass, F. M. Bailey (*Queensland Agr. Jour.*, *9* (*1901*), *No. 2*, *p. 215*, *pl. 1*).—A brief report is given of specimens of grass obtained under this name which is highly recommended as a drought-resisting species. A small quantity of the seed was sown and proved of a vigorous habit of growth, very leafy, and likely to prove a good fodder grass. The grass was identified as *Melinis minutiflora*. It possesses a somewhat peculiar odor, but not of the disagreeable character suggested by its vernacular name. Its drought-resisting qualities are still to be proved.

The mushroom book; a popular guide to the identification and study of our commoner fungi, with special emphasis on the edible varieties, NINA L. MARSHALL (*New York: Doubleday, Page & Co., 1901, pp. 167*).

Studies on the means of dispersal of seeds, M. KRONFELD (*Studien über die Verbreitungsmittel der Pflanzen. Leipsic, 1900, pp. 42, figs. 5; abs. in Bot. Centbl., 87 (1901), No. 2, pp. 58–61*).—Studies are given of seed distribution by wind, especial attention being given Compositæ and Typha.

Plants as water carriers, B. D. HALSTED (*Pop. Sci. Mo., 59 (1901), No. 5, pp. 492–496*).—The author popularly describes the transfer of water through plant tissues.

The transmission of stimuli in plants, B. NEMEC (*Die Reizleitung und die reizleitenden Strukturen bei den Pflanzen. Jena: G. Fischer, 1901, pp. 153, pls. 3, figs. 10; rev. in Nature, 64 (1901), No. 1659, pp. 371, 372*).—The author reviews the previous ideas relative to the transmission of stimuli in plants, and gives an extended account of observations made by himself on this subject. The effects on protoplasm of wounding the sensitive regions of roots and other organs in the main confirm the conclusions of Tangl. The author distinguishes 2 traumatic phases as consequent on such an operation. The first, or primary, response consists in an aggregation of the protoplasm, and it may be of the nucleus also, toward the wounded end of the cell. This effect is propagated with diminishing rapidity in a direction away from the wound, and at a different rate in the different tissues composing the wounded organ. Shortly after this primary manifestation has passed over a cell, recovery follows, to give place to a secondary phenomenon. The protoplasm of the cells in the vicinity of the wounds assumes a more or less gelatinous character, and the vacuoles begin to undergo fusion. This secondary effect is apparently local and does not travel as far or as fast as the primary one.

The author claims to have demonstrated by means of appropriate stains, a continuous fibrillar structure in the cytoplasm. These fibrillæ traverse the cell chiefly in the longitudinal direction, and appear to connect with similar ones in the contiguous cells of the longitudinal series. They are almost always met with in sensitive and motile organs, to which they also appear almost exclusively confined, and the author believes they represent the means whereby stimuli are rendered transmissible.

The respiration of olives and the relation between the respiratory quotient and the formation of oil, C. GERBER (*Jour. Bot. [Paris], 15 (1901), Nos. 1, pp. 9–22; 3, pp. 88–94; 4, pp. 121–136*).—A study was made of the respiratory quotient of olives in the various stages of growth, as affected by variable influences such as temperature, wounding, etc., a preliminary account of which is given in E. S. R., 13, p. 527. According to the author, the growth of the olive may be divided into 3 periods. The first is from the time of fecundation until the pits become hard. During this time the fruits receive mannite from the leaves, storing it as a reserve material, only a small portion being used for the growth of the fruit. During this period the respiratory quotient was represented by 0.92, the volume of oxygen absorbed being in excess of the carbon dioxid given off. Little or no oil is present in the fruits at this time. The second period begins with the hardening of the pits and ends when the fruits are changed to a reddish-violet color. Mannite is still received from the leaves, but the reserve and newly elaborated material is rapidly transformed into oil. The gaseous exchange between the fruits and the atmosphere is influenced by this transformation and the respiratory quotient becomes as high as 1.40. The third period begins with the change of the fruit to a violet color, ending when it is fully ripe and falls from the tree. Mannite is still transported from the leaves to the fruits in small quantity, but is ultimately all transformed into oil. The respiratory quotient falls from the maximum attained in the previous period until an equilibrium is established between the gases. The author establishes the general proposition that fruits and seeds whose reserve of sugar or similar substance is transformed into oil present a respiratory quotient of unity or greater. This respiratory quotient shows the transformation of mannite or of glucose to oil in the fruit or organ which contains it. The studies further showed that temperature, wounding of the fruit, etc., influenced the formation of oil and consequently the respiratory quotient. It is said that in the south of France the reserve material which is transformed into oil is mannite, while probably in more northerly regions it is to be compared with glucose. In this respect there is some variation in the ripening of olives in different regions, but in the formation of acids, alcohol, ethers, etc., the phenomena observed are quite constant.

The influence of alkaloids on the respiration of plants, N. MORKOWINE (*Rev. Gén. Bot., 13 (1901), Nos. 147, pp. 109–126; 148, pp. 177–192; 149, pp. 212–226; 150, pp. 265–275*).—A report is given of an extended series of investigations on the effect of various alkaloids as shown in the respiration of plants. The subjects of the experiments were young shoots and etiolated leaves of *Vicia faba.* This plant was selected on account of its well-known intensity of respiration and the presence of a considerable amount of albuminoids. The leaves and young shoots were arranged in 2 series and placed in a sugar solution, and after remaining in this for 2 or 3 days one lot was removed and placed in a similar solution to which a definite amount of alkaloids had been added. The 2 lots of plants were then placed under identical conditions of light, temperature, etc., and the differences as shown by the respiration determined. The carbon dioxid exhaled by the plants was determined by means of a Pettenkofer apparatus. In the long series of experiments an increased respiration was noticed where the alkaloids were added to the solution, and in most cases an increase was shown in the ash of the plants at the end of the experiment.

The author's experiments further showed that the alkaloids presented toxic influences toward the plants similar to those shown by animal organisms. An important difference, however, is noted in the relative toxic properties. Arranged in order of the most poisonous toward plants the alkaloids were as follows: Quinin, cinchonin, caffein, morphin, cocain, strychnin, atropin, antipyrin, brucin, codein, and pilocarpin. These were not poisonous in dilute solutions except after a considerable exposure. Of all the substances experimented with the hydrochlorate of quinin was the most poisonous.

Poisonous action of mercury on green plants, J. W. DAFERT (*Ztschr. Landw. Versuchsw. Oesterr., 4 (1901), No. 1, pp. 1–10; abs. in Ann. Agron., 27 (1901), No. 7, pp. 350–352*).—The author has made a study of the action of the fumes of mercury on green plants, using in his experiments wheat, barley, rye, oats, clover, pine, aster, white mustard, and verbena. All the plants studied showed a great sensitiveness to the vapors of mercury, young plants being less resistant than older ones. The poisonous action is manifested by the destruction of the chlorophyll-bearing organs, especially in the young leaves, where it seems to check assimilation. The root system of the plants seems to be affected to a less degree, plants being able to grow in soils containing a considerable quantity of metallic mercury. Humidity favors the action of mercury, especially in herbaceous plants. On account of the frequent use of mercury in various physiological investigations, the author recommends that the surface of the mercury should always be covered by a film of glycerin, which checks the formation of vapor. Water and mineral oils do not seem to be as efficient in this respect as glycerin.

Fixation of metals by cell walls of plants, H. DEVAUX (*Compt. Rend. Acad. Sci. Paris, 133 (1901), No. 1, pp. 58–60*).—By placing petioles of Aralia and young stems of Sambucus and of cucurbits in solutions containing various metals, after which the stems were examined spectroscopically, the author was able to note the presence in appreciable quantities of potassium, lithium, sodium, calcium, strontium, barium, iron, nickel, cobalt, cadmium, copper, lead, and silver in the cell walls of the plants;

and it is probable, although the reaction was less striking, that manganese, magnesium, and aluminium are similarly taken up. The proportion of the metal fixed by the cell walls is necessarily small, and increasing the strength of the solutions did not augment the amount of the metal observed. The solubility of the various salts did not seem to influence the fixation, nor was the nature of the acid which entered into the compound of any importance. It was also found that metals already fixed by the cell wall could be displaced by other metals when presented in solution.

On the occurrence of organic iron compounds in plants, U. Suzuki (*Bul. Col. Agr. Imp. Univ. Tokyo, 4* (*1901*), *No. 4*, *pp. 260–266*).—A series of experiments are reported in which the form of iron occurring in plants was investigated. The seeds and leaves of *Polygonum tinctorium* and *Indigofera tinctoria* are exceedingly rich in iron, which exists as inorganic salts. Ether, alcohol, and aqueous extracts of the plants showed no traces of iron, and sodium chlorid extracts gave but slight indications of its presence. A dilute alkali extracted a nuclein-like substance which contains the greater part of the iron of the original material. This may be precipitated and the proteids digested, leaving the products containing the iron, which amounts to 0.5 to 1 per cent of the nuclein-like substance. Tests made to isolate the so-called hæmatogen by the methods of Bunge and Stoklasa gave unsatisfactory results, and it is believed that the greater part of the iron in cases under investigation existed in a form different from hæmatogen. The iron compound which the author obtained was partially soluble by artificial pepsin digestion, while hæmatogen does not undergo any change nor is it affected by dilute hydrochloric acid acting for a short time. It is said that a similar iron compound exists in other plants and its distribution seems very wide.

On the distribution of zinc in plants, L. Laband (*Ztschr. Untersuch. Nahr. u. Genussmtl.*, *4* (*1901*), *No. 11*, *pp. 489–492*).—A compilation of the results of analyses of a number of different plants, which show a wide distribution of zinc in different parts of plants and in different kinds of plants.

Contributions to the physiological knowledge of the tea plant, U. Suzuki (*Bul. Col. Agr. Imp. Univ. Tokyo, 4* (*1901*), *No. 4*, *pp. 289–296*).—Studies are reported on the occurrence of thein in different parts of the tea plant, the seeds, leaves, germinating seedlings, etc., being studied. When in a dormant condition the seeds of the tea plant contain no thein, nor do their proteids yield thein by the action of hydrochloric acid. The cotyledons of germinating seedlings contain it to a slight extent, while stems and roots contain a considerable amount, but the most is observed in the leaves, its quantity being nearly proportionate to the development of the leaves. Light seems to have no direct influence upon the formation of thein, since etiolated shoots, as well as those grown in daylight contain it. It is believed that thein is not a product of synthesis but of katabolism. Doubtful traces were observed in the bark of the shrubs, but the dormant buds contain it in considerable quantity.

On the localization of thein in tea leaves, U. Suzuki (*Bul. Col. Agr. Imp. Univ. Tokyo, 4* (*1901*), *No. 4*, *pp. 297, 298*).—Studies are reported in which the attempt is made to localize the thein of the leaves. If a section of the leaf be left for 2 days in a tannin solution a voluminous precipitate consisting of minute globules was produced in the epidermal cells, while the other tissues of the leaves showed only a slight turbidity. This precipitate consists of tannate of thein, as shown by its solubility in dilute ammonia. This also affords an easy way of distinguishing the precipitate from minute proteosomes, which solidify upon the absorption of ammonia, the tannate of thein being dissolved by it. These investigations show, it is claimed, that thein is localized in the epidermis of the tea leaves.

On the rôle of oxidase in the preparation of commercial tea, K. Aso (*Bul. Col. Agr. Imp. Univ. Tokyo, 4* (*1901*), *No. 4*, *pp. 255–259*).—It is said that the first operation in the preparation of green tea consists of steaming the fresh tea leaves immediately after their collection. This will preserve their color, while if exposed to partial drying in the sun they will gradually turn brown. The reason for these changes is sought, and it is believed that the development of the black color is due to the action of oxidizing enzyms upon the tannin of the tea leaves. The author has investigated the presence of various enzyms in the leaves and has come to the conclusion that the action of oxidase upon the tannin is quite evident, and the so-called fermentation of black tea is due to the action of oxidizing enzyms in the tea leaves. Oxidase, peroxidase, and catalase were tested for in green and black commercial tea, but none were found present. This is explained to be on account of the heating which takes place as a primary stage in the production of green tea, or as one of the final stages in black tea manufacture. Investigations as to the action of iron and manganese upon oxidizing enzyms were conducted, from which the author concludes that proteids containing iron and manganese are present in tea leaves.

On the economic importance of Nitragin, Maria Dawson (*Ann. Bot., 15 (1901), No. 59, pp. 511–519*).—An account is given of experiments conducted with peas in which the efficiency of Nitragin was tested. Two series of experiments were conducted, in one of which the plants were grown in media previously sterilized for 24 hours at approximately 200° C., while in the second series the plants were grown in the open air on unsterilized media. In the experiments with sterilized media the plants were grown in large pots containing ordinary garden soil, a gravelly subsoil, and pure silver-sand, with and without potassium nitrate. Before sowing the seed they were sterilized by being immersed in a 1 per cent solution of mercuric chlorid for 15 minutes. The Nitragin was applied directly to the pots. These experiments were carried on foı 3 consecutive years with practically the same results. The results obtained show that on ordinary garden soil, on sand, and on sand which had received the nitrate, inoculation with Nitragin was accompanied by a loss in the weight of the crop, while a small increase was secured in those plants grown on gravelly subsoil. The plants grown in the sand showed a considerable increase in the crop produced by a supply of nitrate alone, but inoculation with Nitragin in the presence of a sufficient supply of nitrogenous food, whether in the form of humus or of potassium nitrate, was not beneficial. In the open-air experiments the same general conclusion was reached. The tubercle organisms were present in all types of soil, though they seemed less abundant in clay and peat, and in these particular soils alone a large number of infections resulted from the inoculation. As regards the relative weights of the crop an increase was observed only in the plants grown in the gravelly subsoil, and even there it was very small. On peat, clay, loam, or ordinary garden soil the inoculation with Nitragin proved to be both useless and superfluous.

The nature of the bacteroids of the leguminous nodule and the culture of Rhizobium leguminosarum, R. G. Smith (*Proc. Linn. Soc. New South Wales, 26 (1901), pt. 1, pp. 152–155*).—The author briefly discusses the views of Hiltner and Stutzer regarding the nature of the bacteroids of the nodules observed on the roots of leguminous plants. These authors appear to show that bacteroids are degenerate or involution forms of *Rhizobium leguminosarum*. This opinion is not concurred in by the author of the present paper. He claims that the branching forms are in reality simple cells contained in a branching capsule, and that this is readily observed with organisms grown in artificial cultures, as well as those taken from root tubercles. Hiltner's claims that *Bacillus radicicola* requires infusion of leguminous plants for growth and development is not correct, as the author has successfully grown them in extracts of various plants, grass doing as well as extracts of lupines or other leguminous plants, and fairly luxuriant cultures have been obtained upon a gelatin medium containing glucose and inorganic salts.

A description of certain bacteria obtained from nodules of various leguminous plants, S. Burrage (*Proc. Indiana Acad. Sci., 1900, pp. 157–161*).—Studies have been inaugurated to ascertain whether the same species of bacteria always occurs in a given species of leguminous plants, whether the same species occurs throughout all the tubercles on the roots, and whether a given species of plant is always inoculated by the same species of bacteria. The morphology and biological characters are given of 5 species which have been separated from tubercles occurring on the roots of red clover, *Vicia sativa*, *Phaseolus nanus*, alsike clover, and buffalo clover. Cultures have been separated and are being studied from crimson clover, black locust, white clover, cowpeas, and alfalfa.

Spermatogenesis and fecundation of Zamia, H. J. Webber (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 2, pp. 100, pls. 7*).—A technical bulletin treating of the fertilization and fecundation of Zamia, based upon the author's studies while in charge of the tropical laboratory of this Department located in Florida.

ZOOLOGY.

Insectivorous birds (*West Indian Bul., 2 (1901), No. 3, pp. 243–250*).—Notes are given on the unusual injury to cultivated plants in the West Indies from grasshoppers. It is suggested that the introduction of the mongoose has led to the destruction of many native birds which naturally fed to some extent on grasshoppers, and that the unusual prevalence of grasshoppers is partly due to this cause. It was suggested that the Indian starling be introduced into the Island of St. Kitts for the purpose of testing its efficiency in destroying grasshoppers. The matter was investigated, and various opinions were obtained from different authors as to the advisability of this move. These opinions differed to a considerable extent, but the agricultural department recommended the introduction of the Barbados blackbird (*Quiscalus crassirostrus*), and birds were shipped from Barbados to St. Kitts. Preliminary reports indicate that these birds will prove effective in keeping the grasshoppers in check.

The food of the myrtle warbler, C. M. Weed and N. Dearborn (*New Hampshire Sta. Tech. Bul. 3, pp. 117–128, fig. 1*).—Brief popular notes are given on the habits of *Dendroica coronata*. An examination was made of the stomach contents of myrtle warblers killed in New Hampshire. It was found that a large proportion of the food of this bird consisted of the fruit of *Myrica cerifera*. This was especially the case in the autumn, when the fruits of this plant are most abundant. At that time insects constituted only about 30 per cent of the food. An analysis of the fruit of the bayberry was made by F. W. Morse. It is concluded that since the vegetable food of the myrtle warbler has no value, the insects eaten by this bird render it of some economic importance, and it is urged that the presence of the bird be encouraged about the farm.

The rat-destroying bacilli discovered by Danysz, J. Kiester and P. Kötgen (*Deut. Med. Wchnschr., 27 (1901), No. 18, pp. 275, 276*).—Special interest in the problem of destroying rats in large cities has been awakened by the increased danger from bubonic plague. The authors' experiments with the bacterial organisms discovered by Danysz show that rats which were fed on pure cultures died within 5 to 7 days without exception, and that white mice were killed in about the same length of time. The authors believe that in these organisms an effective method is found for the destruction of rats.

Corynethrix pseudotuberculosis murium—a new pathogenic bacillus for mice, Bongert (*Ztschr. Hyg. u. Infectionskrank., 37 (1901), No. 3, pp. 449–475, pls. 2*).—An outbreak of a disease of unknown character occurred among mice which were being kept in the laboratory for experimental purposes. The author made an investigation of this disease and isolated the pathogenic organism, which is described as new. The behavior of this organism on various nutrient media is described and its morphological characters are given in detail. White and gray mice were very susceptible to infection, while the author found it impossible to transmit the disease experimentally to field mice. Rats fed on cultures of the organism failed to develop the disease. Guinea pigs, rabbits, pigeons, and chickens were found to be completely immune to hypodermic, intraperitoneal, or intravenous inoculations of large doses of pure culture. A bibliography of this subject is appended to the article.

Zoological Record, D. SHARP (*Zool. Rec., 37 (1900), pp. 1177*).—This volume, as usual, contains bibliographical references to literature on general zoology, mammals, birds, reptiles, batrachians, fishes, tunicates, mollusks, brachiopods, bryozoans, crustaceans, arachnids, myriopods, insects, echinoderms, worms, cœlenterates, sponges, and protozoans. A list is given of the titles of journals, transactions, etc., which contain zoological papers which are noted in the volume, and an index of new genera and subgenera mentioned in the volume is given by the editor. In each subdivision of the volume the literature is arranged alphabetically according to authors and systematically according to subjects.

Laws for the protection of birds and game in the District of Columbia, T. S. PALMER (*U. S. Dept. Agr., Division of Biological Survey Circ. 34, pp. 8*).—Three laws are in force in the District of Columbia for the protection of game—the District game law of March 3, 1899; an act amending that law, approved March 3, 1901; and the Lacey Act. The objects of these laws are to preserve birds which naturally occur in the District, and to prevent the development of a market in the District of Columbia for birds and game illegally killed in the various States.

METEOROLOGY—CLIMATOLOGY.

Meteorological observations, J. E. OSTRANDER and H. L. BODFISH (*Massachusetts Sta. Met. Buls. 154, 155, 156, pp. 4 each*).—Summaries of observations on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during October, November, and December, 1901. 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[1] (inches).—Maximum, 30.69, January 3, January 20; minimum, 29.01, January 28; mean, 29.955. *Air temperature*[2] (degrees F.).—Maximum, 100.5, July 2; minimum, −10.5, December 7; mean, 46.9; mean sensible (wet bulb), 43.4; maximum daily range, 50, April 29; minimum daily range, 3.5, March 12; mean daily range, 20.5. *Humidity.*—Mean dewpoint, 37.6; mean relative humidity, 71. *Precipitation.*—Total rainfall or melted snow, 49.72 in.; number of days on which 0.01 in. or more rain or melted snow fell, 135; total snow fall, 52.3 in. *Weather.*—Total cloudiness recorded by sun thermometer, 2,590 hours, or 58 per cent; number of clear days, 81; number of fair days, 105; number of cloudy days, 179. *Bright sunshine.*—Number of hours recorded, 1,866, or 42 per cent. *Wind.*—Prevailing direction, W.; total movement, 50,353 miles; maximum daily movement, 520 miles, December 15; minimum daily movement, 3 miles, December 19; mean daily movement, 138 miles; maximum pressure per square foot, 24 lbs., September 11, S. *Dates of frost.*—Last, May 6; first, September 26. *Dates of snow.*—Last, April 3; first, November 11.

Meteorology, W. FREAR and C. W. NORRIS (*Pennsylvania Sta. Rpt. 1900, pp. 388–427*).—"The work of the past year has been chiefly a continuation of the work of the preceding years [E. S. R., 12, p. 618], including observations of the kind usually made by the United States Weather Bureau upon atmospheric phenomena and upon the amount of sunshine." Monthly summaries of observations are given

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[1] Reduced to freezing and sea level.

[2] In ground shelter, 51 ft. below level of other instruments.

in the body of the report and the detailed record in an appendix. The summary for 1899 is as follows:

Summary of meteorological observations, 1899.

	1899.	Growing season (Apr.-Sept.).
Barometer (inches):		
Mean	30.051	
Highest	30.816 (Jan. 2)	
Lowest	29.336 (Dec. 24)	
Temperature (° F.):		
Mean	49.1	64.
Highest	96 (Aug. 20)	96 (Aug. 20).
Lowest	-20 (Feb. 10)	21 (Apr. 3).
Mean daily range	18.8	21.5.
Greatest daily range	38 (Aug. 17)	38 (Aug. 17).
Least daily range	3 (Feb. 13)	
Mean daily relative humidity (per cent)	78.4	74.7
Rainfall (inches):		
Total	34.87	17.63.
Greatest monthly	4.77 (May)	
Greatest daily	1.60 (Aug. 26)	1.60 (Aug. 26).
Number of days on which 0.01 in. or more of rain fell	1.27	60.
Mean percentage of cloudiness	43.2	35.8.
Number of days on which cloudiness averaged 80 per cent or more.	75	21.
Average hours of sunshine per day		7h. 6m.
Maximum velocity of wind per hour (miles)	32 (Mar. 7)	
Last frost in spring		Apr. 17.
First frost in fall		Sept. 30.

Report of the meteorologist, N. HELME (*Rhode Island Sta. Rpt. 1901, pp. 355–371*).—This includes general notes on the weather during the year ended June 30, 1901, and a tabulated record of observations at Kingston on temperature, precipitation, cloudiness, and prevailing winds during each month from July, 1900, to June, 1901, inclusive, with a summary for the year ended June 30, 1901. The latter summary is as follows:

Temperature (degrees F.).—Maximum, 97, August 11, 1900; minimum, −9, January 20, 1901; mean, 48.4; highest monthly mean, 71.6, July, 1900; lowest monthly mean, 21.8, February, 1901; highest daily mean, 83, August 11, 1900; lowest daily mean, 3.5, January 19, 1901. *Precipitation* (inches).—Total (rain and melted snow), 48.47; greatest monthly, 8.78, April, 1901; least monthly, 1.13, February, 1901; greatest in 24 consecutive hours, 3.67, March 26–27, 1901; snowfall—total, 15¾; greatest monthly, 8, February; least monthly, ¾, December. *Weather*.—number of clear days, 134; number of fair days, 97; number of cloudy days, 134; number of days on which there was precipitation of 0.01 in. or more, 114. *Prevailing wind*, west.

The ammonia in meteoric water and in red rain, A. CASALI (*Staz. Sper. Agr. Ital., 34* (*1901*), *No. 9, pp. 833–848*).—Observations during January, February, and March, 1901, on the amount of ammonia in fog, frost, snow, and rain are reported and discussed, as well as an examination into the nature and source of the mineral matter obtained from red rain which fell over Italy, West Austria, and Germany on March 10 and 11. A summary of the results of the first inquiry is given in the following table:

Ammonia in meteoric waters.

[Parts per thousand.]

	Maximum.	Minimum.	Average.
Fog	0.06970	0.01700	0.05140
Frost	.05140	.02730	.02754
Snow	.00935	.00289	.00629
Rain	.01428	.00068	.00561

The red rain examined contained solid matter to the amount of 19.64 gm. per liter. This material was subjected to microscopic and chemical examination. The chemical composition was as follows: Silica, 57.75 per cent; oxid of iron and alumina, 34.94 per cent; magnesia, 2.22 per cent, and lime, 4.87 per cent. The author concludes from his study of this material that it is of meteoric origin.

The dust fall of March 10 and 11, 1901, H. Svoboda (*Ztschr. Landw. Versuchw. Oesterr., 4 (1901), p. 360; abs. in Centbl. Agr. Chem., 31 (1902), No. 3, p. 201*).—Studies similar to those noted above are reported. The source of the dust is considered to be the deserts of North Africa.

The chemical and meteorological history of the atmosphere, J. Stevenson (*Meteor. Ztschr. [Vienna], 18 (1901), pp. 417–420*).

Climate and the effects of climate, H. R. Mill (*Quart. Jour. Meteor. Soc. London, 27 (1901), pp. 169–184*).

Climate, vegetation, and drainage of Cascade Mountains of northern Washington, I. C. Russell (*Jour. School Geogr., 5 (1901), pp. 281–289*).

A study of the agricultural meteorology of the district of Leon, Mexico, in its relation to ordinary and improved culture, J. M. Garcia Muñoz (*Mem. y Rev. Soc. Cient. "Antonio Alzate," 16 (1901), No. 1, pp. 5–29*).—This question was studied with reference to corn during 1893 to 1896. It was found that with the same meteorological conditions the yields were greatly increased by improved methods of culture.

Meteorological atlas of the Argentine Republic, E. A. S. Delachaux (*Atlas meteorológico de la República Argentina. Buenos Ayres: Campania sud-americana de billetes de banco, 1901, pt. 1, pp. 24, maps 24*).—Part 1 is devoted to the Province of Buenos Ayres.

The hail protection congress of Novare, Italy, V. Vermorel (*Grêle, 2 (1901), No. 12, pp. 3–9*).—A brief account of this congress, held October 22, 23, and 24, 1901. It is stated that the attendance was smaller and the interest less marked than at previous Italian congresses. The author thinks that before going further in this matter it is necessary to know what has been accomplished and what it is possible to accomplish by means of cannonading. No real advance is now being made in settling the question.

The influence of cannonading on rain and storms, J. M. Pernter (*Meteor. Ztschr. [Vienna], 18 (1901), pp. 371, 372*).

Shooting away hailstorms, E. P. Lyle, jr. (*Pearson's Mag., 12 (1901), No. 72, pp. 651–660, figs. 6*).

Weather shooting in ancient times, J. M. Pernter (*Meteor. Ztschr. [Vienna], 18 (1901), p. 372*).

Driving frost from fruit, M. Tindal (*Pearson's Mag., 12 (1901), No. 71, pp. 552–554, figs. 4*).

How is temperature measured? K. Arndt (*Prometheus, 12 (1901), No. 622, pp. 792–795, figs. 2*).—A brief explanation and discussion of the construction of different kinds of thermometers.

Instructions for the care and management of sunshine recorders, C. F. Marvin (*U. S. Dept. Agr., Weather Bureau Doc. 252, pp. 19, figs. 5*).—The second edition of these special instructions for the information and guidance of Weather Bureau observers.

The forecaster and the newspaper, H. M. Watts (*Washington: Government Printing Office, 1901, pp. 22, figs. 6*).—This is a paper read before the recent convention of Weather Bureau officials at Milwaukee, Wis., giving in full views briefly presented elsewhere (E. S. R.. 12, p. 1018).

WATER—SOILS.

Analyses of the waters of the state of São Paulo, Brazil, G. d'Utra (*Bol. Agr. São Paulo, 2. ser., 1901, No. 8, pp. 481–488*).—Analyses with reference to potability of a number of samples from different parts of the state are reported.

Investigations on drainage water, Creydt, von Seelhorst, and Wilms (*Jour. Landw., 49* (*1901*), *No. 3, pp. 251–275*).—A daily record of the flow of drains from July 28, 1899, to August 10, 1900, and weekly analyses of the drainage water are reported, with a description of the methods of analysis used and a discussion of the results. The analyses indicate that the loss of nitrogen from soils in the drainage even in case of heavy soils may be appreciable, while the loss of potash and of phosphoric acid is insignificant.

Pollution of streams by agriculture and manufactures, G. V. Khlopin (*Zazryaznenie protochnuikh vod khoz yaistvennuimi i fabrichnuimi ot brosami i myarui k ego ustraneniyu. St. Petersburg: K. L. Ricker, 1901, pp. 60*).

Study of the climate and soil of the clay and sandy clay region of Belgium (*Monographie agricole de la région limoneuse et sablo-limoneuse. Brussels: Ministry of Agriculture, 1901, pp. 1–71*).—This article gives and discusses data for monthly, seasonal, and annual temperatures at a number of places in the region; the temperature of bare and covered soils during different months of the year; sunshine, hail, rainfall, fogs, and storms; the geological characteristics of the region; physical and chemical analyses and characteristics of the soils, including analyses of matter soluble in cold hydrochloric acid of 1.18 sp. gr., in hydrofluoric acid, and in alkaline ammonium citrate in soils and subsoils from 38 localities; estimates of the amounts of fertilizing constituents per hectare; experiments with fertilizers on different classes of soil, and notes on the water supply. The results of the examinations of the soils show that as a rule these are somewhat deficient in phosphoric acid. The amount of potash soluble in cold concentrated hydrochloric acid is generally low, although the total potash as determined by treatment with hydrofluoric acid is high. The results of the fertilizer experiments indicate that the latter is to a considerable extent assimilable by plants and that potash fertilizers are not needed as a rule. The soils, especially those that have been under intensive culture, are poor in nitrogen, containing as a rule less than 0.1 per cent of this constituent. The amounts of lime and sulphates are low, but magnesia is believed to be present in sufficient quantity.

The climate and soil of the Jurassic region of Belgium (*Monographie agricole de la région Jurassique. Brussels: Ministry of Agriculture, 1901, pp. 1–23*).—Data are given for temperature, rainfall, rainy and dry periods, snow, rainy days, and storms, the geological constitution and the chemical and physical composition of the soils of the region, and its hydrological conditions. The soils of this region are very variable in physical character. While, as the analyses show, a few of the soils are quite rich in phosphoric acid, the larger part of them are only moderately supplied with this constituent, and are benefited by the application of phosphates. There is considerable potash present, but a large part is insoluble in hydrochloric acid. As a rule the application of barnyard manure suffices to supply the potash and nitrogen required for medium crops. Liming is beneficial in unlocking the potash, improving the physical condition of the clayey soils, and promoting nitrification by correcting the acidity, which is often sufficient to seriously retard the action of the nitrifying organisms. On account of the slow nitrification in many cases nitrate of soda has been found beneficial.

The tea soils of Assam, H. H. Mann (*The tea soils of Assam, and tea manuring. Calcutta: Indian Tea Association, 1901, pp. 1–59, 104–137, pl. 1*).—This is an account of investigations conducted under the auspices of the Indian Tea Association, including a report on two tours through the Assam Valley to study the causes of the decline in productiveness of the tea soils of this region and the means of improving them.

The general soil and cultural conditions are described, with suggestions as to improvements, and the physical and chemical properties of the soils, based on analyses of samples from typical virgin and cultivated areas, are discussed, the attempt being made "to describe, classify, and indicate the best method of manuring the tea soils of each district in the Brahmaputra Valley." It is shown that the soils used for tea culture in this valley vary from micaceous sand and gravel to stiff red clays.

The field observations as well as the analyses reported show a deterioration of the soils under continuous culture in tea as regards both yield and quality of product. This deterioration is considered to be largely due to decline in fertilizing constituents, especially organic matter and nitrogen, and may, to a large extent, be remedied by the judicious use of local supplies of fertilizing materials. "Tea requires for its successful cultivation a considerable quantity of organic matter and nitrogen in the soil—the best results being obtained only when more than 35 per cent of the nonsandy portions of the soil consists of organic matter and 0.8 per cent of nitrogen. Provided this is present, tea can be cultivated with success in presence of a minimum quantity of other constituents, notably phosphoric acid and potash; but to obtain high-quality tea these latter materials must exist in the soil in larger amount, and, other things being equal, the larger the quantity of phosphoric acid (in presence of sufficient nitrogen) the better will be the tea. . . . One might say that in general terms if on analysis a soil presents (1) less than 35 per cent of organic matter, or (2) less than 0.8 per cent of nitrogen, on the nonsandy portion of the soil it needs these constituents as manure; (3) less than 0.25 per cent of phosphoric acid, calculated in the same way, it needs phosphates, and if high-quality tea is to be produced 0.4 per cent should be present; (4) potash in amount less than 3 per cent of the oxid of iron and alumina, taken together, it needs potash manures. . . . Potash runs parallel with phosphoric acid, but is probably present in ample quantity in Assam soils. In short, much nitrogen with little phosphoric acid will produce rank growth with medium tea only—much nitrogen with much phosphoric acid will give luxuriant growth and high-quality tea—little nitrogen with much phosphoric acid will give high-quality tea, but comparatively little of it—and if there is a deficiency in both, tea can never be profitable. Other constituents besides the three named may possibly have an intimate connection with the quality of the tea. Lime probably has little or none—and is in any case present in ample quantity everywhere." Iron and manganese appear to be present in sufficient quanity in the Assam soils. Whether they exert any important influence on the growth of tea has not yet been definitely determined.

"The methods of manuring recommended are based on the necessity for the addition of organic matter and nitrogen in almost every case, of phosphates often, and occasionally of potash. In a heavy soil generally speaking green manuring crops previously manured with phosphates give the best method; in a light one usually cattle manure or oil cake, also with green manuring, form the best addition, taking into consideration the ultimate object of all manuring—the maximum improvement of the crop at the minimum of cost." (See also p. 749.)

A chemical study of the phosphoric acid and potash contents of the wheat soils of Broadbalk field, Rothamsted, B. DYER (*Phil. Trans. Roy. Soc.* [*London*], *ser. B, 194* (*1901*), *pp. 235–290*).—This gives in full the paper which was noted in abstract (E. S. R., 13, p. 30).

The Eocene deposits of Maryland, W. B. CLARK, G. C. MARTIN, ET AL. (*Maryland Geological Survey: Eocene. Baltimore: Johns Hopkins Press, 1901, pp. 331, pls. 64*).—This includes a historical review of the literature of the subject with a list of 113 references to articles on the subject; discussions of the general stratigraphic relations of the deposits, distribution of strata, general classification of the deposits, origin of the materials, stratigraphical and paleontological characteristics, geological and geographical distribution of species, correlation of deposits, and systematic paleontology of the Eocene deposits, with an index. These deposits are of special interest agriculturally, because they are largely glauconitic and contain the most extensive deposits of greensand marls.

"The Eocene deposits of the Middle Atlantic slope are typically glauconitic, and are found in their unweathered state either as dark gray or green sands or clays. The glauconite varies in amount from very nearly pure beds of that substance to deposits in which the arenaceous and argillaceous elements predominate, although the strata are generally very homogeneous through considerable thicknesses. At certain horizons the shells of organisms are found commingled with the glauconitic materials in such numbers as largely to make up the beds, producing what is known as a greensand marl. These beds are at times so indurated as to form true limestone ledges."

The report states that "two conditions are requisite for the formation of glauconite: First, the deposition of mineral particles of land-derived origin; and second, the presence of foraminifera. In the absence of either. glauconite will not be produced. On the other hand, it is retarded and finally ceases altogether as the amount of deposition of land-derived materials increases adjacent to the coasts. Only, then, within circumscribed limits, which are constantly subject to modification, is the formation of glauconite possible.

"Glauconite seldom, if ever, occurs pure in nature, but is mixed with greater or less amounts of arenaceous materials, producing what is known as greensand, a term which is commonly made to embrace the argillaceous deposits as well, particularly when the glauconite grains are visible, although they are more correctly green clays. When the deposits are distinctly calcareous they are generally known as greensand marls. No definite percentage of any of the constituents is required, and as they are so commonly intermingled the terms just described are used somewhat indiscriminately."

FERTILIZERS.

Pot experiments to test field observations concerning soil deficiencies, B. L. Hartwell (*Rhode Island Sta. Rpt. 1901, pp. 274–293, pls. 4*).—This article discusses briefly the difficulty of accurately determining the available or assimilable plant food in soils, maintaining that "analytical results have frequently failed to account satisfactorily in the case of given soils for differences caused by known fertilization and cropping." This failure is stated to be "probably due in many cases to the fact that the small amount of soil analyzed did not properly represent the large areas from which it was taken." A well-conducted soil test is considered the most satisfactory method of arriving at a knowledge of soil deficiencies, and it is recommended that "soils designed for use as standards in testing methods for determining assimilable plant food should in many cases be first subjected to pot experimentation." Pot experiments on oats during 2 years are reported with 1 soil each from Massachusetts and Indiana, said to be deficient in assimilable phosphoric acid, and 2 from Connecticut, supposed to be lacking in assimilable potash. The pots used were of the Wagner type, 8 in. in diameter and 8 in. deep, holding from 13 to 16 lbs. of the different soils. The systems of manuring followed and the yields of grain, straw, and entire crop are reported, as well as details of the method of conducting the experiments. In the case of only one of the soils did the results of the 2 years' experiments with oats agree fully with the field observations. It is suggested that this may have been due to other factors aside from deficiencies of plant food. For this reason it is recommended that "land upon which field experiments are to be conducted for showing its need of plant food should first receive such treatment, other than the application of the particular ingredient to be studied, as is economical and necessary for the proper growth of most agricultural plants."

The offering of premiums for fertilizer experiments as a means of promoting rational fertilizing, T. PFEIFFER (*Mitt. Landw. Inst. Univ. Breslau, 1 (1901), No. 5, pp. 1-45*).—The author refers to the unreliability of chemical analysis as a means of determining the fertilizer requirements of soils and discusses the relative merits of pot and field experiments. The former he considers a cheap and convenient means of studying fundamental scientific problems, but doubts whether the results so obtained can be directly applied in practice. Carefully conducted field experiments are considered the most reliable means at the command of the farmer for determining the fertilizer requirements of his soils. For this reason the author in 1898 recommended to the Association of German Agricultural Experiment Stations the adoption of a system of premiums to encourage farmers to undertake carefully planned and supervised field experiments with fertilizers (E. S. R., 11, p. 506) with a view to cheapening the cost and improving the methods of plant production in a similar manner to that long prevailing in the field of animal production. The advantages of such a system are explained, and the author describes the plan and reports the results in detail of 39 cooperative experiments begun in 1899 under a system of prizes ranging from 100 to 300 marks offered by the agents of the nitrate, Thomas slag, and potash salts interests. The results obtained were of a very encouraging nature and are taken to indicate the practicability of the plan.

Crop growing and crop feeding, W. F. MASSEY (*Pract. Farmer's Libr., 3 (1901), No. 3, pp. 383*).—"This book is the result of an effort to put into the plain language of the farm the facts which scientists have worked out in the laboratory, and which practical experience has proved to be applicable to the everyday work of the farm." It discusses the relation of air and soil to plant growth; plant breeding; the restoration and maintenance of soil fertility by means of fertilizers, leguminous plants, and proper rotations; plant food and the sources and functions of phosphorus and potash in fertilizers; tests of the needs of soils; fraud in fertilizers; mixing fertilizers on the farm; lime and liming; and gives special formulas and general instructions for fertilizing the principal farm, garden, and orchard crops. There is a special chapter on gardening under glass, and an appendix giving tables of composition of farm crops, fertilizers, etc. "The original design was simply to make the work a reference book on the use of fertilizers for the general farmer. But it is difficult to write of the use of fertilizers without going somewhat into details of cultural methods; and then, too, the market gardener, the orchardist, the florist, and the winter forcer of products under glass are all interested in the use of commercial fertilizers. Hence the idea of the work has grown so as to include some of the work of each. . . . So far as the garden crops and the work under glass are concerned, special attention is paid to the needs of the market gardeners of the South Atlantic and Southern States."

Green manuring with lupines and the use of nitrogenous fertilizers, C. SCHREIBER (*Rev. Gén. Agron. [Louvain], 10 (1901), No. 11, pp. 481-488, fig. 1*).—Pot experiments with oats and field experiments with rye in 1900 and 1901 to test the economy of using commercial fertilizers in connection with lupines as a green manure are briefly reported. The best results as regards yield and profit were obtained when the green manure was supplemented by commercial fertilizers, especially nitrate of soda, the latter being preferable to sulphate of ammonia as a supplemental nitrogenous fertilizer.

Use of town drainage as manure, W. H. MORELAND (*Dept. Land Records and Agr. Northwest. Provinces and Oudh, Bul. 18, agr. ser., 1901, pp. 3*).—This is a brief account of the successful use for irrigating different crops of the drainage water of the Meerut municipality. This drainage water "consists mainly of street rubbish, sullage water, and the like, diluted by the water with which the drains are flushed."

On sewage disposal and purification, J. GLAISTER (*Proc. Phil. Soc. Glasgow, 32 (1900-01), pp. 151-191*).—The methods of sewage disposal and purification, the relative merits of which are discussed in this paper, are divided into two main classes:

(1) Natural, including surface or broad irrigation, and (2) artificial, including (a) precipitation or chemical method, (b) intermittent downward filtration, and (c) bacteriolysis or the bacterial treatment. The first is considered "entirely impracticable for large populous centers" on account of its large cost, failure in time of frost and heavy rainfall, and liability to become malodorous in warm weather.

"With reference to sewage farms, it may be said with absolute correctness that, with everything else equal, they fail without the closest supervision. With that, however, added to the other conditions, such as suitable land, etc., they may be worked up to a high pitch of efficiency."

Analyses are reported which show that wet, compressed, and compressed and steam-dried sludge obtained by precipitation by lime have a comparatively low fertilizing value, the compressed sludge containing only 0.788 per cent nitrogen, which increases to 1.73–1.9 per cent when the sludge is steam-dried. The material contains very small amounts of phosphoric acid. "By the addition of chemical constituents it could be made a valuable manure."

The reduction of nitrates in the presence of barnyard manure, J. P. STREET (*New Jersey Stas. Rpt. 1900, pp. 79–88*).—The experiments here reported were a continuation of those of the previous year (E. S. R., 12, p. 321) and were conducted in the same manner except that loosely covered 400 cc. beakers were used instead of flasks, and a mixture of solid and liquid excrement was employed instead of solid manure alone. In one series 30 gm. of the mixture was placed in each beaker alone and with the addition of sodium nitrate alone at the rate of 83 lbs. per ton of manure, or with acid phosphate, kainit, gypsum, iron sulphate, and potassium sulphate, each at the rate of 26 lbs. per ton, and glucose, wheat straw, and pine shavings each at the rate of 133 lbs. per ton. In a second series ammonium sulphate alone or combined with acid phosphate, kainit, gypsum, and iron sulphate was substituted for the sodium nitrate. The experiments began January 22 and continued 33 days, the changes in ammonia, nitrates, and insoluble nitrogen being determined at 4 different periods. At the end of the experiment the nitrates had entirely disappeared in the tests in which glucose, straw, and shavings had been used. The loss where iron sulphate was used was 7.9 per cent less than where nitrate was used alone (without preservatives). "Acid phosphate and kainit seemed to have a slightly favorable effect, while plaster and sulphate of potash caused no additional loss." There was an increase of insoluble organic nitrogen in all of the tests, but this increase was apparently "smaller where nitrate of soda was used alone, or in connection with superphosphate, kainit, plaster, sulphate of iron, sulphate of potash, or shavings." With the straw there was about the same gain as with manure alone, and with glucose about twice as much. The results of the experiments with ammonium sulphate agreed closely with those obtained the previous year except in case of gypsum, "which, in 1899, was with sulphur the most effective preventive of loss used, but in 1900 was the least efficacious." The loss of ammonia varied from 13.1 per cent with iron sulphate to 33.8 per cent with gypsum. There was a large gain of insoluble organic nitrogen in these experiments, varying from 34 per cent where manure was used alone to 102.7 per cent where manure was used in connection with ammonium sulphate and gypsum.

Investigations relative to the use of nitrogenous materials, E. B. VOORHEES (*New Jersey Stas. Rpt. 1900, pp. 88–110*).—A continuation of experiments of the previous year (E. S. R., 12, p. 322) is here reported. The composition of the solid and mixed solid and liquid excrement of a cow in the fresh condition and after exposure to natural leaching from February 3 to April 13 (70 days) was found to be as follows:

Composition of fresh and leached cow manure.

	Fresh manure.		Leached manure.	
	Solid.	Solid and liquid.	Solid.	Solid and liquid.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Ash	1.831	2.645	3.176	3.005
Organic matter	12.375	12.281	19.781	18.381
Nitrogen (total)	.293	.463	.431	.498
Nitrogen soluble in water	.060	.211	.056	.169
Nitrogen as nitrates	.015	.031	....	....
Nitrogen as ammonia	.031	.090	....	.080
Nitrogen, soluble organic	.014	.090	.056	.089
Nitrogen, insoluble organic	.233	.252	.375	.329
Phosphoric acid	.372	.410	.504	.508
Potash	.141	.199	.350	.414

These figures show that there was in case of the solid manure a loss of 34 per cent of the nitrogen, 27 per cent of the phosphoric acid, and 10 per cent of the potash; but in case of the mixed solid and liquid excrement a loss of 44 per cent of the nitrogen, 16 per cent of the phosphoric acid, and 28 per cent of potash.

Pot experiments with oats and millet were conducted with the above manures in the manner described in the last report. Regarding the amount of nitrogen recovered by the crops as 100 in case of nitrate of soda, the relative availability of the different nitrogenous fertilizers in these experiments was as follows:

Relative availability of nitrogen in different forms.

	Oats.	Oats and millet.
Nitrate of soda	100.0	100.0
Sulphate of ammonia	72.9	77.9
Dried blood	58.5	61.3
Solid manure, fresh	12.0	43.1
Solid manure, leached	12.1	46.4
Solid and liquid manure, fresh	58.2	88.4
Solid and liquid manure, leached	20.0	33.0

Superphosphate applied broadcast, MAIZIÈRES (*L'Engrais, 16* (*1901*), *No. 44, pp. 1047, 1048*).—The dissemination of the phosphoric acid in the soil when superphosphates are applied broadcast is discussed.

Fertilizer experiments with apatite, feldspar, etc., J. SEBELIEN (*Tidsskr. Norske Landbr., 8* (*1901*), *No. 2, pp. 69–78*).

The use of ammoniacal fertilizers on calcareous soils, E. GIUSTINIANI (*Ann. Agron., 27* (*1901*), *No. 10, pp. 462–486, fig. 1*).—This is a continuation of previous experiments on the reactions which occur between calcium carbonate and ammonium sulphate in the medium of sterile sand (E. S. R., 12, p. 330). The experiments here reported consisted of (1) mixing ammonium sulphate and varying amounts of calcium carbonate with a good garden soil in glass bottles so arranged that the amount of ammonia given off could be determined; (2) determining the amount of nitrates present at different dates in similar mixtures of the soil in funnels; and (3) pot experiments with barley to determine the proportion of nitrogen recovered by the crop from soils fertilized with varying amounts of calcium carbonate, ammonium sulphate, and sodium nitrate. In order to lay down a rule for the use of ammoniacal fertilizers in calcareous soils the author undertook first to determine the loss of nitrogen due to the reaction between ammonium sulphate and calcium carbonate in quartz sand (see previous experiments referred to above) and a good garden soil. In the first case it was shown that in the absence of all bacterial action the reaction between the two salts was complete, and if a current of air was introduced the total ammonia was recovered more or less rapidly, depending upon the conditions of temperature and humidity of the medium, but independently of the proportion of lime. In sterilized garden soil, however, the losses were much smaller, the constituents of the soil possessing an absorbent power for the ammonia, retaining under the conditions of the experiment from 40 to 60 per cent of the original nitrogen added. The amount of ammonia driven off from the soil was in direct relation to its richness in lime, the temperature, and the humidity. If the soil was dry the elimination of ammonia was more rapid, but the reaction was soon arrested and the quantity of nitrogen lost was consequently less. In sandy media phosphatic slag caused a very rapid decomposition of the ammonium sulphate, due, evidently, to the free lime which this substance contains. In the experiments on nitrification it was observed that the oxidation of ammonia was quite slow in the rich garden soil, but the losses of ammonia were insignificant. A part of the nitrogen escaped oxidation only when a large excess of lime was added to the soil and the temperature raised.

In the experiments with barley grown on quartz sand and fertilized with ammonium sulphate it was observed that with a medium application of lime nitrification was slow, the losses of nitrogen were quite appreciable, the crop utilized only a part of the nitrogen, and the roots of the plants were injured by the ammonia salt. When, however, the conditions of the medium were more favorable to oxidation of ammoniacal nitrogen, the plants utilized a large part of the nitrogen and the yield was but slightly lower than that obtained with nitrate of soda, although in a sandy medium quite rich in lime ammonium sulphate is generally quite inferior to nitrate of soda as a nitrogenous fertilizer. The fractional application of the nitrogenous fertilizer to some extent favored fructification and increased the proportion of nitrogen in the grain.

It thus appears that ammoniacal fertilizers can be used to best advantage on calcareous soils under conditions favorable to nitrification and to the retention of ammonia, such as occur in moist rich soils. In such soils, however, nitrification of the ammonia is quite slow and the action of ammonium sulphate is for this reason much less rapid than that of sodium nitrate, although much more durable in its effects. Ammonium sulphate is not suited to use either on sandy soils without lime or on such soils containing a large proportion of calcium carbonate. A light soil, in which the proportion of lime does not exceed 5 to 20 per cent, may be benefited by ammoniacal fertilizers provided it is not subjected to drought. In this case also it is desirable to apply the fertilizer fractionally during the earlier months of growth. If the ammonium sulphate is to be used in connection with phosphatic slag, the latter should be applied several days in advance of the former in order that the free lime may become carbonated.

A contribution to the question of liming, SCHLEYER (*Deut. Landw. Presse, 29* (*1902*), *No. 2, p. 12*).—The beneficial effect of liming on fruit trees is reported, and an account is given of the different effects of iron sulphate solution on charlock (*Raphanus raphanistrum*) growing on soil deficient in lime and on that abundantly supplied with lime. In the first case spraying with 10 and 15 per cent iron sulphate solution produced no result, while in the second case a spray of 10 per cent solution quickly killed the weed. It is suggested that on the soil deficient in lime the plants contained an excess of oxalic acid and this prevented the reaction between the iron sulphate and the tannic acid of the plant, resulting in blackening and death.

Fertilizer experiments with lime and marl, P. HILLMANN (*Mitt. Deut. Landw. Gesell., 16* (*1901*), *Nos. 44, pp. 256–258; 46, pp. 265, 266; 47, pp. 272, 273; 48, pp. 275–278; 49, p. 281; 50, pp. 284–287*).—Cooperative experiments in different parts of Germany are reported. These showed in the majority of cases the need and value of liming and marling. On heavy soils containing as much as 0.5 per cent of lime the application of the latter was beneficial.

On the development and present status of the perchlorate question, H. G. Söderbaum (*K. Landt. Akad. Handl. Tidskr., 39 (1900), No. 5–6, pp. 338–345*).

Commercial fertilizers, E. H. Jenkins et al. (*Connecticut State Sta. Rpt. 1901, pt. 1, pp. 94*).—This includes a statement of fertilizer sales in Connecticut in 1901, the text and an abstract of the State laws relating to fertilizers, a list of manufacturers securing licenses under these laws, notes on the sampling and collecting of fertilizers, explanations regarding the analysis and the valuation of fertilizers, a review of the fertilizer market for the year ended October 31, 1901, and tabulated analyses and valuations of 432 samples of fertilizing materials, including nitrate of soda, dried blood, cotton-seed meal, castor pomace, superphosphates, sulphate of potash, muriate of potash, double sulphate of potash and magnesia, kainit, tobacco ashes, bone, tankage, dry ground fish, bone and wood ashes, cotton-hull ashes, wood ashes, limekiln ashes, tobacco stems, lime refuse, soot, wool waste, carbonizing dust, garbage tankage, and muck.

Commercial fertilizers (*Kentucky Sta. Bul. 95, pp. 133–190*).—The results of analysis of 438 samples of fertilizers are reported and briefly discussed. "Of the 438 samples analyzed, 83, representing 71 brands and 30 firms, fell so far below the guaranteed 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. . . . The great majority of the manufacturers, however, have furnished in most instances fertilizers fully up to the guarantee."

Analyses of fertilizers, C. A. Goessmann (*Massachusetts Sta. Bul. 77, pp. 30*).—Analyses of fertilizers collected during 1901 under the provisions of the State law and of miscellaneous materials sent to the station for examination are reported. The miscellaneous materials include wood ashes, cotton-hull ashes, walnut ashes, pine-wood ashes, ashes from soft coal and sawdust, muriate of potash, nitrate of soda, cotton-seed meal, tobacco stems, bone, tankage, ground fish, dissolved boneblack, calcium carbonate, gas lime, muck, marl, river sediment, and samples of marsh and ordinary soils.

Analyses of commercial fertilizers, W. F. Hand et al. (*Mississippi Sta. Bul. 68, pp. 32*).—"This bulletin contains the analyses of the principal brands of commercial fertilizers that have been found on the Mississippi markets during the season of 1900–1901."

Fertilizers (*New Jersey Stas. Rpt. 1900, pp. 15–78*).—This is mainly a reprint of Bulletin 145 (E. S. R., 12, p. 840) with the addition of statistics of the fertilizer trade in New Jersey during 1899 and preceding years, the market prices of fertilizers, text of the fertilizer law, and lists of inspectors, and of manufacturers whose goods were inspected in 1900. From data furnished by 92 out of 112 firms selling fertilizers in New Jersey in 1899 it is estimated that the total consumption of fertilizers in the State was 61,727 tons, valued at $1,573,093. "Complete manures represent 70 per cent of the total number of tons sold in 1899 and 76 per cent of the total value of all sales." The statistics reported show that there has been a decline in the price of the actual plant food furnished in fertilizers since 1886.

Analyses and valuations of fertilizers, L. A. Voorhees and J. P. Street (*New Jersey Stas. Bul. 154, pp. 55*).—This bulletin discusses the trade values of fertilizing ingredients in 1901; the cost, valuation, purchase and guaranteed and actual composition of fertilizers, home mixtures, and special fertilizers; and reports the results of examination of 59 samples of standard unmixed fertilizing materials, 308 brands of complete fertilizers representing 79 manufacturers, 25 samples of ground bone, and 37 of miscellaneous products. In addition there are reported the analyses of 8 samples of home mixtures and 18 samples of mixtures especially compounded by manufacturers to order. The materials examined included, in addition to the mixed fertilizers, nitrate of soda, sulphate of ammonia, dried blood and ammonite, dried and ground fish, tankage, hair manure, superphosphates, muriate of potash, sulphate of potash, kainit, wood ashes, marl, lime, and garbage refuse. About 81 per cent of the brands of fertilizers examined contained as much total plant food as was claimed, but in only 65 per cent was the plant food distributed in the proportions stated. The averages for all brands of complete fertilizers examined during 1901 are as follows: Total nitrogen 2.31 per cent, total phosphoric acid 10.48 per cent, available phosphoric acid 8.08 per cent, insoluble phosphoric acid 2.40 per cent, potash 5.77 per cent, station valuation $21.19, selling price $27.31. "It appears that the manufacturers are delivering on the average somewhat less total plant food than in 1900, but at about the same price per ton."

Commercial fertilizers, H. J. Wheeler et al. (*Rhode Island Sta. Bul. 81, pp. 111-122*).—This bulletin contains analyses of a portion of the fertilizers collected during 1901. The fertilizers examined during this year were much inferior to those of recent years as regards agreement with guarantee. A large proportion of these deficiencies were in the phosphoric acid.

FIELD CROPS.

Range improvement in Arizona, D. Griffiths (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 4, pp. 31, pls. 6, figs. 5*).—This bulletin contains a report on experiments with grasses and forage plants in cooperation with the Arizona Station. An outline is presented of experiments undertaken on a range reserve tract, a piece of public land set aside by the President for the use of the Secretary of Agriculture. A number of letters are reproduced in which the present and past conditions of the grazing lands of southern Arizona are briefly noted. The various species of forage plants, comprising plantains, saltbushes and allied plants, native legumes, cacti, and grasses, are discussed with regard to their value and their distribution.

An estimate based on figures obtained from 18 different plats of the quantity of feed furnished by the plantains on the range reserve tract in the spring of 1901 shows an average yield of 992 lbs. of dry material per acre. On areas where the creosote bush predominates the yields were smallest, varying from 16 to 2,466 pounds per acre. The maximum yield on a single plat amounted to 3,087 lbs. The adaptability of the plantains to grow on the sandy desert mesa is discussed, and an account is given of the distribution of their seed and its germination. Of the different species, Indian wheat (*Plantago fastigiata*) is considered the most important.

The saltbushes and other plants of a like character treated in this connection are the shad scale (*Atriplex canescens*), the most important of the group; the grease wood (*Sarcobatus vermiculatus*), which grows in the moister alkaline regions, and winter fat (*Eurotia lanata*), an almost exterminated species on the open range. Among the native legumes the mesquite (*Prosopis velutina*) has the greatest value. The screw bean (*P. pubescens*) is reported as being also common. *Astragalus nuttallii*, a species common to the moister mesa region, is mentioned as furnishing much palatable feed under favorable conditions.

Opuntia fulgida, *O. spinosior*, *O. versicolor*, and *O. arbuscula*, are given as the species of cacti most frequently used for forage in the vicinity of Tucson. A test of singeing the spines from a specimen of *O. spinosior* proved that the plant without the spines was palatable to stock.

The different species of grasses occurring in the region are briefly noted. The species found on the river bottoms are saccaton (*Sporobolus wrightii*), salt grass (*Distichlis spicata*), drop seed (*Sporobolus cryptandrus*), *S. strictus*, and Arizona millet (*Chætochloa composita*).

Black grama (*Hilaria mutica*), *H. jamesi*, curly mesquite (*H. cenchroides*), blue grama (*Bouteloua oligostachya*), low grama (*B. polystachya*), woolly foot (*B. eriopoda*), side oats grama (*B. curtipendula*), and black heads (*Pappophorum wrightii*) are mentioned as among the most important nutritious species commonly found on the open mesa range. *Chloris elegans*, everlasting grass (*Eriochloa punctata*), vine mesquite (*Panicum obtusum*), *P. colonum*, *Eragrostis neomexicana*, and feather grass (*Andropogon torreyanus*) are reported as occurring in moist locations. On the general mesa six weeks grama (*Bouteloua aristidoides*) is found in large quantities after the summer rains. During the second week in October the author found gentle slopes near the foot hills nearly covered with short growths of *Bouteloua aristidoides*, *B. polystachya*, *Pappophorum wrightii*, and *Nazia aliena*. The grasses reported as occurring in the mountains are *Andropogon contortus*, *A. leucopogon*, *Trachypogon secundus*, *Elionurus barbiculmis*, *Hilaria* sp., *Bouteloua bromoides*, *B. oligostachya*, *B. curtipendula*, *Trioda mutica*, *Eragrostis lugens*, *Muhlenbergia gracillima*, *M. porteri*, *Epicampes rigens*, and *Aristida* sp.

The range reserve tract and the different experiments recently begun are described in detail and various methods for range improvement are suggested.

Miscellaneous forage crops, G. C. Watson and E. H. Hess (*Pennsylvania Sta. Rpt. 1900, pp. 284–306, pls. 3*).—The results of experiments with crimson clover, Canada field peas, flat pea, vetches, spurry, millet, and sunflower, conducted at the station some years past and reported in part in a former publication (E. S. R., 11, p. 436), are reviewed.

Crimson clover sown early in May matured seed in one season. Larger yields were obtained from this crop when sown in July than from August or September sowings. It is recommended that the Canada field pea should be sown with oats in the proportion of 1½ to 2 bu. of peas to 1½ bu. of oats. The experience with the flat pea showed that the seed should be scalded and soaked before planting. The authors advise planting this crop in rows far enough apart to admit of horse cultivation. Russian and spring vetch were grown with good results. Vetch grown with oats was much more satisfactory than when sown alone. The yields of spurry did not indicate that this crop was as profitable as the more common forage crops. Russian gray and Russian white sunflowers grown for 3 years in succession yielded from 41.01 to 53.26 bu. of seed per acre. For poultry the seed is not considered as economical as the cereals.

Plant culture experiments at Norway Agricultural College, 1899–1900, B. R. Larsen (*Christiania, 1901, pp. 48*).—The report gives an account of variety tests of grains, potatoes, and forage plants conducted in different parts of Norway under the direction of the plant culture experiment station of Aas Agricultural College.—F. W. WOLL.

Notes on agriculture in Tunis, A. Kebaïli (*Bul. Dir. Agr. et Com., 6 (1901), No. 20, pp. 257–286*).—This article describes the culture of cereals as practiced by the natives and by Europeans, the use of grazing lands, and the income of the farmer; presents statistics on the agricultural production of the country, and suggests measures by which the native might be induced to adopt improved methods of farming.

Report on tests of sport varieties of cereals in 1899, K. Kittlauss (*Deut. Landw. Presse, 28 (1901), Nos. 1, pp. 79, 80; 15, pp. 115, 116; 16, pp. 127, 128*).—Similar work has been previously reported (E. S. R., 11, p. 538).

Variety tests in 1900 and future work in this direction, Edler (*Mitt. Deut. Landw. Gesell., 16 (1901), No. 25, pp. 145–147*).—A brief résumé of the work, presented as a paper before the German Agricultural Society.

Frost injuries to winter cereals in 1901, P. Sorauer (*Mitt. Deut. Landw. Gesell., 16 (1901), No. 33, pp. 195–197*).—This article treats of the distribution of frost, its intensity and duration necessary to injure winter cereals, the resistance of varieties, and the conditions favoring frost injuries.

Planting Vicia faba on fields of injured winter cereals, R. Schmoldt (*Deut. Landw. Presse, 28 (1901), Nos. 29, pp. 249, 250; 30, pp. 260, 261; 31, pp. 268, 269; 32, pp. 279*).

Mustard and turnips as catch crops, P. Genay (*Semaine Agr., 21 (1901), No. 1053, pp. 228–230*).—In connection with a general discussion of the subject analyses of both plants are reported.

Alfalfa on muck, W. E. Imes (*Amer. Gard., 22 (1901), No. 351, p. 635*).—The author reports growing 8 tons of dry alfalfa hay per acre on muck land in Michigan.

Soil inoculation for alfalfa, G. C. Watson and E. H. Hess (*Pennsylvania Sta. Rpt. 1900, pp. 307, 308*).—Inoculation tests for alfalfa with Nitragin and with soil from an alfalfa field are reported. The best results were obtained on the plat treated with soil from alfalfa ground. The use of Nitragin also showed some effect. The yields in general indicated that alfalfa is not well adapted to shallow limestone soils.

The influence of potash salts on the development of barley, J. Stoklasa and J. Pitra (*Ztschr. Landw. Versuchsw. Oesterr., 4 (1901), No. 5, pp. 567–582, fig. 1*).—The work here reported consisted of pot experiments made to determine the influence of potassium chlorid as a fertilizer on the qualities of brewing barley. The pots were divided into 5 groups of 10 pots each, according to the quantities of potassium chlorid applied. Each pot received 0.5 gm. of nitrate of soda and 1 gm. superphosphate furnishing 0.161 gm. of phosphoric acid, while the quantity of potassium chlorid per pot varied from 0.5 gm. to 3 gm. The results of the experiments are summed up in the following table:

Effect of potassium chlorid as a fertilizer on the quality of barley.

Potassium chlorid applied per pot.	Vitality.	Viability.	Husks.	Starch in dry matter.	Protein in dry matter.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
None	99	97	11.9	57.38	12.86
0.5 gram	99	98	9.8	63.52	9.14
1.0 gram	100	96	8.6	64.00	10.02
1.5 gram	100	95	9.3	61.20	10.31
3.0 gram	98	96	10.2	57.68	10.82

These results show that a rational application of muriate of potash in conjunction with superphosphate and nitrate of soda was beneficial to the development of the barley plant and the improvement in quality of the grain.

Thick vs. thin seeding of corn (*New Jersey Stas. Rpt. 1900, pp. 265, 266*).—Southern White corn was planted June 8, the kernels being placed 10, 12, 14, and 16 in. apart in the drill on 4 different plats. The seed required per acre at these different rates of planting was 6, 5, 4, and 3 qt., respectively. The largest yield was obtained where the kernels were planted 10 in. apart and 6 qt. of corn were used per acre. This plat yielded 9.03 tons of silage corn, or 20.7 per cent more than the plat with the thinnest planting. The plat with the thickest planting suffered most from dry weather and produced the smallest ears, but still results indicate that the thickest planting was the most profitable for silage corn.

Cotton, E. Grimley (*Queensland Agr. Jour., 9 (1901), No. 1, pp. 113–121, figs. 2*).—A paper on cotton culture in Queensland, treating the subject largely from a financial standpoint and discussing the conditions under which it may be profitably grown.

Cotton in Egypt, Y. Henry (*Agr. Prat. Pays Chauds, 1 (1901), No. 1, pp. 55–88, figs. 2*).—This article describes a number of cultivated varieties of cotton, discusses the climate and soil of Egypt, and gives concise descriptions of the methods of growing, ginning, and baling cotton in that country. Chemical and physical analyses of the soil and an analyses of Nile water are reported.

Comparative tests of red clover from different countries, O. Burchard (*Landw. Wchnbl. Schleswig-Holstein, 51 (1901), No. 31, pp. 450–454*).—From the results obtained it is concluded that red clover from North American sources is better able to stand severe winters than red clover obtained from Southern and Western Europe.

Emmer: A grain for the semiarid regions, M. A. CARLETON (*U. S. Dept. Agr., Farmers' Bul. 139, pp. 16, figs. 3*).—This bulletin is a popular discussion on the value and use of emmer and its adaptation for cultivation in the semiarid regions of this country. The botanical characteristics of emmer are pointed out and compared with those of spelt. The names often incorrectly used for this grain are given, and its history and distribution are outlined. Experiments with emmer at some of the experiment stations and tests made by individual farmers are briefly reviewed, and a number of analyses of the grain are shown in tables. Descriptions are given of 2 varieties of spring emmer, Ufa and Yaroslav, and attention is called to the fact that at present no varieties particularly adapted for fall seeding are grown in the United States. The valuable qualities secured from crossing emmer with common varieties of wheat are enumerated as follows: (1) Resistance to fungus attacks, (2) drought resistance, (3) increased fertility of the head, (4) nonshattering, (5) stiffness of straw, and (6) increase of gluten content of the grain. The cultivation of this crop is briefly noted.

Note on the culture of Manila hemp in the Philippines, DE BÉRARD (*Agr. Prat. Pays Chauds, 1 (1901), No. 1, pp. 89–104*).—The varieties of *Musa textilis* principally cultivated in the island of Luzon are briefly described and notes on the climate, soil, culture, and cost of production are given.

Experiments in acclimatizing winter oats, SCHLACHT (*Deut. Landw. Presse, 28 (1901), No 60, pp. 519, 520, fig. 1*).—This article discusses the methods of acclimatizing winter oats and the conditions required to insure success.

Experiments with oats and peas (*New Jersey Stas. Rpt. 1900, pp. 264, 265, pls. 2*).—Experiments in growing oats and peas for grain and for hay are reported. Two bu. each of oats and peas per acre were sown broadcast. The yield amounted to 50 bu. of seed, weighing 24 lbs. per bushel, and 2,205 lbs. of straw. The mixture of grain consisted of 75 per cent of oats and 25 per cent of peas. The analysis of the crop during storage, and of the grain and straw at the time of thrashing, is given in a table. The same mixture grown for hay and harvested the last week in June produced a satisfactory yield. The composition of the green and cured fodder is tabulated.

The ground-nut crop, J. W. LEATHER and C. BENSON (*Dept. Land Records and Agr., Madras, 1900, Vol. 2, Bul. 41, pp. 167–174*).—Notes are given of the peanuts raised in India and the amount of oil and moisture, etc., in a number of varieties.

Fourth report on potato culture, L. A. CLINTON (*New York Cornell Sta. Bul. 196, pp. 43–59, fig. 1*).—This work is in continuation of tillage experiments with potatoes now in progress for a number of years (E. S. R., 10, p. 950). This bulletin gives the results for 1899, 1900, and 1901.

In 1899 a plat sprayed 6 times with Bordeaux mixture and Paris green yielded at the rate of 48 bu. of potatoes more per acre than a plat not sprayed. The results obtained in 1900 indicated that thorough preparation of the soil and intensive tillage are insufficient for the absorption and retention of moisture when the supply of humus is not maintained. In 1901 the average yield of the plats planted May 16 was 250 bu. per acre, the yield of a plat planted on June 12, 162 bu. per acre, and the yield of another plat planted June 17, 197 bu. per acre. Spraying with Bordeaux mixture increased the yield in nearly every case during the entire period. A test of pruning potato vines to one main stalk showed that this process did not increase the yield. The author recommends harrowing potato land after potatoes are planted and before the plants are above ground. Notes are given on potato planters and diggers, spraying apparatus, and methods of keeping seed potatoes.

The influence of selecting seed tubers from productive plants on the yield of potatoes, VON SEELHORST and G. FRÖLICH (*Jour. Landw., 48 (1900), No. 4, pp. 317–324*).—The experiments here described are in continuation of work previously reported (E. S. R., 13, p. 41). The results obtained agreed with the results of previous work, and the authors consider their conclusions of the previous year substantiated, namely, that by the selection of seed the yield of potatoes may be materially increased and the rapid deterioration of varieties prevented.

Correlation and transmission in the rye plant with special reference to the color of the grain, A. GEERKENS (*Jour. Landw., 49 (1901), No. 2, pp. 173–192*).—For the purpose of this work 3 kinds of rye—Goettinger, Pirna, and Russian—were grown in pot and field experiments. The Goettinger and Pirna rye had been selected on the basis of typically formed heads with a desirable number of well-formed grains, while in the case of the Russian rye, strongly yellow and green-colored grains were selected from a quantity of seed. In the pot experiments the tillering capacity, the weight of the plant, and other data concerning the different parts of the plant were determined. Owing to the quantity of the material, the plants grown in the field were not studied so minutely. In the pot experiments all poorly developed plants and in the field test all single-stemmed plants were not considered.

The only difference noticed before the heads appeared was in the development of the plants due to the difference in weight of the grains used for seed. Immediately before the blossoming period it became quite noticeable that the progeny from broad heads with many spikelets produced strong, stiff, upright standing spikes, as compared with long, loose, and bending spikes from square, loose heads with a smaller number of spikelets. This observation leads to the conclusion that the form of the head of parent plants is to a considerable degree transmitted to the progeny. A comparison of the other data showed that as a rule a decrease in the length of the rachis is associated with a decrease in the length of the stem and an increase in the number of spikelets per 10 cm. of the rachis. The number of grains decreased regularly and quite perceptibly as the rachis shortened. There was no great difference noticeable in the number of grains per 10 cm. of the rachis, but the different varieties did not give similar results. In the case of Goettinger and Russian rye this factor remained constant through the different groups, while with the Pirna variety it was greatest where the rachis was of medium length. A short rachis was associated with a smaller number of grains per spikelet than a long rachis. It was further found that the weight per 100 grains decreased slightly with the decrease in length of the rachis. The thickness and the weight of the stems, heads, and grains decreased considerably and regularly with the length of the rachis. The weight of the heads and grains showed a decrease in proportion to the decrease in weight of the stem. Concerning the color of the grains the author concludes that there seems to be a relation between green grains and heads crowded with spikelets, and between yellow grains and loose heads, but that this relation is too weak to manifest itself in all cases. In the progeny of short and crowded heads the weight of the grain and the heads were the lowest of the variety. The number of grains per head was also lowest in the progeny of short, crowded heads, and the weight per 100 grains was in general a little lower than the weight per 100 grains of the progeny from loose heads. The form of the head had no influence on the tillering capacity. The weight of the plant and of the grain per plant was lowest in the progeny of short, crowded heads. From these data it is seen that the best results in the progeny were obtained from the square, loose heads. The field experiments showed that in all instances the color of the grain had been transmitted in a high degree to the progeny. There was no discernable difference in the tendency of transmission between the two colors. In most cases with Goettinger and Pirna rye the progeny of green-colored grains had the heavier heads, the heavier weight of grains, and the largest number of grains per head. In the case of the Russian rye, however, the progeny of the yellow grains produced heavier heads and grains. The weight per 100 grains of the Pirna rye was largest in the plants grown from the yellow seed, while the Goettinger and Russian rye gave the heavier weight per 100 grains from the green-colored seed. The tillering capacity was greatest in the plants grown from yellow grains. In the pot experiments the weight of the plants and the weight of the grain per plant were in favor of the progeny of green-colored seed, while in the field experiments these weights were in favor of the yellow seed. The author states that although there is a series of similar results, the experiments do not show an absolute advantage in favor of either color when, as in this case, the grains were all taken from the same form of head. It was found that the protein content of the grain was apparently transmitted in exceptional cases only to a very small extent. The data collected in making these experiments are reported in tables.

The influence of environment upon the composition of the sugar beet, H. W. Wiley (*U. S. Dept. Agr., Bureau of Chemistry Bul. 64, pp. 32*).—This bulletin is devoted mainly to the study of climatic influences on the composition of the sugar beet. The meteorological, analytical, and geodetic data obtained in experiments conducted by the Bureau of Chemistry in collaboration with the Weather Bureau, and a number of experiment stations located in regions of different climatic conditions, are reported. The average results are summarized in the following table:

The average results with Austrian Special Kleinwanzlebener sugar beets grown under different climatic conditions in 1900.

Locality.	Analytical data.			
	Weight.	Yield per acre.	Sugar in the beet.	Coefficient of purity.
	Ounces.	*Tons.*	*Per cent.*	
Raleigh, N. C	12.4	1.3	5.2	....
Lexington, Ky	9.0	10.0	7.8	69.5
Washington, D. C	18.5	15.0	8.3	69.1
Lafayette, Ind	4.9	....	9.9	83.0
Ames, Iowa	13.0	....	11.7	76.9
Logan, Utah	....	18.9	12.1	84.2
Agricultural College, Mich	12.0	15.8	13.1	80.0
North Judson, Ind	15.2	....	13.7	89.5
Ithaca, N. Y	18.0	15.0	14.0	81.9
Madison, Wis	12.3	9.0	15.2	86.2
Geneva, N. Y	16.1	....	15.5	83.9

Locality.	Meteorological data; May to October.		
	Temperature.	Precipitation.	Sunshine.
	Degrees.	*Inches.*	*Per cent.*
Raleigh, N. C	74.9	24.8	73.9
Lexington, Ky	72.1	16.9	74.7
Washington, D. C	71.7	24.5	64.5
Lafayette, Ind	69.8	30.5	64.7
Ames, Iowa	68.2	36.3	62.7
Logan, Utah	63.0	6.2	81.2
Agricultural College, Mich	64.5	17.5	59.2
North Judson, Ind	68.3	20.2	64.7
Ithaca, N. Y	65.1	13.8	69.2
Madison, Wis	65.9	22.0	....
Geneva, N. Y	66.4	16.3	69.2

Locality.	Geodetic data.		
	Average length of day.	Latitude.	Altitude.
	H. M.	° ′ ″	*Feet.*
Raleigh, N. C	14 7	35 48 00	363
Lexington, Ky	14 18	38 02 25	979
Washington, D. C	14 23	38 53 23	37.5
Lafayette, Ind	14 30	40 23 00	542
Ames, Iowa	14 38	42 02 00	917
Logan, Utah	14 37	41 44 00	4,506
Agricultural College, Mich	14 42	42 45 00	847
North Judson, Ind	14 34	41 11 00	695
Ithaca, N. Y	14 41	42 27 00	810
Madison, Wis	14 44	43 04 36	955
Geneva, N. Y	14 44	42 53 00	453

In several instances the meteorological data in the above table are taken from the records of the station nearest to the locality reported. At the Utah Station, where the beets were grown under irrigation, the sugar content varied from 15 to 18 per cent. The advisability of applying water to a beet field as late as September 1 is considered doubtful. The influence of fertilizer was studied in connection with this work at the Wisconsin Station, where a fertilized portion of a plat yielded almost 4 tons more per acre and produced a richer beet than an unfertilized portion. The general results show that a high sugar content and a high latitude ran very evenly together. The highest percentage of sunshine, nearly 75 per cent of the possible hours of sunlight, was recorded at Lexington, Ky., and the lowest, 59.2 per cent, at Agricultural College, Mich. The observations on the influence of sunlight seemed to show that the diffused light coming through the clouds is apparently as effective as the direct sunlight. The results further show that a low sugar content was closely associated with a high temperature, and that the purity of the juice, although subject to many variations, had a general tendency to follow the percentage of sugar. The figures also show a direct relation of the average length of day from sunrise to sunset to the sugar content of the beet. The short day was associated with a low sugar content, and the long day with a high sugar content. The rainfall, especially in its distribution, was found to bear a very important relation to the sugar content. "The ideal conditions for the growth of the beet are an even distribution of the rainfall of from 3 to 4 in. during the months of May, June, July, and August, and a reduction of the rainfall for September and October."

The influence of intensely drying the soil on the development of the sugar beet, J. J. Vaňha (*Ztschr. Landw. Versuchsw. Oesterr., 4 (1901), No. 5, pp. 562–566*).—A quantity of clay soil of uniform texture was divided into 3 parts, the first being given an ordinary moisture content; the second, thinly spread out and completely dried by the action of the sun, and the third portion placed in an open kettle and subjected to a temperature of from 80 to 100° C. until dry as dust. These differently treated soils were then put in pots for the growth of sugar beets. All pots were given the same quantities of water and fertilizers with the exception of the check pots, which received no fertilizer. The total yield of the fertilized as well as the unfertilized pots was increased by drying the soils. Drying at from 80 to 100° C. gave the best results, more than doubling the yield. The quality of the beets was also favorably influenced by drying the soil. The total yield of sugar was increased as the drying of the soil was intensified. The purity coefficient was diminished slightly on account of an increase in the solids not sugar.

A note on teosinte, C. Chalot (*Agr. Prat. Pays Chauds, 1 (1901), No. 1, pp. 129–136*).—A general discussion on the culture of teosinte and a report on a cultural test with this plant made at the experiment station at Libreville, in the French Kongo country. The chemical composition of the plant is given.

Wheat (*Kentucky Sta. Bul. 94, pp. 121–130, pls. 2*).—Variety tests with wheat are reported and botanical descriptions of the different varieties, with field notes on the same, are given. Similar work has been previously reported (E. S. R., 12, p. 1035). The season of 1901 was unfavorable, and the yield was about one-third less than the year previous. Dawson Golden Chaff, Lancaster Red, Indiana Swamp, Beech-wood Hybrid, Rudy, Fultz, and Harvest King were the most productive varieties during this season, yielding 30.6, 31.5, 31.7, 33, 33.4, 36.3, and 36.3 bu. per acre, respectively. The weight per measured bushel for the different varieties was much less this season than in 1900.

Macaroni wheats, M. A. Carleton (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 3, pp. 62, pls. 11, figs. 2*).—This bulletin treats of the characteristics, distribution, adaptability, cultivation, and marketing of macaroni wheats; discusses the effects of local variations in soil and climate on the quality of these wheats, and briefly reports the results of experimental comparisons of varieties. Statistics are given on the Russo-Mediterranean traffic in macaroni wheat. The following varieties, which have well-marked characteristics and have attained a high reputation, are briefly described: Gharnovka, Arnautka, Kubanka, Pererodka, Beloturka, Velvet Don, Black Don, Sarui-bugda, Medeah, Pellissier, Candeal, Nicaragua, Wild Goose, Missogen, and Polish. Meteorological data for the regions of Russia where these varieties are largely grown and for sections in this country adapted to their culture are tabulated. In discussing the climatic conditions of these regions the author calls attention to the fact that "the normal yearly rainfall of the Great Plains at the one hundredth meridian, where wheat growing is at present practically nonexistent on account of the lack of drought-resistant varieties, is nearly 3 in. greater than that for the entire semiarid Volga region, which is one of the principal wheat regions of Russia, and which produces the finest macaroni wheat in the world." Comparative notes on foreign and domestic macaroni are given and analyses of macaroni produced from different wheats are tabulated. The bulletin further treats of the use of macaroni wheats for bread and of the preparation of semolina or flour used in the manufacture of macaroni.

Fertilizer experiments with wheat, J. OSTERSPEY (*Fühling's Landw. Ztg., 50 (1901), Nos. 12, pp. 417–423; 13, pp. 449–455*).—This experiment was made with highly bred and selected Squarehead wheat on a soil poor in lime. The purpose of the work was to determine the effect of an application of phosphoric acid in the forms of superphosphate and Thomas slag, and of a top-dressing of nitrogen as nitrate of soda and sulphate of ammonia, in addition to a medium application of barnyard manure. The influence of either the phosphoric acid or the nitrogen used with barnyard manure was also studied. Superphosphate increased the yield when applied in addition to barnyard manure, but this increase was not sufficient to make its use profitable, either when used alone or in connection with a nitrogen application. The use of Thomas slag, however, at the rate of 1,500 kg. per hectare was found economical in all cases. The average results of the application of sulphate of ammonia at the rate of 100 kg. per hectare showed neither an increase nor a loss, while 125 kg. of nitrate of soda per hectare given in 2 applications proved highly profitable. The simultaneous use of fertilizers furnishing phosphoric acid and nitrogen produced a profit under those conditions only when the use of the one or the other alone was profitable.

HORTICULTURE.

Report of the assistant in horticulture, A. T. JORDAN (*New Jersey Stas. Rpt. 1900, pp. 213–255, pls. 4*).—Experimental studies are reported on the effect of irrigation, the relative effects of fertilizers with and without irrigation upon early and total yield, and the effect of the addition of nitrate of soda. The results secured with asparagus and a number of bush and orchard fruits in 1900 are recorded in detail and compared with results secured the 2 previous years. The daily and monthly precipitation for the season is also included.

Asparagus (pp. 218–222).—Contrary to the results obtained in 1898 and 1899, unirrigated asparagus plats gave the larger early and total cut. Palmetto was the most productive variety grown in 1900. The increase in early asparagus with this variety was worth commercially $24.60, and the early and total cut $111.77, more than any other variety grown. Plats fertilized with complete fertilizers have given the largest early cut, while the lowest yields have regularly appeared on the nitrate of soda plats. The difference in favor of selected crowns as compared with commercial roots, which was very marked at first, has been growing less and less each year, and in 1900 the yields were practically identical.

Blackberries (pp. 222–225).—Erie has been the most productive blackberry grown, and Agawam the least. Irrigation increased the early yield in 3 out of 4 cases, but the total yield was larger on the unirrigated plats. In previous years the results have been considerably in favor of irrigation. The addition of an extra amount of nitrate of soda was without benefit.

Raspberries (pp. 225–227).—Turner gave the largest yield, 4,327 qt. per acre, but "it crumbles badly and is very undesirable." Cuthbert, which stood first in 1899, yielded but 3,316 qt. in 1900. The combined yields in 1900 of all the unirrigated plats were slightly greater than from the irrigated as regards early and total yield. The effect of different fertilizers has been irregular. Plats receiving extra amounts of nitrate of soda have, on the whole, given decreased yields.

Currants and gooseberries (pp. 227–230).—A quart of currants has been found to weigh about 20 oz. Victoria was the most productive sort in 1900, yielding 7,507.2 qt. per acre, followed by Red Dutch, 6,764.4 qt. The increased yield due to irrigation was 15.6 per cent. Plats fertilized with barnyard manure have given the best yields, followed by complete commercial fertilizers, while the poorest results have been obtained when additional amounts of nitrate of soda have been added.

With gooseberries, Houghton, with a yield of 14,391.8 qt. per acre, was the most productive sort, with Downing second, 13,860.8 qt. Irrigation increased the yields in 1900 about 10 per cent. In previous years the heaviest yields have been obtained on the unirrigated plats. Barnyard manure has given better yields than any other fertilizer, followed by complete commercial fertilizers containing an extra amount of nitrate of soda.

Strawberries (pp. 230–240).—Nitrate of soda added to complete fertilizers resulted in increased yields. In early yield better results were secured with subirrigation than with surface irrigation, but in total yield the surface irrigated plats exceeded the subirrigated by 13 per cent and the unirrigated by 28 per cent. The surface irrigated plats also gave the largest late yield. Subirrigated plats gave 12 per cent greater yields than no irrigation.

In the study of the relative merits of matted row and hill culture, the hills were set in main rows 4 ft. apart with 3 rows a foot apart, and the plants 1 ft. distant in the rows. Thus set, it required 32,670 plants to set an acre. The matted rows were 4 ft. apart with plants 18 in. distant in the row. Only one-third as many plants were required to set an acre by this method, and the cost of labor was approximately only one-third as much as by the hill system. The following 11 out of 35 varieties grown have given larger yields by the hill system than by the matted row, showing that some varieties are much better adapted to hill culture than others: Gandy, Gladstone, Hunn, Johnson Early, Lady Thompson, Margaret, Parker Earle, Ridgeway, Starr, Warfield, and Wm. Belt.

"On the other hand, there are those in which the yields from the matted rows far exceed that from the hills, and thus the matted rows of Bismark and Buback have given more than double, while that of Glen Mary, Manwell, Ocean City, and Sample have given nearly double the yield obtained from the hills."

The most productive variety grown by the hill system was Warfield, with Wm. Belt and Big Berry (Corsican) close seconds. In the matted row Sample led, yielding 30,154 qt. per acre, followed by Bederwood (19,010 qt.), Cobden Queen (18,070 qt.), and Manwell and Bismark, each yielding over 17,000 qt. per acre.

The varieties most prolific in the formation of runners were Cobden Queen, Johnson Early, Sample, Tennessee, and Warfield. Brief notes are given on the 35 varieties grown, as well as tabulated data regarding early and total yields, freedom from producing runners, etc.

Tree fruits (pp. 240–255).—Experiments largely with fertilizers and irrigation are reported with apples, standard pears, peaches, dwarf pears, plums, and cherries. The crop secured with plums, cherries, and peaches in 1900 was the first one, and much of the data recorded are given as matter of record. On the whole, the irrigated plum plats gave increased yields of about 30 per cent as compared with the unirrigated.

No increase resulted with cherries. Dwarf plums on irrigated plats gave 17 per cent better yields than on unirrigated. The fruit was somewhat larger. Much difference occurred in the time of ripening of different trees of Newman plum and Crawford and Susquehanna peaches. Sneed was the earliest peach to ripen, followed 3½ weeks later by Triumph, the second earliest, and 3 weeks after Triumph by Champion, the third earliest. Sneed has not yet proved very productive, Triumph somewhat more so, and Champion very productive. Crosby has been a sure bearer, with medium sized fruits.

Three peach trees set according to the Stringfellow method and 3 according to the usual method came into bearing in 1900. On the whole, trees set according to the usual method yielded 28 per cent more fruit than those set by the Stringfellow method. Along with this experiment another in thinning was undertaken. Where over two-thirds of the fruit set was removed in thinning, 2.83 baskets of fruit, worth $2.83 per basket, were produced. Where only one-third of the set was removed, approximately 1 basket more fruit per tree was obtained, but its value was only $1.76, as against $2.83 in the preceding case. In the case of the third tree where the total set was not quite as large as the others and with 28.84 per cent removed in thinning, 3.53 baskets, worth $1.59, were obtained.

Some data with illustrations are given showing the value of renewing old peach orchards by cutting back.

Horticultural division, F. W. Card and G. E. Adams (*Rhode Island Sta. Rpt. 1901, pp. 227–244, pls. 9*).—Notes and some data are here given on the fruiting habits of blackberries, pollination and manuring of blackberries and raspberries, plant selection, mixing of field and sweet corn when planted in close proximity to each other, crossing and pollinating melons, and methods of planting fruit trees. Some data on the San José scale, apple maggot, and carnation stem rot included in the report are noted elsewhere in this issue.

With Agawam, Ancient Briton, and Early Cluster blackberries, the flower clusters were near the main stem, usually within 2 to 4 buds, while with the Taylor variety there were found to be nearly always 4 to 8 sterile buds next to the main stem, and unbranched canes often did not develop flowers within 2 or more feet of the ground. It is suggested, therefore, that it is not advisable to practice as close pruning with Taylor as with the other varieties noted. Agawam and Early Cluster blackberries when planted together were observed to give considerably better yields than when planted separately, due, it is thought, to better pollination being secured. Some data on the yield of blackberries and raspberries fertilized with different combinations of commercial fertilizers are given but no conclusions drawn.

In experiments in plant selection, work with especially early fruiting canes of Taylor blackberries and of Cuthbert raspberries is noted. It is hoped to propagate the early fruiting tendencies of these selected specimens. In this connection, 5 plants of Kansas raspberries which to the eye promised to be among the best and most productive plants were marked, and the fruit at picking time counted and weighed. With these 5 plants the number of berries varied from 576 to 851 per bush, and the weight of fruit from 648 gm. to 1,130 gm. The average weight of the berries from different plants varied from 1.13 to 1.43 gm. It is pointed out that these variations might have been very much greater had the comparison been made between the poorest and best plants in the field rather than between the 5 best ones.

The experiment here reported on planting sweet corn in close proximity to Longfellow flint corn is in continuation of that reported in 1898 (E. S. R., 11, p. 928). At that time no kernels of the sweet corn type were observable on the flint corn ears, while there was an abundauce of yellow kernels on the sweet corn ears. The year following 3 plantings of corn were made from the crossed corns as follows: (1) With yellow kernels found on the sweet corn ears; (2) with apparently normal sweet corn kernels from sweet corn ears that also contained yellow kernels; and (3) with kernels taken from field corn ears which appeared normal, but which had been grown near sweet corn. The yellow kernels from the sweet corn were planted in an unfavorable place and failed to grow. The white kernels produced ears showing very little mixing, only now and then a kernel appearing which was not true. The kernels from the field corn produced ears which showed numerous sweet corn kernels.

"It seems safe to conclude, therefore, that the presence of sweet corn in proximity to field corn does not influence the character of kernels of the latter during the season of growth, while the field corn does affect the sweet corn, entirely changing the character of the kernels pollinated by it. Kernels of field corn may, however, be fecundated by sweet corn pollen, and the result will show the following year when those kernels are planted, though the effect has not been visible upon the kernels themselves. It seems, however, that when sweet corn has been crossed by field corn the effect generally if not always shows, and that kernels which do not show the effect will give a pure product the following year."

Further experiments with crossed and self-pollinated muskmelons and watermelons (E. S. R., 11, p. 928) are reported. Seed from a green-fleshed watermelon crossed with a pink-fleshed variety when planted produced melons intermediate in character beween the 2 fruits, the flesh having a yellowish cast tinged with pink. The seeds also varied in character. Sixty-four crosses and pollinations were made in 1899, and 45 in 1900. Nothing could be detected in the resulting fruit or seed which tended to show any immediate influence of the pollen on either color of the fruit or character.

Further notes and illustrations are given on the growth of fruit trees differently topped and root pruned at the time of transplanting to the permanent orchard (E. S. R., 11, p. 928). The result of 3 years' observations are thus summarized by the authors: "For practical purposes the most rational method seems to be to leave all sound roots and shorten back the tops, which not only helps to bring about a proper balance between root and leaf, but also improves the subsequent character of growth of the tree."

The garden book for practical farmers, T. Greiner (*Pract. Farmer's Libr., 3 (1901), No. 2, pp. 190, figs. 129*).—In this number methods of laying out the garden are discussed, garden tools illustrated and described, directions given for making hotbeds, cold frames, and cheap greenhouses, and popular information given regarding gardening operations and the control of insect and fungus pests affecting garden crops.

Experiments with nitrate of soda on early beets, T. Brown (*New Jersey Stas. Rpt. 1900, pp. 110–114*).—This experiment with table beets is in continuation of that previously reported (E. S. R., 11, p. 444). It differs from it only in the larger plats used. Its purpose was to study the value of increasing amounts of nitrate of soda for table beets grown in rich garden soil. The amount applied varied from 400 to 700 lbs. per acre. The effect on the increased earliness of the crop, total yield, and value of the crop on the different plats are recorded. As in the previous year, the extra earliness of the crop was considerably increased by the use of the nitrate, varying in amount from 6.5 per cent in the case of the application of 400 lbs., to 13.4 per cent when 600 lbs. per acre was applied. The total increased value of the crop due to the use of nitrate varied from $30.20 when 400 lbs. per acre was applied, to $68 when 700 lbs. was applied. On the whole, an average return of $5 was obtained for every dollar invested in nitrate of soda. The average increased net value of the crop per acre was $54.15, showing, as in the previous year, the practical importance of a sufficiency of available nitrogen for quick-growing garden crops where earliness is a prominent factor in the profits.

An experiment with different forms and amounts of nitrogen on muskmelons in 1899 and 1900, C. C. Hulsart (*New Jersey Stas. Rpt. 1900, pp. 114–123*).—The first year's work in the use of different amounts and forms of nitrogen for muskmelons has already been noted (E. S. R., 11, p. 445). The average increased yield from the use of nitrate of soda in 1899 was 110 per cent, sulphate of ammonia 84 per cent, and dried blood 108 per cent—results in accord with those of the preceding year. The amount of nitrate of soda used in the first group of plats was 150 lbs. per acre, sulphate of ammonia 120 lbs., and dried blood 200 lbs. The actual amount of nitrogen applied was the same in each case. These amounts seemed to conduce to a normal growth of melons. When the amounts were multiplied by $1\frac{2}{3}$ and $2\frac{1}{3}$ the yield of melons was considerably depressed and the value of the crop decreased. The effect of the fertilizers on earliness is somewhat conflicting in the different groups; the average percentage of early melons for all groups is as follows: Nitrate of soda 34.6 per cent, sulphate of ammonia 44.6 per cent, and dried blood 54.5 per cent. The proportion of culls from the nitrate of soda plats for the 2 years, 1898 and 1899, averaged 24.7 per cent, from the sulphate of ammonia plats 31.6 per cent, and from the dried blood plats 31 per cent.

In 1900 the experiment was modified to study, in addition to the features already noted, the relative advantages of 2 and 3 applications of the different nitrogenous fertilizers. Unfavorable weather interfered with the experiment. In the main the results correspond with those of the 2 preceding years. Two applications proved more effective with nitrate of soda than 3, but the unfavorable weather experienced does not give weight to this result.

Experiment with different forms and amounts of nitrogen upon sweet corn, C. C. Hulsart (*New Jersey Stas. Rpt. 1900, pp. 124–130*).—This experiment was begun in 1898 (E. S. R., 11, p. 446) and has now been conducted 3 years. Nitrate of soda, sulphate of ammonia, and dried blood have been compared as sources of nitrogen for sweet corn. In the first group of plats 150 lbs. of nitrate of soda, 120 lbs. of sulphate of ammonia, and 200 lbs. of dried blood, furnishing the same amount of nitrogen in each case, were used per acre. In the second and third groups these amounts were multiplied by $1\frac{2}{3}$ and $2\frac{1}{3}$. The results of the experiment at the end of 3 years show an increase in yield for the different forms of nitrogen of from 23.3 to 40.2 per cent. The largest yield of both corn and stalks in every instance, save nitrate of soda, has been obtained with the heavier applications of nitrogen. The total results are in favor of sulphate of ammonia as a source of nitrogen for corn, though there is but little difference between the ammonia and the dried blood. The gross returns for the 3 years for the use of sulphate of ammonia were $12.66 per acre, dried blood $9.95, and nitrate of soda $9.69. The cost of the fertilizers in each case averaged about $4 per acre, thus showing a very satisfactory net profit from the use of these fertilizers on soils already in good cultural condition.

An experiment with cabbage in 1899, C. C. Hulsart (*New Jersey Stas. Rpt. 1900, pp. 131–133*).—Nitrate of soda, sulphate of ammonia, and dried blood were used alone in increasing amounts with cabbage. All 3 forms of nitrogen gave greatly increased yields over the control plat, but the dried blood, applied at the rate of 270 lbs. per acre, was most effective. Nitrate of soda, applied at the rate of 200 lbs. per acre, stood a close second. The average increased value, due to the use of all the fertilizers, was over $50 per acre. All forms were about equally effective in hastening the earliness of the crop.

Irrigation experiments, E. B. Voorhees (*New Jersey Stas. Rpt. 1900, pp. 182–212*).—The author discusses the subject of irrigation in the humid climate of the Eastern States, basing his statements largely on the results secured in New Jersey with blackberries, raspberries, gooseberries, currants, and miscellaneous crops. Nearly all the data given have appeared previously (E. S. R., 11, pp. 735, 1039). Topics discussed are the shortage of water in humid regions, in which it is shown that in 53 out of the last 60 years in New Jersey there has been at least 1 month in the growing season when there was such a deficiency of rainfall as to cause a serious shortage of crops, 33 years in which the deficiency extended through 2 months, and

18 years for 3 months; the amount of water required for irrigation; storage of water; small irrigation plants and the cost of the same; irrigation in humid *vs.* arid districts; furrow irrigation; and flooding small beds of plants. Experiments at the station show a gain from irrigation with a number of crops as follows: Early cabbage, 31.3 per cent; onions, 16.9 per cent; sweet corn, 51.5 per cent; sweet potatoes, 72.6 per cent; Lima beans, pole, 23.8 per cent; watermelons, 44 per cent; white potatoes, 36.4 per cent; and bush Limas, 8.8 per cent.

In some experiments carried out by G. A. Mitchell under the station auspices irrigation regularly promoted earliness of maturity with Early Jersey Wakefield cabbage and increased the profits $18.24 per acre. With tomatoes the profits were increased about $18, with watermelons $25, and with sweet potatoes $43.68 per acre by irrigation.

Experiments in the crossing of plants, B. D. HALSTED (*New Jersey Stas. Rpt. 1900, pp. 428-447, pls. 7*).—A report is given of attempts made in crossing plants, the experiments having been made within the past 2 years. Cucumbers, Lima beans, tomatoes, sweet corn, and salsify have been successfully crossed. Two crosses of White Spine and White Pearl cucumbers were successfully made and plants grown from each. The fruits of the crosses showed the influence of both parents, but they appeared much more nearly like the White Spine. The crosses with Lima beans were made between the varieties Burpee and Henderson. The resultant crosses, of which 20 were obtained, showed in the size of plants that they were midway between the parent plants. The vigor of many of the plants was remarkable. In the combinations secured it was desired to obtain a better bearing variety than Burpee, and the points desired have been obtained, but the quality remains to be fixed. Experiments are reported in which an upright growing variety of tomato and one with large reclining vines were crossed. The first variety produced red fruit of medium size, the second a large yellow fruit. A large number of seedlings were produced, and great differences were noted among the plants in size, color, form of foliage, etc. The product obtained from a yellow fruit resulting from a cross of the Dwarf Champion on a Golden Sunrise was a red fruit indicating a cross, although the color was not of the same tint as that of the staminate parent. The product of the reverse cross was quite uniform in all respects, all the fruits being red. Two plants were obtained which seemed to be exceptional in their characters; one was from the first lot of those from red fruits. The fruitfulness was far less than surrounding plants, and the fruit was smaller and almost seedless. The flowers were larger than usual and the foliage somewhat mottled. The second plant was almost gigantic in size of stems and foliage. It combined the leaf characters of the 2 parent plants, and the flowers were of an unusually large size. One of the most remarkable facts was the smallness of the fruit, averaging only about an inch in diameter. The yellow variety of tomato used sometimes shows fruit more or less blotched with red, but it is suggested that the redness of the yellow fruits is not a result of crossing with the red variety.

Experiments in crossing sweet corn are continued from the previous year (E. S. R., 12, p. 353). The primary object of the experiments was to test the susceptibility of the varieties Black Mexican, Stowell Evergreen, Egyptian, Stabler Nonpareil, and First of All, to bacterial diseases and corn smut. A number of crosses were incidentally obtained, which are reported upon at some length. The crosses indicate an increased vigor of the plant, although a striking exception was noted in the case of black grains upon an ear of Egyptian. Pink grains from Egyptian gave a very prolific crop of corn of remarkably uniform appearance, with light, dark, and pink grains thoroughly mixed. Subsequent plantings of these varieties have been made but the varieties are not yet established. The results of this season's work seem to indicate that there is a much greater influence of the male plant than the female on the style of the ear and color of grains.

A species hybrid between the cultivated salsify and the wild species is reported upon at some length. The hybrid seems to be intermediate between the 2 parent forms.

Experiments in plant hybridization, G. MENDEL (*Jour. Roy. Hort. Soc.* [*London*], *26* (*1901*), *No. 1, pp. 1–32*).—Herewith is given a translation of this paper which was first published in 1865 in the *Abhandlungen des naturforschenden Vereines in Brünn* (volume 4). The importance of the article attracted little attention at the time, owing to the greater attention being given to the Darwinian doctrines regarding the problems of species. Recently work along this line has been resumed by a number of hybridists and the article rediscovered and found to have an unusual value in this connection. In the article the results are given in detail of 8 years' experiments with peas (*Pisum sativum*), and the law is definitely established for the plants under observation that "in respect of certain pairs of differentiating characters the germ cells of a hybrid, or crossbred, are pure being carriers and transmitters of either the one character or the other, not both." The original parental characters remain intact and do not coalesce but reappear in the progeny in a certain definite ratio, in accordance with their "dominant" or "recessive" characteristics. When peas were crossed which differentiated from each other in one characteristic only, the hybrid character of the progeny so closely resembled that of one of the parental forms that the other either escaped observation completely or could not be detected with certainty. The character which is transmitted intact or almost so in the hybridization is termed by the author the "dominant" character, and those which become latent in the process the "recessive" characters; and it is further shown that it is immaterial whether the dominant character belongs to the seed-bearing or to the pollen-bearing plant, the form of the hybrid remains the same in both cases. As a result of several series of experiments in which peas were used which differed from one another in one characteristic only, it was definitely established that the relation of the dominant to the recessive characters, in the case of the pea at least, is as 3:1. The hybrid forms which maintain the recessive characters in the first generation remain constant in their offspring for all subsequent generations and do not vary as regards this character. When the seed showing the dominant character is grown, however, and self-fertilized, two-thirds yield offspring which show the dominant and recessive characters in the proportion of 3:1, while only one-third remain with the dominant characters constant. The ratio of 3:1 which appears in the first generation therefore resolves itself in the second generation to 2:1:1, and this relation, it is thought, will probably hold true for all subsequent progeny, since in trials as regards form and color of the peas it held good for 6 generations through which the experiment was carried.

Peas differing from one another in several characteristics were also experimented with and the results secured are given in great detail. As the number of differentiating characters increases, the complexity of the results also increases, but "for the whole of the characters involved in the trials the principle applies that the offspring of the hybrids in which several essentially different characters are combined represent the components of a series of combinations, in which the developmental series for each two different characters are associated. It is demonstrated at the same time that the relation of each two different characters in hybrid connection is independent of the other differences in the two original parental stocks."

In investigating the composition of the egg and pollen cells of hybrids, the theory that "pea hybrids form egg and pollen cells which, in their constitution, represent in equal numbers all constant forms which result from the combination of the characters when conjoined by fertilization," was justified experimentally. Experiments with beans (*Phaseolus* spp.) led to a like conclusion.

The article contains an introductory note by W. Bateson, in which a brief biographical sketch is given of the author and some comments made upon the paper. In these remarks Mr. Bateson states that it is hardly too much to say that Mendel's laws of hybridization deduced in these experiments "are worthy to rank with those that laid the foundation of the atomic laws of chemistry."

Further contribution regarding the differential value of characters in crossing beans and peas, E. Tschermak (*Ztschr. Landw. Versuchsw. Oesterr., 4 (1901), No. 6, pp. 641–731, figs. 12*).—An extended study of the characteristics of the seed of peas and beans obtained by crossing different varieties and species. The work was carried out along lines laid down by Mendel. In all the tests it is stated that Mendel's scheme lost something of its generality, but nothing of the importance for theoretical and practical plant breeding purposes of its classical doctrine of the differential value of characters in transmission.

Onion culture, T. C. Nye (*Truck Farmer, 5 (1901), No. 2, pp. 56–59*).—The method of the author in growing Bermuda onions on a large scale in Texas is given. Heavy fertilizing, transplanting, and irrigation are given as essential factors in successful culture. Early planting of sets in August and September resulted in total failure. Sets, in the author's experience, should not be put out before November. From 7 acres 147,000 lbs. of onions were secured, which sold for 2¼ cts. per pound.

The Bermuda onion, H. W. Brown (*South. Farm Mag., 9 (1901), No. 7, pp. 26, 27*).—Cultural directions are given for growing Bermuda onions in the South. The use of imported seed is insisted upon.

The chayote: A tropical vegetable, O. F. Cook (*U. S. Dept. Agr., Division of Botany Bul. 28, pp. 31, pls. 8*).—An extended account is given of the nature, culture, and economic value of the chayote. This is a tropical vegetable belonging to the squash family. It is now grown quite extensively in Porto Rico, Mexico, tropical America, Algeria, East Indies, and Australia, and is believed to be worthy of cultivation in the Gulf States, California, Hawaii, and the Philippines. The plant is a perennial climbing vine, sensitive to frost, and requires a long season to come to maturity. It will endure where the ground does not freeze in the winter. The vine dies back, but the reserve material in the root enables it to grow again when favorable conditions appear. One vine will cover about 20 sq. ft. of surface and bear from 300 to 500 fruits in a season. The fruit is pear-shaped and weighs from 8 oz. to 3 lbs. It contains but one seed. This germinates readily and the fruit normally continues alive for some time after separation from the plant. The fruit is cooked and eaten like summer squash, and is otherwise prepared. The flavor is considered by some more delicate than squash and by others as insipid. Mixed with rosella it has the flavor of apple sauce. The vines, fruit, and roots are also valuable as fodder. An analysis is given of the tuberous roots, which show a starch content of 20 per cent. It is believed that the chayote will prove valuable as a winter vegetable for shipment to northern city markets.

Lessons in pomology from 1899–1900, J. H. Hale (*Connecticut Bd. Agr. Rpt. 1900, pp. 214–237*).—Popular review of the development of the fruit industry along various lines, with many suggestions regarding culture, packing, shipping, etc.

Fruit harvesting, storing, marketing, F. A. Waugh (*New York: Orange Judd Co., 1901, pp. VIII+224, figs. 61*).—This book purports to be a practical guide to the picking, grading, packing, storing, shipping, and marketing of fruit. Methods of fruit storage are given most attention and a number of plans detailed for constructing storage houses in which ice refrigeration or cooling by ventilation are the important factors. Under the subject of harvesting, the utilization of waste fruits is discussed and suggestions given regarding methods of drying, evaporating, canning, etc. The appendix is an important practical part of the work. It contains data on the imports and exports of fruits of the United States, fruit-package laws in different States, apple-shippers' rules regarding quality and grades of fruit, regulations of the National League of Commission Merchants of the United States, including a roster of the members in the principal cities, commission charges on different fruit and vegetables, refrigerator cars and shipments, etc.

Experiment in root pruning, R. GOETHE (*Ber. K. Lehranst. Wein, Obst u. Gartenbau, Geisenheim, 1900–01, pp. 18, 19, fig. 1*).—Thirty apple trees were used in this experiment; 15 were root pruned according to the usual method, and 15 close root pruned according to the Stringfellow method. The 2 lots were planted in similar soils under like conditions and treated exactly alike in all other respects. Of the 15 trees root-pruned according to the usual method, 14 grew well and made a good root system; while of the 15 pruned according to the Stringfellow method, 12 died outright.

Root-pruned trees in Mexico, H. L. TROTT (*Rural New Yorker, 60 (1901), No. 2698, p. 690*).—The author holds that success in root pruning by the Stringfellow method is a question of latitude rather than climate. It is stated that in setting out a plantation of 500,000 coffee trees, 2 to 5 years old, the trees were cut back to a trunk of 6 in. and a root of 6 in., and shipped. When these were set out 2 in. more were cut off both trunk and root. The stubs were then planted in holes driven by a pointed stick. These stubs grew well and made trees superior to those grown from unpruned nursery stock because they branched low. Rubber trees were successfully grown in the same way.

Self and cross pollination: The influence of pollination on the form of the seed, R. GOETHE (*Ber. K. Lehranst. Wein, Obst u. Gartenbau, Geisenheim, 1900–01, pp. 19–24, figs. 14*).—This is an account of some experiments to determine the degree of fertility or sterility of apple and pear blossoms to their own pollen, and of the effect on the form of the seed of crossing different varieties of pears. Illustrations are given of the parent seed in each instance and of the seed of the crossed fruit.

Fertilizing orchard fruits, A. WAGNER (*Wiener Illus. Gart. Ztg., 26 (1901), No. 10, pp. 345–352*).—A comprehensive popular article on orchard fertilizing.

Subtropical fruits in Florida, A. A. BOGGS (*Fruitman's Guide, 12 (1901), No. 298, pp. 12, 13, 17*).—A paper read at the Buffalo meeting of the American Pomological Society, 1901. The status in Florida of the pineapple, citrus fruits, mango, avocado, pear, papaw, etc., is noted.

Nursery culture of apples, J. P. ANDREWS (*Nat. Nurseryman, 9 (1901), No. 10, pp. 254, 255*).—Some of the problems confronting nurserymen in the Northwest are presented and discussed.

Study of the ripening of apples, R. OTTO (*Proskauer Obstbau-Ztg., 1901, July; abs. in Chem. Centbl., 1901, II, No. 8, p. 553*).—The changes in the composition of apples brought about by ripening and storing were studied by the author. The water content of apples decreased as the green apples approached maturity, while the dry matter increased. The 4 per cent of starch present in the green apples examined decreased at first slowly, later rapidly, and finally disappeared entirely as the apples ripened. The ash content of the dry matter decreased with the ripening period and with storage. The cellulose content remained constant during the early stages of ripening. The nitrogenous matter and cane-sugar content increased with ripening, but decreased with storage. The total acid, calculated as malic, decreased constantly as did also the small amount of pectin present.

Culture of the date palm, G. SCHWEINFURTH (*Gartenflora, 50 (1901), Nos. 19, pp. 506–517; 20, pp. 541–546*).—This is a popular article dealing with the cultural and climatic condition required in date growing, fertilizers, irrigation, pollination, varieties, renovation of old palm trees, grafting, statistics of the industry, and the problem of changing the sex of palms.

The fig in Asiatic Turkey (*California Fruit Grower, 26 (1901), No. 697, p. 1*).—The methods followed in curing and packing figs in the vicinity of Smyrna are noted and contrasted with California methods.

The olive in Tunis, M. MINANGOIN (*Tunis: Dir. Agr. et Com., L'Olivier en Tunisie, 1901, pp. 70, pls. 10, figs. 4*).—This deals with the propagation, culture, and varieties of olives grown in the different fruit regions of Tunis. Other phases, such as manuring, irrigating, and insects and diseases of olives, are also considered, and a chapter given to the discussion of the relative advantages of the proprietor assuming entire directions and responsibility in the growing of olives, and of his furnishing the land to small farmers who plant and care for the orchard and pay the rent by giving the proprietor a certain portion of the crop.

Observations on olives in Asia Minor, G. C. Roeding (*Pacific Rural Press, 62 (1901), No. 16, p. 245*).—Methods of oil production are principally discussed. The vast acreage of olives in Asia Minor makes it impossible for the olive mills to utilize the crop as fast as it is gathered. The fruit is therefore stored in stone vats in the open air. These vats are about 8 ft. wide, 8 to 10 ft. long, and 8 ft. deep. After a vat is filled it is covered over with a heavy cloth resembling burlap. Boards are then placed above this and weighted with heavy stones. No precautions are taken to keep out rain. It seems to make no difference whether rain goes in or not. Olives thus stored lose their shape and become a mass of flesh and pits. They do not spoil or become rancid, however, and the oil produced from them is rather heavy and greasy, though not disagreeably so, and possesses a good bouquet.

Pickling ripe and green olives, F. T. Bioletti (*California Sta. Bul. 137, pp. 21*).—This bulletin presents the results of experiments by the station in pickling ripe and green olives by the lye and salt methods, and is the outcome of many complaints received by the station reporting failure in pickling when the methods recommended by the station were followed. (E. S. R., 11, p. 46.)

Experiments with pickling ripe olives (pp. 3–13).—The olives used in this experiment were nearly all dead ripe. They had been picked and shipped without any special precautions and were considerably bruised. The problems investigated were whether large, overripe, bruised olives, which were otherwise in good condition, could be used to produce wholesome marketable pickles, and whether such pickles could be preserved in good order for a reasonable length of time. The olives were sorted and graded, and experiments made with 8 varieties. They were covered with a 1.4 per cent lye solution, and in most cases with a 2 per cent salt solution at the same time, and left from 7 to 20 hours, after which they were rinsed and covered with a 2 per cent salt brine. The brine was changed from time to time and gradually increased in strength for 25 to 38 days, at the end of which time they were placed in a 12 per cent salt solution and either immediately or about 8 months later transferred to (1) a fruit preserving jar and left untreated, (2) an earthen jar and kept submerged by a floating cover, or (3) a fruit preserving jar and heated to 80° C. once and sometimes 3 times. In some instances the jars were sealed and heated, and again they were covered with a layer of paraffin before sealing and heating. The details and results of all these different methods are given at length.

The results of the experiments show "that even soft, overripe olives may be successfully pickled by proper modifications of the lye and salt method, even when the fruit has been somewhat carelessly handled before pickling and when the water used is not of the purest. The main precautions in such cases are to use a certain amount of salt from the beginning of the process, and to watch carefully for the first appearance of scum or slime on top of any of the liquids in which the olives are immersed. On the appearance of the slightest of these signs of fermentation, the solution must be changed and the receptacle thoroughly disinfected with boiling water. The salt hardens the flesh and makes it more resistant to fermentative organisms which exist in the water, and at the same time the antiseptic properties of the salt, even when used in such small proportions as 2 per cent, are probably of use in delaying the increase of these organisms, molds, and bacteria. All the samples, with the exception of the Sevillano, kept without perceptible deterioration for 8 months in open jars after pickling, although they were unprotected from the air except for a floating wooden cover. A ring of mold formed around the edge of the cover, but there was no perceptible injury to the flavor of the pickles, except for a slight moldiness in taste of the Sevillano."

Eleven unheated samples kept in a fair to good condition for 11 months, but they were all more or less spoiled within 32 months. Twenty samples heated to 80° C. kept perfectly for 32 months, at the end of which time they were as good as when made, with the exception of one sample which deteriorated slightly.

"It may be concluded from this that heating to 80° C. (176° F.) is a sufficient means of preserving ripe olives, even in weak brine, for an indefinite period in hermetically sealed glass jars, provided that they are exposed to no greater changes of temperature than occur in an ordinary room in Berkeley. . . . There is every reason to believe that a slightly higher heating, say to 90 or 95° C., would have made them perfectly secure in any climate. . . . The only objection to heating noted was that it causes a diffusion of the coloring matter of the olives into the brine, so that after heating the olives were lighter-colored and the brine darker than before. This diffusion, however, takes place in time even with unheated olives, and at the end of 32 months the unheated olives were in most cases actually lighter-colored than those which had been heated."

The results of the test indicate that Gordal, Manzanillo, Columbella, and Regalis are the best varieties for home use; and that Sevillano, Mission, Picholine, Manzanillo, and Gordal are most satisfactory for market purposes.

Experiments in pickling green olives (pp. 13-21).—Experiments have been made to determine the best methods of pickling green olives so as to preserve the green color. None of the usual methods of treating ripe olives, either with comparatively strong lye for short periods or with weaker lye for a longer period, was successful and in pure running water the olives turned brown the quickest. This fact suggested that possibly the oxygen in the air dissolved in the water might be a factor in the discoloration. Further experiments were therefore made with weak lye solutions which had been boiled to expel the air. The olives were kept in the lye solution until their bitterness was neutralized. With the weaker solutions it was found necessary to renew the lye several times. After neutralization they were pickled with salt solutions of gradually increasing strength as with ripe olives. By this treatment it was found possible to produce green olives which retained their color for 12 months. It is necessary first to find the proper strength of the lye solution to use for the variety or grade of olives to be pickled. This may be done by using a series of pint fruit-preserving jars containing the olives. In these should be poured different strength lye solutions beginning with ½ per cent and increasing by ½ per cent to 3 per cent solutions. When a solution is found just a little stronger than is necessary to neutralize the bitter principle in the olives in 48 hours, this strength should be chosen for curing the bulk of the crop. The proper strength having been determined, it is recommended that the olives be placed in a 50 gal. barrel having a 4 or 5 in. bung-hole and covered with lye. After soaking 48 hours the lye should be drawn off, the olives washed quickly with 2 changes of fresh water, and covered immediately with a 2 per cent brine solution. This should be replaced successively by 4 and 8 per cent solutions, allowing each solution to remain from 48 to 72 hours, depending on the size of the olives, and finally by a 12 per cent solution.

"The essential part of the process is to avoid exposing the olives to the air during the pickling, until all the bitterness and acid are completely neutralized by the lye. After this the green color seems to be fixed, and exposure to the air does not change it much, though it is well, all through the process, to avoid leaving the olives uncovered by liquid any longer than necessary.

"As different varieties of olives and even the same variety in different seasons and from different localities differ very much in bitterness, the importance of treating each variety separately is evident, as each will require lye solutions of different strength to neutralize them. Very bitter olives, such as Mission, Sevillano, Manzanillo, and True Picholine, require solutions containing from 1½ to 2½ per cent of pure potash lye, while olives containing little bitterness, such as Ascolano and Columbella, require only from ½ to 1 per cent solutions. As many of the commercial lyes are far from pure, some containing not more than 50 per cent of potash, the number of preliminary tests must usually be at least six, as indicated above. Preliminary tests conducted as described do not require an analysis of the lye, though it is probable that lyes containing a large amount of common salt would act more slowly; and with such lyes a treatment exceeding 48 hours might be necessary."

Nitrate of soda for oranges (*Pacific Coast Fruit World, 12 (1901), No. 4, p. 6*).—The writer states that from 3 to 5 lbs. of nitrate of soda per tree, according to size, scattered over the ground in the early spring, while it is moist, and immediately cultivated in, seems to give the best results with oranges. "Too large a dose tends to coarsen the fruit or thicken the rind, while the wood growth and general vigor of the tree is greatly stimulated."

Pineapple growing, P. H. Rolfs (*U. S. Dept. Agr., Farmers' Bul. 140, pp. 47, figs. 4*).—This is a popular article dealing with the outdoor culture of pineapples in Florida, and the diseases and insects affecting the same. Figures are given on the cost of growing pineapples and the possible profits in the business. Such matters as harvesting, packing, shipping, and canning the fruit, fertilizing and irrigating the plants, etc., are discussed in considerable detail.

Culture of the Queen pineapple, T. Coomber (*Gard. Chron., 3. ser., 30 (1901), No. 772, pp. 269, 270, fig. 1*).—Methods observed by the author in growing the Queen pineapples under glass are given.

Manures for tea in Assam, H. H. Mann (*The tea soils of Assam, and tea manuring. Calcutta: Indian Tea Association, 1901, pp. 60–103; figs. 2*).—The chapters of this work included within these pages treat of the general principles of tea manuring and of the materials suitable for this purpose in Assam, and the method of their application. Peat bheel is considered one of the best top-dressings for tea, to increase its luxuriance, in Assam. In one experiment the use of this material increased the yield of tea about 25 per cent. The tea from the dressed plat gave a slightly brighter liquor than that from the undressed plat, but otherwise did not differ in value from it, thus showing that contrary to the general impression in the province no decrease in quality is likely to result from the use of this material as a top-dressing. It is stated that not more than 100 to 120 tons should be used per acre. Peat bheel soil is formed by the decay of many generations of rank growing plants, the principal part of the decay taking place under water. This material contained from 21 to 30 per cent organic matter and 0.6 to 0.68 per cent nitrogen in the samples reported. The greater use of cattle manure on all Assam tea soils is urged. Mustard and the legume "mati kalai" (*Phaseolus aconitifolius*) have been most successfully used as green manures. The "mati kalai" has proved the better of the two. This plant should be sown in April or May. It is urged that some green-manure crop should occupy the ground during the greater period of the rains, and form a normal part of tea culture.

The use of the leguminous "sau" tree (*Albizzia stipulata*) in tea gardens is stated to produce undoubted beneficial effects, probably due to the fixation of the nitrogen in the soil by its roots; though some analyses made by the author of soils under these trees gave only irregular results, and whether or not nitrogen is increased in the soil through the agency of this tree could not be determined by these analyses. Some objections to these trees are that they induce long, stalky growth and hence a lower quality of tea, and in addition encourage various insect pests and blights. A rotation of these trees, not to exceed a period of 3 years, is suggested to overcome these objections.

The use of either mustard or castor cake as a manure gave immediate and profitable results without decreasing the quality of the tea. The cake is best applied before the first hoeing in spring. It may be applied in a trench around each bush about a foot away from the stem, but broadcasting and hoeing in is considered almost as good.

The mustard is considered about four-fifths as valuable as the castor cake, and linseed cake a little more valuable than the mustard cake. The use of the nitrates of soda and potash and of sulphate of ammonia as fertilizers for tea is not as satisfactory as some of the more permanent forms of nitrogen, and should not exceed, in the author's opinion, 5 per cent in any fertilizer mixture. Basic slag is considered one of the most satisfactory sources of phosphoric acid for tea manuring. This is the element most closely related to quality of tea (see article on Tea soils, p. 723).

Burning tea prunings and returning the ashes to the soil is believed to be safer than burying them. If the garden is entirely free from blight, however, the prunings may be buried. In this case they should be buried as soon as cut and covered at least 6 in. deep with soil. If basic slag is used it may be dusted over the prunings in the trenches at the rate of 400 to 500 lbs. per acre. When basic slag is used without the prunings it may be broadcasted on the surface either at the autumn deep hoeing or with the first spring hoeing, and then followed with a crop of "mati kalai" in May, to be hoed in in June. Wood ashes is also recommended as a phosphatic fertilizer to be used in the same manner as basic slag. Lime is not required to any great extent in Assam soils, but may be used to help rot buried prunings in the place of basic slag, and for its fungicidal effects. Potash manures are not deficient in Assam soils, and while potash may form a component part of the fertilizer mixtures for tea it should never be applied alone. Relative to time and methods of manuring, the author is of the opinion that this should be carried on the year before heavy pruning of the plant takes place.

Rotation of manures is suggested as follows: First year, light dressing of bheel soil, not more than 4 in. thick when put on; second year, crop of mustard in May and June to be hoed in as a green manure; third year, 8 cwt. per acre of basic slag in November; fourth year, crop of "mati kalai" in May and June, to be hoed in as a green manure; fifth year, nothing; sixth year, 7 tons per acre of cattle manure in March; seventh year, nothing. Modifications of the above rotation are also suggested.

Culture and preparation of tea, A. DOLABARATZ (*Rev. Agr. Réunion, 7 (1901), Nos. 7, pp. 272–281; 8, pp. 321–325*).—Notes on the culture, preparation, and on the quality of Réunion tea.

Instructions for growing tea from seed (*Bol. Agr. y Ganadería, 1 (1901), No. 13, pp. 20, 21*).—Methods of growing tea from seed, transplanting, etc., are given.

Small fruits in 1900, J. P. PILLSBURY (*Pennsylvania Sta. Rpt. 1900, pp. 352–371*).—The results obtained in tests with 65 varieties of strawberries, 32 of raspberries, 4 of blackberries, 8 of currants, and 12 of gooseberries are recorded in tables and notes. Similar earlier work with these fruits has been reported (E. S. R., 12, p. 645). In the experiment with strawberries the fruiting period extended from June 4 to July 9. Meek Early and Ella were the earliest varieties tested and Hunn the latest. Warfield has been the best yielding variety grown at the station for the past 4 years. In 1900 the best 5 varieties in point of yield in hill culture were Crawford, See No. 5, Brandywine, Crescent, and Dayton, in the order named; and the best 5 varieties in matted rows were Brandywine, Warfield, Crawford, Ohio Centennial, and See No. 5. In the comparison which is being made between the hill system and matted row culture of strawberries—with regard to the production of berries of large size—the results of the season seem to show a decided increase in favor of the matted row. With 19 varieties grown by both systems there was a difference varying from 0.05 to 2.7 gm. in favor of the hill system, and with 35 other varieties the difference varied from 0.01 to 3.65 gm. The average results, as regards yields per acre, with a large number of varieties grown from 2 to 4 years at the station by both systems of culture are quite largely in favor of the matted row.

The phosphates in strawberry culture (*Sci. Amer. Sup., 52 (1901), No. 1349, pp. 21625, 21626*).—The method of fertilizing strawberries observed by M. Condon in France is stated. By this method the following fertilizers are applied by mulching in the month of March: Seven kg. sodium nitrate, 3 kg. superphosphate, and 4 kg. potassium chlorid per acre. This mixture costs scarcely 8 francs per year, and is said to occasion an increased production of 65 to 70 kg.

Grapes in Germany, J. C. WHITTIER (*Pacific Coast Fruit World, 12 (1901), No. 4, p. 4*).—An account of the grape industry on the Rhine, between Cologne and Bingen.

The influence of cross fertilization on the form of the seed, R. GOETHE (*Ber. K. Lehranst. Wein, Obst u. Gartenbau, Geisenheim, 1900–01, pp. 64–66, figs. 3*).—Some illustrations are given on the results obtained in the form of the seed in cross fertilizing different varieties of grapes.

Manufacture and commerce of dried raisins in Central Tunis, L. GERARDIN (*Bul. Dir. Agr. et Com., 6 (1901), No. 20, pp. 247–251*).—Methods of preparing dried raisins in Turkey, Spain, and the islands of the Eastern Mediterranean are also noted.

Preservation of posts by different methods, C. SEUFFERHELD (*Ber. K. Lehranst. Wein, Obst u. Gartenbau, Geisenheim, 1900–01, pp. 45, 46*).—Posts used in vineyards were dipped in different solutions to preserve them against rot. The period of the experiment covers 24 years. The best results have been secured with tar. Only 9 per cent of fir posts impregnated with tar had rotted at the end of 24 years. At the end of 20 years 33 per cent of those impregnated with copper sulphate had rotted; nevertheless, the ease and cheapness with which posts, particularly green posts, can be saturated with copper sulphate solutions seems to make its use more desirable than that of the tar.

Wall and water gardens, GERTRUDE JEKYLL (*New York: Charles Scribners' Sons, 1901, pp. 177, pls. 133*).—The beautifying of the garden and home by the use of rocks, walls, and water is made the special feature of this book. There are named and described some of the rock and wall plants easiest to grow and directions given for their use and culture. The making and planting of terrace and garden walls in sun and shade, the construction of rock gardens, planting of lakes, ponds, small streams, bogs, tubs, stream margins, etc., are discussed in as many chapters and richly illustrated. Water lilies, their uses, and the varieties best adapted for different purposes, is the subject of the last chapter. The book, while written from the English standpoint and illustrated largely from English examples, contains many helps and suggestions for American gardeners.

Lilies and their culture, G. B. MALLETT (*Gard. Chron., 3. ser., 30 (1901), Nos. 759, pp. 22–24; 760, pp. 41, 42, fig. 1; 761, pp. 66, 67, fig. 1; 764, pp. 129, 130; 765, pp. 146, 147, figs. 2; 766, p. 164; 767, pp. 181, 182*).—The various groups and more important species of lilies are described and their culture characteristics noted.

On the history of the orchid-flowered or Italian cannas, C. SPRENGER (*Rev. Hort., 73 (1901), No. 19, pp. 446–448*).—Some orchid-flowered cannas originated by the author are noted.

The proper use of shrubs, G. C. BUTZ (*Pennsylvania Sta. Rpt. 1900, pp. 372–382, pls. 6*).—The use of shrubs in ornamental plantings about the home is considered and descriptions given of a large number of ornamental shrubs of recent introduction.

Experiments with lawn grasses, B. D. HALSTED (*New Jersey Stas. Rpt. 1900, pp. 460, 461*).—Nine plats of grasses seeded in the spring of 1896 have been kept closely cut with the lawn mower in each succeeding season and the present condition of each plat is shown. The Rhode Island bent grass continues in good condition and the Kentucky blue grass has proved very satisfactory. Redtop and perennial rye grass seem to be depreciating rapidly.

Distribution of seeds and plants, E. J. WICKSON and J. B. DAVY (*California Sta. Seed Bul., 1901–02, pp. 7*).—This gives a list of the seeds and plants available for distribution throughout the State and the rules governing their distribution.

FORESTRY.

The influence of forests in preventing floods, P. VESSIOT (*Rev. Eaux et Forêts, 40 (1901), No. 19, pp. 590–593*).—The influence of forests on the humidity of soil and drainage, upon infiltration, upon subterranean waters and the outflow of springs, and upon floods is treated in separate chapters, together with a review of a recent publication by Ebermayer. It is claimed that the leafy cover of the forest prevents to a great extent the violent downfall of water and retains an important amount of the precipitation. It also protects the soil from the drying action of the sun, as well as from nocturnal radiation, and prevents wide variation in the maxima and minima of temperature such as result in late frosts. The humus, moss, and other ground covering absorb a great amount of water, which slowly percolates through it and in this way checks to a great degree the erosion which takes place in unprotected regions. The network of roots acts materially in holding the soil in place. The forest cover is said to retain from 20 to 40 per cent of the atmospheric precipitation. Much of this is given off by the transpiration of the plants. This reduces the temperature and increases the humidity of the surrounding region. As to the influence on precipitation, the author claims that observations made at Nancy, France, from 1867 to 1872 showed that 24 per cent more water fell upon timbered regions than in the open in the months from May to October, and about 12 per cent in the remaining 6 months of the year. This difference is believed to be due to the forest cover as reacting upon the atmosphere.

The upper limits of forest vegetation on mountains, C. FLAHAUT (*Rev. Eaux et Forêts, 40 (1901), Nos. 13, pp. 385–401; 14, pp. 417–439*).—The forest vegetation of the mountains of France is described at some length, particular attention being paid to the alpine and subalpine zones. The principal species which characterize these regions are described. The forest vegetation does not appear to extend beyond the subalpine limits, which are determined by a number of climatic and other conditions. The alpine and subalpine meadows are described and notes given upon their distribution. The subalpine zone is characterized in France by coniferous trees, and is determined by climatic conditions which coincide with the upper normal limits of woody plant growth. The alpine vegetation is herbaceous, or small shrubs. The reforestation of portions of the subalpine zone upon which the timber has been destroyed is possible, and suggestions are given whereby it may be carried out, but the attempt to introduce forest growth in the alpine regions is considered futile.

Important Philippine woods, G. P. AHERN (*Manila, 1901, pp. 112, pls. 43*).—This work consists mainly of a compilation of notes on the most important timber-tree species of the Philippine Islands, giving information concerning the Philippine forests, characteristics of the leading timber-tree species, value of the same (present and future), and methods of procedure to secure licenses to cut timber. Extracts are given from the forestry regulations, stating the conditions under which timber may be cut. The timber trees of the country are divided into 6 groups, the stumpage price per cubic foot of the State timber varying from 1 to 14 cts. per cubic foot. Of the more valuable groups it is not permitted to cut any for fuel. The different species of trees are arranged according to groups in which the popular and scientific names, so far as known, are given. The State forests are estimated to comprise from 20,000,000 to 40,000,000 acres. In some places the cuttings have been very small, while in other provinces most of the readily accessible timber has been cut. The present forestry regulations enumerate 396 species, in addition to which a number of others are known, so that at present there are 665 native tree species listed. On account of the lack of means of communication and the character of laborers to be obtained, forest exploitation will be exceedingly difficult. There are no pure forests of any one species, and in order to obtain a cargo of any particular timber it would be necessary to secure the same from different sections. The local and oriental markets are discussed at some length, and the prices of different kinds of timber are quoted. Fifty species of the more important timber trees of the islands are described at considerable length, their characteristics and uses being given.

Chapters are also given on the depredations caused by the white ant, and an experiment with a number of American and native woods is briefly described. Oregon pine, bull pine, and spruce were completely destroyed within 30 days, while hemlock, California redwood, and California white cedar were practically uninjured. Notes are given on the strength and weight of the more common timbers, and their uses are mentioned. A brief chapter is given on the gutta-percha industry of the islands, and a list is given of more than 50 species or trees belonging to the orders Sapotaceæ and Urticaceæ, which may be expected to yield gutta-percha. The report concludes with a brief list of authorities cited.

The yield of oak high forests, WIMMENAUER (*Allg. Forst u. Jagd Ztg., 67 (1901), May, pp. 157–163; June, pp. 193–198*).—A brief statement is given of the oak forests along the Rhine, and the value of the stand at various ages is shown. The questions of rents and soil productive values are discussed at some length. The forest values and interest upon investments are given. The maximum value as an investment seems to be attained when the trees are from 80 to 100 years old. The open stand with coppice system is also considered. The increment for the system is shown and the money value of different density and age is indicated.

The cork oak, E. A. MÜLLER (*Abhandl. K. K. Geogr. Gesell. Wien, 2 (1900), No. 7, pp. 75, pls. 2, chart 1; abs. in Bot. Centbl., 86 (1901), No. 9, pp. 314–316*).—Treats of the natural history of the cork oak (*Quercus suber*) and gives its distribution, uses, methods of handling, etc.

Notes on the red cedar, C. MOHR (*U. S. Dept. Agr., Division of Forestry Bul. 31, pp. 37, pls. 2, figs. 13, map 1*).—A report is given on the red cedar, in which is included *Juniperus virginiana* and *J. barbadensis,* the trees not being distinguished in their forest and timber characteristics. The red cedar is one of the most widely distributed of our forest trees, occurring from Canada to the Gulf, and westward to the limit of tree growth in the Mississippi Valley. It usually occurs in rather small areas over this large region, and commercial areas are found only in the southeastern part of the United States. The distribution of the tree through its region of greatest production is described at some length, together with notes on its uses, rate of growth, timber characteristics, insect and fungus enemies, etc.

Plantations of timber trees as a commercial speculation, J. S. CHEESBROUGH (*Agr. Gaz. New South Wales, 12 (1901), No. 6, pp. 717–720*).—A statement is given of the probable profit accruing from a plantation of 100 acres planted to red cedar (*Cedrela toona*). This tree is said to mature its crop in about 40 years, at which time the value of the crop at present market prices would be about $14,000 per acre above all expenses.

A new means for protecting coniferous seedlings against white grubs, A. MILANI (*Allg. Forst u. Jagd Ztg., 67 (1901), Aug., pp. 268–273, figs. 3*).—A description is given of a sort of vessel in which the seedlings are grown for 6 to 8 years, when by disintegration the roots are set free. The material from which it is made is porous enough to admit water, does not act injuriously upon the roots, and protects them until old enough to withstand the grubs.

Turpentine and rosin, W. M. STEUART (*Twelfth Census United States, Census Bul. 126, pp. 12*).—A report is given of the turpentine and rosin industry of the United States, comparisons being made between the present status of those industries and their condition during the period of the 5 previous census years. The number of establishments at present engaged in this industry, as reported in the bulletin, is 1,503, with a capital of $11,847,495, which produced products valued at $20,344,888, an increase of 124 per cent in the number of establishments and 151 per cent in the value of the products over the previous census year. This industry, which is confined to the long-leaf pine region, is of commercial importance in but 7 States, viz, Alabama, Florida, Georgia, Louisiana, Mississippi, North Carolina, and South Carolina. The development of the industry and methods of gathering the rosin, and the preparation of the various products, are described at some length.

The increase of the forest domain of Belgium (*Rev. Eaux et Forêts, 40* (*1901*), *No. 20, pp. 630, 631*).—Since 1897 the forest domain of Belgium has been increased by 2,847 hectares at a cost of 2,761,727 francs. In 1900 and 1901 the extension amounted to 1,768 hectares, of which 826 were high forest and coppice, 82 coppicè, 613 coniferous forest, and 242 uncultivated or abandoned lands.

Forest fires in Gascony, MILLIES-LACROIX (*Les incendies dans les forêts de pins des landes de Gascogne. Paris: Mouillot, 1901, pp. 70*).—A discussion of proposed legislation regarding forest fires in the pine forests of Gascony.

The forest, its influence and management, F. W. CARD (*Rhode Island Sta. Rpt. 1901, pp. 245–253*).—A popular paper on forest influences and forest management.

The treatment and management of forests, particularly of deciduous trees, L. BOPPE (*Rev. Eaux et Forêts, 40* (*1901*), *No. 15, pp. 449–455*).—The author calls attention to various methods whereby the management of forests may be improved so as to provide increased returns.

Forest improvement. An outline of lectures with numerous references, R. HESS (*Die Forstbenutzung. Ein Grundriss zu Vorlesungen mit zahlreichen Litteraturnachweisen. Berlin: Paul Parey, 1901, pp. XV + 318*).

Experiments in thinning, SCHWAPPACH (*Allg. Forst u. Jagd Ztg., 67* (*1901*), *June, pp. 198–202*).—The principles of forest thinnings are discussed and various applications in practice pointed out.

Annual review of the publications and more important events in forestry, forest zoology, agricultural chemistry, meteorology, and forest botany for the year 1900 (*Allg. Forst u. Jagd Ztg., 67* (*1901*), *Sup., pp. 93*).—Lists of publications, reviews of articles and works, and accounts of important events in the departments indicated are given.

SEEDS—WEEDS.

The seed coats of certain species of the genus Brassica, A. J. PIETERS and VERA K. CHARLES (*U. S. Dept. Agr., Division of Botany Bul. 29, pp. 19, pl. 1, figs. 6*).—A study was made of the seeds of different species of Brassica to ascertain if possible how to distinguish certain valuable high-priced seeds from those which are less valuable or worthless weed seed. The external appearance and gross anatomy of the seeds of 7 species of Brassica are discussed and the histological characters are illustrated and described at considerable length. A brief key is given for determining the seeds of the species studied. This key is based upon the characters mentioned above.

The action of concentrated sulphuric acid upon seed, particularly upon the hard seeds of certain Leguminosæ, F. TODARO (*Staz. Sper. Agr. Ital., 34* (*1901*), *No. 7, pp. 613–689*).—On account of the desirability of increasing the germination of hard seed, which often occur in great numbers among leguminous seed, and for the treatment of beet and other seed to hasten their germination and to destroy fungus spores that may have found lodgment upon the seed bolls, the author conducted an extended series of experiments on the effect of sulphuric acid when applied to a great variety of seeds of leguminous and other plants. He found that concentrated sulphuric acid of a density of 1.84 acted upon hard seeds of all leguminous plants, rendering them capable of prompt germination. Hard seeds of various leguminous species were found to withstand immersion in concentrated sulphuric acid, without any injury to their viability, for about 1 hour at a temperature of 25 to

28° C., or a somewhat longer period at a lower temperature. Among other leguminous plants, the seeds of which are not characterized as hard, immersion in concentrated sulphuric acid was injurious except when applied for a comparatively few minutes. Ordinarily leguminous seeds which belong to species that are characterized by the occurrence of hard seeds are resistant to the action of sulphuric acid. In all the experiments with leguminous seeds treated with concentrated sulphuric acid the germination of the hard seeds was effected and a more rapid and uniform sprouting was secured. In order to secure the best results from treatment with sulphuric acid the seed should be repeatedly washed to secure the elimination of the acid and planted immediately. If the seeds are left to dry the advantage secured by the treatment is lost. In experiments with seeds of lotus, sulla, etc., it was found that 30 parts sulphuric acid to 70 of water gave results which were equal to those secured by the use of concentrated acid. Upon such seed as sulla, bird's foot clover, melilotus, black medick, etc., it was shown that concentrated sulphuric acid not only secured the greater total germination but appreciably hastened it.

Experiments in which hemp was treated with sulphuric acid showed the germinative power was always diminished by the immersion. Seed bolls of beets showed no injury, even when the immersion was prolonged considerably beyond the time necessary for the destruction of the fungi which are contained in the seed boll. This fact can be made use of in disinfecting beet seed before planting. Sulphuric acid showed itself injurious upon the seed of all cereals experimented with. It was found that the seed of various grasses, if submerged for 2 or 3 minutes in concentrated sulphuric acid, had their glumes attacked to such an extent that the effect produced upon germination was decidedly favorable. Cuscuta seed showed that they were not only resistant to the action of sulphuric acid, but their germination was in many cases favored by the treatment. The seeds of *Plantago lanceolata*, verbena, Rumex, spurry, foxtail, and some others which frequently occur in red-clover seed were all destroyed by a brief immersion in the sulphuric acid, without any detriment whatever to the red-clover seed.

Seeds of commercial saltbushes, G. N. Collins (*U. S. Dept. Agr., Division of Botany Bul. 27, pp. 28, pls. 8*).—Illustrated descriptive notes are given of the fruit and seed characters of 23 species of Atriplex. On account of the increased interest in the saltbushes this study was made to determine, if possible, some means for the definite recognition of the different species by seed characters.

The duration of vitality in the seeds of Castilloa elastica, W. R. Tromp de Haas (*Teysmannia, 12 (1901), No. 7–8, pp. 442–444*).—A note is given of the results of keeping seeds of Castilloa in charcoal powder, in earth, and in a vacuum. The seeds in charcoal germinated 80 per cent after 4 weeks, while all but 5 per cent of those kept in earth for the same time had lost their vitality. The seeds kept in a vacuum for 4 weeks were all dead.—H. M. PIETERS.

Some factors in the germination of seed, C. Sajo (*Prometheus, 12 (1901), No. 587, pp. 236–238*).—An account is given of experiments with a number of kinds of seeds of perennial plants, and it is believed that in addition to heat, light, and moisture, other factors are to be considered, prominent among them the action of bacteria.

Germination in distilled water and the poisonous effect of copper solutions, P. P. Dehérain and E. Demoussy (*Ann. Agron., 27 (1901), No. 11, pp. 553–559, figs. 3*).—An account is given of experiments made by the authors to determine the effect of distilled water on the germination of seed, and also the poisonous influence of traces of copper. This paper has been previously noted from a summary published elsewhere (E. S. R., 13, p. 143).

Seed testing, T. W. Kirk (*New Zealand Dept. Agr. Rpt. 1901, pp. 329–339*).—During the period covered by the report about 400 samples of farm seeds were examined by the author. The purity and germination of the different varieties of seed are shown in tabular form, from which it appears that a decided improvement is noted in the quality of seed over that formerly reported. The samples obtained were secured by private individuals, so that the seed merchants could not have information as to the use to which they were to be put. The results, as shown by the test, seem to warrant the belief that the publication of seed tests has demonstrated its value as a means for securing a better quality of seeds in the open market.

Report of seed testing at Modena in 1900, F. Todaro (*Staz. Sper. Agr. Ital., 34* (*1901*), *No. 11, pp. 881–889*).—The report shows that 1,226 tests of seeds of all kinds were made during the year, the principal varieties being alfalfa 421, red clover 360, and white clover 304. The maximum, minimum, and average percentages of purity, germinability, and intrinsic value of the different kinds of seed are shown in tabular form. In most cases an increase is shown in the percentages over the averages for 10 years with the same kinds of seed.

Tables of standards for agricultural seeds, and average data for seed examinations at Swedish seed control stations, 1895–1899, A. Lyttkens (*Meddel. K. Landtbr. Styr., 1901, No. 75, pp. 52*).

The origin, present condition, and future of the Swedish seed control, B. Jönsson (*K. Landt. Akad. Handl. Tidskr., 40* (*1901*), *No. 3, pp. 204–215*).

Report of Danish seed control, 1898–99, O. Rostrup (*Copenhagen, 1900, pp. 57*).

Experiments with weeds, B. D. Halsted (*New Jersey Stas. Rpt. 1900, pp. 458–460*).—In continuation of the weed experiments hitherto reported (E. S. R., 12, p. 350) a list is given of the weeds occurring for the fourth season upon the weed plat. A number of species which were reported as quite aggressive in the earlier years have disappeared, and the list for 1900 shows the most aggressive weeds to be ragweed, smartweed, sorrel, wild carrot, dandelion, velvet leaf, night flowering catch fly, sheep sorrel, oxeye daisy, narrow-leaved plantain, etc., their aggressiveness being in the order of enumeration.

On the eradication of charlock by means of iron sulphate solutions, A. B. Vestergaard (*Ugeskr. Landm., 47* (*1901*), *No. 47, pp. 451–454*).

DISEASES OF PLANTS.

Report of the botanist, B. D. Halsted (*New Jersey Stas. Rpt. 1900, pp. 407–476, pls. 5*).—The principal lines of investigation conducted by the botanical department for the year covered by this report were experiments with various truck crops and salad plants, studies of pear blight, asparagus rust, chrysanthemum rust, crossing of tomatoes, beans, salsify, and corn, and a continuation of weed studies.

Experiments with turnips have been continued, and the former opinion that air-slaked lime is a remedy for club root was again confirmed. The fungus causing the club root of turnips was reported as having been observed on specimens of rape. The effect of mulching potatoes was investigated, a small gain being given for the mulched ground. The investigations of potato scab were continued and it was found that the variety Green Mountain was most susceptible to the disease, while State of Maine, White Star, and Queen were less so. Winter rye as a cover for the ground was without influence on the production of scab.

Experiments with beets showed that sulphur was efficient in reducing the scab on those roots. In the bean experiments only the bacterial blight was observed, and the foliage of both varieties which were experimented with was equally infested but neither severely injured. Spraying with Bordeaux mixture was apparently without marked results in the prevention of this disease. Negative results were obtained in the experiments where Lima beans were given 6 applications of Bordeaux mixture, the plants in no case showing any disease. The yield for the sprayed plants was somewhat less than for those not treated with the fungicide. The effect of mulching on peas was studied, but no marked difference was noted between plants upon mulched and unmulched land, and no disease appeared. The effect of mulching and spraying with Bordeaux mixture was tested on tomatoes. The presence of disease was quite limited and the experiments are of rather doubtful value.

Experiments with cucumbers sprayed 8 times with Bordeaux mixture were without practical results, since the vines were nearly destroyed by insects before the appearance of any disease. Experiments with lettuce are reported, in which the bacterial blight was present to a small extent but the Septoria was quite abundant, particularly upon the variety Wonderful. The plants were not equally infested upon all parts of the plat, and this uneven distribution is attributed to the removal of the soil from some spots for experiments elsewhere. This seems to indicate a marked retentive power of the soil in holding the germs of the lettuce leaf spot. Plats of eggplant were sprayed 8 times with Bordeaux mixture, but the leaf blight appeared on different plats, although the sprayed were less infested than those untreated. The superior appearance of the plants is reputed to be due, however, to the comparative freedom from beetles occasioned by the application of the Bordeaux mixture. In continuation of previous seasons' work, the author again tested a number of varieties of salad plants, among them Swiss chard, New Zealand spinach, and Malabar spinach. The Swiss chard was sprayed 9 times with Bordeaux mixture, which rendered the plants comparatively free from leaf spot. The effect of new and old land upon crop production showed that, as a whole, the rotation of crops is the best method of keeping plants in good health. A green winter cover seemed to be without appreciable effect upon the health of plants. Winter and spring mulching, except in the case of potatoes, did not give any appreciable advantage either in yield or in diminishing disease.

The author reviews experiments in spraying. During the past season but one fungicide, Bordeaux mixture, was employed. On account of the limited occurrence of many of the more troublesome diseases, striking results were not obtained, but where important differences were secured they were generally in favor of the plants which had been given applications of the fungicide.

Experiments were conducted with hemp to ascertain the influence of environment upon the sex of the plant. This plant, as is well known, is diœcious and the greatest difference was noted in plants grown upon very rich soil. Here there were more than twice as many pistillate as staminate plants. The effect of early, medium, and late production of seed was tested and there was found to be a decided increase in the number of pistillate plants of the later over the earlier gathered seed.

Experiments are also reported with buckwheat, in which the effect of the soil on the production of the long and short styled flowers was investigated. There seemed to be no relationship between the fertility of the soil and the dimorphic forms of the flowers.

Experiments with ornamental plants are briefly reported, but none of these were sprayed during the present season except to destroy insects.

Notes are given on the white mold of radish, in which the life history of the fungus is described. Associated with it is frequently another fungus, *Peronospora parasitica*. The two can be readily distinguished by the appearance of their summer spores. An account is given of an attack of grape mildew upon grapes in an arbor at the station. The disease first made its appearance on the fruit clusters early in June, but soon after was noticed upon the foliage and stems. Two species of grapes were grown upon the arbor and the disease is reported to have been most severe in its attack upon the species which possessed woolly leaves, the smooth-leaved variety being fully 2 weeks later in showing any trace of disease.

Experiments with pear blight were continued from the previous year (E. S. R., 12, p. 354). It is believed that there is little to indicate the best time of pruning for the prevention of this disease. The effect of fertilizers has been investigated for a number of years, and during the past year the trees which withstood the disease to the greatest extent were those which had received no manure or fertilizer. Great individuality was noticed among the different trees and no conclusions can be drawn concerning the effect of fertilizers upon fruitfulness.

In continuation of the report of the previous year (E. S. R., 12, p. 354), experiments were conducted with asparagus to test the value of different substances in preventing the spread of the rust of this plant. This experiment was undertaken on account of the general opinion that the less susceptible varieties of asparagus are those possessing a thick epidermis, and it was thought that artificial coatings might be of value without having any particular fungicidal action. For this purpose gelatin, creolin, glue, lime, milk, and soap were sprayed upon the plants, 6 applications being given them. The smallest amount of rust was noticed upon the plants which received the soap spray, followed by gelatin, milk, creolin, glue, and lime in the order enumerated. The trials, however, were on such a small scale that conclusions are not safely warranted from the results obtained. Inquiries were sent out to all the experiment stations in the country to ascertain the range of the asparagus rust. From the replies received it seems that the rust is widely scattered in the central portion of the United States and that it is quite injurious. In some instances the parasitic fungus *Darluca filum* is reported as aiding materially in keeping the disease in check.

Investigations of the chrysanthemum rust have been continued, and the inspection of various establishments of chrysanthemum growers showed the disease to be very prevalent. A circular was issued (E. S. R., 11, p. 946) describing the disease and suggesting remedies. Studies are being pursued from which it is hoped that more rational methods of treatment may be found. A brief discussion on fungi as related to weather completes the report.

The year has been comparatively free from complaints of those fungi that ravage truck crops. The temperature was cool in the spring and very hot in summer with considerably less precipitation than usual, and to these factors is attributed the freedom from fungus attacks.

An epidemic of currant anthracnose, F. C. Stewart and H. J. Eustace (*New York State Sta. Bul. 199, pp. 63–80, pl. 1*).—During the past season a serious outbreak of the leaf blight or anthracnose of currants, caused by the fungus *Glœosporium ribis*, was reported in parts of New York. The lower leaves were yellow and thickly covered with small brown spots, and nearly all currant plantations in the Hudson River Valley were more or less affected. The disease affects the lower leaves first, working upward, causing the foliage to drop. In addition to attacking the leaves, the fungus occurs on the leafstalks, causing conspicuous sunken spots; also upon the fruit, stems, berries, and new canes. This is believed to be the first report of the occurrence of the fungus on the wood of the cane. Contrasting characters are drawn between this and other diseases of the plant, and the fungus is described in considerable detail. As far as the authors' investigations are concerned, the disease was more destructive in old plantations than among young plants. Plants in the nursery row were last to be attacked, and consequently suffered least. The different host plants of the fungus are enumerated. While it may attack several species of Ribes, it seems to have a decided preference for *R. rubrum*, to which belong the red and white varieties of cultivated currants. It is also reported as occurring on black currant and cultivated gooseberry, but the authors have failed to find any serious injury to the black currant or the occurrence of the fungus upon the gooseberry. A considerable variation in the susceptibility of varieties was noted, but the investigations have not been sufficiently advanced to warrant publishing lists of resistant varieties. For the prevention of this disease, although the authors have not conducted extensive experiments in this line, it is recommended that the bushes should be thoroughly sprayed with Bordeaux mixture, the first application to be given before the leaves appear, the second as the leaves are unfolding, and thereafter throughout the season at intervals of 10 to 14 days until the fruit is two-thirds grown. Where attacks of currant worm are expected, Paris green or green arsenoid may be advantageously added to Bordeaux mixture.

Notes from the botanical department, F. C. STEWART and H. J. EUSTACE (*New York State Sta. Bul. 200, pp. 81–101, pls. 5*).—Notes are given on a number of investigations conducted by the botanical department during the past year.

Trouble with pear trees in a nursery cellar.—Early in March the station was requested to investigate a serious trouble among pear trees in the nursery cellar of a Rochester nurseryman. Twenty-five thousand 3-year-old standard pear trees had been tied in bundles and placed in the cellar in an upright position. The bundles of trees were set in rows and the roots covered with sand after the usual custom. The bark on the trunks and branches of the trees when examined was of normal color and apparently healthy to a height of about 3½ ft., but beyond this the bark was black and many of the branches were dead. This condition prevailed throughout the cellar in a strikingly uniform manner. Upon investigation it was found that during the winter the sand about the roots of the trees froze and remained frozen until February, when the trees were dug out of the frozen sand and packed for shipment. Much difficulty was experienced in removing the trees from the sand, and it was decided to build a fire in the cellar to thaw it. This was done on February 27, and a few days later the trees were observed in the unhealthy condition above described. It appears that the heated air rose to the ceiling, which was unusually tight, and the warm layer of air caused the rapid thawing of the branches resulting in their destruction. The trees were rendered almost useless for wholesale purposes, although many of them which were cut back and sold at retail subsequently developed into good stock.

Shot-hole fungus on cherry fruit pedicels.—The shot-hole fungus (*Cylindrosporium padi*) is more or less prevalent throughout New York, being especially common on the English morello. While examining trees severely attacked by the fungus, the authors observed the fruit pedicels considerably affected. The leaves had fallen so that the trees looked quite bare and the fruit pedicels were so generally attacked that it was difficult to find one which was entirely free from the brown spots. The presence of these spots on the pedicels caused the fruit to ripen unevenly; many of the fruits were dwarfed and some withered without coming to maturity.

In connection with the appearance of this fungus on the fruit pedicels, the authors observed a spotting of the green fruits in which numerous small, brown, slightly sunken spots appeared on the fruits at the time they were about the size of peas. The spots enlarged as the fruits grew, but there was no tendency to rot. As the cherries began to swell and color in ripening, the spots disappeared, so there was little or no loss from this cause. The cause of this spotting is unknown.

Anthracnose of yellow toadflax.—The authors report the occurrence of the anthracnose of snapdragon on the common wild yellow toadflax (*Linaria vulgaris*). While the disease does considerable damage to the weed, it is not thought probable to turn the fungus to any practical account as an aid to the eradication of the weed.

Imperfect fertilization and the little peach disease.—During the past season the authors were called to investigate a suspected outbreak of the "little peach" disease. Instead of this disease it was found to be simply a case of imperfect fertilization. It is common to find unfertilized peach fruits in the spring on trees, but they generally fall early in the season, in what is called the June drop. The unusual feature in the present case was the persistence of the unfertilized fruit until ripening time, some of them making considerable growth. In the little peach disease ordinarily the pit is of normal size and contains a well-developed kernel, whereas in the present case the pit was abnormally small and contained no kernel, or at most an abortive one. When the tree is affected by the little peach disease, all fruits on a branch are affected and are fairly uniform in size, whereas in the case under consideration normal and small fruits were found on the same branch. Several instances of imperfect fertilization of fruits are cited, and no apprehension is felt for succeeding crops.

Tile drain clogged by fungus.—A report is given of the clogging of the tile drain to a vinegar cellar by a fungus which proved to be *Leptomitus lacteus*. The fungus produces a growth resembling the "mother" of vinegar and had to be removed in various ways from time to time. The application of a small quantity of copper sulphate to the drain succeeded in eradicating it. The authors believe that the clogging of drains in this manner is more common than is generally known.

Occurrence of a fungus in refrigerators.—The attention of the authors was called during the summer to the improper working of a refrigerator. Upon investigation it was found that the drain pipe was plugged throughout its entire length with a fungus growth of a gray or dirty gray color, consisting of a mixture of fungus mycelium and dirt from the ice. It had a slimy, slippery feel and clung together in sheets or rope-like masses several inches in extent. An examination of the fungus showed spores resembling those of Fusarium, although species of this genus rarely live in water. The definite determination of the organism has not yet been made. The simplest and most effective way of getting rid of this fungus would be to occasionally wash out the drain pipe and ice chamber of the refrigerator with boiling water.

Botanical botherments, F. H. HALL, F. C. STEWART, and H. J. EUSTACE (*New York State Sta. Buls. 199 and 200, popular ed., pp. 12, pls. 2*).—A popular summary of the above bulletins.

Experiments with smut, M. B. THOMAS (*Proc. Indiana Acad. Sci., 1900, pp. 123, 124*).—A report is given of field trials for the combating of oat smut with solutions of formalin. Three fields were sown in April with seed which had been soaked 40, 60, and 90 minutes in a solution of 1 part formalin to 200 parts of water. The seed used were from a badly infested crop, and a similar area was sown with untreated seed. No difference in the fields was noted at the time of germination, and but little difference until the time of cutting. At this time fully 15 per cent of the heads of the untreated seeds were smutted, while not a single stalk was observed from the fields where the seed had been treated. Of the 3 separate lots of treated seeds, the one soaked for 60 minutes seemed to be the best, and that time is recommended as safe and efficient for the treatment.

Seed barley treated with bluestone, J. R. MARTIN (*Queensland Agr. Jour., 9 (1901), No. 2, p. 187*).—The author reports the successful prevention of smut by the soaking of seed barley in copper sulphate solution. The seed is soaked for from 2 to 3 hours in a solution which is made so that about ¼ lb. of the chemical is used for every bushel of grain.

Rust in wheat and other cereals, V. THIELE (*Agr. Jour. Cape Good Hope, 18 (1901), No. 12, p. 809*).—The author briefly describes the use of a fungicide known as "Ceres Beize," which is said to be efficient in preventing rust, smut, and other diseases of cereals.

The generic nomenclature of cedar apples, J. C. ARTHUR (*Proc. Indiana Acad. Sci., 1900, pp. 131-136*).—The author's conclusions are given relative to the nomenclature of the common cedar apples which have hitherto been described as species of Gymnosporangium. As a result of his investigations it was claimed that Tremella replaces the name Gymnosporangium as a genus of Uredineæ, and the necessary changes of synonymy are indicated.

A disease of mangolds and sugar beets, R. H. BIFFEN (*Dept. Agr. Cambridge Univ. Rpt. 1901, pp. 87-89*).—The author reports having observed in July, 1900, a disease of mangolds in which the first noticeable symptoms were a browning of the outer leaves, while the inner ones became yellowish-green and much wrinkled. The disease seems to first show itself along the edge of the leafstalk. Upon examination the root showed no external symptoms of disease beyond being drier and tougher than normal. When cut across, the vascular bundles were stained with a purplish-black color. Specimens removed from the field and grown in the greenhouse showed that while the disease did not actually kill the plants it greatly stunted their growth. Examination of the vascular bundles showed that they were filled with a mucilaginous mass containing large numbers of bacteria. The symptoms presented by this disease seemed to be identical with a disease reported on sugar beets, and it is believed to be due to the same cause.

Bacterial disease of the potato, G. BATTANCHON (*Prog. Agr. et Vit. (Éd. L'Est), 22 (1901), No. 37, pp. 318–321*).—An account is given of the occurrence in a number of localities in France of the bacterial disease of potatoes believed to be identical with that described by Erwin F. Smith as due to *Bacillus solanacearum* (E. S. R., 8, p. 895). The characteristics of the attack are described at some length and a number of instances cited to show the extent of injury caused by the attack.

A bacterial disease of tomatoes, W. STUART (*Proc. Indiana Acad. Sci., 1900, pp. 153–157, figs. 2*).—This is an abstract of an article published in the Thirteenth Annual Report of the Indiana Station (E. S. R., 13, p. 57).

A report on the condition of vineyards in portions of the Santa Clara Valley, F. T. BIOLETTI and E. H. TWIGHT (*California Sta. Bul. 134, pp. 11, figs. 4*).—An investigation was carried on to determine the cause of the failure and death of a large number of vines in certain parts of California during the past 3 years. The dying of the vines was most conspicuous in the Santa Clara Valley, but similar cases were reported from other regions. In the Santa Clara Valley nearly all the older vineyards were more or less affected, in some cases nearly every vine being destroyed; in others the injury was sporadic. The distribution of the injured and dead vines was such as to suggest that the disease was not of an infectious parasitic nature. Dead vines were found to have been severely injured, usually by the cutting off of large branches at pruning, and leaving large wounds. These did not heal over and a decay set in, resulting in some cases in the hollowing out of the interior of the vine. This decay furnished a suitable locality for boring insects and the growth of wood-rot fungi. It was noted that in nearly every case the dying vines were old, although there was a great difference in the behavior of different varieties. The death of the vines, as shown by the investigation, seems to be due to a number of causes which may be more or less supplementary. Among them are mentioned growing on excessively gravelly soil, susceptibility of certain varieties due probably to heavy bearing, large wounds made in pruning, age of the vine, and the injurious effect on the young growth by spring frosts. These causes acting independently or in combination, together with the combined effect of the heavy crops of 1896 and 1897, and the 4 years of drought which followed, are believed to be the reason for the destruction. It has been suggested that the death of the vines was due to what is known as the California vine disease, but the destruction in this case bears no resemblance to that disease.

Powdery mildew on grapes, J. M. GUILLON and G. GOUIRAND (*Rev. Vit., 16 (1901), No. 404, pp. 293–295*).—The authors report the abundant occurrence of the perithecial stage of *Uncinula spiralis* upon grapes in a number of localities in France. The powdery mildew in Europe does not ordinarily produce the perithecia, but the climatic conditions seem to have been favorable to an abundant production during the season.

Combating grape mildew by early pruning, L. PLAGNES (*Prog. Agr. et Vit. (Éd. L'Est), 22 (1901), No. 44, p. 510*).—It is claimed that pruning grapevines in October, following this treatment with 2 applications of sulphur in the early spring, is of decided advantage in combating the grape oidium. Experiments are cited in which comparisons were made between vines pruned in October and others in February or March, both of which received the same sulphur treatment. The result of this experiment was decidedly in favor of the early pruning.

Some fungus diseases resembling black rot, V. DUCOMET (*Prog. Agr. et Vit. (Ed. L'Est), 22 (1901), No. 34, pp. 225–233, pl. 1*).—In a previous publication (E. S. R., 11, p. 759) the author described a number of fungus diseases which were of importance on account of their great resemblance to the grape black rot. In the present paper a number of other leaf diseases are described which, although usually of infrequent occurrence, sometimes cause considerable injury to the plants attacked. The resemblance to black rot is shown in the effect produced upon the foliage of the plants. The diseases described are leaf spots of walnut, due to *Marsonia juglandis;* of oleander, caused by *Septoria oleandrina;* of linden, due to *S. tiliæ;* of poplar, caused by *S. populi;* of capers, due to *Cercospora capparidis;* of cork oak, due to *Phyllosticta ilicina;* of vetch, caused by *Ascochyta viciæ;* of quince, caused by *Sphæropsis cydoniæ;* and of hackberry, due to *Taphrina celtis.*

Grape rot and Coniothyrium, L. DEGRULLY (*Prog. Agr. et Vit. (Éd. L'Est), 22 (1901), No. 32, pp. 161, 162*).—Editorial comments are made on the gray rot of grapes which is reported as abundant in a number of regions of France. Attention is called to the claims made for a number of fungicides as means for the prevention of this and other diseases. Among those commented upon are copper-sulpho-steotite and a mixture of steotite and aluminum. The author states that neither of these substances seems to be very efficient in preventing gray rot. Against the white rot, frequent sprayings with copper fungicides are recommended and it is thought that the treatment will to some extent keep in check the gray rot.

Gray rot of grapes, J. GUÉNIER (*Prog. Agr. et Vit. (Éd. L'Est), 22 (1901), No. 36, pp. 295, 296*).—A gray rot of grapes, caused by attacks of *Botrytis cinerea*, is reported to have caused serious losses in many regions of France during the past year, in some places as much as 50 per cent of the crop being destroyed within 2 days. The fungus is said to have acquired a greater importance than that of the black rot, and thus far no adequate means for its prevention seems to have been found. Characteristics of the fungus and its attack upon the grape are described.

White rot of grapes, J. D. CATTA and A. MAIGE (*Bul. Agr. Algérie et Tunisie, 7 (1901), No. 16, pp. 398–400, figs. 3*).—The occurrence of white rot of grapes in the north of Africa is noted and descriptions given of the fungus (*Charrinia diplodiella*). For the prevention of the attacks of this disease the authors recommend spraying thoroughly with the better fungicides.

The use of soda against grape oidium, A. LEBEDEFF (*Prog. Agr. et Vit. (Éd. L'Est), 22 (1901), No. 41, pp. 424–426*).—A report is given of the use of a 2 per cent solution of sodium carbonate for the prevention of grape oidium. The vines were sprayed at frequent intervals during the season with this fungicide and very satisfactory results secured. The author suggests that from 200 to 400 gm. of common glue be added to each hectoliter of the fungicide in order to make it more adhesive. It is also thought possible that by replacing with sulphur the second treatment, which is ordinarily given during the flowering period of the vine, the efficiency of the fungicide will be still more improved.

A root rot of grapes in Portugal (*Agr. Jour. Cape Good Hope, 19 (1901), No. 7, pp. 463–466*).—An account is given of a disease of grapevines which is becoming very troublesome in parts of Portugal. This is caused by a fungus similar to and probably identical with *Rosellinia necatrix*. The use of carbon bisulphid about the roots of the vines is recommended as a means for preventing the distribution of the mycelium through the soil. Diseased vines and other plants subject to attacks of the fungus should be destroyed and good drainage, which is of primary importance, be provided.

The red rot of coniferous trees (*Rev. Eaux et Forêts, 40 (1901), No. 18, pp. 563, 564*).—A description is given of the red rot caused by *Trametes radiciperda*, which attacks spruce and Scotch pine.

Carnation stem rot, F. W. Card and G. E. Adams (*Rhode Island Sta. Rpt. 1901, pp. 233, 234*).—In continuation of the experiments hitherto reported (E. S. R., 12, p. 966), an attempt was made to determine the effect of stable manure and chemical fertilizers in potting soil on the carnation stem rot. Cuttings were started in clean sand, after which half were potted in soil which received no stable manure but which was supplied with chemical plant food, and the other half was started in ordinary potting soil. When planted out, the same precautions were taken with the soil. At the end of the season no stem rot developed in either lot. The indications seemed to show that as in the previous year the use of stable manure did not produce greater injury than chemical fertilizers.

Rose mildew, E. O. Orpet (*Amer. Gard., 22 (1901), No. 358, pp. 745, 746*).—Ivory soap is said by the author to be a specific for rose mildew. A bar of the soap is dissolved in a pail of boiling water and diluted to 6 pailfuls. The mixture may be used with one-third less water and be safe, but it is stated that it is a preventive at the above strength if sprayed on with a fine spray with force.

Mildews, C. W. Dodd (*Gard. Chron., 3. ser., 30 (1901), No. 771, p. 254*).—Brief popular descriptions are given of mildews which attack a number of ornamental plants. Among those described are the mildews of roses, Michaelmas daisies, irises, hybrid montbretias, and hybrid saxifrages.

An atlas of plant diseases, G. Delacroix (*Atlas de pathologie végétale. Paris: J. Lechevalier, 1901, pls. 59*).—Illustrations are given of a large number of diseases of plants caused by fungi, insects, and other parasites, as well as a number of common abnormal growths.

ENTOMOLOGY.

Report of the entomologist, J. B. Smith (*New Jersey Stas. Rpt. 1900, pp. 479–572, figs. 10*).—During the season of 1900 there were droughts accompanied with high temperature and resulting in an increase in the numbers of Hessian fly and Angoumois grain moth and a decrease in the numbers of plant lice. It is reported that the San José scale does not develop so rapidly or breed so long in the northern as in the southern counties of New Jersey. It appears, however, that there are no local conditions in the State which are adverse to the development of this species. Most nurserymen have constructed fumigating houses of boxes for the treatment of all their stock. The sinuate pear borer is reported from a number of localities. In nurseries trees showing infestation by this insect are ordered destroyed. Peach thrips prevailed to an injurious extent in the latter part of the season and destroyed the leaders of many trees. Kerosene emulsion was applied against this insect in 2 nurseries with practical results. Pear psylla occurred in a number of localities, but appears to have been effectively checked in orchards where crude petroleum had been applied during the previous winter. The chief insects of plums during the season were plum plant lice and the curculio. Quince curculio is reported as having been unusually injurious. An account of its life history is presented. There is no time during the life cycle of the insect when it may be successfully reached by insecticides, and the method of combating it which was recommended by the author consists in jarring the trees daily during the period when the beetles are found in the orchard. Eggs of the apple plant louse were noticed in great numbers in the spring, but the insects did not develop to the usual extent. In some localities the species had almost disappeared by the middle of May. Injuries to strawberries are reported from the attacks of ground beetles. In one locality this pest occurred in such numbers as to become annoying in houses. On currants, attacks of plant lice, currant worms, spanworms, and the San José scale are reported. Pea louse caused considerable damage in several parts of the State. Red clover appears to be the normal food of the insect, and later in the season it flies from the clover to pea vines. English sparrows are reported as feeding upon the pea louse to such an extent that the insects were exterminated in some localities. Cabbage worms and cabbage-root maggots caused considerable injury in certain localities. The cabbage plusia is reported as very numerous and destructive throughout the State. Corn, especially sweet corn, was badly infested with corn worms. The best means of controlling this insect is fall plowing. Hessian fly caused great damage during 1900. The southern part of the State was comparatively exempt, while the northern portion was badly infested. Late-sown wheat suffered as much or more than that which was sown earlier. Angoumois grain moth caused an unusual amount of damage during 1900. The life history and habits of this insect are described and the usual remedies are recommended. Potato beetle attracted considerable attention, being considered the most injurious insect in some parts of the State. Its attacks on tomatoes and eggplants were especially severe. Blister beetles were destructive throughout the State on a large variety of plants, including strawberry, tomato, potato, and beet; carrots and peppers were avoided. Horn fly had largely disappeared for a number of years, but occurred in large numbers in 1900. *Cetonia inda* is reported as eating into fruits, including apples, plums, and peaches. *Daremma catalpæ* occurred in large swarms in several localities and defoliated the catalpa badly. The life history of the insect is given. It is much attacked by parasites and various diseases and large numbers of the broods may be destroyed by destroying a few leaves on which the larvæ first appear. Later, spraying with Paris green will be found effective.

Experiments with crude oil soap showed that this substance is unsatisfactory as a winter treatment. Potash fish-oil soap with an admixture of tobacco, when used as a winter application, was very injurious to vegetation, especially peach buds, and it appeared that the tobacco added nothing to the killing power of the mixture. Many complaints are reported as to the ineffectiveness of Paris green, and it is suggested that possibly insects, such as potato beetles, are acquiring an increased resisting power to this poison. In the work of the author as State entomologist special attention is given to San José scale; but during the inspection of nurseries the sinuate pear borer was considered sufficiently dangerous to debar nurserymen from obtaining a certificate until the insect was destroyed. A brief summary is given of the reports of correspondents throughout the State regarding injurious insects. Insecticide work was continued in the experiment orchard. No trees were harmed by applications of undiluted oil where the oil was applied as a spray. It was found, however, that peach buds could be killed by drenching with oil. A few varieties of apples were injured by fruit growers whose general success in the use of crude oil had been previously very good. With regard to the dilution of oils, it is urged that it is the oil which kills insects, and that the water simply serves to spread the oil over a greater area. In the opinion of the author the application of undiluted oil is to be preferred in all cases. A discussion is given to the subject of the varieties of crude oil coming from different localities.

A brief report is made of a trip to various countries of Europe for the purpose of studying insect conditions and the state of economic entomology in those countries.

The insect book, L. O. Howard (*New York: Doubleday, Page & Co., 1901, pp. XXVII+429, pls. 48, figs. 264*).—In this volume the author presents a popular account of bees, wasps, ants, locusts, flies, and various other groups of North American insects, exclusive of moths, butterflies, and beetles. Special attention is given to the consideration of the life history of one or more numbers of each group in as great detail as the present knowledge will permit. Various unknown points in connection with the life history of each species are also noted for the purpose of directing investigation along those lines. Analytical tables are presented for the identification of some of the more common species of each order of insects, and bibliographical references are given to literature where further information may be obtained on these groups. An extended bibliography on entomology is given, reprinted from Bulletin 24 of the Division of Entomology of this Department, and short chapters are presented on methods of collecting and preserving insects for study. The plates are reproduced from photographs and are all original in this volume.

Injurious insects, E. FLEUTIAUX (*Agr. Prat. Pays Chauds, 1 (1901), No. 3, pp. 393–396*).—Brief notes are given on a species of Aræocerus which attacks menado coffee when stored, eating out the inside of the berries. A brief account is also given of Dryocœtes, injuring the custard apple; *Apate monacha*, an enemy of coffee and cacao, and *Prodenia littoralis*, which attacks the cotton plant.

The potato worm in California (Galechia operculella), W. T. CLARKE (*California Sta. Bul. 135, pp. 30, figs. 10*).—This is considered the most important insect pest of the potato in California, the damage to the potato crop being estimated in some years at 25 per cent. Following upon the attacks of this insect various fungi are observed to obtain a foothold in the injured portions of the potato and hasten the destruction of the tubers. Injuries to potatoes in the field are usually not so great as in storage, though sometimes the whole crop is destroyed. Bibliographical notes are given in connection with the various descriptions and published articles of this insect. The species is described in detail in all its stages. The eggs are laid either upon a stem of the potato vine or in the bodies of the tubers. Usually the eggs are deposited singly, but sometimes more are laid near the same potato bud. The color of the larva depends somewhat upon the material upon which it is feeding, whether the inside of the tuber or the green material of the stem or surface of the tuber. The larva when 6 weeks old comes to the surface of the tuber and pupates in the mouth of the burrow, or in some depression of the potato, or in the cracks of the bins or sacks in which the potatoes are stored. The life history of this species was carefully followed by the author, and the complete life cycle is stated as being ordinarily from 63 to 69 days, except for the winter generation, when 84 or 85 days may be required. The egg stage requires from 7 to 10 days, the larval from 42 to 45 days, and the pupal from 14 to 16 days. The injury from this insect may be to the growing plant and to the tubers. When the growing plants are attacked the eggs are deposited at the base of the leaf and the larvæ, on hatching, bore downward through the stem and finally enter the tuber. In the tuber they feed either through the substance or immediately underneath the epidermis. Potatoes may therefore become infested through the stalk, through tubers which are exposed in the hill, through tubers which are allowed to lie on the ground for some time after digging, and while in storage. Field experiments demonstrated that if affected stalks are removed and destroyed as soon as they are noticed, the infestation does not proceed any further. It was found, also, that lantern traps were very effective in catching the moths. More moths of this species than of all other species combined were captured by lantern traps, and 60 per cent of those captured were females. The larva feeds inside of the stem or tuber, and therefore no spraying experiments were tried. It was demonstrated by experiments that when the earth was well pulverized about the hills and all potatoes carefully covered, no infestation took place, although check hills which were covered with cloddy or lumpy soil became quite badly infested. It was therefore concluded that careful, compact hilling reduces the infestation to a minimum. Experiments showed that when potatoes were exposed after digging, especially in the evening or over night, a considerable proportion of the tubers almost invariably became infested. When potatoes which were known to be uninfested were piled up in the field and covered with infested stalks, it was found that about 70 per cent became infested, while potatoes which were not covered with stalks remained uninfested. A series of experiments were conducted for the purpose of determining the effectiveness of removing and destroying the stalks while the larvæ were still in them. It was found that by destroying all of the potato tops about one week before the time of digging and while the larvæ were still in the stalks that the potatoes remained uninfested; the removal and destruction of infested potato tops is therefore considered an effective and practical means of controlling this insect. It was shown by experiments that moths may winter over in infested potatoes which are left in the ground. Experiments with potatoes in storage showed that the insect may rapidly increase under such conditions, and that a slight infestation may cause the almost total destruction of large quantities of stored potatoes, if no means are taken to destroy the insect during a whole winter. Experiments with carbon bisulphid in the destruction of this species in stored potatoes were successful. It is recommended that 5 treatments be given to each lot of potatoes, one when the potatoes are stored, and a second, third, fourth, and fifth treatment at intervals of about 2 weeks. For treating 1,000 cu. ft. of space, which would hold from 200 to 250 sacks of potatoes, 5 times, from 5 to 7½ lbs. of carbon bisulphid will be required. It was recommended that native food plants of this species, such as *Solanum douglasii*, *S. nigrum*, *S. umbelliferum*, and *S. xanti*, be destroyed. In addition to the other remedies already mentioned, it is recommended that all potato tops in fields which had been infested should be destroyed.

Brief notes are also given on 2 species of flea-beetles (*Epitrix subcrinita* and *E. hirtipennis*), for which spraying with Paris green in the proportion of 1 lb. to 150 gal. of water is recommended. Yellow ground crickets belonging to the genus Stenopelmatus are sometimes reported as injuring potatoes by biting out portions of the surface of the tuber.

Successful sprayer for the pea louse, E. D. Sanderson (*Rural New Yorker, 60 (1901), No. 2685, pp. 41, 42, figs. 2*).—Notes are given on previous insecticide work in controlling this insect. A description is given of the spraying machine which has been devised for operation upon infested peas. The general appearance of the sprayer from a distance is that of a grain drill, and it is furnished with a tank containing a pump with an air chamber above the tank, which is attached by gearing to one of the wheels. Underneath the tank are pipes leading to nozzles from which the spray is delivered. As the spraying machine moves along, the vines are picked up by a V-shaped wooden fork and held in such position as to receive the spray with best effect. The machine sprays 3 rows, and the total cost per acre for labor and materials is about $2.50.

San José scale insect: Its appearance and spread in Connecticut, W. E. Britton (*Connecticut State Sta. Bul. 135, pp. 14, pls. 5*).—A brief account is given of the introduction of the San José scale into this country, its discovery and distribution in Connecticut, nursery inspection in the State, legislation with regard to the insect, its life history, description of various stages, food plants, means of distribution, effects on trees, and remedies to be used in combating it. Spraying experiments were made with kerosene, crude oil, and whale-oil soap. In these experiments it was found that crude oil or kerosene in 20 per cent mixture with water, if thoroughly applied, killed the scales without causing any serious injury to the trees. It is not regarded as safe to apply either crude oil or refined kerosene on damp cloudy days. In some localities a solution of whale-oil soap containing 2 lbs. of soap per gallon of water is preferred, but this treatment is more expensive and not quite so effective in destroying the insects as either kerosene or crude oil. Greater difficulty is also experienced in applying whale-oil soap in the form of a spray. For summer treatment it is recommended that kerosene be applied in a 15 per cent mixture in water, or whale-oil soap in the proportion of 1 lb. to 5 gal. of water. In fumigating nurseries, the formula for producing hydrocyanic-acid gas as used by the author was as follows: Cyanid potash (97 per cent) ⅝ oz.; sulphuric acid (specific gravity 1.83) 1¼ oz.; water 1⅞ oz. per 100 cu. ft. of space. This treatment is not certain to kill all scales, but is considered one of the surest methods of destroying them in nursery stock. The illustrations accompanying the bulletin include figures showing infested pears, discoloration of apples and pears due to infestation of San José scale, the scales on peach twigs and on plum leaves.

San José scale, F. W. CARD and G. E. ADAMS (*Rhode Island Sta. Rpt. 1901, pp. 241–244*).—Experiments in combating this insect were conducted on city lots which were more or less infested. Two lines of treatment were tried in 1900, one with whale-oil soap and the other with kerosene. In the spring of the present year these lines of treatment were supplemented by crude petroleum, which was applied to most of the trees treated with kerosene in the autumn of 1900. The first application was made November 7, after most of the leaves had fallen. A mixture of kerosene and water of uncertain proportions was used, on account of the imperfections of the pump. The percentage of oil was probably between 15 and 20. The mixture was applied to apple and pear trees. Apple, pear, and quince trees were also treated with whale-oil soap, 1 lb. to 2 gal. of water. On April 13, 1901, the trees were again treated, whale-oil soap being applied on those trees which had received this substance in the previous autumn, but at the rate of 2 lbs. to 1 gal. of water. Most of the trees which were treated with kerosene the previous fall received crude petroleum in the spring, in about a 25 per cent mixture. The other trees were treated with a 25 per cent mechanical mixture of kerosene and water. Kerosene proved to be more effective than whale-oil soap as an autumn treatment. No injury to the trees was apparent. More live scales were found after soap had been used than where kerosene had been applied. When the trees were examined on June 19 no live scales were found on those which had been treated with crude petroleum, but a number of apparently living scales were found on the trees which were treated with whale-oil soap and with kerosene. The authors conclude that petroleum treatment is the most effective and satisfactory remedy for San José scale, being also cheaper and more easily applied.

Scale insects of importance and list of the species in New York State, E. P. FELT (*Bul. New York State Mus., 9 (1901), No. 46, pp. 289–382, pls. 15, figs. 5*).—A general discussion is presented of the characteristics, number of species, injuries, means of dispersal, and means of recognizing the various scale insects of economic importance. An analytical key for the identification of the more important species is given. A special account, including description, life history, food plants, natural enemies, and remedies, is given of oyster-shell bark louse, scurfy bark louse, San José scale, European fruit scale, Putnam's scale, *Aspidiotus forbesi*, and *A. hederæ*. Bibliographical references are given in connection with the discussion of each species. A short chapter is devoted to a discussion of the remedies which have been found effective against scale insects. These remedies include whale-oil soap, alone and in combination with crude petroleum; crude petroleum, undiluted and in emulsions; kerosene, pure and in emulsions, and fumigation by hydrocyanic-acid gas.

A technical study of 4 species of Aspidiotus (*A. ancylus*, *A. ostreæformis*, *A. perniciosus*, and *A. forbesi*, by Margaret F. Boynton is included in the report. This study is concerned with detailed descriptions of anatomical characteristics by which the 4 species may be definitely identified. A list of the scale insects found in the State of New York is appended to the bulletin.

Scale insects of the Lesser Antilles—I, H. MAXWELL-LEFROY (*Imp. Dept. Agr. West Indies, Pamphlet No. 7, 1901, pp. 63, figs. 20*).—This pamphlet contains a general account of scale insects, including the following subjects: Life history and anatomy, distribution, injurious effects, means of dispersal, preventive measures, remedies, a description of the common species in the Lesser Antilles, and a list of their food plants. The number of species which are discussed in a special manner is 20, and includes, besides others, *Lecanium hemisphæricum*, *L. longulum*, *L. hesperidum*, *L. mangiferæ*, *L. nigrum*, *L. oleæ*, *Aspidiotus articulatus*, *A. ficus*, *A. destructor*, *A. personatus*, *A. dictyospermi*, *Diaspis amygdali*, and *Mytilaspis citricola*.

Report on the protection of olive culture from an enemy which threatens the destruction of olives, BORRIGLIONE (*Bul. Agr. Algérie et Tunisie, 7 (1901), No. 20, pp. 500–508*).—The olive fly (*Dacus oleæ*) is considered one of the greatest enemies of olive culture. The larvæ feed on the pulp of the olive, completely destroying it. The olives which are stung fall to the ground prematurely, and furnish an oil of an inferior quality. Of the many remedies which have been proposed for combating this insect the author considers none as permanently effective, except where all the residents of a given locality cooperate in fighting the insect. For destruction of the larvæ while hibernating in soil, carbon bisulphid is recommended as effective. Brief notes are also given on *Phlœotribus oleæ*.

Apple maggot, F. W. CARD and G. E. ADAMS (*Rhode Island Sta. Rpt. 1901, p. 227*).—Observations in 1899 indicated that deep plowing of orchards in spring might serve as a check on the apple maggot. The results obtained in 1900 were not encouraging; fully 75 per cent of the fruit was affected in an orchard which had been treated in this way. Further experiments are being conducted for the purpose of determining the conditions which influence this excessive infestation.

Notes on the life history of Alsophila pometaria, W. E. HINDS (*Canad. Ent., 33 (1901), No. 7, pp. 185–190, figs. 7*).—The insect is described in its various stages, and notes are given on its history and life habits. The egg mass, containing 220 eggs, was found on the golden willow on March 14. The mass was kept at the temperature of the laboratory until April 23, when the larvæ began to emerge. During the last larval stage the insect feeds voraciously, but becomes sluggish near the end of the stage. The larvæ enter the earth and form cases of soil particles, held together by silk threads. The pupæ were allowed to remain in the soil until October, when an examination disclosed the fact that all of them had been destroyed, probably by red ants.

Erinose of the vine, F. T. BIOLETTI and E. H. TWIGHT (*California Sta. Bul. 136, pp. 7, figs. 5*).—This disease is characterized by swellings of the upper surface of the leaves, with depressions on the lower surface. When numerous, the swellings may cause deformation of the leaves, but no change of color. The leaves retain their green color until late in the season. The lower surface of the infested leaves becomes covered with a felt of white hairs, which later in the season becomes brown.

The cause of the disease is the presence of a mite, *Phytoptus vitis*. A description of the mite is given. The 4-legged larvæ hibernate in the bark of the vine or among the bud scales. The mite rarely causes serious injury to the vine; occasionally, however, it may interfere with the growth of the vines and reduce the crop to some extent. The worst infestations observed in California were on Flame Tokay and Mission varieties. The mite was also found on Zinfandel and Muscat. The use of sulphur checks the progress of this disease, and where this treatment is regularly applied the mite does not occur to any great extent. Cuttings from affected vines may be disinfected by placing them in water at a temperature of 122° F. for 10 minutes.

Means of combating Tortrix ambiguella in spring and summer, J. LABORDE (*Prog. Agr. et Vit. (Éd. L'Est), 22 (1901), No. 23, pp. 693–707*).—The author makes a detailed report on the various methods which have been used for destroying this insect in its different stages. During the spring and summer *T. ambiguella* and *Endemis botrana* occur in vineyards in all stages, and artificial methods of destruction must be chosen with reference to the special conditions of each case. The methods which have been most successfully used for destruction of the moths are the use of lantern traps and catching by means of rackets moistened with liquid insecticides. The conditions which are most favorable to the use of lantern traps are dark nights without rain and with a moderate temperature. Notes are given on the numbers of moths captured by these methods in different months of the year. In the destruction of the eggs various insecticides have been used, including sulphuric acid in 1 or 2 per cent solutions, essence of terebinth and soap, and kerosene emulsion. The most successful remedy for destroying caterpillars was found in Bordeaux mixture to which arsenical soap had been added. Spraying with these insecticides caused a nearly complete destruction of the caterpillars and caused no injury to the grapes. The author believes that while artificial remedies may be adopted in the combating of the insect in all its stages, it is specially desirable that the chief efforts should be directed toward destroying the insect in its larval stage.

The ravages of Tortrix pilleriana in the Beaujolais, and the destruction of the moths by means of acetylene gas lamps, G. Gastine and V. Vermorel (*Compt. Rend. Acad. Sci. Paris, 133 (1901), No. 13, pp. 488–491*).—The author made use of acetylene lamps with the jet of the height of from 12 to 15 cm., situated above the center of a shallow circular metallic vessel of from 40 to 50 cm. diameter. The vessel was partly filled with water covered with a film of kerosene. In using these lamps in vineyards it was noticed that comparatively few moths were captured in the early evening. The most abundant captures took place late at night. Detailed tables are given showing the number of moths of *T. pilleriana*, and a number of other insects caught by each lamp for each night. From these tables it appears that from July 13 to 31, 170,000 moths of *T. pilleriana* were captured, or an average of 940 moths for each lamp per night. The cost of maintaining an acetylene lamp was found to be about 8 centimes per night.

Smyrna figs growing in California, H. E. Van Deman (*Rural New Yorker, 60 (1901), No. 2680, p. 403*).—The author recounts the history of attempts to introduce the fig insect into California for the purpose of fertilizing Smyrna figs. A large quantity of good fruit was produced as a result of the successful introduction of this insect, and the fruit, according to the opinion of the author, is equal to that which is imported directly from Smyrna.

Orchards, insects, diseases, and spraying, F. Sherman (*Bul. North Carolina State Bd. Agr., 22 (1901), No. 10, pp. 9–24, figs. 7*).—The benefits of spraying are briefly discussed in a general manner. A report is given upon an inspection of orchards of the State, in which especial attention is given to the quality and quantity of the fruit and the comparative prevalence or scarcity of the insect and fungus pests. Directions are given for the selection and management of different kinds of spraying apparatus, together with formulas for Bordeaux mixture, Paris green, and kerosene emulsion. A list of the nurserymen doing business in the State is presented, and suggestions are given to intending purchasers concerning inspection of nursery stock before it is accepted.

Beneficial insects, H. Fæs (*Chron. Agr. Canton Vaud, 14 (1901), No. 22, pp. 555–559, figs. 3*).—Descriptive, biological, and economic notes on species of ichneumon and tachina flies.

Scavenger beetles and the fertilization of the soil, C. Onelli (*Bol. Agr. y Ganadería, 1 (1901), No. 1, pp. 27–29*).—The author calls attention to the work of various species of scavenger beetles in altering the physical characters of the manure of cows and horses and in burying these substances beneath the soil. The well-known habit of these insects in burying small balls of manure in which their eggs are deposited makes it necessary to remove about 5 cc. of soil for each ball. Estimates are given by the author of the amount of earth thus removed from given areas by scavenger beetles. This quantity in localities where the beetles are numerous is so large that it may be compared with the work of earthworms. In making excavations underneath and around the droppings of cows and horses it was found that the soil was rendered more loose and friable by the work of the beetles, and that small particles of the manure were scattered through the soil at various depths. In pasture land the droppings of domestic animals contain many seeds of grasses which are still capable of germination if placed in favorable conditions; these seeds are buried by the insects along with the manure and at a suitable depth for the development of vigorous grass plants. It is believed that a considerable saving in the fertilizing value of the manure is made by being buried beneath the soil where it is not subject to desiccation. When thus placed beneath the surface of the soil it is distributed in small quantities in immediate contact with the roots of the grasses and is thus more immediately available for these plants. The species of insects which are most concerned in this work are *Copris campestris*, *C. cylindrica*, *Phænus imperata*, and *Ontophagus hirculus*.

Aquatic insects in the Adirondacks, J. G. Needham and C. Betten (*Bul. New York State Mus., 9 (1901), No. 47, pp. 383–612, pls. 36, figs. 42*).—This report is based on the results of a study of the life history of about 100 species of insects. During this work 10 new species and 2 new genera were discoverd and many additions were made to the knowledge of the life history of the other known species. The work was done along the Saranac River and included the study of the aquatic insects found in various small ponds and streams in this region. A description is given of the location, and the methods of biological research which were adopted. The life histories are given in detail of a number of species of Plecoptera, Ephemerida, Odonata, Neuroptera, Trichoptera, and Diptera, besides brief notes on other orders of insects. A list of sawflies, with descriptions of 2 new species, is given by A. D. Macgillivray. New species of Diptera are described by D. W. Coquillett, and new parasitic Hymenoptera are described by W. H. Ashmead.

A monograph of the Culicidæ or mosquitoes, F. V. Theobald (*London: British Museum of Natural History, 1901, vols. 1, pp. XVIII + 424, figs. 151; 2, pp. XIII + 391, figs. 148; 3, pp. 8, pls. 42*).—The present monograph constitutes the most complete account of mosquitoes which has ever been published. In the first volume a general discussion is given on the anatomy, life history, habits, and geographical distribution of mosquitoes. The natural enemies of mosquitoes are mentioned and a brief account is presented of the agency of mosquitoes in carrying malaria, yellow fever, filariasis, and other diseases. A synoptic table is given for the identification of the different genera of the family, 22 of which are recognized by the author. A table is given showing the species of each genus, and another table is presented giving the geographical distribution of the species of mosquitoes. In all, 122 species which had previously been described are recognized as good species and redescribed, while 136 new species are described. This brings the total number of species recognized in the monograph up to 258, with a possible addition of 42 species not yet identified, which would make the total number 300. It is stated that in the collections of the British Museum there are 100 or more new species which will be described in a subsequent volume. It will probably also become necessary to revise the genus Culex, on account of its unwieldy nature, and perhaps to exclude certain species from that genus. An extensive bibliography on mosquitoes is given in the second volume, which is also furnished with an index. The figures and plates are original, 37 of the latter being done in color, while 5 of the plates are from micro-photographs of the wing scales of different species of mosquitoes.

FOODS—NUTRITION.

Studies on bread and bread making at the University of Minnesota in 1899 and 1900, H. Snyder (*U. S. Dept. Agr., Office of Experiment Stations Bul. 101, pp. 65, pls. 3, fig. 1*).—The investigations reported cover studies of (1) the comparative nutritive value—including both composition and digestibility—of graham flour, entire-wheat flour, and standard patent roller-process flour milled from the same lot of hard Scotch Fife spring wheat; (2) the comparative digestibility of bread and of oatmeal in experiments with a ration consisting of a large, a medium, and a small amount of bread and milk, and of a large and a small amount of oatmeal and milk; (3) the digestibility of bread made from flour in which the proportion of starch is increased; and (4) the quality of the bread as affected by increasing or diminishing the proportion of starch, by raising or lowering the temperature of the flour, by prolonged heating of the flours, and by blending different types of flour.

The digestion experiments with standard patent white bread, entire-wheat bread, and graham bread, gave the following average coefficients of digestibility:

Digestibility of different sorts of bread.

	Protein.	Fat.	Carbohydrates.	Energy.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Standard patent white bread	85.3	56.4	97.5	90.1
Entire-wheat bread	80.4	55.8	94.1	85.5
Graham bread	77.6	58.0	88.4	80.7

The principal results of all of the experiments follow:

Chemical analysis showed that the patent flour contained a little less protein than the graham and entire-wheat flours, but its protein was more thoroughly digested than that of the coarser flours. The digestibility of first and second patent flours was not appreciably different from that of standard patent flour. In every case the digestibility was high, doubtless owing to the fact that the flours were finely ground. Generally speaking, small rations were somewhat more thoroughly digested than larger rations, and bread and milk a little more thoroughly than oatmeal and milk. This the author believes is due to the fact that the oatmeal was much coarser than the flour from which the bread was made.

An increase in the proportion of starch in flour caused a slight decrease in the digestibility of protein. When starch was added to flour with a high percentage of gluten containing 37.2 per cent glutenin and 62.8 per cent gliadin, the size of the loaf was not reduced. The physical qualities of the bread, however, were materially altered. It contained less moisture than bread made from normal flour. When the proportion of starch in flour was diminished by the addition of moist gluten, the size of the loaf was not increased. These experiments indicate that the character of gluten rather than the starch content of flour affects its bread-making qualities, the size of the loaf being determined by the ratio of gliadin to glutenin rather than by the percentage of gluten present.

The effect of the temperature of the flour used for bread making was most noticeable in the rate of expansion of the dough and the physical quality of the bread, the best bread being obtained when the temperature of the flour was about 70° F. Prolonged heating of flour impaired its bread-making qualities, affecting both color and lightness.

By blending hard and soft wheats the undesirable properties of each were counterbalanced. When flour containing a high percentage of glutenin was mixed in equal proportions with flour containing a high percentage of gliadin, the loaf produced was larger and of better quality than that from either flour alone, but was not equal in quality to that produced from wheat containing a normal, well-balanced gluten.

A further study of the losses in the process of making bread, L. A. Voorhees (*New Jersey Stas. Rpt. 1900, pp. 134–176*).—A number of experiments are reported on the losses of material involved in bread making and related topics. A part of this work has been abstracted from a previous publication (E. S. R., 11, p. 768). The experiments not previously noted, according to the author, "have shown that the variability in the loss of dry matter, as observed in the results of different investigators, may occur as readily in the experiments of a single investigator, and at a single bakery, since the range of the same in these experiments [which were made under such condition] was from 1.41 per cent to 3.76 per cent. The experiments have also shown the usual disappearance of the fat. If this loss of fat is considered absolute, in some of the experiments the loss of carbohydrates was not sufficient to account for their consumption by the yeast to a sufficient degree to raise the bread. . . .

"An examination of the crust and crumb of bread separately in search for the seat of this discrepancy revealed the unexpected result that in the composition of the dry matter of each there was but little difference; and the crumb, which had been subjected to a temperature probably no higher than that of the boiling point of water, showed as decided a lack of ether extract as the crust which received the full heat of the oven, whereas the fuel values of crust, crumb, and raw materials were practically the same. In fact the similarity of composition of the dry matter in crust and crumb was such as to warrant the assertion that the losses and destructive processes occurring in the crust, while of greater magnitude, perhaps, affected the nutrients in the same relative manner as in the crumb, so that the composition of their dry matter was practically the same. Their fuel value was also practically the same, and while there may have been complications in the case of the crust which renders it advisable to suspend judgment, it is probable that the composition of the dry matter of the crumb of the bread was practically the same as that of the dough, or raw materials, which is to say that not more than a trifle of the fat was actually lost."

Experiments on losses in cooking meat, 1898–1900, H. S. Grindley, H. McCormack, H. C. Porter (*U. S. Dept. Agr., Office of Experiment Stations Bul. 102, pp. 64*).—The author reports 29 experiments on the losses sustained when meat is cooked by pan broiling, *i. e.*, frying in a hot pan without the addition of fat, and by boiling and stewing. In the latter experiments the water used was of different emperatures at the start and the time of cooking was also varied. The principal conclusions which were drawn follow:

The chief loss in weight during the cooking of beef is due to the driving off of water. When beef is "pan-broiled" there appears to be no great loss of nutritive material. When beef is cooked in water from 3 to 20 per cent of the total solids is found in the broth. The material thus removed from the meat has been designated as a loss, but is not an actual loss if the broth is utilized for soup or in other ways. Beef which has been used for the preparation of beef tea or broth has lost comparatively little nutritive value, though much of the flavoring material has been removed. The amount of fat found in the broth varies directly with the amount present in the meat—*i. e.*, the fatter the meat the larger the quantity in the broth. The amount of water lost during cooking varies inversely as the fatness of the meat—*i. e.*, the fatter the meat the less the shrinkage in cooking. In cooking in water the loss of constituents is inversely proportional to the size of the piece of meat. In other words, the smaller the piece the greater the percentage of loss. The loss appears to depend upon the length of time of cooking. When meat in pieces weighing from 1½ to 5 lbs. is cooked in water at 80 to 85° C. (175 to 185° F.) there appears to be little difference in the amount of material found in the broth whether the meat is placed in cold water or hot water at the start. The nature of the nitrogenous ingredients of the broth is not yet fully understood. This subject is now being studied in connection with further inquiries regarding the changes in meat in cooking.

The examination of egg pastes, A. Schmid and E. Philippe (*Schweiz. Wchnschr. Pharm., 39 (1901), pp. 330–341; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 1, p. 32*).—Analytical data are reported.

Milk as food for man at different ages, F. E. Hellström (*Helsingfors, 1901; rev. in Tidn. Mjölkhushall., 10 (1901), No. 23, p. 90*).

A new source of food (*Dietet. and Hyg. Gaz., 17 (1901), No. 12, pp. 728, 729*).—It is stated that an edible meal may be prepared from horse chestnuts by extracting the pulverized nuts with alcohol.

A study of the diet of the laboring classes in Edinburgh, carried out under the auspices of the town council of the city of Edinburgh, D. N. Paton, J. C. Dunlop, and Elsie M. Inglis (*Edinburgh: O. Shulze & Co., 1901, pp. 104*).—Dietary studies are reported of 15 families living in the thickly congested districts of Edinburgh. As regards income, the families were divided into 3 groups: (1) those with the regular wages under \$5 per week, (2) those with \$5 to \$5.75 per week, and (3) those with incomes of from \$7 to \$10 per week. The different families and groups are discussed at some length. On an average, it is stated, the typical diet of an Edinburgh laborer's family contained 107 gm. protein, 88 gm. fat, and 479 gm. carbohydrates, together furnishing 3,228 calories. Both the protein and the energy were regarded as too small. More than one-half the protein was supplied by vegetable foods. Although more money was spent for animal foods than for vegetable foods, more nutritive material was supplied by the latter. The average cost of the diet was about \$1 per man per week. The principal foods used were bread, potatoes, milk, vegetables, sugar and beef. Relatively large amounts of more expensive foods, such as beef, milk, and eggs, were consumed, and a relatively small amount of cheaper food, such as oatmeal, peas, and barley. The authors note that there is a tendency to use bread and tea or bread and butter in place of the oatmeal porridge once so commonly eaten. The superior food value of porridge is pointed out. In order to improve the diet of families like a number of those cited, the authors believe that they should be taught "(1) that a diet of tea and bread, or of tea, bread and butter (the lazy diet), is faulty; (2) that the faults of the tea and bread diet can be corrected by the free use of meat, eggs, or other animal food, but that this mode of correction is expensive; (3) that the faults can also be corrected by the free use of oatmeal with milk, or of peas or beans, without extra cost; and (4) that to correct the faults of a tea and bread diet, either money spent on animal food or labor spent on the cooking of vegetable food is necessary; if they have not the former, the money, they must use the latter, the labor of properly cooking more nutritive foods."

Some results of recent dietary studies in the United States, O. F. Tower (*Western Reserve Univ. Bul., n. ser., 4 (1901), No. 3, pp. 47–63*).—Recent dietary studies made in the United States are discussed, and a dietary study, made by the author, of a professional man's family in Cleveland, Ohio, is reported. The average amounts consumed per man per day were: Protein 98 gm., fat 87 gm., carbohydrates 377 gm., together furnishing 2,735 calories.

Dietary studies at Western Reserve University, O. F. Tower (*Western Reserve Univ. Bul., n. ser., 4 (1901) No. 6, pp. 146–164*).—Two dietary studies are reported; one was made at a boarding club consisting of men students, and the other at a club consisting of women students. The former consumed on an average per man per day, 140 gm. protein, 157 gm. fat, and 444 gm. carbohydrates, the fuel value being 3,830 calories. The average amounts consumed per woman per day in the second study were 103 gm. protein, 131 gm. fat, and 348 gm. carbohydrates, the fuel value being 3,060 calories. This was calculated as equivalent to 129 gm. protein, 164 gm. fat, 435 gm. carbohydrates, and 3,825 calories per man per day. The results of these studies are compared with similar data obtained elsewhere.

Proteids and their value from the standpoint of the physiology of nutrition, A. Jolles (*Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), No. 24, pp. 1163, 1164*).—In a paper presented at the Hamburg meeting of German Naturalists and Physicians, 1901, the author reports experiments on the nutritive value of different proteids. In his opinion, unless nitrogen is present in any given proteid in a form which yields urea it is not well utilized. Hexon bases were recovered in the feces and not in the urine.

Since the form in which nitrogen is present determines its nutritive value, the author believes that it is not possible to learn the nutritive value of proteids by the ordinary analytical methods.

Influence of formic aldehyde upon the metabolism of children, F. W. Tunnicliffe and O. Rosenheim (*Jour. Hyg. [Cambridge], 1 (1901), No. 3; abs. in British Med. Jour., 1902, No. 2143, Epit., p. 16*).—From their experiments the authors conclude that "in healthy children dilute formic aldehyde given with food (1 in 9,000) produces a retention of water in the body, but has no appreciable effect on nitrogen or phosphorus metabolism or fat assimilation, though a tendency in larger doses to diminish phosphorus and fat assimilation, referable to an influence upon pancreatic digestion, is inferred. In a delicate child no retention of water in the body results, and there is a diminution in nitrogen, phosphorus, and fat assimilation, with intestinal irritation, referable to interference with pancreatic digestion. In all the cases the excretion of lecithin was diminished, and no intestinal antiseptic action was noticed, while the general health remained constant."

Cleaning fruit before it is eaten, B. Ehrlich (*Arch. Hyg., 41 (1901), No. 2, pp. 152–176*).—A number of instances are cited in which diseases were conveyed by fruit gathered, marketed, or handled under unsanitary conditions. The author points out that micro-organisms adhere readily to the surface of fruits. Experiments were therefore undertaken to determine the number and kinds of such micro-organisms. The smallest number were found on blueberries and plums and the largest number on currants and cherries. It was found to be possible to remove the greater number of micro-organisms by washing.

ANIMAL PRODUCTION.

Fodders and feeds (*New Jersey Stas. Rpt. 1900, pp. 177–180*).—Analyses are reported of oat and pea forage, hay and straw (manured in different ways), ground oats and peas, alfalfa of different cuttings, alfalfa hay, cowpeas and Kafir corn forage, wheat fodder, crimson clover, ground beans, hominy meal, hominy feed, cotton-seed meal, middlings, wheat bran, pea meal, gluten meal, dried distillers' grains, dried brewers' grains, corn meal, oat feed, and several commercial feeds. The wheat fodder had the following percentage composition: Water, 77.26; protein, 2.35; fat. 0.68; nitrogen-free extract, 11.97; crude fiber, 5.92; and ash, 1.82.

Market prices of commercial feeds (pp. 180, 181).—The average market price in New Jersey of a number of feeding stuffs for several years is recorded.

Inspection of feeding stuffs, W. H. Jordan and C. G. Jenter (*New York State Sta. Bul. 198, pp. 33–61*).—Under the provision of the State feeding-stuffs law analyses were made of samples of cotton-seed meal, linseed meal, gluten meal, gluten feeds, germ oil meal, special gluten, malt sprouts, proprietary feeds (cereal breakfast food by-products), corn bran, barley, poultry foods, offals from milling wheat and rye, and ground grains, chiefly mixed corn and oats. The bulletin also contains a list of the brands of feeding stuffs licensed in the State for the year 1901, comments on the facts shown by the analysis made, as well as suggestions to manufacturers and consumers.

Pea-vine hay, W. F. Massey (*Bul. North Carolina State Bd. Agr., 22 (1901), No. 9, pp. 19, 20*).—Directions are given for curing pea-vine hay.

Hay of Norwegian fodder plants, F. H. Werenskiold (*Tidsskr. Norske Landbr., 7 (1900), No. 11, pp. 498–509*).—Chemical and botanical analyses of 62 samples of hay from grasses and legumes, 28 samples of hay from mountain pastures (*säterhö*), and 27 samples of marsh and woodland hay (*skoghö*). The ordinary food constituents are given in all cases; also digestible and indigestible albuminoids and amids.—F. W. WOLL.

The utilization of potatoes (*Braunschweig Landw. Ztg., 69 (1901), No. 51, pp. 214, 215*).—The possibility of profitably feeding potatoes when they are low in price is discussed, and directions given for feeding them to different farm animals.

Milk-molasses feed (*Braunschweig Landw. Ztg., 69 (1901), No. 51, p. 216*).—A brief account of the nature and uses of a feed made from molasses and the albumin and casein of skim milk.

On the feeding value of seaweeds, P. R. Sollied (*Tidsskr. Norske Landbr., 8 (1901), No. 1, pp. 13–30*).—Chemical analyses are given of samples of Fucus, Laminaria, and Sarcophyllis species, with a discussion of their value as feeding stuffs, and a bibliography on the subject.—F. W. WOLL.

Rice ensilage (*Queensland Agr. Jour., 9 (1901), No. 4, p. 415*).—A brief note is given on the successful use of rice for silage. The crop was cut when the rice was in the ear but before the grains had begun to harden.

On the physiological valuation of nutrients—animal metabolism, H. Isaachsen (*Tidsskr. Norske Landbr., 7 (1901), No. 10, pp. 433–470*).

Concerning metabolism when water is withheld, A. Spiegler (*Ztschr. Biol., 41 (1901), No. 2, pp. 239–270*).—Experiments are reported and discussed.

The resorption of fat is due to the fact that it is rendered soluble in water, E. Pflüger (*Arch. Physiol. [Pflüger], 86 (1901), No. 1–2, pp. 1–46*).—Experiments are reported and discussed.

Further investigations on the resorption of fat in water soluble form, E. Pflüger (*Arch. Physiol. [Pflüger], 88 (1901), No. 6–8, pp. 299–338*).—A large number of experiments are reported.

Concerning the value of soaps in the resorption of fat, E. Pflüger (*Arch. Physiol. [Pflüger], 88 (1901), No. 9–10, pp. 431–452*).—Experiments which are reported in detail and an extended review of the subject led the author to the conclusion that fatty acids are absorbed in a form in which they are loosely bound together; that is, in a labile condition. This is regarded as midway between a dissociated condition and a condition of stability. The resorption of fat, however, necessitates a cleavage into fatty acids and glycerin.

Resorption in the intestine—III, R. Höber (*Arch. Physiol. [Pflüger], 86 (1901), No. 3–4, pp. 199–214*).—A study of resorption by the epithelial cells of the intestine.

Concerning quantitative resorption in the large and small intestine, F. Reach (*Arch. Physiol. [Pflüger], 86 (1901), No. 5–6, pp. 247–258*).—From experiments with gelatin and albuminose solutions, with and without salt, the conclusion is drawn that resorption is much greater in the small intestine than in the large intestine.

On the resorption of artificially colored fat, L. Hofbauer (*Arch. Physiol. [Pflüger], 84 (1901), No. 11–12, pp. 619–627*).—The additional experiments reported confirm the author in his opinion that minute particles of fat pass the intestinal wall without saponification. (E. S. R., 12, p. 981.)

Experiments on resorption, digestion, and metabolism in Echinoderma, O. Cohnheim (*Ztschr. Physiol. Chem., 33 (1901), No. 1–2, pp. 9–54*).—Report of large number of investigations.

The chemistry of peptic and tryptic digestion of proteids—I, D. Lawrow (*Ztschr. Physiol. Chem., 33 (1901), No. 3–4, pp. 312–328*).—From experiments which are reported in detail, the conclusion is drawn that when pig stomach is allowed to digest itself, decomposition being hindered, the long-continued action of pepsin induces as deep-seated cleavage of protein as trypsin.

Investigations on the occurrence of proteolytic enzyms in the animal body, S. G. Hedin and S. Rowland (*Ztschr. Physiol. Chem., 32 (1901), No. 6, pp. 531–540*).—Numerous experiments were made to show the presence of enzyms in the organs and tissues of cattle, calves, horses, and dogs and to study their nature when present. The principal deductions are summarized as follows: The spleen, lymphatic gland, kidneys, and liver of the different classes of animals examined contained a proteolytic enzym which was most active in an acid solution. The skeletal muscles also contained a proteolytic enzym, but it is relatively less active and its action was practically the same in alkaline, acid, and neutral solutions. An enzym found in the muscles of the heart was similar in action to that as present in the organs enumerated above.

Studies of muscle heat, M. BLIX (*Skand. Arch. Physiol.*, *12* (*1901*), *No. 1–2*, *pp. 52–128*, *pls. 3*).—Experimental methods are described and an extended series of investigations reported and discussed.

Concerning a hitherto unknown reducing body in blood, P. MAYER (*Ztschr. Physiol. Chem.*, *32* (*1901*), *No. 6*, *pp. 518–530*).—According to the author's investigations, glycuronic acid united with some other body is a normal constituent of beef blood.

Feeding experiments with molasses and ground peat, O. KELLNER, O. ZAHN, and H. VON GILLERN (*Landw. Vers. Stat.*, *55* (*1901*), *No. 4–5*, *pp. 379–388*).—Experiments were made with 2 sheep on the digestibility of molasses, fed with and without the addition of ground peat. In both cases the basal ration consisted of meadow hay, and the digestibility of this feeding stuff alone was studied. The special object was to determine the influence of ground peat on the digestibility of the molasses. The average results follow:

Digestibility of molasses and molasses feeds—Average of two sheep.

	Organic matter.	Protein.	Fat.	Nitrogen-free extract.	Crude fiber.	Pentosans.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
1,000 gm. meadow hay	64.8	59.7	54.8	68.7	60.5	64.9
850 gm. meadow hay, 250 gm. peat meal, and 100 gm. molasses	49.5	42.9	44.8	53.9	43.8	51.4
800 gm. meadow hay and 100 gm. molasses	65.9	58.4	53.5	71.3	59.0	62.0
Calculated for molasses alone	77.5	49.0	....	87.9	....	....

The authors conclude that not only is the ground peat itself indigestible, but it diminishes the feeding value of the other materials, since it increases the amount of nutrients excreted in the feces.

The Angora goat, G. F. THOMPSON (*U. S. Dept. Agr., Farmers' Bul. 137*, *pp. 47*, *figs. 7*).—A popular edition of a publication previously noted (E. S. R., 12, p. 1077).

Poultry division, A. A. BRIGHAM (*Rhode Island Sta. Rpt. 1901*, *pp. 297–333*, *pls. 6*).—Brief statements are made concerning the work of the station poultry division. The work included brooding experiments with incubator chickens (see p. 793), a study of poultry diseases (see p. 793), determinations (by Martha Austin) of the amount of carbon dioxid in the air of incubators, breeding experiments with Belgian hares resulting in the production of a black strain, and other investigations, which are reported elsewhere in detail.

The determinations of carbon dioxid are not regarded as sufficient for drawing definite conclusions as to the influence of the amount on the hatching of eggs. The object of the investigation was to learn why so large proportion of chickens expire on the nineteenth or twentieth day of incubation when the embryonic growth is nearly or quite complete.

Preservation of eggs (pp. 304–323).—The value was tested as a preservative for eggs of water glass, dry table salt, limewater and salt brine, vaseline, ashes, gypsum, powdered sulphur, powdered sulphur and sulphur fumes, permanganate of potash, salicylic acid and salt brine. Some of the eggs used were fertile, others infertile. The general deductions drawn from the investigations follow:

"Of the different methods tested in this series of experiments the old way of using slaked lime and salt brine proved to be very effectual, and has also the advantage of being inexpensive. It is also not difficult to practice. For a period of a few weeks only, smearing the eggs with vaseline may prove an effective method of preservation. In the place of vaseline almost any clean, greasy substance may be used. For a period of a few months only, packing in dry table salt is worthy of recommendation. Of all the substances experimented with, the water glass solution proved most worthy of commendation. The . . . experiments showed that the water glass solution could be reduced to 3 per cent and still retain its preserving quality. Water glass can be obtained of druggists at from 40 to 60 cts. per gallon. It is easily manipulated and the solution may be repeatedly used. The eggs should be completely immersed in the solution, and if any eggs float, an inner cover which will sink them below the surface of the liquid should be used. In several tests where the eggs were placed in stone jars inverted saucers were used for this purpose. The expense for the water glass at 60 cts. per gallon would amount to about two-thirds of a cent per dozen eggs. This does not include the expense of the jar or other receptacle, which may be of stoneware, glass, or wood."

Notes on Rhode Island Reds (pp. 324-333).—The origin and characteristics of the strain of poultry known as Rhode Island Reds is discussed.

Trap nests, T. H. TAYLOR (*Rhode Island Sta. Rpt. 1901, pp. 334-346, pl. 1, dgm. 1*).—Comparative tests were made with a number of sorts of trap nests. The author noted the number of times the nests operated and failed to operate, as well as the number of eggs laid in the nest, outside the nest, etc.

"Although it is possible by the use of trap nests to determine the number of eggs laid by individual hens, the impracticability of their use on a large scale is evident, since the expense of attending them overbalances in a business sense the results obtained. In all the tests here reported it was found necessary to look at the nests during the busy laying season at least 5 times per day, and if a hen had laid each time it took considerably more than the 'one minute a day' claimed by more than one of the inventors to release the hen and credit the egg to her account. . . .

"We fail to see how any of the devices could prevent egg eating, as was claimed for some of them. In all the nests the hen had access to the egg after it was laid, and in one or two instances a hen was known to eat the egg."

Narrow, medium, and wide rations for chickens, T. H. TAYLOR (*Rhode Island Sta. Rpt. 1901, pp. 347-354*).—Tests extending over 3 years were made of the comparative value of narrow, medium, and wide rations. In every case 3 lots of 10 chickens each were used. The chickens fed the medium ration were given cracked corn in the morning and at night a mash of mixed ground grain and beef scrap, the nutritive ratio of the ration being 1:5. The lot receiving the narrow ration received oats in the morning and the same mash at night as lot 1. In addition they were given cut green bone 3 times a week. The nutritive ratio was 1:2.8. The lot fed the wide ration received the cracked corn in the morning and at night a mash of bran and corn meal. The nutritive ratio of this ration was 1:8.4. The tests covered a total of 92 days. In every case the greatest number of eggs was produced on the narrow ration and the smallest number on the wide ration. The average cost of the feed per hen per day on the 3 rations was 0.19, 0.18, and 0.16 ct., respectively. The cost per egg on the 3 rations, 0.97, 0.8, and 1.34 cts., respectively.

Chemical analyses showed that the manure from the narrow ration contained the largest percentage of nitrogen.

American breeds of fowls. II, The Wyandotte, T. F. McGREW (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 31, pp. 30, col. pls. 10, figs. 3*).—The origin of the Wyandotte breed and the characteristics of the different classes are treated of. The bulletin also contains information on breeding Wyandottes, their value as general-purpose fowls, and related topics.

Poultry division (*New Zealand Dept. Agr. Rpt. 1901, pp. 178–185, pls. 7*).—Statistics of the poultry exported are given, and poultry raising under local conditions and similar topics are discussed.

A Queensland duck farm (*Queensland Agr. Jour., 9 (1901), No. 4, pp. 398–400, pls. 2*).—A descriptive article.

Renewed studies in oyster culture, J. NELSON (*New Jersey Stas. Rpt. 1900, pp. 315–359, pls. 4*).—Experiments on the artificial propagation of oysters are reported, and the general principles of oyster culture discussed. The author believes that the methods of the artificial propagation of oysters are not sufficiently developed so that they can be successfully applied commercially.

"Meanwhile the method of shell planting with intermixed spawners has been shown to be eminently successful and to meet the wants of the oyster planters. The only thing that stands in the way of its immediate development in our State is the unsatisfactory legal status of the business."

DAIRY FARMING—DAIRYING.

Report of the assistant in dairy husbandry, C. B. LANE (*New Jersey Stas. Rpt. 1900, pp. 257–264, 266–311, pls. 8*).—The principal lines of dairy work during the year are reported upon in detail.

Soiling crops (pp. 260–264).—Fourteen forage crops were grown for soiling purposes, tabulated data for which are given showing the dates of seeding and cutting, amount of seed used, cost of labor, seed, and fertilizers, and the yield, together with notes on the different crops.

Experiment with wide vs. balanced rations (pp. 266–273).—A ration composed of silage, timothy and clover hay, wheat bran, and corn-and-cob meal, and having a nutritive rate of 1:8.9, was compared with a ration composed of silage, timothy and clover hay, wheat bran, dried brewers' grains, and cotton-seed meal, and having a nutritive ratio of 1:5.4. The two rations were fed to 2 lots of 2 cows each for 30 days and were then reversed, and after a transition period of 7 days were fed for 30 days longer. The yield of milk was 12.8 per cent greater and the yield of fat 14.6 per cent greater on the "balanced" than on the wide ration. The fat content of the milk averaged 4.24 per cent on the wide ration and 4.32 per cent on the balanced ration. When the wide ration was fed the cost of food for 100 lbs. of milk and 1 lb. of butter was, respectively, 69.1 and 13.9 cts., and when the balanced ration was fed 66.3 and 13.2 cts., respectively. The animals also made a greater gain in live weight on the balanced ration.

Feeding twice vs. three times daily (pp. 273–276).—Four cows were divided into 2 lots and fed the same ration, composed of silage, dried brewers' grains, wheat bran, and cotton-seed meal, morning and evening during 2 periods of 15 days each. In addition, lot 1 during the first period and lot 2 during the second period were fed cornstalks at noon. When fed 3 times a day the cows produced 2.4 per cent more milk and 2.7 per cent more butter and made a greater gain in live weight than when fed twice a day. The gain in milk is estimated as paying for the cornstalks actually eaten at the rate of $4.35 per ton.

Number of tests required in testing cows for quantity and quality of milk (pp. 277–289).—Tables are given showing the yield and fat content of the milk of 2 cows tested daily and at intervals of 7, 14, 21, and 30 days for 5 months. Tests made once a week gave 100.3 per cent of the actual yield of milk and fat as shown by the daily record; tests made once in 2 weeks, 99.7 per cent of the milk and 99.3 per cent of the fat; tests made once in 3 weeks, 99.5 per cent of the milk and 102.2 per cent of the fat; and monthly tests 99.6 per cent of the milk and 98.3 per cent of the fat. The conclusion is drawn that quite satisfactory records may be obtained by tests at intervals of 7, 14, 21, or 30 days. It is recommended, however, that composite samples for at least 2 days be taken where the intervals are longer than 2 weeks. Reference is made to results obtained at the Illinois and Vermont stations relative to the number of tests required during a period of lactation.

Dehorning cattle (pp. 289–294).—A record is given of 3 cows for 20 days preceding and 20 days following dehorning, and also for both periods for 3 other cows not dehorned. The yield of milk of the dehorned cows decreased 16.9 per cent and of the other 3 cows 13.6 per cent during the second period as compared with the first. Notes are given on preventing the growth of horns by means of caustic potash. In experiments with 6 calves the best time for making the application was found to be between the fifth and tenth days.

Cost of producing milk (pp. 295–298).—Data showing the cost of the milk production of the herd of 30 cows for the year ending April 1, 1900, are given and averaged with similar data obtained during the 3 preceding years. The average yield of milk per cow for the 4 years was 6,467 lbs., and the average cost per quart of milk, including food, labor, and interest on and decrease in the value of the herd, was 2.39 cts.

Soiling crop rotation (pp. 298–301).—Tabulated data are given showing the total yield and amount of nutrients obtained per acre from the various combinations of crops supplying forage to the dairy herd from May 1 to October 1.

Dairying in relation to soil exhaustion (pp. 301–303).—The amount of fertilizing elements contained in the feeding stuffs purchased was decidedly greater than that in the milk produced by the station herd during 4 years.

Record of the dairy herd (pp. 303–311).—A monthly record of 27 cows is given for the year ended April 1, 1900. The average yield of milk per cow was 6,380 lbs. and the average fat content of the milk 4.57 per cent. The best cow produced 9,511 lbs. of milk and 452 lbs. of butter and the poorest cow 3,135 lbs. of milk and 233 lbs. of butter. The author considers that a cow producing less than 5,000 lbs. of milk per year is unprofitable.

The waste in handling and delivering milk for 4 years averaged 8.3 per cent.

Methods of dairy feeding, H. Hayward (*Pennsylvania Sta. Bul. 56, pp. 6*).—An experiment covering 3 thirty-day periods was conducted with 15 cows divided into 3 uniform lots to compare feeding in pens and stalls and to test the effect of having water constantly before cows in stalls. During the first and third periods the 3 lots were tied in stalls and turned out once a day in the yard to be watered. During the second period lot 1 was turned loose in a pen 12 by 26 ft., and furnished with a constant supply of water; lot 2 received the same treatment as during the first and third periods; and lot 3 was confined in stalls and given a constant water supply. The same ration was fed throughout. The results are summarized as follows:

"(1) The results of this experiment failed to show any advantage in having water constantly before the cows in the stable. The cows that were turned into the yard for water once a day made as good returns as those having constant access to water in the stable.

"(2) Much more bedding was required to keep the cows clean and comfortable in the pens than in the stalls. Apparently it would not be economical to keep milch cows loose in pens on farms where the supply of bedding is limited.

"(3) Considerably less labor was required to care for the cows in the pen than for those in the stalls. The increase in the amount of bedding would also result in the production of a greater bulk of manure.

"(4) The fewest bacteria were found in the milk of those cows which stood in the stalls constantly, and which were consequently the cleanest."

Feeding experiments to determine the effect of increasing amounts of concentrated feeds upon the yield of milk, K. Hittcher (*Molk. Ztg., 15 (1901), Nos. 30, pp. 527, 528; 31, p. 547; 32, pp. 563, 564*).—Two feeding experiments, one made with 39 cows and the other with 42 cows, are reported. In each case the cows were divided into 3 lots as nearly alike as possible, and fed for 4 periods varying in length from 3 to 9 weeks in the first experiment and from 4 to 12 weeks in the second experiment. Varying amounts of concentrated feeds consisting of wheat bran, sunflower cake, palm-nut cake, and brewers' grains were fed the different lots in addition to coarser feeding stuffs. In the first experiment feeding 7 lbs. of concentrated feed was more profitable than feeding 10 or 13 lbs., and in the second experiment feeding 4 lbs. was more profitable than feeding 7 or 10 lbs.

A study of individuality of dairy cows in a modern dairy barn, W. A. Conant (*Rhode Island Sta. Bul. 80, pp. 41–107, pls. 14*).—A detailed account is given of the kind and amount of food eaten and the yield and fat content of the milk produced by each of 11 cows during the period from December 1, 1900, to March 14, 1901, together with illustrations and notes on the history and characteristics of each cow. The feeding stuffs used were Chicago gluten meal, cotton-seed meal, wheat bran, wheat middlings, oat hay, and corn silage. The data for each cow as regards the amounts of the several feeding stuffs and of the different nutrients which gave the best results, the average yield of milk for all the rations fed, and the yield for the most favorable ration, etc., are summarized in tables. Various suggestions are made throughout the article in regard to the feeding and care of cows and a full account is given of the management of one of the cows at calving time. Averaging the results for the whole herd and the different feeding stuffs separately, the best yield of milk was obtained with 1.29 lbs. of Chicago gluten meal, 1.81 lbs. of cotton-seed meal, 3.83 lbs. of wheat bran, 4.05 lbs. of wheat middlings, 5.73 lbs. of oat hay, and 38.85 lbs. of corn silage. The best results were obtained with 21.07 lbs. of digestible dry matter, 2.10 lbs. of digestible protein, and a nutritive ratio of 1:5.9.

Pan-American model dairy, V. E. Fuller (*Jersey Advocate and Dairyman, 1 (1901), No. 37, Sup., folio*).—Ten breeds were represented by 5 cows each. The record as given shows the kind, quantity, and cost of food consumed, and the milk, fat, and solids produced by each cow for the 6 months of the test. The following table summarizes the yield of milk, fat, and solids by breeds for the entire test as well as the cost of food and the net profit in estimated butter and in solids·

Record of 5 cows each of 10 breeds for 6 months, showing total production, cost of food, and net profit by breeds.

Breed.	Yield of milk.	Yield of fat.	Yield of solids.	Cost of food.	Profit in butter.	Profit in solids.
	Pounds.	*Pounds.*	*Pounds.*			
Jersey	26,986.3	1,223.88	3,770.08	$137.77	$225.41	$200.63
Guernsey	27,134.5	1,248.09	3,754.99	136.99	230.11	202.56
Ayrshire	32,998.2	1,219.44	4,185.32	140.74	217.91	235.87
Shorthorn	31,986.2	1,129.77	4,086.59	162.08	171.82	205.64
Holstein	39,059.9	1,275.85	4,760.57	164.57	210.62	262.15
Polled Jersey	20,326.6	948.31	2,831.73	109.62	169.24	145.18
French Canadian	24,615.2	984.11	3,277.36	113.11	176.45	181.83
Brown Swiss	30,890.3	1,123.15	3,943.03	147.30	182.99	207.51
Red Polled	28,713.0	1,141.81	3,773.73	138.15	198.15	201.15
Dutch Belted	24,893.3	847.50	3,066.50	132.48	116.79	132.60

The Red Polled and Dutch Belted cows were selected from a comparatively small number available for this purpose, and during the first 18 days of the test the Dutch Belted were represented by 3 cows only. "The first deduction that would naturally be drawn from the net profit in estimated butter is that the breeds which are specially bred for the dairy show a very strong lead in this particular." The Red Polled is noted as a possible exception to this statement. The Guernseys made the greatest profit in butter, with the Jerseys second, and the Ayrshires third. The Holsteins produced the most milk and solids, and stood first as regards profit in solids, but fourth as regards profit in estimated butter. The Ayrshires are considered as having made an excellent showing.

Lessons from the model dairy, E. Van Alstyne (*Abs. in Jersey Advocate and Dairyman, 1 (1902), No. 45, pp. 6, 7*).—The author draws a number of deductions from the records of the Pan-American model dairy, among which, in substance, are the following: The best cows are not all in any one breed. The Channel Islands cattle are certainly the ones to be selected for butter production. For milk production without regard to fat content the Holsteins are to be selected, especially if the food supply is plentiful and easily obtained. Size alone is no criterion of the value of a dairy cow. An excessive grain ration was not always the most economical. Bran, 6 lbs., and "gluten" (containing 28 per cent of protein), 4 lbs., as a basis for the grain ration gave the best results. Corn silage was shown to be an economical feed in summer as well as in winter. No change in the character of the feed produced any notable change in the fat content of the milk. Nutritive ratios varying from 1:4 to 1:6 gave as good results with particular cows or feeds as a nutritive ratio of 1:5.5.

The importance of exercise and principles of breeding are also briefly discussed in this connection.

On the productive capacity of Funen (Danish) cattle, N. Petersen (*Mälkeritid., 14 (1901), No. 32, pp. 491–502*).—An investigation of the progeny of prize bulls of the Funen breed with reference to their productive capacity. The report includes data for 1,116 cows in 26 different herds that competed for prizes in agricultural society herd contests during 1894–1900. The data have been used for discussions of many questions bearing on dairy practice, and on relations of yield of milk, age of animals, or time of lactation to quality of milk produced, etc.—F. W. WOLL.

Report of Milk Control Station, Christiania, Norway, 1900 (*Aarsbr. Offent. Foranst. Landbr. Fremme, 1900, pp. 319–325*).—The average fat content of 154,725 samples of milk tested at the Christiania Milk Control Station during 1896 to 1900 was 3.477 per cent. The monthly averages, including between 10,000 and 15,000 analyses each, were as follows: January, 3.439 per cent; February, 3.411 per cent; March, 3.362 per cent; April, 3.344 per cent; May, 3.305 per cent; June, 3.432 per cent; July, 3.545 per cent; August, 3.543 per cent; September, 3.629 per cent; October, 3.662 per cent; November, 3.577 per cent, and December, 3.509 per cent.—F. W. WOLL.

Reports of milk control stations in Trondhjem and Bergen, Norway, 1900, T. Soelberg and K. Seielstad (*Aarsbr. Offent. Foranst. Landbr. Fremme, 1900, pp. 326–334*).

Skimming and churning in Norwegian creameries, S. J. Benterud (*Aarsbr. Offent. Foranst. Landbr. Fremme, 1900, pp. 287–292*).—Investigations of the thoroughness of skimming and churning in Norwegian creameries gave the following results: Out of 110 samples of separator skim milk 12 contained less than 0.1 per cent of fat and 20 more than 0.2 per cent, the average fat content being 0.16 per cent. Of 87 samples of undiluted buttermilk from ripened cream, 14 contained less than 0.25 per cent and 14 more than 0.5 per cent, the average being 0.4 per cent.—F. W. WOLL.

Observations on separators, H. Hayward (*Pennsylvania Sta. Rpt. 1900, pp. 318–320*).—Tabulated data are given for 17, 16, and 31 tests, respectively, of the United States No. 1, the Sharpless Tubular, and the Alpha Acme DeLaval separators.

The food source of milk fat, with studies on the nutrition of milch cows, W. H. Jordan, C. G. Jenter, and F. D. Fuller (*New York State Sta. Bul. 197, pp. 32*).—An experiment with one cow reported in an earlier bulletin of the station (E. S. R., 9, p. 1083) led to the conclusion that milk fat, in part at least, can be formed from carbohydrates. In the present bulletin additional experiments concerning the source of milk fat and other questions relating to the metabolism of the milch cow are reported and briefly summarized as follows:

"Three cows were used: Cow 12 fed a fat-poor ration in which the protein supply was gradually decreased from 2.6 lbs. daily to 1.6 lbs. and then gradually restored to the maximum, with accompanying increase and decrease in carbohydrates, so that the digestible dry matter of the ration was kept fairly uniform; cow 10 fed a ration with normal supply of fat at first which was gradually increased to 1.4 lbs. daily, then gradually restored to the normal; and cow 2 fed the herd ration having a nutritive ratio about 1:5.6. These rations were quite varied in character and contained some fat-extracted foods, yet showed a quite uniform digestibility of about 70 per cent of the dry matter. It is believed that this figure represents fairly the digestibility of rations made up in part of silage and containing a fair proportion of high-class grains. A widening of the nutritive ratios appeared to render rations less digestible, especially the protein. The marked changes in protein content and in fat content of rations did not produce noticeable changes in the character or composition of the milk. In the former test, during 59 days, 18.4 lbs. of fat was formed in the milk which could not have had its source in food fat or food protein and could hardly have been drawn from the cow's body fat, as she increased in weight 33 lbs. in the same time. In this test cow 12 in 74 days produced 39 lbs. of fat similarly unaccounted for, with a body gain of 15 lbs.; and cow 2, in 4 days, $1\frac{1}{4}$ lbs. These amounts of fat must have come from the carbohydrates in the food.

"A lessening of protein supply in the food did not produce a corresponding decrease in protein in the milk solids, but caused a marked lessening of protein decomposition in the body. Calorimeter determinations show that the heat value of urine bears no constant relation to its nitrogen content, and also prove that the formula used in computing heat energy of urine, $N \times 5.343$ cal., is greatly in error, actual results being from 3 to 4 times as large as calculated by this formula. The energy values of nutrients as given by Rubner—protein and carbohydrates each 4.1 cal. and fats 9.3 cal.—appear to be fully high enough for herbivora, even when the loss due to escape of unoxidized gases, methane chiefly, is not considered.

"Over 40 per cent of the available energy value of the rations was used for maintenance, over 30 per cent reappeared in the milk solids, leaving a balance of from one-fifth to one-fourth of the ration. The logical conclusion is that this balance, in part at least, sustains the work of milk secretion."

Fat in milk from starch in food, F. H. HALL ET AL. (*New York State Sta. Bul. 197, popular ed., pp. 8*).—A popular summary of the above bulletin.

A feeding experiment with sheep, showing the influence of the fat in the ration upon the amount and composition of the milk, A. MORGAN ET AL. (*Chem. Ztg., 25 (1901), No. 87, pp. 951–953*).—This experiment was carried on during a portion of 2 years and was made with the object of ascertaining the influence of the fat in food upon the fat content of the resulting milk. In comparison with the usual ration, consisting of a number of common foods, rations were fed poor in fat and rich in fat. The ration poor in fat was made up of carbohydrates containing small amounts of fat, and the ration rich in fat was made up in part of sesame cake and peanut oil. The rations consisted of about 167 gm. of digestible protein and 600 gm. of nitrogen-free stuff including fat, to each 50 kg. of live weight. The fat content of the rations ranged about 10, 50, and 76 gm., respectively. The dry susbtance of the milk obtained in feeding the ration poor in fat contained the following per cents, more or less, than those obtained with the normal ration: Fat −7.1, sugar +2, ash +0.5, and nitrogen +0.6 per cent. The ration rich in fat gave, in comparison with the normal ration, the following per cents, plus or minus: Fat −1.2, sugar +0.6, ash +0.1, nitrogen +0.05 per cent. These experiments will be continued, but from the results so far obtained it would appear that fat in food in the form of sesame cake or peanut oil, in certain amounts, has an important influence on the fat content of the milk. In a ration with a nutritive ratio of 1:3.6 and a fat content equal to about 1 gm. to 1 kg. of live weight, the addition of more fat in lieu of carbohydrates tended to a diminution in the yield of milk fat; a decrease in the fat in the food, if below a certain limit, caused a decrease in the fat content of the milk and an increase in the sugar, ash, and nitrogen. Again, the fat in the food may cause an increase in the fat content of the milk, but not of the other components. The fat in the food in increased amounts produces an increased fat content of the milk, up to a certain limit. Beyond that it varies with the individuality of the animal, and in an unusual amount may even cause a lessening of the fat content.

Investigations concerning the germicidal action in cow's milk, O. F. HUNZIKER (*New York Cornell Sta. Bul. 197, pp. 61–91, dgms. 3*).—The source of bacteria in milk is briefly discussed and investigations to determine the presence and degree of germicidal qualities in milk and the conditions most favorable for their action are reported in detail. The cause of the germicidal action in milk, according to the author, is unexplained. The data for the experiments are tabulated, and 3 diagrams are given showing graphically the germicidal action in milk as affected by temperatures ranging from 40 to 70° F. by heating to 149–212° F., and by the acidity of the milk. From the results of the experiments, which are discussed at some length, the following conclusions are drawn:

"(1) Freshly drawn milk of most cows contains varying germicidal qualities.

"(2) The degree of the germicidal action varies greatly in milk of different animals and sometimes in milk of the same animal taken at different milkings.

"(3) The bactericidal influence behaves differently at different temperatures. It appears to be greatest, while it lasts, at 70° F.; at lower temperatures it is less pronounced but of longer duration. At 70° F. the maximum duration of the germicidal action was 12 hours, the average duration 3 to 6 hours.

"(4) Heat is detrimental to the germicidal agent. Milk subjected to a temperature of 149° F. for 40 minutes had lost its bactericidal qualities.

"(5) The acidity in milk did not increase appreciably while the germicidal action lasted. A decided and continuous increase of acidity occurred only about 15 to 20 hours before the milk curdled.

"(6) Owing to the lack of control over the germicidal power, the latter can at present be of little value in practical dairying.

"(7) So far as investigations up to the present time have shown, the best means of improving the keeping quality of milk, without the use of chemical preservatives, seems to be scrupulous cleanliness and low temperatures."

Studies in dairy bacteriology and dairy science, E. PETERSSON (*K. Landt. Akad. Handl. Tidskr., 39 (1900), No. 5–6, pp. 275–317*).—A report of the following German, Swiss, or Danish dairy institutes or schools: Göttingen, Hameln, Fulda, Kiel, Stargard, Kleinhof-Tapiau, Berne, and Copenhagen, and of the dairy experiment stations connected with the larger of these institutions. A detailed outline of a short bacteriological laboratory and lecture course given by Professor Salomonsen, Copenhagen, is presented, as are also the results of work on the occurrence of lactic-acid bacteria, their general morphological and biological characteristics, done by the author in the dairy bacteriological laboratory at Göttingen Agricultural Institute.—F. W. WOLL.

Milk bacteria investigation, V. A. MOORE (*New York Produce Rev. and Amer. Creamery, 1902, Jan. 22, p. 29*).—The following deductions are drawn from a study of bacteria in milk:

"(1) Milk as it is drawn from the udder contains a variable, but rarely an excessive, number of bacteria.

"(2) Ordinarily the dirt and finer particles of dust that fall into the pail during the process of milking carry a large number of bacteria with them into the milk.

"(3) If the stables are kept clean, the cows groomed, and the skin of the udder and surrounding parts are carefully moistened before milking, the number of bacteria that gain entrance to the milk from without can be greatly reduced.

"(4) The bacteria in the freshly drawn milk do not begin to multiply to any great extent for from 6 to 9 hours when kept at a temperature of 70° F., or below. After that time they multiply very rapidly if the temperature is favorable.

"(5) If the milk is carefully protected and promptly cooled down to and kept at a temperature of 40° F., the number of bacteria in it will not subsequently exceed the number present at the close of the milking process. This number should not exceed a maximum of 100,000 per cubic centimeter. If intelligent care is exercised a minimum of at least from 10,000 to 50,000 per cubic centimeter should be maintained. If cooled to 55° F., like results are obtained for at least 36 to 48 hours and often for a longer period.

"(6) An excessive number of bacteria in milk at any time within 72 hours after it is drawn indicates that it has not been carefully handled. When this is the case, the milk is liable to contain acids and by-products which may be injurious to the consumer. There is also the further danger, as exemplified in many epidemics of typhoid fever, diphtheria, and other infectious diseases, that the general carelessness in protecting milk against contaminations would permit the entrance into the milk of disease-producing bacteria, should these be present on the premises where the milk is produced.

"(7) There is a pronounced germicidal action in the milk of certain cows. It is absent in that from others. In the mixed milk from a dairy it has but a slight value in reducing the actual number of bacteria, but it seems to be the effective agent in preventing the increase of bacteria immediately after the milk is drawn unless it is kept at the body (98° F.) temperature."

Bacterial life of milk, H. L. RUSSELL (*Columbus: Ohio State University Dept. Agr., 1901, pp. 15, pl. 1, figs. 5*).—An address on this subject delivered before the Ohio State Dairymen's Association.

On sterilization of milk, A. JOHANNESEN (*Eira, 1901, No. 11; Tidn. Mjölkhushall., 10 (1901), Nos. 32, pp. 125, 126; 33, pp. 129, 130*).

Reports of periodical butter exhibits in Hangö, Finland, for 1898–99 and 1899–1900 (*Helsingfors, 1900, pp. 19; 1901, pp. 18*).—In the third series of butter exhibits, 1898–99, 210 creameries furnished in all 420 tubs of butter, the average weight being 54.1 kg. The butter contained on the average 12.9 per cent of water, 94.3 per cent of the samples containing between 10 and 15.9 per cent. Over 13 per cent of the tubs lost brine while kept in storage, the maximum amount lost being 770 gm. and the average amount 245 gm. The loss in weight of the tubs during storage amounted to 0.44 per cent.

In the fourth series, 1899–1900, 185 creameries took part, furnishing 446 tubs of butter. The average water content of the butter was 14 per cent, the limits being 10.5 and 19.1 per cent. Both reports give statistics as to the size and management of the creameries participating in the exhibits and summaries of butter scores, weights, etc.—F. W. WOLL.

Danish butter exports, 1899–1900, B. BÖGGILD (*Tidsskr. Landökon., 1900, No. 12, pp. 565–574*).—The gross exports during the year were 149,292,724 Danish pounds, the net exports 108,980,892 Danish pounds, the average price received being 95.5 öre (23.5 cts. per pound avoirdupois).—F. W. WOLL.

The production of cheese from the milk of sheep and goats in Siena, G. FAPI (*Staz. Sper. Agr. Ital., 34 (1901), No. 10, pp. 929–951*).

On the use of pure cultures in cheese making, H. J. RASMUSSEN (*Mälkeritid., 13 (1900), No. 49, pp. 839–849*).

Experiments with Dr. von Freudenreich's bacterium for Emmenthaler cheese, S. J. BENTERUD (*Aarsbr. Offent. Foranst. Landbr. Fremme, 1900, pp. 281–287*).

On ventilation of cooling rooms, B. Böggild (*Mälkeritid., 14 (1901), No. 39, pp. 618–621*).

On the manufacture of condensed milk, E. Petersson (*K. Landt. Akad. Handl. Tidskr., 39 (1900), No. 5–6, pp. 317–330*).—History and economics of the industry, with special reference to Swedish conditions.—F. W. WOLL.

On the importance of dairying to Danish industry and trade, B. Böggild (*Mälkeritid., 14 (1901), No. 29, pp. 443–447*).

Recent progress in dairying, R. Gripenberg (*Tidn. Mjölkhushall., 10 (1901), No. 17–18, pp. 67–70*).

VETERINARY SCIENCE AND PRACTICE.

Trichinosis in Germany, C. W. Stiles and A. Hassall (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 30, pp. 211*).—The purposes of the investigation as reported in this bulletin were to ascertain the value of microscopic examination of pork products in Germany, to determine whether cases of trichinosis had been definitely traced to American pork bearing a stamp of inspection from this Department, and to investigate the basis for charges made in Germany against American meats. In the bulletin the following subjects are discussed: The history of the discovery of trichinosis, life history of the parasite, preventive measures, trichinosis as an international question between Germany and America, local regulations regarding trichinæ in Germany, number of trichina inspectors, the expense of such inspection, and statistics on the amount of American pork imported into Germany for the years 1892 to 1898.

In addition to this general discussion the report contains a detailed statistical review of trichinosis in Germany during the years 1881 to 1898, inclusive. In this review the conditions in Prussia, Saxony, Bavaria, Brunswick, Bremen, Alsace-Lorraine, Hamburg, and Lübeck are considered separately. Special attention is given to the subject of European cases of trichinosis of alleged American origin. Translations are presented of an article by Rudolph Virchow on American trichinæ, and by Bouley on importation of salted pork of American origin, and an extended bibliography on the subject of trichinosis in Germany is appended to the report. The bibliography is arranged alphabetically according to authors and chronologically under each author.

The information contained in the report is from German sources and largely from official reports. It appears from the official German reports that microscopic inspection of pork as carried out in Germany is not successful in detecting all the cases of trichinosis in hogs, and in fact a considerable portion of cases of trichinosis in man are traced directly to pork which had been inspected by German inspectors and passed as free from trichinæ. The evidence for trichinosis in man from eating pork of American origin is considered inconclusive.

The utilization of meat condemned on account of trichina, Edelmann (*Deut. Thierärztl. Wchnschr., 9 (1901), No. 18, pp. 181, 182*).—While the complete destruction of such meat or its use for technical purposes satisfies all sanitary requirements in the matter, the author believes that the meat may safely be given to inspectors or other persons who understand the danger of it when not sufficiently cooked.

Studies on Echinococcus alveolaris or multilocularis, N. Melnikow-Raswedenkow (*Beitr. Path. Anat. u. Allg. Path., 1901, sup. 4, pp. 295, pls. 6, figs. 94*).—The general results of this investigation may be briefly stated as follows: The alveolar echinococcus is found in animals and man primarily not in the liver but in other organs such as the brain, spleen, and suprarenal bodies. The changes which are induced in the tissues of the host through this parasitism depend upon the peculiarities of the parasite itself. The unilocular or multilocular hydytids are different species of parasite and do not represent the encysted stage of the same species. This parasite has a much wider distribution in Russia than has previously been suspected.

The sources and methods of infection are not well understood. The treatment in animals is not very satisfactory on account of the very great expense. In man, the only treatment is surgical. Infection experiments in which it was attempted to develop a mature form of this worm in the alimentary canal of other hosts were only slightly satisfactory.

Relation of bovine tuberculosis to the public health, D. E. SALMON (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 33, pp. 36*).—This bulletin is a report which was read before the American Public Health Association in Buffalo on September 16, 1901. The topics discussed in the report include extent of bovine tuberculosis in Europe and the United States, effect of products of diseased animals on the public health, and the communicability of bovine tuberculosis to man. The report is of a controversial nature, and an attempt is made to show that the evidence upon which Koch based his statement that the disease is not transmissible from animals to man or from man to animals is not well founded. Numerous experiments of different investigators showing positive infection and extensive development of tuberculosis by feeding cattle upon tubercular material of human origin are cited. It is argued that since bovine tuberculosis is communicable to a large number of widely separated species of animals, it is probably communicable to man. Especial attention is given to a discussion of cases of accidental infection of man by bovine tubercle material, the infection of man by milk from tuberculous cows, and the extent and significance of intestinal tuberculosis in man. It is admitted that it is not absolutely proved that any case of tuberculosis in man was caused by tubercle material of bovine origin, but the evidence is considered as strong as could be expected in the absence of positive experiments.

Studies of tuberculosis and cow temperatures, J. NELSON (*New Jersey Stas. Rpt. 1900, pp. 361–404, pls. 5*).—Tables are presented showing the record of abortions in the college herd. The rate of abortion is reported to have continued uninfluenced by treatment, which has been accurately applied. Further study on the subject is required.

The records of tuberculin tests on the college herd are presented in a tabular form. One animal was slaughtered on account of the presence of physical signs of tuberculosis, and after the application of the tuberculin test it was found that at least 7 other animals in apparently good health were infected with tuberculosis. The results of post-mortem examinations of these animals are given in detail. The general college farm herd was retested for the fifth time and the results are tabulated. The herd is tested twice each year. It is considered necessary to apply the tuberculin test thus often in order to detect any new cases of tuberculosis which may have arisen in the interval since the last test. Of the 7 cases which reacted, 5 were known to be tuberculous and had reacted on previous tests.

The study of the normal temperature of cows was undertaken for the purpose of determining the fluctuations in temperature which may occur under ordinary circumstances. This matter is of importance, especially in its bearings on the interpretation of the results of tuberculin tests. The fluctuations of the temperature of the cows show wide limits. These variations in temperatures are rapid, so that even in a single day the highest and lowest temperatures may differ more than the temperatures of successive days at the same hour. The temperatures of the cattle in a herd do not vary in unison. One animal may show a high temperature while another shows a low. The variations in temperature may be much more frequent in one animal than in another. In order to determine accurately the normal temperature of an animal it is necessary to obtain a full record of the normal temperature at different times of the day and under different conditions, and the observations should be numerous and close together. The record of normal temperatures should be complete in another respect, viz, it should continue during the hours corresponding to those at which reaction temperatures are taken. In general there is a rise of temperature which begins during the feeding and milking time, reaches the climax a few hours afterwards, and then subsides. This produces two marked elevations of temperature during each day. The results of extended observations on the normal temperatures of cows are presented in a tabular form.

The author describes some apparatus devised for use in a bacteriological laboratory. One device consists of a wire-cloth cylindrical basket into which are fitted 2 tin disks perforated with holes of the right size for receiving test tubes. In disinfecting plugs for test tubes the author's method is as follows: Dry, clean tubes are plugged with absorbent cotton, the plugs being carefully trimmed so that the cap can be readily drawn over them. The plugged tubes are then subjected for 2 or 3 hours to a temperature of 300° F. During this process the cotton becomes somewhat charred. The fire is then shut off and when the test tubes are cool enough to handle each one is dipped, plug end downward, in a solution consisting of 100 parts water, 20 parts alcohol, and 3 parts copper sulphate.

The tuberculin test of imported cattle, D. E. SALMON (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 32, pp. 22*).—This bulletin is of a controversial nature, and in it the author argues for the necessity of continuing the application of the tuberculin test to all imported cattle. The various subjects which are discussed include the necessity of guarding against tuberculosis, danger from the disease, losses caused to farmers by tuberculosis, the necessity of the tuberculin test in detecting the disease, and the desirability of continuing present regulations for controlling the disease.

Tuberculosis of the udder in goats, C. SCHROEDER (*Ztschr. Fleisch u. Milchhyg., 11 (1901), No. 9, pp. 261–266*).—A detailed report is made on the symptoms and post-mortem findings in the case of a goat which suffered from this disease. The clinical symptoms were those of bronchitis together with large tuberculous swelling of the right side of the udder. This swelling contained numerous small tubercles, some of which were caseous or calcified. The milk of the goat was used for human food for some time after the disease had appeared, and the author strongly urges the necessity of inspecting goats the milk of which is used for human consumption, in order to detect any cases of tuberculosis.

Generalized tuberculosis in the horse, O. MARTIN (*Ztschr. Fleisch u. Milchhyg., 11 (1901), No. 9, pp. 269, 270*).—The author describes the peculiarities and course of tuberculosis in the horse and gives detailed descriptive notes on the symptoms and pathological lesions of one case in which the larynx and bronchial glands were affected, as well as various other abdominal and thoracic organs.

Lupus in cattle, N. MACKEL (*Ztschr. Fleisch u. Milchhyg., 11 (1901), No. 9, pp. 268, 269*).—Notes are given on the appearance of tuberculosis of the skin in cattle. In one case where lupus was evident on the side of the animal a post-mortem examination exposed evidences of a few tubercules in the lungs. It was found by making a tuberculin test with the other animals of the herd that all had become infected with tuberculosis.

The value of tuberculin as a test for tuberculosis, C. J. VALENTINE (*Jour. Agr. and Ind., South Australia, 4 (1901), No. 10, pp. 809–811*).—The article is of a controversial nature and deals with the question of the reliability of the tuberculin test in cases of long and short standing. Brief notes are given on the extent to which the test is made in the various countries of Europe, and the application of the test is urged by the author.

The application and significance of tuberculin in combating tuberculosis, N. K. PETERSEN and B. BANG (*Maanedsskr. Dyrlæger, 13 (1901), No. 2, pp. 49–75*).—This discussion is in the form of 2 articles by the 2 authors, and is concerned with various controversial matters regarding the use of tuberculin in stamping out tuberculosis.

Experimental studies on acid-proof bacteria which resemble the tubercle bacillus, HÖLSCHER (*Centbl. Bakt. u. Par., 1. Abt., 29 (1901), No. 10, pp. 425–428*).—These organisms were first discovered while examining milk and butter for the presence of tubercle bacilli. Inoculation experiments were made on 80 guinea pigs, rabbits, and white mice. None of the experimental animals developed tuberculosis or were affected to such an extent as to give evidence of any serious disease. Some of the animals were killed, and a post-mortem examination gave evidence of a peculiar pathological appearance in the liver of a few, while no evidence was obtained for the presence of tubercle bacilli.

Measures for preventing the transmission of tuberculosis in the milk of cattle, Marsac (*Jour. Agricole* [*Paris*], *12* (*1901*), *No. 137, pp. 143, 144*).—The author considers the danger from this source of sufficient importance to warrant the putting forth of every effort to prevent the spread of contagion in milk. He has recommended that a special scientific corps be appointed for this work, that public and private schools be interested in the movement, that milk dealers be compelled to register and submit their products for examination, and that the names of approved dealers with healthy animals and good milk be published from time to time.

Indemnities for tuberculous cattle, A. Laquerrière (*Jour. Agricole* [*Paris*], *12* (*1901*), *No. 138, pp. 151–154*).—The author discusses this problem from various points of view, and comes to the conclusion that in cases of animals which are totally condemned the loss should fall upon the seller. In the cases of partial condemnation the contract may be allowed to hold, but the buyer should be reimbursed for the amount of his loss, as determined by the inspector who condemned the meat.

Interesting diseased-meat case in Edinburgh (*Vet. Jour.*, *52* (*1901*), *No. 311, pp. 267–275*).—This article contains a detailed report of a case of prosecution for selling meat suspected of being tuberculous. The evidence obtained by experts from a microscopic examination of the meat was considered as proving that the meat was tuberculous, but the defendant succeeded in establishing the point that he had no reason for suspecting the meat and could not have known that it was tuberculous.

Bibliography of literature on tuberculosis (*Rev. Tuberculose, Paris, 8* (*1900*), *No. 2, pp. 268–299*).—A classified list of titles of literature relating to tuberculosis of man and animals published during the year 1900.

Public veterinary service, Metzger (*Deut. Tierärztl. Wchnschr.*, *9* (*1901*), *No. 21, pp. 215–217*).—During the year 1900 preventive inoculation for swine erysipelas according to the Lorenz method was made on 15,208 hogs. So far as reports were received, injurious effects were noted in only 3 cases as a result of the inoculation. The vaccine material is furnished at a very moderate price for private use, but only to veterinarians, who are under obligation not to use the material outside of the country.

A map is given showing the distribution of foot-and-mouth disease in Germany at the end of April, 1901, and brief notes are presented on the success which has been obtained in fighting sheep scab and on the prevalence of blackleg during the year 1899.

Concerning the existence of sensitizing substances in antibacterial sera, J. Bordet and O. Gengou (*Ann. Inst. Pasteur*, *15* (*1901*), *No. 5, pp. 289–302*).—The authors investigated the question concerning the existence and relationship of alexins and sensitizing substances as found in normal and immunized sera. Experiments were conducted on sera obtained from various sources, including guinea pigs vaccinated against anthrax, horses vaccinated against swine erysipelas, guinea pigs immunized against typhoid fever, and human typhoid fever patients in convalescence. From these experiments it is concluded that specific sensitizing substances are of constant occurrence in organisms which have been subjected to vaccination. These substances are not so readily influenced by heat as are the alexins and do not exert any direct injurious influence upon the bacterial organisms. Their effect upon bacteria is to cause the latter to absorb the alexins by which they may be ultimately destroyed. The action of alexins upon bacteria varies according to the species of micro-organism which is concerned.

The process for collecting and distributing large quantities of serum, G. Poujol (*Compt. Rend. Soc. Biol. Paris, 53 (1901), No. 14, pp. 424-427, figs. 3*).—The author describes in detail an apparatus suitable for collecting blood in large quantities and separating the serum, together with notes on accessary apparatus necessary for dividing the serum into equal quantities.

Texas or acclimation fever, C. A. Cary (*Alabama College Sta. Bul. 116, pp. 227-289*).—The author gives a general account of the nature of Texas fever, including details concerning the blood parasite which causes the disease, the pathological changes in the blood, the quarantine line established by the Federal Government, and the appearance and habits of the cattle tick. It is argued that ticks could be exterminated in Alabama inside of 2 years if all cattle owners would put forth their best efforts in this direction. One advantage to be derived from the extermination of the ticks would be the unrestricted cattle trade with the North and with Europe at all seasons of the year. If ticks were destroyed in certain localities only, other Southern animals raised in localities where the tick no longer exists would not be immune and would be subject to fatal attacks of the disease, provided the beasts should become infested with ticks. Notes are given on the symptoms of Texas fever, the appearance of the organs of animals dead with the disease, and the various methods for producing immunity. The author undertook to immunize animals which might be sent to the station for that purpose. The results of these inoculations are presented in tabular form. Only one death occurred from a fatal relapse after immunity had apparently been produced. The author believes that one mistake was made in that 3 full-blooded bulls which were inoculated for the purpose of rendering them immune to Texas fever were not permitted to become infested with ticks early enough in the following spring. The danger of a too serious infestation of ticks later in the season should always be borne in mind in connection with inoculation experiments. The author believes that better results will be obtained if the second inoculation dose contains 2½ cc. of defibrinated blood, rather than 1½. According to M. Francis, whose opinion is quoted, the best age for inoculation is between a few months and 2 years, preferably about 1 year, and the best time of the year from November to March. In the Texas experiments about 90 per cent of all Northern cattle which were brought into the State and inoculated were successfully immunized against the disease.

Blackleg in Kansas, and protective inoculation, P. Fischer and A. T. Kinsley (*Kansas Sta. Bul. 105, pp. 27*).—A general account is given of the occurrence, geographical distribution, cause, symptoms, and period of incubation of blackleg. Brief notes are given on the influence of climatic conditions, breed, sex, and age of animals upon the development of the disease. The symptoms of anthrax, malignant œdema, and septic metritis are given for the purpose of distinguishing these diseases from blackleg. A historical account is presented of work of various authors in devising methods for vaccinating animals against this disease. At the station vaccination was first made in 1898, according to the method of Arloing. From a total of 54,393 cattle vaccinated by this method 323, or less than 0.6 per cent died after vaccination. The loss in an equal length of time before vaccination amounted to 4.23 per cent. A few accidents were experienced from improper care in vaccinating. In the manufacture of single vaccine of a virulence intermediate between that of the 2 vaccines which were used in the previous experiments the authors also secured good results. Of 11,268 animals which were vaccinated 34, or about 0.3 per cent died after vaccination. In a similar number of animals during the same length of time 308, or 2.75 per cent died before inoculation. The authors believe that the double vaccination is safer and more effective than the single vaccination.

Anthrax in Algeria: Natural immunity of pure native races of cattle, E. MARTIN (*Bul. Agr. Algérie et Tunisie, 7 (1901), No. 12, pp. 271-277*).—It was long believed that anthrax did not exist in Algeria. The disease, however, had been confused with blackleg, and careful microscopic tests disclosed the fact that it frequently occurs in a typical form. Notes are given on the various periods of the disease. During a study of anthrax by the author, it was found that pure races of native cattle were naturally immune to the disease. Inoculations with virulent blood in doses of from 1 to 3 cm. failed to produce the disease in Arabian cattle, while similar inoculations in imported cattle or crosses between imported cattle and native stock readily developed symptoms of anthrax. Infection could not be produced, either by inoculation in the jugular vein, by subcutaneous injection, or by feeding with virulent anthrax material. It appears, therefore, that the influence of race may be very decisive in determining the degree of susceptibility to anthrax. It is indicated that cattle raisers will take up the question of determining to what extent the knowledge of the immunity of native cattle may be taken advantage of in producing more improved breeds.

Anthrax infection of carnivorous animals, L. LANGE (*Hyg. Rundschau, 11 (1901), No. 11, pp. 529-532*).—A brief review is given of the literature on the subject of anthrax in carnivorous animals, and an account is presented of an outbreak of this disease among the animals in the Royal Zoological Garden in Posen. During the outbreak of anthrax 2 lions, 1 jaguar, and 1 jackall died of the disease, and several bears apparently had mild cases, from which they recovered. The disease was contracted in each case from eating the meat of a horse which had died of anthrax.

Foot-and-mouth disease, P. BRUNO (*Gior. R. Soc. Accad. Vet. Ital., 50 (1901), No. 16, pp. 379-382*).—A discussion is given of the sanitary measures at present adopted in Italy and elsewhere for the control and eradication of this disease. The author believes that by careful and thorough application of these methods the disease may be successfully controlled.

Treatments for foot-and-mouth disease, H. LERMAT (*Jour. Agricole [Paris], 12 (1901), No. 134, pp. 86, 87*).—No satisfactory direct treatment for this disease has been devised. In case of an outbreak of the disease, it is advisable to disinfect the premises as thoroughly as possible and apply antiseptic washes to affected parts of the animals. The substances which are recommended for this purpose include salicylic acid, corrosive sublimate, lysol, sulphate of iron, etc.

Diarrhea in young calves, LESAGE and DELMER (*Ann. Inst. Pasteur, 15 (1901), No. 6, pp. 417-439*).—This disease has long been known as prevalent among young calves and fatal in a large proportion of cases. The peculiarities of its occurrence and distribution indicate clearly that the disease is contagious. The authors made an examination of the blood and various organs of calves affected with the disease and identified a species of Pasteurella as the cause of the infection. A technical description is given of the organism and an account of its prevalence and occurrence in the bodies of diseased calves. The organism is found before and after death in the blood, the alimentary tract, and the nasal mucous secretion. *Bacterium coli* is also found in conjunction with the pathogenic organism, but is not found in the blood during life. It is not considered, therefore, as in any way directly concerned in the production of the disease. The disease is considered identical with "white scour" of Ireland. The authors prefer the use of the term diarrhea to enteritis or septicæmia, which latter terms refer only to one phase of the symptoms. In new-born calves the disease develops sometimes rapidly, within from 1 to 2 days, or more slowly, within from 8 to 20 days. In such cases the organism gains entrance to the animal through the umbilical cord. The first period of the disease is characterized by an inflammation of this structure. Later the organism passes into the blood and causes a septicæmia which persists until death. Occasionally the septicæmia disappears and the pathogenic organism continues to multiply in the alimentary tract and in the respiratory organs. Where the disease occurs in calves of greater age it is believed that the organism finds entrance through the nasal passages. Experiments conducted by the authors for the purpose of attenuating the organism were partly successful. Cultures of the organism maintained for 1 hour at a temperature of 60 or 70° C. failed to produce any immunity to the disease when inoculated for preventive purposes.

White scour and lung disease of calves in Ireland, E. Nocard (*Rec. Med. Vet. Paris. 8. ser., 8* (*1901*), *No. 10, pp. 231–244*).—Detailed notes are given on the symptoms and pathological lesions of this disease. A bacteriological study indicated clearly that white scour is due to an umbilical infection, which may be prevented by cleansing the cows with a solution of lysol before parturition. It is recommended that the umbilical cord be washed with a mixture containing 1 liter of water, 2 gm. of metallic iodin, and 4 gm. of potassium iodid; and later with a solution of 2 gm. of metallic iodin in 1 liter of methyl alcohol.

Contribution to the study of jaundice, or hæmoglobinuria of cattle in Tunis, E. Ducloux (*Bul. Dir. Agr. et Com., 6* (*1901*), *No. 20, pp. 244–247*).—The author investigated the disease which is known in Tunis under various names and which prevails to a considerable extent. A preliminary study of the subject showed a striking resemblance of the disease to Texas fever. A further study confirmed this idea, and the blood parasite of Texas fever was found in affected animals.

Enzootic abortion, J. Steele (*Vet. Jour., 52* (*1901*), *No. 311, pp. 275–278*).—The symptoms and nature of this disease are discussed in detail and the usual antiseptic precautions are recommended.

The injurious effects of certain grass seeds on live stock, J. D. Stewart (*Agr. Gaz. New South Wales, 12* (*1901*), *No. 3, pp. 357–360, pl. 1*).—Attention is called to the injurious effects of certain grass seeds which bear sharp awns. The grasses mentioned as being most injurious are barley grass and "spear grass." The injurious effects of these awns on horses are more severe than on cattle, but even in the latter animals swellings are produced upon the jaw from the irritation set up by the presence of these awns in the flesh. Such swellings have in some instances been mistaken for tuberculosis or actinomycosis.

The action of acid salts of morphin on ruminants, Hess (*Arch. Wiss. u. Prakt. Thierh., 27* (*1901*), *No. 3–4, pp. 233–268*).—The author discusses the literature of the subject in connection with an extensive bibliography. The results obtained by different experimenters are very contradictory, but the desirability is recognized of finding a more convenient method of narcosis for ruminants than by ether or chloroform. It was found during the numerous experiments of the author that none of the ruminants or hogs were immune to the action of morphin and that the stimulating effect of normal doses was especially noticeable. When large doses were given serious paralytic effects were observed, as is the case in man, and a complete narcosis was not produced without administering doses which were likely to prove fatal.

Rumenotomy, Nüesch (*Schweiz. Arch. Thierh., 43* (*1901*), *No. 2, pp. 60–62, fig. 1*).—A description is given of an instrument designed for making an incision into the first stomach in case of tympanites. The instrument has a sharp point upon a short blade of moderate width and is circular in cross section behind the blade. The circular part of the instrument carries a groove on one side, which extends into the handle and permits the gas to escape.

The teeth of cattle and sheep as affected by age, C. McCulloch (*Virginia Sta. Bul. 118, pp. 145–155, figs. 8*).—Brief descriptive notes on the anatomical characteristics of the teeth of cattle and sheep, with a short account of the changes which they undergo.

The teeth of the horse as affected by age, C. McCulloch (*Virginia Sta. Bul. 117, pp. 129–144, figs. 25*).—Brief notes on the changes which take place in the teeth of the horse between the ages of 6 and 21 years.

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A study of the larvæ of Gastrophilus in the stomach of the horse, J. GUYOT (*Arch. Parasit., 4 (1901), No. 2, pp. 169–221, figs. 11*).—A review is given of the literature of the subject in connection with a bibliography of the more important articles relating to Gastrophilus. A historical discussion is presented on *Gastrophilus intestinalis*, *G. hæmorrhoidalis*, and *G. nasalis*. Special attention is devoted to *G. intestinalis*, which is considered by the author to be a more correct name than *G. equi* for the common species which infests the stomach of the horse. The eggs in different stages of the larvæ are described in detail and considerable attention is devoted to the manner in which the larvæ are attached to the wall of the stomach, and to the pathological lesions which their presence causes. Experiments were conducted for the purpose of testing the action of certain chemicals on young larvæ. It was found that the larvæ could live for 4 days in ordinary water, for 1 day in olive oil, and for 14 hours in corrosive sublimate in the proportion of 1 : 1,000. When placed in certain volatile substances such as bisulphid of carbon, benzin, ammonia, sulphuric ether, and chloroform, the larvæ died instantaneously. Experiments with full-grown larvæ showed that they could live 5 days immersed in a 3 per cent solution of formalin, and for 1 hour in a saturated aqueous soluton of corrosive sublimate. It was found that young larvæ, which were hatched from eggs which had been removed from the hair of the horse, were alive 3 months after the removal of the eggs. The pathological lesions caused by the botflies in the stomach of the horse are restricted to the mucous layer of the stomach which is destroyed at the point where the botflies are attached. An accumulation of leucocytes at such points is also noted.

Rabies, M. P. RAVENEL (*Pennsylvania Dept. Agr. Bul. 79, pp. 28, figs. 3*).—A general discussion of this disease is presented, including its history and distribution; a list of animals subject to the disease; the cause of the disease; nature of the virus; method of invasion; resisting power of the virus; danger from bites of rabid animals; period of incubation; influence of seasons; the various types of the disease in man, dog, cat, horse, cow, and birds; pathological changes in the tissues of animals attacked by the disease, and the various features of the Pasteur method of preparation of vaccine; and treatment of affected animals.

The action of leucotoxic serum on lesions in the central nervous system in cases of rabies, C. FRANCA (*Compt. Rend. Soc. Biol. Paris, 53 (1901), No. 17, pp. 502–504*).—Experiments previously conducted with rabies indicated that death was partly due to an excessive formation of leucocytes during the acute stages of the disease. It was decided, therefore, to try experiments for the purpose of testing this theory. Dogs were experimentally inoculated with rabies and after the appearance of the acute symptoms were treated with injections of the leucotoxic serum. Considerable improvement was noted, and another injection gave evidence of increased benefit from this treatment. Further work along this line is promised, and the author believes that toxins may ultimately be produced which may be used for the purpose of preventing too pronounced development of leucocytes.

Negative chemotaxis of the leucocytes of rabbits which have been inoculated with a pure culture of the bacilli of fowl cholera, A. ZILBERBERG and J. ZELIONY (*Ann. Inst. Pasteur, 15 (1901), No. 8, pp. 615–629, pl. 1*).—The author briefly reviews the literature on the subject and discusses in detail the methods and results of his investigations. Since rabbits are especially susceptible to fowl cholera these animals were considered most suitable for investigation on the subject of negative chemotaxis. The experimental animals were inoculated hypodermically and in the body cavity with pure cultures from artificial nutrient media and from natural fluids of the body. The animals were killed within from 1 to 5 hours after inoculation and various organs, including the liver, kidneys, spleen, spinal column, and lungs, were examined for the purpose of determining the relation between the pathogenic bacteria and the leucocytes. After a hypodermic or intraperitoneal injection of a virulent culture of fowl-cholera bacilli from gelatin, the complete absence of the phagocytosis on the part of the leucocytes was observed. Similar conditions were found after intravenous injections of virulent cultures from the serum of the body cavity. The author explains the phenomenon of phagocytosis, which was observed in rabbits which had been inoculated with virulent cultures of fowl-cholera bacilli developed on an artificial medium, by the presence of any such cultures of nonvirulent bacilli. It was shown that the white blood corpuscles of the rabbit do not surround the virulent bacilli of fowl cholera during any stage in the progress of the disease. It is not believed that this fact is due to a poisonous influence of the bacilli upon the leucocytes, but the phenomenon is explained as an example of negative chemotaxis.

Biological division, C. CURTICE (*Rhode Island Sta. Rpt. 1901, pp. 201–224*).— Numerous experiments were made for the purpose of determining the conditions which influence the rate of mortality among chickens during incubation or in artificial brooders. Of 58 chickens placed in an outdoor brooder, 53 died within 3 weeks. The cause of death was in most cases lung trouble of the nature of pneumonia, and was due to exposure to sudden changes of temperature. Some of the chicks died of congestion of the lungs and others of intestinal troubles. On account of this great mortality, experiments were conducted for the purpose of securing a uniform temperature and observing the influence of these conditions upon chickens. The best results were obtained when the temperature of the room was kept high enough so that no marked difference of temperature prevailed between the air in the room and that in the brooders. When the temperature in the brooder was kept too high, it was found that the exposure of the chickens to changes of temperature in moving in and out of the brooder were liable to cause disease and death. Box brooders were constructed and heated by setting a papier-maché or wooden pail of water at a temperature of 140 to 165° upon them. It was found possible to maintain the temperature of the brooder by this means between 75 and 90° F. Green food was obtained for the chickens, mostly in the form of lettuce, in addition to cracked grain and wheat, oatmeal, scraps, and animal food (consisting for the most part of boiled eggs, boiled liver, and animal meal). A number of chickens were taken from a warm incubator and placed in cotton-lined baskets, supposed to be warm enough to protect the chickens. They were carried for about three-quarters of a mile and placed in brooders. About 60 per cent of these chickens died later from lung diseases due to the temperature changes.

During these experiments attention was given to the food of young chickens, and it is recommended that cracked grain and cracked wheat and other similar food should be sifted, so as not to offer too coarse or too fine material for the chickens. In addition to the usual food of this sort and of an animal nature, grass, lettuce, or other green material is highly recommended. The author considered the question of whether artificial incubation has any effect upon the vigor of the chickens. It is believed by the author that chickens which come from the egg in a fully developed condition do not die on account of weakness due to incubation. Of the incubated eggs examined by the author, in which dead embryos were found, death had occurred in most cases after the fourteenth day of incubation. When insufficient moisture is furnished during incubation, it was found that a considerable percentage of chickens failed to hatch. It is believed that an incubator that furnishes air nearly saturated with moisture, so as to prevent drying of the embryo, will furnish the largest and strongest chickens.

Attention is called to the desirability of further investigation on the subject of blackhead of turkeys. A report is made on several serious outbreaks of goose cholera. One dealer in geese lost about 3,200 between July and October. The course of the disease is usually about 36 hours, and the chief symptoms were an unsteady gait, peculiar movements of the head, and formation of considerable quantities of mucous in the throat and nasal cavities. In some cases a catarrhal condition of the intestines was observed. Feeding experiments with the internal organs of dead geese demonstrated that the disease may be communicated in this way. The symptoms of geese fed upon this material were the same as those which had become diseased under natural conditions, and post-mortem examination revealed the same pathological changes. Details of bacteriological work, in cooperation with Dr. Theobald Smith, will be given in a future publication. A similar outbreak occurred in another locality, where about 20 per cent of the geese were lost. It is recommended that geese raisers should divide the birds up into small lots in order that the disease may be more readily controlled when outbreaks occur.

The author made experiments to determine the effect of hothouse brooding on the vitality of chicks. The birds subjected to these conditions appear to develop in a strong and vigorous manner, and, judging by the appearance of their feathers and by their weight and color, they were equal in vigor to hen-raised chickens. It is considered possible, however, that such birds might not be able to compete in the open field with chickens raised by their natural mothers.

AGRICULTURAL ENGINEERING.

Report of irrigation investigations in California (*U. S. Dept. Agr., Office of Experiment Stations Bul. 100, pp. 411, pls. 29, figs. 16*).—This is an account of investigations made during 1900 by the Office of Experiment Stations in cooperation with the California Water and Forest Association under the direction of Elwood Mead, expert in charge of irrigation investigations of this Department, assisted by eight specialists in irrigation. These specialists and the streams on which they studied irrigation conditions were as follows: W. E. Smythe, Susan River; Marsden Manson, Yuba River; J. M. Wilson, agent and expert in irrigation investigations, Cache Creek; Prof. Frank Soulé, of the University of California, San Joaquin River; Prof. Charles D. Marx, of Stanford University, Salinas River; C. E. Grunsky, city engineer of San Francisco, Kings River; Edward M. Boggs, Los Angeles River; James D. Schuyler, Sweetwater River.

The report reviews the agricultural situation in California and shows that in many of the principal portions of the State agricultural development is greatly hindered by the inadequacy of irrigation laws. It is claimed that the chief obstacles to such development in the State are an unremitting production of cereal crops in the great interior valley and a lack of more diversified farming; opposition to irrigation in districts which the census shows to be measurably decreasing in wealth and population; a too great zeal on the part of advocates of the Wright district law, followed by unwise investments which have led to loss and disappointment and a consequent opposition to irrigation laws of whatever nature; overappropriation of streams, resulting in confusing uncertainty as to the number and extent of valid appropriations; the conflicting nature of the water laws, and the existence, side by side, of the two opposing doctrines of appropriation and riparian rights; absolute private ownership of water in face of the fact that all leading countries where irrigation is necessary recognize only the rights of use and attach them not to the owner of land or to canal companies, but to the land itself, from which they are inseparable, and finally, and most important of all, the absence of any State control of streams or of any State administration of rights to their use.

The conclusions of the special agents and experts who made the investigations are that the State should ascertain the volume of available irrigation water, define all rights to its use, whether already acquired or to be acquired hereafter, and provide an efficient system of water administration. The definite recommendations for attaining these ends embody, among other measures, the creation of a State board of control of waters, similar to that in existence in Wyoming for the past 10 years, the making of unappropriated waters State property, the limitation of all appropriations to actual beneficial use, and the attachment of all rights to water to the land irrigated.

Irrigation in field and garden, E. J. Wickson (*U. S. Dept. Agr., Farmers' Bul. 138, pp. 40, figs. 18*).—The instructions given in this bulletin are intended for the individual farmer and not for the engineer or manager of an irrigation system. They deal with simple methods of determining levels and constructing ditches, the measurement of small streams, sources of water supply and their use, distribution of irrigation water, methods of applying water, choice of irrigation method, and time of applying water.

The open range and the irrigation farmer, R. H. Forbes (*Forester, 7 (1901), Nos. 9, pp. 216–219; 10, pp. 254–258*).—This article discusses the injury done by overstocking and the improvement that may be brought about by rest, control of flood water, judicious planting, etc.

Trials of agricultural machinery at Ultuna, H. Juhlin-Dannfelt (*Landtmannen, 11 (1900), Nos. 40, pp. 633–636; 43, pp. 684–687*).—Report of trials of 11 mowers, 11 horse rakes, and 1 hay turner, the machinery being of domestic or American manufacture.—F. W. WOLL.

Comparative trials of threshing machines at Ultuna experiment station, G. Timberg (*Landtmannen, 11 (1900), No. 41, pp. 651–657*).—Five different firms furnished 12 threshing machines which were scored as to power required, capacity, general applicability, etc.—F. W. WOLL.

Comparative trials of seed-cleaning machinery and of sweep powers, G. Timberg (*Landtmannen, 11 (1900), No. 42, pp. 667–673*).

Proceedings of the International Good Roads Congress held at Buffalo, N. Y., September 16–21, 1901 (*U. S. Dept. Agr., Public Road Inquiries Bul. 21, pp 100*).—A condensed report of proceedings and the text of the following papers presented: Importance of the road question, by A. H. Longino; Rural road naming and house numbering, by Rachel J. Davison; State aid in New York, by E. A. Bond; State aid in New Jersey, by J. E. Owens; Pennsylvania's road system, by J. Hamilton; History of highway legislation in New York, by J. A. C. Wright; Road laws and road building in Massachusetts, by C. M. Ross; Functions of the Government, the State, and the county in American highway improvement, by J. A. Holmes; Road making from the engineer's standpoint, by A. W. Campbell; Good roads work for the new century, by R. Stone; The highways of commerce, by L. C. Haupt; Progress of road improvement in Florida, by W. S. Jennings; Shall the farmer have aid for highway improvement from the wealth of the nation, by S. S. Bailey; The road situation in Iowa, by I. G. Heaps; A question of education, by E. Daniels; A farmer's views on the road question, by J. F. Bean; Steel-track roads, by S. C. Dickinson; The brick wheel-track road, by D. N. Long; The Government road system of the Yellowstone National Park, by H. M. Chittenden; Farmers' views of good roads, and how to get them, by W. T. Creasy; Organizations for good roads in Kentucky, by J. C. Van Pelt; What is our duty, by W. H. Moore; The road problem, by A. Patullo; The roads of Belgium, by M. V. Valliant; Facts and suggestions, by H. S. Earle; Work of the press for good roads, by A. H. Battey; Use of convict labor, by F. W. Lyon; Rural free mail delivery in relation to road improvement, by A. W. Machem; Methods of construction and cost of good roads in Hennepin County, Minn., by G. W. Cooley, and A simple plan for a better road system, by F. A. Polsley.

Earth roads, M. O. Eldridge (*U. S. Dept. Agr., Farmers' Bul. 136, pp. 24, figs. 20*).—This bulletin gives the simple, and in the main, inexpensive, methods of earth road construction and maintenance which are generally practiced by the most successful road builders, and which "are based entirely on a thorough system of drainage."

A modern dairy barn, A. A. Brigham (*Rhode Island Sta. Bul. 80, pp. 17–38, pls. 10*).—A general description and detailed drawings, plans, and specifications are given for a barn recently constructed at the station for the "purposes of sheltering a herd of dairy cows and furnishing storage room for hay, grain, straw, and fodder." It consists of an octagonal storage barn 60 ft. in diameter and 21 ft. in height to the plates, with a circular silo 14 ft. in diameter and 34 ft. high in the center; and wing on the south side 100 ft. long east and west and 37 ft. wide, designed for a cow barn. The capacity of the silo is 80–100 tons and the storage space of the octagon around it will accommodate 100 tons of hay. A steel track for a horse fork used in handling the hay is carried around under the roof of the octagon.

The cow barn "is provided with rows of swinging stanchions and box stalls and will readily accommodate 40 head of cattle. Sectional plank flooring is provided for

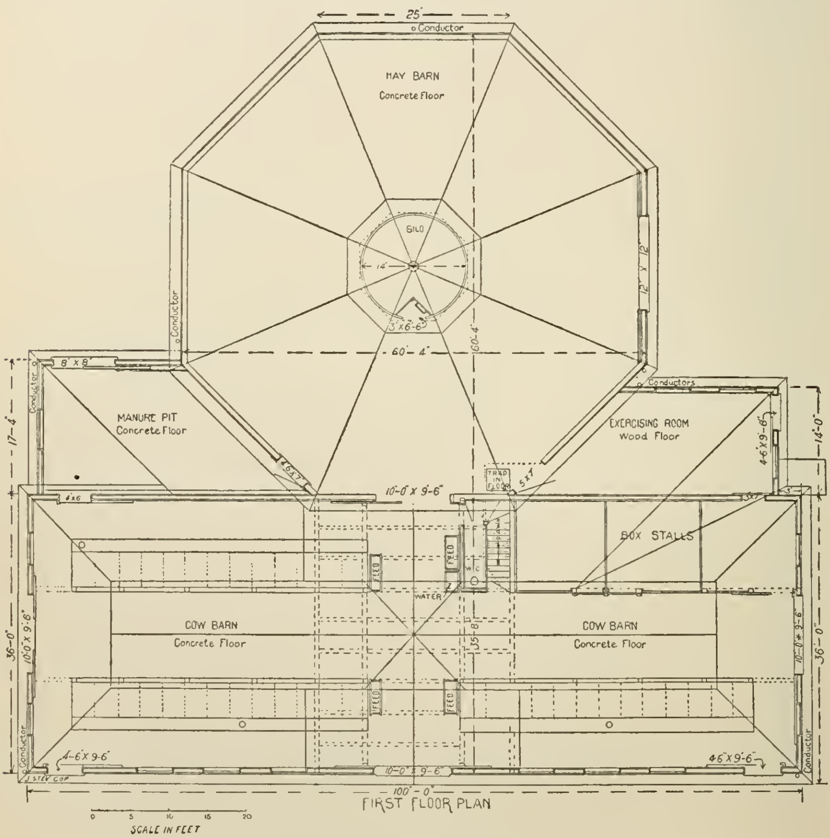

FIG. 3.—Rhode Island Station dairy barn—floor plan.

the cows to stand upon. The floor is concreted. Deep gutters behind the cattle connect with an adequate sewer system, which takes all of the drainage and roof water and carries it, together with any seepage from the gutters, to a cistern situated about 500 ft. down the slope to the west of the building. This structure has a monitor roof, except in the middle where the granary is located in a second-story room. Here, over the south entrance and passageway through the cattle barn to the octagon, is provided ample room, furnished with bins, for storing grain in large quantities. A stairway leads from near the octagon door to the granary above. . . . Large windows on the south side of the cow barn admit abundance of light. The sides of the monitor roof are mainly windows which, when necessary, are opened by means of rods operated from the floor to provide ventilation. These windows also admit a large amount of light. Large doors are placed in the east and west ends of the structure, and a team can be driven through in front of the rows of stanchions from one end of the barn to the other. On the north side of this structure are the east and west wings, which fill in the space between the cow barn and two sides of the octagon. The west wing has a lower floor than the main building and is used mainly for the storage of sawdust, which is used for bedding. At its west end stands the manure spreader into which the dung and soiled bedding can be dumped through a door behind it, opening directly from the cattle barn. The east wing is the only part of the structure which has a cellar underneath it. This room is provided with a strong plank floor, and has been used, in the absence of other shelter, for a small flock of sheep, and some of the time for calves and yearlings, and for storage of straw. The cellar is for the storage of roots. It has two

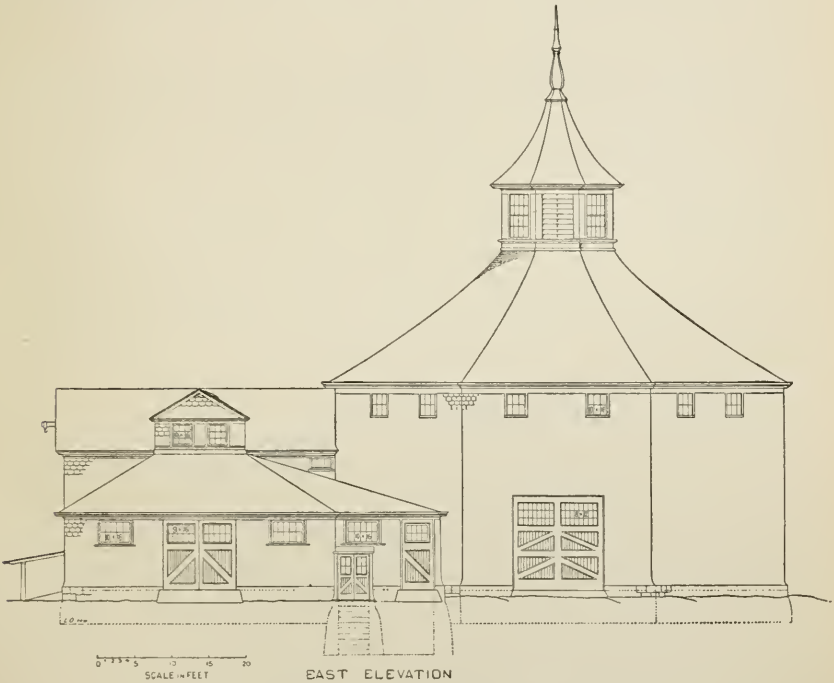

FIG. 4.—Rhode Island Station dairy barn—east elevation.

entrances, one at the east end of the building, and one inside near the center of the cattle barn, both being provided with suitable stairways. The cellar is thoroughly underdrained and has a concrete floor."

Figures 3 and 4 give the ground plan and general appearance of this barn.

STATISTICS—MISCELLANEOUS.

Fourteenth Annual Report of Kansas Station, 1901 (*Kansas Sta. Rpt. 1901, pp. XXII*).—This gives the organization list of the station, a financial statement for the fiscal year ended June 30, 1901, a review of the work of the different departments during the year, and a subject list of station publications.

Annual Report of New Jersey Stations, 1900 (*New Jersey Stas. Rpt. 1900, pp. XVII + 572*).—This includes the organization lists of the stations; a financial statement of the State Station for the year ended October 31, and of the College Station for the fiscal year ended June 30, 1900; a report of the director reviewing the different lines of station work; and reports of the chemists, assistant in horticulture, assistant in dairy husbandry, biologist, botanist, and entomologist noted elsewhere.

Annual Report of Pennsylvania Station, 1900 (*Pennsylvania Sta. Rpt. 1900, pp. 432*).—This includes the organization list of the station, a financial statement for the fiscal year ended June 30, 1900, a brief review of station work by the director, several articles noted elsewhere in this issue, and reprints with the addition in some cases of detailed data of articles already abstracted from different sources as follows: The agricultural use of lime (E. S. R., 12, p. 627), analyses of rose soils (E. S. R., 11, p, 625), effect of various systems of fertilizing upon the humus of the soil (E. S. R., 13, p 330), a contribution to the chemistry of butter fat (E. S. R., 11, pp. 308, 615, 616), the chemical analysis of the apple and some of its products (E. S. R., 12, p. 554), variety tests of wheat (E. S. R., 13, p. 449), methods of steer feeding (E. S. R., 12, p. 875), and the manurial value of the excreta of milch cows (E. S. R., 12, p. 927).

Fourteenth Annual Report of Rhode Island Station, 1901 (*Rhode Island Sta. Rpt. 1901, pp. 183–389*).—This includes the organization list of the station, a report of the director reviewing briefly the work of the station during the year, departmental reports and miscellaneous articles noted elsewhere, a financial statement for the fiscal year ended June 30, 1901, and lists of donations, exchanges, and station publications.

Memoranda of the origin, plan, and results of the field and other experiments conducted on the farm and in the laboratory of the late Sir John Bennet Lawes at Rothamsted, England, J. H. Gilbert (*Report to the Lawes Agr. Trust Committee, 1901, pp. 123, figs. 2, dgms. 7*).—This is a report on the work of the Rothamsted Experiment Station, containing summarized results up to the present time.

The Rothamsted experiments (*London: William Clowes & Sons, Ltd., 1901, pp. 17, figs. 2, dgms. 7*).—Summarized data from the above report.

Crop Reporter (*U. S. Dept. Agr., Division of Statistics Crop Reporter, Vol. 3, Nos. 7–9, pp. 8 each*).—Among a large number of short articles of a statistical nature contained in these numbers are the following: The report of the Statistician for November, the raisin industry of California, the 1901 flaxseed crop, preliminary estimate of the cotton crop of 1901–1902, annual report of the Statistician for the fiscal year 1901, exports of wheat, the United States bean crop, production of peas and potatoes in Russia since 1883, the foreign trade of the United States in hides and leather, the beet-sugar industry, receipts at primary markets and exports of wheat, the vegetable-oil trade, the export of the United States and Canada in dairy products, Russian crops in 1901, official estimate of German crops, 1901, and potatoes in the United States.

Cotton ginning—crops of 1899 and 1900, D. C. Roper (*Twelfth Census United States, Census Buls. 58, pp. 16; 98, pp. 21, figs. 5*).—Statistics as collected from ginning establishments by correspondence and through enumerators show that the cotton crop of 1899 was 9,645,974 commercial bales, amounting to 4,672,695,500 lbs.; and the crop of 1900, 10,486,148 commercial bales, equivalent to 5,061,513,294 lbs. The most significant feature is considered the extraordinary increase in the crop of Texas—from 2,658,555 commercial bales in 1899 to 3,536,506 in 1900. "Texas grew 34 per cent of the total crop of 1900 and one-fourth of the world's crop in that year." Bulletin 98 concludes with an historical and descriptive account of ginning cotton.

Cotton-seed products, D. C. Roper (*Twelfth Census United States, Census Bul. 129, pp. 10, dgm. 1*).—From this report on the manufacture of cotton-seed products for the year ended May 31, 1900, it appears that there were 357 establishments engaged in the extraction of cotton-seed oil and that the total amount and value of the several products were as follows: Cotton-seed oil, 93,325,729 gals., valued at $21,390,674; oil-cake and meal, 884,391 tons, valued at $16,030,576; hulls, 1,169,286 tons, valued at $3,189,354; and linters, 57,272,053 lbs., valued at $1,801,231.

Manufacture of beet sugar, G. L. Spencer (*Twelfth Census United States, Census Bul. 59, pp. 15, figs. 5*).—This is a report on the development and present condition of the beet-sugar industry in the United States. "From this report, it appears that there were 31 beet-sugar factories in the United States in the census year, distributed among 10 States and 1 Territory, representing an invested capital of $20,958,519, and producing 71,427 long tons of beet sugar, valued at $7,323,857."

Salt, E. W. Parker (*Twelfth Census United States, Census Bul. 116, pp. 16*).—The total value of salt products manufactured in the United States in 1899 was $7,966,897. There were 159 establishments representing a capital of $27,123,364.

Statistics on the fruit industry of California, E. S. Holmes, Jr. (*U. S. Dept. Agr., Division of Statistics Bul. 23, misc. ser., pp. 11*).—A brief statistical presentation is given of the acreage and number of fruit and nut trees and their distribution in California. Figures are also given on shipment of fruits by rail and by sea and the increase of these shipments for the years 1890 to 1900. In 1900 there were 16,192,876 bearing fruit trees and 13,209,411 nonbearing trees, covering an area of 452,252 acres. The State shipped 88,189.2 tons of green deciduous fruit by rail in 1900 and 84,899.9 tons of dried fruit, 34,217.5 tons of raisins, and 45,679.9 tons of canned goods. The bulk of these shipments was from the northern part of the State. The larger amount of citrus fruits was shipped from the southern portion of the State. The total shipment for the whole State in 1900 by rail amounted to 226,456.6 tons. The annual shipments of various fruits and canned goods have increased from 161,170.1 tons in 1890 to 519,380.8 tons in 1900.

Agricultural monograph of the Jurassic region of Belgium (*Monographie agricole de la région Jurassique. Brussels: Ministry of Agriculture, 1901, pp. VI+77*).—The region included in the study here reported occupies the southern extremity of Luxemburg, bounded on the west and south by France, on the east by the Grand Duchy of Luxemburg, and on the north by the Ardennes. The subjects treated are climate and soil (see p. 723) agricultural operations (plant and animal production), agricultural manufacturing industries, permanent improvements, and the agricultural régime.

Agricultural monograph of the clay and sandy clay region of Belgium (*Monographie agricole de la région limoneuse et sablo-limoneuse. Brussels: Ministry of Agriculture, 1901, pp. 270*).—The region embraced in the study of which this is a report extends across the country from France on the west to Limburg in Hollaud on the east, and from the Escaut and Demer on the north to the Sambre and the Meuse on the south. The report deals with climate and soil, see (p. 723), agricultural operations, including the methods and results of the culture of various crops and the production of animals, as well as the manufacturing industries closely allied to agriculture; permanent improvements, and the agricultural régime. This is one of a series of monographs which are designed to give the results of a systematic study of all of the various agricultural regions of Belgium.

The practical results obtained in the experiment fields at Lauchstädt (*Mitt. Deut. Landw. Gesell., 16 (1901), No. 25, pp. 144, 145*).—A brief review of the results obtained at Lauchstädt, calling attention to their practical value. A paper read at the meeting of the German Agricultural Society at Halle.

Twentieth century of inventions, G. Sutherland (*London, New York, and Bombay: Longmans, Green & Co., 1901, pp. 286*).—This is a discussion of the present tendencies of invention and a forecast of the probable line along which greatest development is likely to occur in the future, the forecast being based on actual records of the trials of inventions. A chapter is devoted to inventions of interest to agriculture. In this is discussed the substitution of portable motors (electric) for muscular power and of skilled labor using machines for hand labor; the development of cheap sources of power (water wheels and windmills) to produce electricity, which is to be stored and transmitted as needed to different parts of the farm for plowing, etc.; the improvement of pumps and other means of lifting water for irrigation; and the use of electricity in the production of nitrates. "Modern improvements in agriculture will probably be, in the main, such as are based upon fundamental processes unknown to the ancients. By the word 'processes' it is intended to indicate not those methods the scientific reasons for which were understood—for these in ancient times were very few—but simply those which from long experience were noticed to be beneficial," such as rotation of crops and the enrichment of the soil by legumes. A great development of irrigation is predicted, and methods of raising and applying water for this purpose are discussed at some length. It is also predicted that the expert in plant diseases, equipped with apparatus for fumigation on a large scale, will be a person of increasing importance in the future.

NOTES.

Connecticut College.—William H. Hall, of Willington, has been appointed a trustee of the college, *vice* William D. Holman, deceased.

Iowa College and Station.—James Atkinson, instructor in agriculture in the college and agriculturist of the station, has resigned to accept a position as editor in Des Moines, Iowa. An extensive feeding experiment with cattle has been undertaken by the station in cooperation with A. E. Cook, of Odebolt, Iowa. Various rations are being fed to 11 lots of 20 steers each, and it is expected that the experiment will cover a period of five or six months.

Kansas College and Station.—At a recent meeting of the board of regents, J. G. Haney, a graduate of the college, was appointed superintendent of the Fort Hays Branch Experiment Station. G. A. Dean, also a graduate of the college, has been appointed assistant entomologist of the station, to succeed J. B. Norton, who has resigned to accept a position as scientific aid in the Bureau of Plant Industry of this Department. A. T. Kinsley, assistant in the veterinary department of the college and station, has resigned to accept a position as instructor and to pursue advanced work in the Kansas City Veterinary College. He will enter upon his new duties about September 1.

Maryland College and Station.—The legislature of Maryland, at its recent session, passed a bill appropriating $5,000 per annum for the maintenance, repairs, and insurance of the buildings of the experiment station, to aid in the printing of its bulletins and making exhibits showing the results of its work, and to contribute toward its investigations on tobacco, meat production, and in irrigation. The agricultural college receives $5,000 for the enlargement of the mechanical buildings, $25,000 for dormitory accommodation for students, and $3,000 for renovating the main college building.

Massachusetts College and Station.—D. L. Cleaves has resigned his position as instructor in chemistry in the college and has been appointed assistant chemist in the fertilizer division of the chemical department of the station, to succeed S. W. Wiley, resigned. Mr. Cleaves will enter upon his new duties about April 15.

Michigan College and Station.—J. D. Towar, formerly agriculturist of the station, sailed for South Australia April 10, under a five-year contract with the Roseworthy Agricultural College. Professor Towar will succeed the late William Lowrie as principal of the agricultural college and professor of agriculture. A. M. Brown, of Schoolcraft, has been elected secretary of the State board of agriculture and of the college and station to succeed A. C. Bird, resigned.

Missouri University and Station.—George M. Tucker, Ph.D., a graduate of the Rhode Island College of Agriculture and Mechanic Arts, has been elected instructor in agriculture, to have special charge of work in agronomy. He will enter upon the position next September, and in the meantime he will carry on some investigation work in the chemical laboratory of the station.

Cornell University.—The winter course in agriculture just completed has been one of the most successful ever held at the university. Nearly 100 students were enrolled, the courses in dairying and in general agriculture being about equally attended.

Oklahoma College and Station.—W. H. Merten, of Guthrie, Okla., has been appointed a member of the board of regents, *vice* W. H. Coyle.

Porto Rico Station.—The legislative assembly of Porto Rico has appropriated $15,000 for the purchase of a suitable tract of land for the experiment station established by this Department in that island. Proposals have been asked for and the bids will be opened the first of May.

South Carolina College.—An act was passed by the general assembly, at its recent session, requiring the board of trustees to provide for investigations in the coast region of the State. An inquiry is being made as to the lines of work needing attention.

Texas College and Station.—R. H. Price, horticulturist and mycologist to the college and station, has resigned to engage in truck farming and fruit growing in Virginia. His resignation will take effect in June.

Washington College and Station.—E. E. Elliott, associate professor of agriculture, has been elected professor of agriculture in the college and agriculturist of the station, *vice* W. J. Spillman, resigned. H. S. Davis has been made assistant zoologist.

Reorganization of the Experiment Station at Gembloux.—This station has by recent royal decree been reorganized and extended under the name of the State Chemical and Bacteriological Institute of Gembloux. A. Petermann remains as director. The head of the chemical section is A. Grégoire. The head of the bacteriological section, which is the main new feature, is L. Remy. The institute proposes to undertake on broader lines than heretofore researches in chemistry, physiology, and bacteriology as related to progress in agriculture and hygiene, and will be relieved of control analytical work.

School of Horticulture, Hartford, Conn.—The School of Horticulture established at Hartford, Conn., by the trustees of the handicraft schools of that city has been in operation less than two years, and yet it is compelled to keep a "waiting list" for applicants who can not yet be accommodated. The school is located just outside of the city on a farm of 75 acres donated to the Handicraft Schools by Rev. Francis Goodwin, who also provides all funds for carrying on the work. The buildings used by the school include a greenhouse, potting room, class room, library, office, storeroom, tool room, sheds, stables, etc.

The students received include apprentices and pupils from the Watkinson Farm School and from the city schools. Pupils from the Farm School spend two and a half hours each day at the school of horticulture and receive instruction in horticulture, floriculture, botany, forestry, entomology, market and landscape gardening, and orchard management. About half or three-fourths of an hour is spent in the class room, and the remainder of the time is devoted to practical work in greenhouse, potting room, orchard, or garden. This work includes practice in grafting, budding, layering, and other horticultural operations.

Pupils from the city schools are received daily for school garden work. There is one class in the afternoon of each school day and several on Saturday. Each pupil is given a plat of ground to work and is allowed to keep the products of his labor. He takes charge of his plat about the first of May and cares for it until the crop is harvested. In case any pupil neglects or abandons his plat it is given to some one on the waiting list.

In the spring of 1901, out of some 70 applicants, 34 boys were given garden plats, and of this number 25 carried on their work throughout the season. The cost of the experiment, including everything but rent and the salary of an instructor, was $48. Each plat was 4 by 25 ft. and produced on an average the following articles: Lettuce, 15 heads; radishes, 250; beets, 20; wax beans, 8 qt.; shelled beans, 6 qt.; squashes, 10; corn, 18 ears; verbenas, 1,000 blossoms. The average age of the boys was 13½ years, and the average attendance 84 per cent. The attendance during the summer vacation of the city schools was kept up by the Vacation Schools Committee which has undertaken with considerable success "to provide other influences than those of the streets and alleys of our tenement districts for the children during the long summer vacation."

The school garden experiment was the most successful work undertaken at the School of Horticulture last year. This fact led the director of the school, Mr. H. D. Hemenway, to broaden his plans for that feature of the work during the season of 1902. For those who had garden plats last year he provided preliminary greenhouse work during March and April in propagating plants for transplanting. The size of the plats this year will be 10 by 30 ft. for second-year boys and 10 by 20 ft. for first-year boys. Provision has been made also for a class of girls who will receive instruction and be given garden plats like those provided for the boys.

Agricultural Education in the British West Indies.—The subject of agricultural education received considerable attention at the West Indian Agricultural Conference held recently at Bridgetown, Barbados. As reported by Dr. Morris, commissioner of agriculture for the West Indies, the system of education now in vogue in those islands comprises (1) lectures to teachers in charge of elementary schools, (2) agricultural teaching in secondary schools and colleges, and (3) itinerant instruction to planters. The entire system is in charge of the Imperial Department of Agriculture for the West Indies, which employs for this work a staff of 2 lecturers in agricultural science, 1 traveling instructor in agriculture, and 5 agricultural instructors. The lectures to teachers in charge of elementary schools are given in courses at the leading towns on the different islands in the group. Classes of teachers are organized by the lecturers or instructors in agriculture and meet daily for several weeks (usually four) to receive instruction in elementary science and agriculture, subjects which they are then required to introduce into the elementary schools. Such courses of lectures have been given by the board of agriculture at two places on the island of Jamaica, at British Guiana, Trinidad, Barbados, the Windward Islands, and the Leeward Islands. At Barbados and in the Windward and Leeward islands practically all the teachers have attended these lectures. As a further aid to this work the Imperial Department of Agriculture has published a text-book for teachers entitled Nature Teaching, and a pamphlet containing hints for laying out and planning school gardens. Agricultural instruction of a higher grade is given in secondary schools and colleges, among which are agricultural schools located at St. Vincent, Dominica, and St. Lucia. Attached to the agricultural schools are experiment stations where the students assist in farming operations. The course of study lasts for three or four years, according to the age of the student at admission. Seven scholarships in agriculture, including two of the annual value of £75 each for the Windward and Leeward islands, are maintained by the department. Itinerant instruction is of recent origin. In September and October last a series of seven lectures to planters was delivered by the officers of the Imperial Department of Agriculture on such subjects as sugar cane, soils, and manures in relation to the cultivation of certain varieties of cane; hints on the planting and cultivation of sugar cane; insect pests on sugar cane, and the fungoid diseases of the sugar cane. These lectures were attended by about 120 to 140 planters and were greatly appreciated.

Instruction in Agriculture in the Primary Schools of Russia.—At a meeting of Russian school instructors at Moscow, the diffusion of popular agricultural information through the medium of primary schools was discussed. The congress expressed itself opposed to the introduction of the study of trades in primary schools, believing that special schools should be established for that purpose; but, on the other hand, it expressed the opinion that it is very desirable to diffuse agricultural information among the teachers of this grade of schools by means of periodical special courses for their benefit.

Nature Study.—A nature study exhibition will be held at the gardens of the Royal Botanic Society, Regent Park, London, S. W., beginning Wednesday, July 23.

The promotion and management of the exhibition is in the hands of the executive committee of the Nature Study Exhibition Association, of which Sir John Cockburn is chairman and John C. Medd honorary secretary. The exhibition will include 9 groups, comprising exhibits from agricultural or horticultural colleges and schools, experimental farms, agricultural departments of universities and university colleges; secondary schools (public and private); primary day schools (public and private); continuation schools; normal training colleges and day training departments of the university colleges and public teachers' schools; schools for the deaf and blind; home office schools and workhouse schools; horticultural and other societies, as well as individuals that encourage nature study or nature lore as a subject of education, and exhibits from the colonies of Great Britain and from the United States. Each group may include any or all of the following 5 classes of exhibits for which certificates of merit or medals will be offered: (1) Statistical information—printed reports, leaflets, etc., bearing on nature study, natural history object lessons, school gardens, school excursions, and similar topics, and catalogues of books suitable for a school library on these subjects; (2) pictorial illustrations—plans and photographs of school gardens, school excursions, schoolrooms in which pupils are at work on nature-study topics, etc.; (3) organization—courses of instruction in nature study; (4) apparatus for teaching—diagrams, apparatus, models in clay, plaster, etc.; (5) work done by pupils—drawings, models, paintings, notebooks, drawing books, collections of plants and insects, etc. The funds necessary for defraying the expenses of the exhibition, including prizes and medals, are being raised by voluntary contributions from members of the Nature Study Exhibition Association.

The New Hampshire College Agricultural Experiment Station has begun the publication of nature-study leaflets, the first number of which, the Pollination of Plants (pp. 12, figs. 10), by C. M. Weed, appeared in March, 1902. This leaflet is intended for teachers, to show them "how easily they can utilize in the spring the subject of the relation of flowers to wind and insects for nature study in any grade above the fourth." The examples chosen are familiar trees, grasses, and wild flowers.

In *Nature* for February 20, 1902, appears a review of the first number of the *Nature Study Journal*, published by the Southeastern Agricultural College, Wye, Kent, and maintained by a society of teachers known as the Nature Study Society. "The object of the journal," as set forth in the preface and introduction, "is mainly to facilitate the teaching of 'nature knowledge' in rural schools by enabling the teachers to interchange ideas and schemes of instruction and to be in communication with the Wye College as a central organization." It is to be largely devoted to the publication of specimen lessons, the first number containing two such lessons: "Leaves and their veining," by H. Brooker, of the Ewhurst National School, and "Dodges of nature," by A. E. Chandler, of Puttenham.

The school garden as an educational feature in the public school is the subject of much discussion, both in the United States and countries of Europe. *Nature* for February 20, 1902, contains an account of a conference on school gardens held February 15 at Reading College under the auspices of the Berkshire County technical education committee, in which is pointed out the prominence given to outdoor training in the schools of Great Britain and the Continent. In this country school gardens have not received so much attention as in Europe, but the movement for their general establishment is gaining ground. As an evidence of this we have only to refer to the programme of the fifth annual conference of the Eastern Public Education Association at Baltimore, May 1 to 3. One-half of the programme is given up to papers and discussions on the subject of "School and home gardens for children as an opportunity for industrial and æsthetic training."

Organization of Pacific Northwest Economic Entomologists.—The entomologists of the experiment stations of Montana, Idaho, Washington, and Oregon met for conference at Moscow, Idaho, March 14, continuing in session through the following day. The principal insect pest of the section, the San José scale and the codling moth, were fully discussed. Many other insects were more briefly taken up. The relation of station entomologists to the State horticultural inspection work was one of the topics considered, the unanimous opinion being that the entomologist should keep in touch with this for the sake of the assistance it would give him in planning his experimental work, but that he should not act as an inspection or quarantine officer. The most threatening insect pests at present are the Hessian fly, already introduced about Portland, Oreg., and the plum curculio, which was reported as existing in the Bitter Root Valley of western Montana, on the west side of the continental divide. Plans were made for the coming season, involving among other things a fuller study of the codling moth at all the stations, to determine the number of broods and to test the efficacy of sprays. An organization was effected under the name "Pacific Northwest Economic Entomologists," and it was decided to hold a meeting annually. The membership being necessarily small, a secretary was the only officer elected, J. M. Aldrich, of Idaho, being chosen to that position.

Nebraska Academy of Science.—At the twelfth annual meeting of the Nebraska Academy of Science G. A. Loveland presented a paper on The Relative Humidity in Dwelling Houses, giving the results of experiments upon the humidity of houses heated by various means, and the results of experiments with various expedients to increase the degree of moisture, and G. D. Swezey described A New Form of Sunshine Recorder, capable of registering not only the total amount and hours of sunshine during the day, but also the varying intensity. G. R. Chatburn presented a paper of considerable practical importance on The Strength of Nebraska-Grown Catalpa and Osage Orange, and C. E. Bessey noted Some Recent Changes in the Nomenclature of Nebraska Plants, which have been rendered necessary by the modifications of nomenclature introduced in recent botanical text-books.

Reclamation of the Zuider Zee.—Interest in the proposed reclamation of the Zuider Zee has been revived by the publication of a number of articles upon the subject of late, and by the introduction in the second chamber of the States General of a bill granting authority for inaugurating the work and raising the necessary funds. As is generally known, about two-thirds of the area of Holland consists of reclaimed lands intersected by a system of main drains and navigable canals of a combined length of over 2,000 miles. The annual budget for the maintenance of its dikes and canals amounts to about $2,500,000. The reclamation of Haarlem Lake about sixty years ago, furnishing about 42,000 acres of rich land, upon which are now the great market gardens of Amsterdam, suggested the reclamation of the Zuider Zee, and in 1892 a commission was appointed to investigate and report upon the project.

The inundation which resulted in the formation of the Zuider Zee occurred in the latter part of the thirteenth century, and was caused by the North Sea breaking through the embankments in several places. The water uniting with Lake Flevo formed the Zuider Zee, a vast inland salt-water sea, 80 miles long and in places 30 miles wide, but quite shallow in many places. Several plans have been advanced for the reclamation of this tract by means of dikes, and the commission, which rendered its report several years ago, traversed the whole ground and outlined a plan which is held to be practicable. The old plan of entirely reclaiming the Zuider Zee by uniting the islands marking the former coast line has been abandoned as impracticable. The present plan contemplates the erection of a great sea dike 18 miles in length, extending from the north Holland coast, near the island of Wieringen, to the Friesland coast near Pianm. This dike is estimated to cost about $15,000,000, and to require ten years for its construction. The plan is to reclaim only those portions of the sea which have a clay bottom, leaving free the mouths of the rivers and the present lines of water communication. For this purpose four inclosing banks are to be constructed, and the areas inclosed pumped out. For the present it is proposed to build only the sea wall and to reclaim two large areas of land on the west side, which are now entirely covered by water, containing together over 131,000 acres, of which 115,000 will be available for cultivation. The reclamation of these two western "polders," together with the indemnities to the fishing interests and other incidental expenses, is estimated to cost about $40,000,000, and would occupy about fourteen years. The area of the two other "polders" to be reclaimed later is 365,000 acres. The total cost of reclaiming the 480,000 acres of cultivable land is estimated at about $75,000,000, and would occupy some thirty-three years. The rental value of the reclaimed land is placed at $10 an acre. Aside from providing a large body of land suitable to cultivation, it is urged that the project will be of great economic advantage in effecting a saving in the present cost of pumping and maintenance of sea banks, as well as by providing direct communication by road and railway along the top of the dike between Holland and Friesland, shortening the distance materially.

It is understood that the consideration of the bill for inaugurating this work has been temporarily postponed, owing to the condition of the finances of the country.

Personal Mention.—Dr. K. von Tubeuf, chief of the biological division of the German department of health, has been appointed professor of forestry in the University of Munich.

Prof. W. H. Brewer, for thirty-seven years professor of agriculture in the Sheffield Scientific School of the Yale University, will, according to a note in *Science*, retire from the active duties of the professorship at the end of the present academic year.

Oscar Clute, LL. D., a graduate of the Michigan Agricultural College in the class of '62, president of the Michigan Agricultural College from June, 1889, to August, 1893, and of the Florida Agricultural College from 1893 to 1897, died January 23, 1902.

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EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Assistant Director.*

EDITORIAL DEPARTMENTS.

Chemistry, Dairy Farming, and Dairying—The Editor and H. W. Lawson.
Meteorology, Fertilizers and Soils (including methods of analysis), and Agricultural Engineering—W. H. Beal.
Botany and Diseases of Plants—Walter H. Evans, Ph. D.
Foods and Animal Production—C. F. Langworthy, Ph. D.
Field Crops—J. I. Schulte.
Entomology and Veterinary Science—E. V. Wilcox, Ph. D.
Horticulture—C. B. Smith.
With the cooperation of the scientific divisions of the Department and the Abstract Committee of the Association of Official Agricultural Chemists.

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EXPERIMENT STATION RECORD.

Vol. XIII. No. 9.

The agricultural appropriation act for the year 1902–3, passed by Congress the latter part of May, carries an increase of $626,540 over that of the previous year, the total amount now aggregating $5,208,960. The largest increases are for the Weather Bureau, the Bureau of Animal Industry, and the four new bureaus formed last year. The latter are recognized in the act in place of the former divisions which they represented, and special provision is made for the continuance of the new bureau organization.

Two new lines of work are provided for, which the Department has given little attention to in recent years, namely, the study of the proper treatment and processes for securing uniform grade and quality of table sirup and investigations in silk culture. For the investigations in sirup making $20,000 is appropriated and for silk culture $10,000. The former will be assigned to the immediate charge of the Bureau of Chemistry and the latter to the Division of Entomology.

The Weather Bureau appropriation amounts to $1,248,760, an increase of about $100,000, $50,000 of which is for the purchase of sites and the erection of six new station buildings for use as observatories. There is also provision for extending its cable and telegraphic connections. The Bureau of Animal Industry receives an increase for its inspection and investigation work of $93,000, out of which $10,000 may be used for the purchase of additional land in connection with its experiment station at Bethesda, Md. The total amount named for the Bureau is $1,247,180.

The total increase for the Bureau of Plant Industry aggregates $116,000, making the total for that Bureau $612,730, including the $270,000 for the purchase and distribution of seeds. The largest increase is for vegetable pathological and physiological investigations, $50,000. The new lines of work mentioned are the investigation of cañaigre and other tannin-bearing plants, the cause of decay in forest timber, the practical application in agriculture of the fixation of atmospheric nitrogen by bacteria and other micro-organisms, and the cultivation and distribution of these "nitrogen fixers." The appropriations for botanical, pomological, and grass and forage-plant investigations are increased by $10,000 in each case, being now $55,000 for botanical investigations and $30,000 each for the other two branches. The Arlington Farm receives an additional $5,000, making the total $15,000, and the fund for tea-culture investigations is increased to $10,000. The allowance of $20,000 for seed and plant introduction, out of the $270,000 for the purchase and distribution of seeds, is continued, and $10,000 additional is authorized from this fund for the construction of a seed warehouse.

The Bureau of Forestry receives an increase of $106,420, mostly for general operating expenses, making the total for that Bureau $291,860. The increase for the Bureau of Soils is $60,540, including $21,540 for additional salaries placed upon the statutory roll. The total for the Bureau is $169,680. In the case of both of these bureaus the increased appropriation is principally to enable an extension of the operations along lines already approved, rather than to enter upon new lines.

The appropriation for the Bureau of Chemistry is more than doubled, including that for sirup investigation mentioned above, and a number of new duties are imposed. Among these are the establishment of standards of purity for food products and the determination of what shall be regarded as constituting adulteration, the investigation of dairy products and the adulterants of the same, a study of the influence of environment upon the chemical composition of wheat and other cereals, suitability of barley for brewing, etc., and the investigation of the chemical composition of sugar-producing plants in the United States and its possessions, together with the effect of environment upon the same. The total for the Bureau is now $73,700.

The appropriation for agricultural experiment stations is $796,000, which includes an increase of $4,000 for this Office and $3,000 for the Alaska stations. The fund for irrigation investigations (assigned to this Office) is increased from $50,000 to $65,000, and in addition to its other duties provision is made for a study of the laws as affecting irrigation and the rights of riparian proprietors, the making of plans for the removal of seepage and surplus water by drainage, and the use of different kinds of power for irrigation and other agricultural purposes. An attempt to secure an increase for the stations in Hawaii and Porto Rico, giving them the same amount as is received by each State and Territory, was unsuccessful; and an increase of $7,000 in the appropriation for this Office to enable it to enter into cooperation with the farmers' institute work of the country, which was granted by the Senate and retained by the conference committee, was later reduced to $4,000 by a concurrent resolution introduced to correct a clerical error in the total appropriation. The appropriation of $20,000 for nutrition investigations remains as before.

The Division of Entomology receives $57,450, together with the $10,000 for silk investigations previously mentioned, a total increase of $31,250; and the Division of Biological Survey receives $45,850, an increase of $13,050.

The fund for the Division of Publications is increased from $198,020 to $228,820, of which $107,500 is for farmers' bulletins. This is aside from the general printing fund for the Department of $175,000.

The appropriation for the Division of Statistics remains the same as last year, except that the $15,000 for the Section of Foreign Markets is deducted, making the total for the Division of Statistics $141,160, and the Section of Foreign Markets is raised to an independent division. A clause is inserted calling upon the Secretary of Agriculture to report to the next Congress upon the advisability of consolidating with the Weather Bureau all of the work of the Department relating to the gathering and compilation of crop reports and statistics.

The fund for Public Road Inquiries is increased from $20,000 to $30,000, and that for the Library is raised from $16,000 to $18,000. Other appropriations are as follows: Office of the Secretary, $74,410; Division of Accounts, $24,100; Museum, $2,260; and contingent expenses, $37,000.

The provision for a new agricultural building is contained in a separate bill, which at this writing is still in the hands of the Senate committee on public buildings. In this connection, as showing the great need of additional accommodations, it may be mentioned that the appropriation act cited above authorizes the expenditure of about $22,000 for the rent of buildings, to be used almost exclusively for laboratory and office purposes. Moreover, permission to rent quarters was denied several branches for which it was asked, and the growth of whose work makes it practically a necessity. The new appropriation for rented buildings is more than double that authorized in the last act, not to mention the increased incidental expense for watchmen, heating, etc.

The administration of ex-Secretary J. Sterling Morton, whose death occurred April 27, was marked by a number of important events which contributed in no small degree toward the reorganization and development of the Department. While nothing like a general reorganization was undertaken, a number of changes were made in the direction of a more compact organization, and several new lines were inaugurated which materially strengthened the work of the Department. The Divisions of Soils and of Agrostology, for example, were established in his time, as was also the Dairy Division in the Bureau of Animal Industry. Congress appropriated funds for the collection and distribution of information relating to public roads, out of which grew the Office of Road Inquiry; and the Section of Foreign Markets was reorganized and placed under the Secretary's immediate supervision.

Through Secretary Morton's recommendation the experiment stations and the Department were brought into much closer relations. In his first annual report he called attention to the lack of any Federal supervision of the funds given for experiment stations, and advocated an amendment of the law placing such supervision in the hands of the Secretary of Agriculture. In response to this, Congress empowered the Secretary to prescribe the form of the annual financial statements and directed him to ascertain whether the expenditures conformed to the requirements of the Hatch Act, which has taken the form of an annual inspection. The advisability of this step is universally accepted, since, aside from safeguarding the funds, it has brought the Department into much closer relations with the stations, and has strengthened the organization of the whole movement.

Secretary Morton also obtained the first appropriation for nutrition investigations, which carried the first legislative provision for cooperation with the experiment stations, a feature which has since assumed more importance every year and has proved of mutual benefit in working out practical problems in the application of science in agriculture.

The Yearbook, which supersedes the former annual report and has become one of the foremost agricultural annuals of the world, was started in the second year of Secretary Morton's administration; and he secured the first appropriation from Congress for the publication of farmers' bulletins, which he hoped to substitute for the Congressional seed distribution. Failing in this effort and in his attempt to bring about the abolition of the seed distribution, he set about improving the quality of the seed furnished, by establishing a laboratory for testing the purity, viability, and genuineness of the seeds which were purchased for that purpose. This laboratory has been continued and its duties and scope materially enlarged.

Secretary Morton appreciated the inadequacy of the present Department quarters and the great desirability of a commodious and appropriate building. In his last annual report he pointed out that over $2,066,000 had been covered back into the Treasury during his administration, and strongly recommended that the amount so saved be applied to the erection of an agricultural building.

Mr. Morton's deep interest in tree planting and practical forestry is widely known, and he will be remembered especially as the author of arbor day legislation.

Upon the receipt of the news of the ex-Secretary's death a committee was appointed to draw up appropriate resolutions, which were subsequently adopted at a meeting of the officers and employees of the

Department. Secretary Wilson has directed that a portrait of Mr. Morton be inserted as a frontispiece in the forthcoming Yearbook, now in press.

The Seventh Annual Report of the Director of the Office of Experiment Stations brings out the fact that much progress has been made in the direction of cooperation between the agricultural experiment stations and this Department. The lines in which the stations can most effectively cooperate with the Department are being determined, and encouraging progress made in working out the methods of arranging and conducting cooperative operations. Since both the stations and the Department have had enlarged resources it has been possible not only to increase the number of cooperative enterprises, but also to conduct them on a larger scale. At present the stations in 43 States and Territories are cooperating with the Department. This cooperation covers a very broad field, including tests of varieties of grasses and forage plants in many localities, special experiments with grasses and forage plants for the arid regions and the improvement of range lands, breeding experiments with plants, especially cereals, experiments with hybrid orange trees, the culture of sugar beets, dates, and tobacco, the planting of forest trees, the nutrition of farm animals and of man, the gluten content of wheat as affected by various conditions of environment, plants poisonous to stock, injurious insects, soil studies, and irrigation problems.

In some cases it has been found desirable to form groups of stations to investigate some problem affecting a large region. Thus, for example, a group of stations, in cooperation with the Bureau of Plant Industry, is engaged in investigations on the breeding of varieties of cereals adapted to the Northwest In other cases a single station is sufficiently aided by the Department to enable it to undertake the thorough treatment of problems in a special line. Thus, the Pennsylvania Station, in cooperation with the Bureau of Animal Industry, is preparing to make elaborate researches in animal nutrition, and for this purpose has devised and built a respiration calorimeter for experiments with large animals, which in size and complexity surpasses any apparatus hitherto used for such experiments. In other cases, two or more branches of the Department combine to work in conjunction with a station on some complex problem. Plans have been made, for example, for an extensive experiment on the problems of range conservation and improvement, in which the Arizona Station will unite with the Bureaus of Forestry and Plant Industry and the Office of Experiment Stations (irrigation investigations). It is evident that a very great variety of effective combinations can be made, which will result in a union of forces thoroughly acquainted with local conditions with those having broad views and relations. Such a strong combination of forces for attacking the problems of agriculture exists nowhere else. It is believed, therefore, that largely increased benefits will soon accrue to agriculture from this union of the stations with the Department. At the same time the stations were never so strong locally, and are better equipped than ever before to work by themselves on problems of immediate importance to their own constituencies.

Instances of governmental activity for the advancement of agriculture in the old world as well as in the new are more numerous than formerly, indicating that greater enlightment on the practical value of the results of experiment station work is having a marked effect. The Russian Department of Agriculture and Imperial Domains is displaying considerable activity in its soil and forestry investigations and in the establishment of stations for the investigation of special subjects, such as the growing of flax, cotton, olives, etc.

In Australia the Victoria Department of Agriculture is undergoing reorganization. The Victoria Royal Commission on Technical Education has brought to a close its study of Australian, European, and American departments of agriculture, agricultural schools, and experiment stations, and published its final (sixth) report. The Minister of Agriculture is now seeking a director of agriculture, who will proceed to reorganize the Department and put it on a better working basis.

In England the Board of Agriculture has made larger grants than formerly to agricultural colleges and societies for conducting agricultural investigations. The Agricultural Education Committee is doing important work for agriculture and agricultural education by publishing circulars on various topics and nature-study leaflets for teachers. During the year Messrs. John S. and T. M. Remington have established the Aynsome Experiment Station at Lancashire, a private institution.

The Austrian Government has recently established several experiment stations, notably the station for plant culture at Brünn, the station for investigations in plant and animal production at Otterbach, and an agricultural physiological station, with divisions of chemistry, physiology, and bacteriology, at Prague. In Hungary an experiment station for the analysis and study of wines was established last year at Fiume.

France has established at Nogent-sur-Marne a colonial garden to have administrative control over French colonial stations and botanic gardens in different parts of the world and to furnish these institutions with seeds and plants. During the year œnological stations have been established at Toulouse and Beaune and an agricultural station at Besançon.

In Germany five years of successful work at the Lauchstädt Experimental Farm, which is connected with the Agricultural Chemical Experiment Station at Halle, has given so much evidence of the value of experimental farms in connection with experiment stations that there is a movement in that country toward the extension of the so-called "American system" of field experiments, conducted on a large scale and in a more practical way than has hitherto been customary in that country. Two new stations have been established during the year, a flax-culture station at Sorau and a viticultural experiment station at Weinsberg.

In the West Indies and South America also the claims of agricultural education and research have received much attention. The Department of Agriculture in the West Indies has established three new stations at Montserrat and one at Tortola, and has conducted several meetings of planters and investigators, at which great interest in the advancement of agriculture was displayed. The Bolivian Government has established an agricultural college at Cochabamba and an agricultural school for Indians at Umala. Brazil has recently established a botanical garden and experimental demonstration field at San Vicente; and Argentina, which hitherto had no stations, has decided to establish four experiment stations on the same general plan as those in the United States.

An irrigation experiment station has been established at Calgary, Canada, a dairy station at Gembloux, Belgium, and a veterinary pathological institute and animal vaccine institute at Christiania, Norway; and a department of agriculture, with a small staff of experts attached, has been organized at Bangalore by the government of Mysore, India.

Thus the organized effort for the advancement and improvement of agriculture increases year by year, the example and experience of one country seeming to stimulate others to action or to increased activity. The well-deserved reputation of the American stations for doing work of practical bearing and quite direct application to agricultural practice is causing them to be looked to by the newer countries, and the so-called American system is finding many imitators.

THE STATION FOR PLANT BREEDING AT SVALÖF, SWEDEN.

David G. Fairchild,
Agricultural Explorer of the U. S. Department of Agriculture.

In connection with an expedition for plant introduction the writer had the pleasure in the summer of 1900 of visiting the Station for Plant Breeding at Svalöf, Sweden. This station is so unique and promises so much for the agriculture of Sweden that it is worthy the serious consideration of American agriculturists.

The object of the station is the development by systematic breeding and selection of new, better, and more productive varieties of agricultural plants. So far, it has confined its attention to the improvement of wheat, oats, rye, barley, peas, and vetches.

The institution is the outcome of private enterprise and owes its origin to the farsightedness and liberaiity of B. Welinder, a wealthy landowner of the province of Schönen. Mr. Welinder became convinced, through his travels in Germany and England, of the importance to agriculture of cultivating the best varieties of cereals; and in 1884, or thereabouts, he imported into South Sweden and grew on his own estate a number of different foreign varieties of grain. Among this number was the Scottish variety of wheat known as Square Head.

Mr. Welinder distributed seed of this Scottish sort among his neighbors, who discovered upon growing it that with the same amount of labor they were harvesting nearly 2,000 kg. per hectare of this new variety, instead of 1,200 kg., the ordinary yield of wheat.

The success of this introduction, together with other arguments, induced Mr. Welinder to form in 1886 the South Swedish Society for the Breeding and Selection of Seeds. In this he was heartily seconded by Freiherr F. G. Gyllenkrook and other large landowners of the province of Schönen. The object of this society was to raise the standard of Swedish agriculture thro gh the introduction and origination of better varieties of grain and forage plants. In connection with the society, and the breeding station which was the outcome of it, there was established in 1891 a seed company, which at present is capitalized at $100,000. This company is a business concern for the purpose of growing in large quantities and distributing advantageously and economically seeds of the cereals and fodder plants which have been originated or tested by the breeding station and proved of special agricultural value. In the early years of the breeding society the attempt was made to combine these two related objects, but it was found that too much time of the plant breeders was absorbed in the purely business transactions of selling and shipping seed.

The effort of Mr. Welinder and his associates soon attracted attention in other parts of Sweden and resulted in the formation of the General Swedish Breeding Society, which later, by absorption of smaller institutions in middle Sweden, became the Swedish Seed Breeding Association.

Although owing its origin to private initiative, the association has received since 1891 an annual government appropriation, which now amounts to 18,000 crowns, or nearly $5,000. This sum, together with 700 to 800 membership fees, subscriptions from various Swedish agricultural societies, receipts from the sale of grains from the experimental plats, etc., makes the total fund for maintenance of the institution nearly 53,000 crowns, or $14,300.

Until recently the business relations between the association and the company have been somewhat complicated. Seeds of new varieties originated by the breeding station have been appraised by a joint committee and sold outright to the company. Under the present arrangement the association receives a royalty of 1 per cent of the gross receipts of the company on the sales of seed originated by the breeding station.

Although it was not expected in the formation of the company that any profit would result in the first few years from the sales of seed, the books already show a small credit balance, and it seems assured that from a business standpoint the company will be a success.

From 1886 to 1892, unproductive methods of selection were employed and not a single really superior variety of grain was developed. Since 1892, when Director N. H. Nilsson introduced an original method of selection which has proved very important, several new and valuable sorts have been distributed on a large scale and many more promising ones are on trial. As it requires about five years to grow a sufficiently large quantity of the seed to justify putting it on the market, it was not until 1897 that the company could really begin to get any benefit from the work of the plant breeders.

Upon receiving seed of a new and thoroughly tested variety from the breeding station, the company sows it at once on its own land, which is adjacent to the grounds of the station; and when a sufficiently large quantity has been harvested, the company distributes it to correspondents under the simple agreement that the latter shall sell the whole crop harvested from this seed to the company, receiving for their extra pains a price somewhat in advance of the market price for ordinary grains. No special precautions are considered necessary to prevent the grower from stealing a small quantity for his own use and subsequent sale. So much depends upon the inspection of the growing grain and harvested product and the certificate furnished by the breeding station that Swedish farmers evidently prefer to pay the extra price charged for the certified seed.

Throughout both Sweden and Finland the Svalöf varieties of grain are spoken of in the highest terms. As far north as the sixty-sixth parallel they yield better returns than native sorts whenever the season is sufficiently long. In short seasons, when the frosts come unusually early, the southern varieties do not ripen. It could not be expected that sorts from southern Sweden would prove well adapted in this respect to the northernmost localities.

The seed company carries in stock a limited number of standard seed varieties that have not been bred at the Svalöf station. These are, however, all subjected to inspection by the experts of the station, and every sack of seed sold by the company bears the stamp of the latter and contains a certificate as to its purity. All pedigreed grains which are purchased by the company from its correspondents must, before purchase, be inspected in the field and officially recommended by an expert of the breeding station.

In a brochure[1] for the guidance of a committee of the German Agricultural Society, published on the occasion of its visit to Svalöf in 1898, Dr. Nilsson describes in more detail than the limits of this article will allow the organization and scientific principles of the institution. This brochure is worthy the careful perusal of every American plant breeder.

The breeding station at Svalöf is housed in a modern laboratory of attractive exterior and conveniently arranged interior, and is surrounded by a small neatly kept park. (Pl. II, fig. 1.) The experimental plats, of which there are more than 2,000, are scattered among the larger fields of pedigreed grain and cover in all about 25 acres.

Special stress is laid by Dr. Nilsson upon the fact that all of his experimental plats are under as nearly as possible natural conditions, and to insure still further accuracy, each variety is tested on not less than three different plats.

The work of the station naturally runs along two lines, i. e., the search for mother plants for starting new varieties, and the elimination of all but the very best of the varieties started.

All selection of mother plants is based upon (1) the general qualities of the plant itself, (2) its ability to produce plants of high average quality, and (3) its ability to produce plants of nearly absolute uniformity in botanical characters.

The method of work is practically the same for all crops handled.

[1] N. H. Nilsson, Einige kürze Notizen über die schwedische Pflanzen-Veredlung zu Svalöf. Malmö, 1898.

FIG. 1.—STATION FOR PLANT BREEDING, SVALÖF, SWEDEN.

FIG. 2.—INCREASE PLAT OF PEAS, THE PROGENY OF A SINGLE PLANT.

and in Pl. II, fig. 2, is shown a small plat of peas which is the product of the single best plant grown in a similar plat the year before.

As soon as one of the plats seems to warrant it, i. e., when its uniformity of type and general excellence of yield have been demonstrated, a number of the best yielding plants, excepting of course the single best one, are chosen to plant an increase plat. From the seed obtained from this increase plat, providing the uniformity of type and general excellence still hold good, the variety test plats are planted. Here is applied the third and final test, and all but the one or two very best are eliminated. The variety or varieties that hold out through all this process of selection are increased for distribution. The method of selection outlined has been in use at Svalöf since 1892.

Although directly productive of no novelties, the early years of activity were not lost, for they resulted in the discovery of numerous valuable methods and instruments for correctly appraising the practical value of certain characters of cereal and fodder plants. They made it possible for the investigator to express, often in statistical form, the value of a variety of grain.

The amateur plant breeder is often blinded to the real problem at issue by the ease with which a host of new forms can be produced by cross fertilization. He learns later, as Dr. Nilsson says, that it is easy enough to produce new varieties, but far more difficult to determine which of their characteristics are worth reproducing, or can be reproduced. When Dr. Nilsson hit upon the idea of conducting all experiments from the standpoint of a single plant, he was able with the aid of the experience of former years to correctly and quickly decide the value of such new varieties as he observed and selected from his fields. He was able by the same means to select from each following generation the desirable type for propagation.

The discovery of certain easily observable seed characters on the grains of barley made it possible to group the many varieties of each subspecies into 4 tolerably distinct strains, and to analyze quickly large quantities of seed of a given sort in order to determine its purity as a variety (*Sortenreinheit*). The botanical arrangement of the oat inflorescence, i. e., the number of flowers per spikelet, etc., have made a tolerable classification of the varieties of this plant possible, and the breeder can detect at a glance in his experiment plats the presence of a valuable *botanical* variation.

These purely botanical characters have correlated with them valuable economic ones, and it has been one of the services of the Svalöf station to point out some of these correlations and to emphasize the importance of this principle. For example, it has been found that the close headed wheats have the strongest straw, and the three-flowered spikelets of the oat bear the largest grains.

Too much stress can not be laid, according to Dr. Nilsson, upon the value of a pure botanical variety. In the production of a barley for brewing purposes uniformity of germination is of prime importance, and at the Swedish Brewers' Exposition at Malmö, in 1898, the varieties of barley which took the prizes were all botanically pure or nearly so. Such sorts as were mixtures of several strains were invariably of inferior quality. It can be easily understood that grains which are descended from a common parent will show a greater uniformity, even in length of time required to germinate, than those from different parentage.

Dr. Nilsson finds that none of the existing races of cereals now sold by seedsmen is pure, but rather mixtures of many different strains, which he is able to separate and identify. He holds that when a race has been produced which is botanically pure a remarkable uniformity results. The writer saw 14 acres of a new variety of wheat, not yet on the market, which had for several years been subjected to the most careful selection. Every plant in the field was the offspring of the same ancestral plant which Dr. Nilsson had discovered some 4 or 5 years before. The uniformity of color and evenness of growth were most remarkable. Two bands of dark green along the margin of the field could be seen for hundreds of yards, and were as distinct as if painted above a chalk line. Upon closer observation they proved to be formed by the dark green upper nodes of the individual plants, which were of such uniform height that the nodes stood at the same level.

It is easy enough, in Dr. Nilsson's opinion, to secure variable varieties and curious sports by crossing; but it is very difficult, once the strain is disturbed by cross breeding, to secure uniformity. At present he finds so many variations in his experimental fields without recourse to hand crossing, and he has been so successful in rendering the best of these uniform, that he has not paid much attention to the matter of artificial cross fertilization. He admits, however, that crossing must be judiciously resorted to for the production of quite new varieties of superlative excellence.

Not content merely with the production of a new variety, the station continues work upon sorts already put on the market by the company. Every year a new representative plant is selected from the trial plats, the seed from it sown, and the machinery set in motion for its multiplication. The Svalöf Princess barley of 1898 is not the same nor as well bred as that of the same pedigree, but originated in 1900. The system of records and methods of systematically studying each of the characters of these pedigreed sorts are among the most interesting features of the station. The field and record books, and the system of numbers employed to keep track of these almost countless variations, are the result of years of experience. Extensive herbaria and photographs assist in rendering the short descriptions of the various sorts intelligible, and in looking these over one is impressed with the thorough manner in which this kind of experimental work is systematized.

The station laboratory is a machine shop of specialized contrivances. Among these may be enumerated counting cases for quickly registering the grains per spikelet, specialized racks upon which the pedigreed grain is hung, tables of peculiar construction, racks and trays of convenient form, self-sorting balances, special pincers for cutting the grains of barley in two in order to examine their flour texture, abacus-like and ordinary counting machines for diminishing the labor of calculation, ingenious shaking sieves for grading and registering quickly large quantities of grain, marking boards to guide the plat planters in planting the seed, and calipers for registering the relative compactness of the wheat head.

Dr. Nilsson has two scientific assistants, Dr. H. Tedin and Mr. P. Bolin. The former is at work upon the improvement of forage plants, with which he has already had excellent results, while the latter has made a specialty of barley, and his Princess variety is rapidly superseding other sorts through southern Sweden. It is an essential of success in plant breeding that the breeder shall become so intimately acquainted with the plants he is breeding that he learns which among the host of characters constantly developed are of significance for his purpose; and the organization and specialized scope of the Svalöf station foster this intimate acquaintance.

Among the valuable varieties already produced by this remarkable breeding station are the Grenadier wheat, which is not yet on the market but has yielded over 70 bu. per acre where ordinary kinds gave only 35 bu.; the Princess barley just mentioned, which took 20 out of 28 prizes offered by the Brewers' Association at a recent exposition in Malmö, Sweden, and a variety of vetch (*Vicia sativa*) quite proof against the mildew (Peronospora), which has for several years almost completely destroyed the fields of this fodder plant at Svalöf. This vetch was found by Dr. Nilsson in a field which has been devastated by the disease. It was noticeably free from the malady, and its progeny now form a race which is quite immune to the Peronospora. Considering the short time that has elapsed since the proper method was discovered for the improvement of plants, and that the staff of the station includes only three breeders, these are certainly most worthy results. What might be done if this work were prosecuted on a large scale does not require much imagination to discern.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

Method for preparing strictly tenth-normal, fifth-normal, etc., hydrochloric or nitric acid, R. K. MEADE (*Jour. Amer. Chem. Soc., 23 (1901), No. 5, pp. 343–347*).—The method described depends upon the decomposition of copper sulphate in solution by the electric current. Barium chlorid is afterwards added to the solution, a double decomposition taking place, barium sulphate and hydrochloric acid being formed. The process is carried out as follows: In making tenth-normal hydrochloric acid there is introduced into 12.487 gm. of crystallized copper sulphate in 500 cc. of water, a cylinder of copper foil attached to the negative wire and a platinum rod attached to the positive wire of an electric circuit with a current of from 1 to $1\frac{1}{2}$ amperes. The beaker is covered with a watch-glass perforated for the rod, and the current passed through the solution for from 6 to 8 hours, or longer. After removing and rinsing the apparatus, 12.215 gm. of crystallized barium chlorid, dissolved in water, is added and the solution made up to 1 liter. In order to have the volume correct 26 cc. of water is added to fill the space taken up by the precipitate. After the precipitate has settled the clear liquid is siphoned through a dry tube upon a dry filter and caught in a dry stock-bottle.

In making tenth-normal nitric acid by this method, 13.076 gm. of barium nitrate should be used in lieu of barium chlorid, the quantity of copper sulphate remaining the same. Where the standard hydrochloric acid is for use with alkaline earths, it is necessary to add a little in excess of the amount stated of barium chlorid. The author prepared only tenth-normal and fifth-normal acids by this method, but states that normal acid can also probably be prepared, but that the waste caused by the loss of solution retained in the precipitate would be somewhat greater.

The determination of nitrates in water containing chlorids, R. MARCILLE (*Ann. Agron., 27 (1901), No. 12, pp. 596–600*).—The method proposed is a modification of that of Grandval and Lajoux,[1] which is based upon the coloration produced by the formation of trinitrophenol or picric acid when water containing nitrates is treated with sulphophenic acid. The chlorids are eliminated by precipitation with a concentrated ammoniacal solution of silver sulphate, the determination of nitrates being made in the solution without filtering to remove the precipitate. The method of procedure is as follows: To 10 cc. of the water in a small porcelain dish add a few drops more than enough of the silver solution to precipitate the chlorids; evaporate to dryness at a temperature not much over 120° C.; cool, add 1.5 to 2 cc. of sulphophenic acid (8.1 parts of phenol to 100 parts of sulphuric acid), and mix to a homogeneous paste; dilute to about 10 cc. with water, and add a slight excess of ammonia; pour into a glass tube, make volume to 50 or 100 cc. with distilled water, and determine nitrates by the ordinary colorimetric method. The silver solution is prepared by heating pulverized silver sulphate with a little water and adding ammonia little by little. Even small amounts of chlorids are shown to interfere with the accuracy

[1] Compt. Rend. Acad. Sci. Paris, 101 (1885), p. 62.

of the determination of nitrates, but theoretical results were obtained when the chlorids were precipitated in the manner described.

Synoptic tables for the chemical analysis of water, P. Goupil (*Tableaux synoptiques pour l'analyse chimique de l'eau. Paris: J. B. Baillière & Son, 1901, pp. 70, figs. 10*).

The quick determination of nitrates in soils, C. Montanari (*Staz. Sper. Agr. Ital., 34 (1901), pp. 690–693; abs. in Chem. Centbl., 1901, II, No. 13, p. 793*).—The author adapts the method of Grandval and Lajoux, referred to above, for the determination of nitric nitrogen in air and water to this purpose.

Methods of analyzing commercial fertilizers, F. Kretschmer (*Ztschr. Angew. Chem., 14 (1901), No. 45, pp. 1136–1138; abs. in Chem. Centbl., 1901, II, No. 24, p. 1277*).—A brief account of methods commonly employed in Germany for the determination of nitrogen, phosphoric acid, potash, and lime.

The solubility of phosphatic manures in some organic acids, W. F. Sutherst (*Chem. News, 84 (1901), No. 2187, pp. 199, 200*).—Tests are reported of the action of 1 per cent acetic, tartaric, and citric acids on Christmas Island coprolite, basic slag, basic superphosphate, and precipitated phosphate. In the method followed 1 gm. of the phosphate was digested for 24 hours with frequent agitation in 100 cc. of the solvent, phosphoric acid being determined in 50 cc. of the filtered solution thus obtained by the molybdic method. The solubilities obtained were very variable. Acetic acid gave much lower results than the other two acids tested. The author states that "though citric acid seems to be now fixed upon as the reagent in testing phosphates, it is not at all a true representative, . . . for the most satisfactory results as a general solvent are given by tartaric acid."

A suggestion regarding the modification and simplification of phosphate analysis, M. Passon (*Ztschr. Angew. Chem., 14 (1901), No. 45, pp. 1134–1136; abs. in Chem. Centbl., 1901, II, No. 24, p. 1277*).—It is recommended that such weights of material be used (12.8 gm. per liter or 6.4 gm. per half liter) that each milligram of the magnesium pyrophosphate obtained shall correspond with a definite percentage (0.1) of phosphoric acid, thus obviating the necessity of calculating the percentage. Modifications based on the same principle are suggested for the volumetric methods.

On the separation and determination of small amounts of potassium in salt mixtures, F. H. van Leent (*Ztschr. Analyt. Chem., 40 (1901), No. 9, pp. 569–573*).—For this purpose the author recommends, on the basis of his experiments with sea water, a modification of the cobalt nitrate method of de Koninck and Gilbert, converting the potassium finally into perchlorate or the platinum salt and weighing in these forms. The conclusion is reached that the method is better adapted for use with mixtures of potassium with other salts, especially when the proportion of potassium is small, than the direct platinum or perchlorate method. The reagent employed is prepared by dissolving 9.58 gm. cobalt chlorid with 25 cc. of glacial acetic acid in 500 cc. of water. Just before use equal parts of this solution and of a solution of 90 gm. of sodium nitrate in 500 cc. of water are mixed.

Estimation of sucrose and lactose in condensed milk, S. H. R. and C. N. Riiber (*Ztschr. Analyt. Chem., 40 (1901), No. 2, pp. 97–110*).—The method of Kjeldahl for estimating two sugars at the same time and in the same solution depends upon whether the copper yielded by each sugar present is in a correct ratio to the total. This method is correct when the two sugars reduce Fehling's solution with equal rapidity. This is not exact with others, like invert sugar and lactose, and the authors propose a formula for calculating an approximate result. The figures they obtained by the calculation agreed very closely with those applied to 3 samples of milk prepared with known amounts of sugar.

Determination of milk sugar by the Wollny refractometer in comparison with analytical and polariscopic methods, R. Braun (*Milch Ztg., 30 (1901), Nos. 37, pp. 578, 579; 38, pp. 596–599, figs. 4; 39, pp. 613–616*).

The determination of saccharin, F. Wirthle (*Chem. Ztg., 25 (1901), No. 77, p. 816*).

Note on the approximate estimation of formaldehyde in milk, J. F. Liversege (*Analyst, 26 (1901), No. 303, pp. 151, 152*).—A color reaction obtained by the adition of a reagent composed of 25 cc. of normal ferric chlorid in 100 cc. of pure concentrated sulphuric acid. Ten cc. of the milk is placed in a 25 cc. stoppered cylinder and the reagent added, 1 cc. at a time, from a burette and the color noted. In the presence of formaldehyde a violet color appears which increases in intensity with the amount of formaldehyde in the sample.

Detection of formalin in milk, O. Henzold (*Milch Ztg., 30 (1901), No. 40, pp. 629, 630*).—The addition of sulphuric acid to milk containing formalin gives a distinct violet color at the contact of the two layers.

The estimation of formaldehyde, Z. Peska (*Chem. Ztg., 25 (1901), No. 71, p. 743*).—A discussion of methods.

Estimation of the acidity of the fat in foods, G. Loges and K. Mühle (*Landw. Vers. Stat., 56 (1901), No. 1, pp. 95, 96*).—The authors recommend the direct extraction of the fat, carried out with 5 gm. of material and 100 cc. of water and acid-free ether. An aliquot portion of the filtrate is taken for the determination of the acidity, using an alcoholic potash solution containing 50 per cent of alcohol for titrating. The results of a series of tests of this method with various foods are shown in comparison with the ordinary method. The results are in every case higher with the former method.

The application of iodin monobromid in the analysis of fats and oils, J. Hanus (*Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), No. 20, pp. 913–920*).—The author has made an extended study of the use of iodin monobromid in the analysis of fats and oils. The formation of iodin monobromid, a gray, crystalline, metallic substance, soluble in alcohol and acetic acid, is given. A table is shown, giving the number obtained with this compound, in comparison with the Hübl number. The method of obtaining the iodin monobromid number is as follows: 0.6 to 0.7 gm. of fat and 0.2 to 0.25 gm. of oil, or, in case the iodin number is above 120, 0.1 to 0.15 gm. of oil is put into a glass-stoppered flask of 200 cc. capacity and 10 cc. of chloroform added. After the fat is dissolved 25 cc. of a solution made of 10 gm. of iodin monobromid in 500 cc. of acetic acid is run in, and after 15 minutes, with occasional shaking, 15 cc. of potassium iodid solution (1:10) added. The free iodin is then titrated with sodium thiosulphate solution, using starch as an indicator.

The advantage of the iodin monobromid solution in acetic acid over the usual method of obtaining the iodin number is as follows: (1) The solution is more stable and keeps for a longer time; (2) the results with the iodin monobromid solution are more uniform and it is not necessary, therefore, to employ so many blank determinations; (3) the flask needs to stand only a quarter of an hour, so that a greater number of manipulations may be carried out in a short time; and (4) the numbers obtained by this method very closely approximate those obtained by the usual method.

A method for the quantitative separation of cholesterin from fat, E. Ritter (*Chem. Ztg., 25 (1901), No 81, p. 872*).

Concerning lecithin compounds, H. J. Bing (*Skand. Arch. Physiol., 11 (1901), Nos. 3–4, pp. 166–175*).—A chemical study of the compounds which lecithin forms with sodium chlorid, sodium acetate, platinum chlorid, salacin, amygdalin, and a number of other reagents, the purpose of the investigation being to study the chemical constitution of lecithin.

Glycogen obtained by extraction with boiling water in comparison with the total glycogen present, J. Nerking (*Arch. Physiol. [Pflüger], 85 (1901), No. 7–8, pp. 313–319*).—In the studies with the flesh of calves the author found that by continued extraction with boiling water only about $\frac{2}{3}$ or $\frac{3}{4}$ of the glycogen was obtained.

Comparison of volumetric methods of tannin analysis with hide-powder method, H. R. Procter and A. B. Searle (*Wiss. Tech. Beil. Ledermarkt, 2 (1901), p. 60; abs. in Chem. Ztg., 25 (1901), No. 80, Repert., p. 283*).—By the Jean method the results were lower than by the Löwenthal method and much lower than by the hide-powder method. There was no constant relation between the results obtained by the 3 methods.

Studies of the pentosans of jute, vegetable sponge, and brewers' grains, A. Schöne and B. Tollens (*Jour. Landw., 49 (1901), No. 1, pp. 21–28*).—The authors made a study of the pentosans of the substances named, and the application of various modifications in the methods of analysis. Comparisons were made between heating on the water bath in the usual manner and heating under pressure. Lower results were obtained by heating in an autoclave at 125 to 118°, with 1 per cent sulphuric acid, than heating with 5 per cent sulphuric acid in the water bath. By digesting jute with dilute soda solution and precipitating with alcohol 4.6 per cent of wood gum was obtained, representing 1.2 per cent of xylose. The vegetable sponge yielded 0.63 per cent of xylose. Brewers' grains heated in the water bath with 3 per cent sulphuric acid yielded 24.77 per cent of pentosans, equivalent to 28.16 per cent of pentoses. The treatment was found to have extracted the pentosans and inverted them to pentoses quite completely, although the residue continued to show the lignin reaction.

The constituents of the tea leaf, and the changes which these substances undergo during the manufacture of tea, A. W. Nanninga (*Meded. 'S Lands, Plantentuin, 1901, No. 46, pp. 60*).—This contribution treats of the quantitative determination of caffein, tannic acid, and some other soluble constituents of the tea leaf. The methods of v. Romburgh and Lohmann of extracting with alcohol, and that of Vité of extracting with water, were carefully tested with samples having a known caffein content. It was found that the alcohol method could not be used for green tea nor for freshly dried leaves because giving too low figures, while for black tea both methods gave practically the same results. Further tests showed that the cause of the unsatisfactory results obtained with the alcohol method were due to the presence of the tannic acid, and that it was not practicable to satisfactorily extract caffein with chloroform from an aqueous solution when tannic acid is present. The water method failed to return quite all the caffein present in the green and in the freshly dried leaf. The method finally adopted was that of extracting with chloroform. This method also was the most satisfactory in analyzing coffee and kola nuts. The results of the several methods with fresh, dried, and fermented tea leaves are shown in tables.

Great difference of opinion has long existed regarding the properties of the tannic acid of tea. This is probably due to impurities in the extract, and to avoid this the author devised a method for obtaining pure tannic acid from the leaves. It was found that the presence of 20 per cent water in the powdered tea made possible the complete extraction of the acid, which was impossible with dry leaves. The tannic acid of tea is very hygroscopic and deliquesces at once, assuming a yellowish-brown color and a sirup-like consistency. The characteristics of the dry powder as regards solubility, taste, and reactions with a variety of chemicals are given. The deflection of the plane of polarized light is practically constant for different samples—about 3.4°, showing that the tannic acid of tea is a pure chemical combination and not a mixture as tannin.

The peculiar property of being absorbed by hide powder was tested with the tannic acid of tea. The conclusion was reached that in the quantitative determination of tannic acid it is necessary to add the hide powder in small amounts every 10 minutes. If the entire amount is added at once there is at first a rapid absorption of the acid, followed by a decrease in the absorptive power of the hide powder, so that not all the acid is taken up, although the quantity of powder is sufficient to absorb the whole amount of acid when added in small quantities at short intervals.

The reactions of the tannic acid of tea with a number of chemicals are briefly mentioned. The molecular weights in two cases determined were 503.5 and 502.

A comparison of the properties and reactions of the tannic acid of tea with the two groups of tannic acids established by Trimble show that it belongs to neither, but occupies an intermediate position.

A substance closely resembling quercitin was found to differ from it in some reactions. This substance, which has not been named, plays no important part in the manufacture of tea.

Tea leaves also contain a glycosid which the author provisionally calls tea-glycosid. The method of obtaining it is described.—H. M. PIETERS.

An oven for igniting the precipitate of ammonium-magnesium phosphate in porcelain Gooch crucibles, SCHALLER (*Ztschr. Angew. Chem., 14 (1901), No. 32, pp. 800, 801, figs. 2*).—An oven of the Hempel pattern to accommodate 4 crucibles is described.

The C. Fresenius-Offenbach distilling apparatus for the determination of ammonia (*Bul. Assoc. Belge Chim., 15 (1901), No. 6, p. 219*).—This apparatus is briefly described and the advantages claimed for it are stated.

The foundation principles of chemistry—a guide for the use of agricultural educational institutions. I, Inorganic chemistry, G. ALTMANN (*Grundriss der Chemie. Ein Laitfaden für den Unterricht an landwirtschaftlichen Lehranstalten. Leipsic, 1900, 5. rev. ed., pp. IV+132, figs. 37*).

Agricultural chemical exercises for agricultural schools, A. MAHRENHOLTZ (*Die agrikulturchemischen Übungen an Landwirtschaftsschulen. Liegnitz: Reinersche Buchhandlung, 1901, 2. enl. and rev. ed., pp. 68, ill*).

BOTANY.

The effect of water on the maturing of woody stems, F. KÖVESSI (*Compt. Rend. Acad. Sci. Paris, 132 (1901), No. 22, pp. 1359-1361*).—The author claims that an abundant fruiting follows a year of drought, and that a humid season is followed by one of small fruit production. This is due in a large degree to the maturing of the branches which carry the floral buds, and in the ripening of these branches the water which they contain plays an important part. It is stated that branches arising directly from the trunk or occurring in the interior of the top contain a large amount of water, and as a result are poorly matured at the end of the growing season. These branches suffer severely on account of the winter's cold, and as a result many are destroyed, and the tree naturally pruned. It is claimed that the location of the flower-bearing branches conforms to the same rule. They are most numerous on the slender branches in which the water conduction is limited, on account of the distance of transfer, and they are also most numerous if the branch assumes a vertical position, in which by the added action of gravity there is a diminution of water content. In this manner the form of the tree, as well as the location of the flower-bearing branches, is determined by conditions influencing the maturity of branches, and the maturing of branches, as well as the number of flowers and fruits, depends to a great degree upon the amount of water which the plant receives.

Osmotic pressure and its rôle in defending living cells against cold, D'ARSONVAL (*Compt. Rend. Acad Sci. Paris, 133 (1901), No. 2, pp. 84-86*).—Attention is called to the extreme brittleness to which animal and vegetable tissues are subject when exposed to liquid air, and also the fact that yeasts and various bacteria do not lose their vitality when subjected to the temperature of liquid air for several weeks. This resistance, the author claims, is due to the osmotic pressure existing in the yeasts. If the osmotic tension be lowered by placing the yeast or bacteria in solutions of sodium chlorid, potassium nitrate, or glycerin, they are no longer able to withstand the temperature of liquid air. It is believed possible to determine the value of the osmotic pressure for any given cell by which the temperature at which its vitality will be destroyed.

The periodicity of root growth, J. HÄMMERLE (*Beitr. Wiss. Bot., 4, pt. 2, pp. 15; abs. in Bot. Centbl., 88 (1901), No. 4, p. 107*).—The roots of *Acer pseudoplatanus* were found to make their principal growth in the spring of the year and in the autumn. During the months of January, February, and March there was an almost entire cessation of growth. During mid-summer a similar cessation of growth was noticed. Investigations were made upon a number of 1 to 5 year old trees grown in the open and in pots, the results obtained confirming previous observations. The duration and amount of growth was found to be influenced by age, soil, climate, etc. Contrary to the observations reported by others, the author was unable to find any root growth taking place in the red beech during autumn. Willows, oaks, and hazel make strong root growth in the fall of the year, and the hazel showed considerable growth during January.

The structure of the sprouts from various trees, M. DUBARD (*Compt. Rend. Acad. Sci. Paris, 132 (1901), No. 22, pp. 1356–1358*).—A study is reported of the sprouts which rise from the roots of poplar, elm, hazel, etc., from dormant buds of the oak, and from the cambium layer of oak, black poplar, etc. These sprouts show by their anatomy the characteristics of herbaceous plants. Their growth is rapid, and they have elongated internodes and develop stipules which persist for a long time. There is little differentiation of tissues, particularly of the protective and strengthening tissues. There is a considerable production of cortex in proportion to wood, and the whole ripens poorly. Within the same genus of plants the structural characteristics of the shoots are most nearly alike for those species which are nearly related.

The form and manner of root growth of some trees, M. BÜSGEN (*Allg. Forst u. Jagd Ztg., 67 (1901), Aug., pp. 273–278; Sept., pp. 305–309, figs. 4*).—The root systems of a number of trees are described. The time of the most important root growth of a number of trees and shrubs, as shown by the observations of the author and others, is indicated by a chart. The principal species reported upon are ash, birch, beech, alder, oak, maple, poplars, willows, elms, locust, spruce, pine, larch, white fir, etc. Considerable variation is shown in the period of maximum root growth of the different species, as reported by the different observers. As a rule the most of the root development takes place between April and October, with little or none in December and January. Exceptions are noted, however, and there seems to have been a cessation of growth during the summer months in some species, and willows, maples, lindens, horse chestnut, and a few shrubs are shown to have increased their root development during December and January.

Concerning the proteid formation by plants, W. ZALESKI (*Inaug. Diss., Kharkov, 1900; abs. in Bot. Centbl., 87 (1901), No. 8, pp. 277–282*).—A review is given of the literature bearing upon the subject of proteid synthesis by plants, and experiments conducted by the author are described, from which he draws some conclusions. The subject is considered to be still in an indefinite state as to some of the phenomena. Proteid formation from organic nitrogen in the dark, proteid regenertion from metabolic products, and proteid synthesis from nitrates are discussed at some length. Experiments with onions, potatoes, and narcissus bulbs showed that there was an increase in the proteid content when kept in the dark, and the author claims that it was not made at the expense of asparagin, but from other little-known nitrogenous bodies. Experiments with etiolated lupine seedlings showed their ability to build up proteids from some of their metabolic products, and experiments with sunflower leaves kept in the dark showed they were able to form proteids from nitrates and sugar.

The probable function of calcium oxalate crystals in plants, A. SCHNEIDER (*Bot. Gaz., 32 (1901), No. 2, pp. 142–144*).—Calcium oxalate is said to occur in plants in 4 predominating types. Of these the least common is that called crystal sand. The prismatic and aggregate forms are about equally common and are very widely distributed. The needle-shaped or acicular crystals are very common but predominate in monocotyledonous plants. The author reviews the common opinion that calcium oxalate occurs in plants as a protective agent, and from his own and other observations concludes that its prime function is that of mechanical support, and that its rôle as a reserve product is doubtless secondary. The principal reasons favoring the mechanical support theory are given at some length. Cells containing prismatic crystals are generally associated with bast fibers. As a rule the crystal-bearing cells are thin-walled and each contains a single crystal. These cells surround the bast fibers or bast bundles, and are very abundant in the bark of many trees. In other instances the crystal-bearing cells are believed to serve as a substitute for mechanical tissues, taking the place of sclerenchyma. For example, in the seed of the quince and the ordinary garden bean, particularly in the latter, the sclerenchymatous tissue is replaced by a layer of cells containing large prismatic crystals so constructed and placed as to best resist vertical and lateral pressure. In the case of the acicular crystals of monocotyledonous plants it is quite evident that they give elasticity as well as support against pressure. The crystoliths which occur so abundantly in Ficus leaves perform a purely mechanical function. It is frequently found that cells bearing calcium oxalate take the place of mechanical cells in leaves, which is particularly true about the stomata of the leaves. It is believed to be highly probable that in many plants and plant organs calcium oxalate exists accidentally, but in the majority of instances its function is that of mechanical support, as indicated.

The sensitiveness of higher plants to the action of salts of potash, H. COUPIN (*Compt. Rend. Acad. Sci. Paris, 132 (1901), No. 25, pp. 1582–1584*).—In a previous paper (E. S. R., 13, p. 620) the author has shown the remarkable sensitiveness of some plants to very small quantities of toxic substances. The present paper reports the sensitiveness of plants to some of the useful salts. Experiments were made with wheat which had been germinated. After unfolding the second leaf the seedlings were placed in solutions containing known quantities of potash salts, and comparisons made with the development of plants in distilled water. The strength of the stronger solution was 1:5,000, and this was decreased in a regular arithmetical progression through a series of 13 cultures. It was found that the plants were sensitive as shown by their growth to various salts of potash as follows: Potassium carbonate, 1:1,000,000; potassium phosphate, 1:25,000,000; potassium sulphate, 1:8,000,000; potassium chlorate, 1:300,000; and potassium nitrate, 1:400,000. These figures show the remarkable sensitiveness of the plants to the action of potash salts.

The etherizing of plants, E. CHARABOT and A. HÉBERT (*Compt. Rend. Acad. Sci. Paris, 133 (1901), No. 8, pp. 390, 391*).—It is claimed that terpene alcohols are transformed into ethers in the chlorophyll-bearing organs of plants, and that the etherizing is most active when the plant is best adapted for assimilation. The etherization in the plants is produced by direct action of acids on alcohol, and it is favored by the presence of diastase, which exerts a dehydrating action through the medium of the chlorophyll.

Notes for a monograph of the phenomena of plant transpiration, A. BURGERSTEIN (*Verhandl. K. K. Zool. Bot. Gesell. Wien, 51 (1901), Nos. 1, pp. 49–64; 2, pp. 65–106; abs. in Bot. Centbl., 87 (1901), No. 7, pp. 233, 234*).—The methods of investigation are given and descriptions of intercellular and epidermal transpiration; transpiration of leaves and of the palisade parenchyma; the transpiration of halophytes and succulent plants; the influence of light, temperature, moisture, and anæsthetics upon transpiration; transpiration and the phenomena of transpiration exhibited by tropical plants, and other special variations.

Concerning symbiosis between plants and animals, F. Fedde (*Jahresber. Schles. Gesell. Vaterländ. Cultur, 1900, II, pp. 2–15; abs. in Bot. Centbl., 86 (1901), No. 2, p. 61*).—According to the relationship between the symbionts, there are 3 forms of symbiosis—that between animals, between plants, and between plants and animals. From a biological consideration one of the symbionts may be injurious to the other, which is the case in the relation between parasites and host plants. The author discusses various kinds of symbiosis and calls attention to various well-known instances where animals live in this relationship, as well as numerous plants. The symbiosis between plants and animals is said to occur in the case of certain plants requiring for their fertilization certain insects, as in the case of Yucca and Pronuba, and in the case of the mutualism which exists between ants and various plants.

The cell nuclei of Saccharomyces, C. Hoffmeister (*Sitzber. Deut. Naturw. Med. Ver. Böhmen, n. ser., 20 (1900), No. 5, pp. 251–263, pl. 1; abs. in Bot. Centbl., 87 (1901), No. 4, pp. 129, 130*).—In the first part of this work the author gives a short review of the previous investigations and theories relative to the occurrence of nuclei in the Saccharomycetes. New species are described from pure cultures made from various yeasts, and the methods of fixing and staining are given. The author concludes that so far as his investigations go species of Saccharomyces and yeast-like organisms possess nuclei. The nucleus is generally in the center of the cell or may be somewhat displaced, and is in shape more or less that of a flattened sphere.

Investigations on the fall of the leaves of dicotyledons, A. Tison (*Mém. Soc. Linn. Normandie, 20 (1900), No. 1, pp. 121–168*).

An edible fungus, J. C. Arthur (*Indiana Sta. Rpt. 1901, pp. 20, 21, pls. 2*).—An illustrated description is given of the spiny or hedgehog mushroom (*Hydnum erinaceum*).

Plants used by the Indians of Mendocino County, California, V. K. Chesnut (*U. S. Dept. Agr., Division of Botany, Contributions from the U. S. National Herbarium, vol. 7, No. 3, pp. 295–408, pls. 12, figs. 13*).—A report is given of the economic uses of plants by the Indians in Mendocino County, California, based upon investigations made by the author in 1897 and 1898.

Elements of vegetable biology, J. Pavillard (*Elements de biologie végétale. Paris: Société d'ed. Sci., 1901, pp. 589*).

Nitrogen assimilation by living bacterial cells, J. Stoklasa and E. Vitek (*Centbl. Bakt. u. Par., 2. Abt., 7 (1901), No. 8, pp. 257–270*).—A review is given of some of the more recent literature regarding the value of Alinit as a fertilizer. The authors maintain that *Bacillus megatherium* is able to assimilate free atmospheric nitrogen when supplied with proper carbohydrates, and report a number of experiments in which it was used to inocculate oats and barley. The results, it is claimed, demonstrate the efficiency of the organism for nitrogen assimilation.

METEOROLOGY.

Monthly Weather Review (*Mo. Weather Rev., 29 (1901), Nos. 10, pp. 447–487, pl. 1, figs. 5, charts 9; 11, pp. 489–533, figs. 2, charts 13; 12, pp. 535–589, figs. 5, charts 10*).—In addition to the usual reports on forecasts, warnings, weather and crop conditions, meteorological tables and charts (for the months of October, November, and December, 1901), recent papers bearing on meteorology, etc., these numbers contain the following articles and notes:

No. 10, special contribution on The measurement of sunshine and the preliminary examination of Angström's pyrheliometer (illus.), by C. F. Marvin; and notes by the editor on Weather Bureau men as instructors, applied climatology, the barometer as used at sea, what is a storm wave? on barometric oscillations during thunderstorms, and on the brontometer, an instrument designed to facilitate their study (illus.) (by G. J. Symons), colored snow, electrical phenomena—incandescent clouds, and fake forecasts.

No. 11, special contributions on The westward movement of the daily barometric wave (illus.), by O. L. Fassig; The reduction of records of rain gages, by M. S. W. Jefferson and A. J. Henry; The temperature of the soil and the surface of the ground, by D. A. Seeley (see p. 833); and The sun-spot period and the temperature and rainfall of Jamaica (illus.), by M. Hall; and notes by the editor on relative frequency of sun spots, hailstorms on the St. Lawrence, earthquake-proof buildings, signs and weather, the equinoctial storm, the November meteors, ice caves and freezing wells, the temperature of water in wells, periodicity in climate, auroral light, establishment of the Martinique weather service, and second Mexican meteorological congress.

No. 12, special contributions on Evaporation underground, by E. S. Balch; Facilities for systematic study of corresponding weather types (illus.), by F. H. Brandenburg; A proposed classification and index of weather maps as an aid in weather forecasting (illus.), by W. V. Brown; Classified weather types, by E. B. Garriott; An auroral-lunar halo display, by H. H. Ten Broeck; and The physical basis of long-range weather forecasts, by C. Abbe; and notes by the editor on classified weather types, the influence of small lakes on local climate, meteorological observations with kites at sea, climate and crops, the Meteorological Society of Mauritius, early meteorological records, lunar halo and lunar corona, and halo of Hevelius (illus.).

Meteorological chart of the Great Lakes, A. J. Henry and N. B. Conger (*U. S. Dept. Agr., Weather Bureau, Meteorological Chart of the Great Lakes, 1901, No. 2, pp. 32, charts 13*).—This is the usual summary of observations for the season of 1901 on storms, atmospheric precipitation and lake levels, opening and closing of navigation, wrecks and casualties, fog, etc., with a paper on the use of barographs on the Great Lakes.

Meteorological observations at the Michigan Agricultural College for 1900 (*Michigan Sta. Rpt. 1901, pp. 121–145*).—Tabulated daily and monthly summaries of observations during 1900 on temperature, pressure, precipitation, humidity, cloudiness, wind movement, etc. The summary for the year is as follows: Mean temperature, 48.08° F.; humidity, 91 per cent; atmospheric pressure (reduced to 32° F.), 29.099; cloudiness, 46.1 per cent; amount of rain or melted snow, 31.02 in.; snowfall, 47.10 in.; number of thunderstorms, 38.

Meteorology in Prussia (*Rev. Sci.* [*Paris*], *4. ser., 17* (*1902*), *No. 1, p. 26*).—A note on the report for 1900 published by the National Institute of Prussia, giving summaries of observations at 200 meteorological stations, 2,200 rainfall stations, and 1,400 storm-warning stations.

Results of meteorological observations in German Southwest Africa (*Dankelmann's Mitt. Dut. Schutzgebieten, vol. 14; abs. in Meteor. Ztschr.* [*Vienna*], *19* (*1902*), *No. 1, pp. 41–45*).

Report of the Meteorological Council (*Rpt. Meteor. Council* [*Great Britain*], *1901, pp. 162, charts 4*).—An account of the work of the council during the year ended March 31, 1901, in the following lines, ocean meteorology, weather telegraphy and forecasts, climatology, and miscellaneous investigations, is given with statements regarding publications of the council and its library and finances.

Climate of the British Empire, 1900, A. Buchan (*Symons' Mo. Meteor. Mag., 36* (*1901*), *pp. 167, 168*).

Climate and mineral waters of Spain, A. Labat (*Climat et eaux minérales d'Espagne. Paris: J. B. Baillière & Son, 1901, pp. 78*).

The daily barometric wave, H. H. Clayton (*Science, n. ser., 15* (*1902*), *No. 371, p. 232*).—A brief discussion of a recent paper by O. L. Fassig on the westward movement of the daily barometric wave.

The story of the snow crystals, W. A. Bentley (*Harper's Mo. Mag., 104* (*1901*), *No. 619, pp. 111–114; noted in Science, n. ser., 15* (*1902*), *No. 368, p. 111*).—Essentially the same as the article contributed by the author to the *Monthly Weather*

Review (E. S. R., 13, p. 425). Microphotographs of snow crystals formed under different atmospheric conditions are shown and the results of a careful study of the different forms are discussed, it being claimed that "the extent and the character of a storm may be read directly from its crystals."

Hailstorm clouds, C. Kassner (*Meteor. Ztschr.* [*Vienna*], *18* (*1901*), *pp. 526–528*).

On "weather shooting" at Windisch-Feistritz in southern Steiermark, F. Klengel (*Wetter*, *18* (*1901*), *pp. 270–276*).

Hailstorm cannon, L. Dumas (*L'Ing. Agr. Gembloux*, *12* (*1902*), *No. 6*, *pp. 295, 296*).—A brief note on cannonading as a means of preventing hailstorms.

The moon and rainfall, A. B. MacDowall and H. R. Mill (*Symons' Mo. Meteor. Mag.*, *36* (*1901*), *pp. 165–167, 183–184*).

The dry moon and the wet moon, A. K. Bartlett (*Ciel et Terre*, *22* (*1901*), *pp. 433–437*).

Weather and the horns of the moon (*Symons' Mo. Meteor. Mag.*, *36* (*1901*), *pp. 184, 185*).

Influence of the moon on the barometric state of the air, N. Demtchinsky (*Ann. Soc. Météor. France*, *49* (*1901*), *pp. 246–249*).

The influence of rainfall on commerce and politics, H. H. Clayton (*Pop. Sci. Mo.*, *60* (*1901*), *No. 2*, *pp. 158–165*).—Studies on the relation of rainfall to wheat yields and pasturing of sheep in Australia, by Wills, and to sugar production in Barbados and Jamaica, by Rawson and Hall, respectively, are described and data are presented to show that every severe financial panic with its attendant political changes "has been closely associated with a protracted period of deficient rainfall." A plea is made for the more liberal endowment of institutions for the broader scientific study of the atmosphere in its relation to man.

Some economic aspects of the heat and drought of July, 1901, in the United States, R. DeC. Ward (*Bul. Amer. Geogr. Soc.*, *33* (*1901*), *Oct.; noted in Science, n. ser.*, *15* (*1902*), *No. 368*, *p. 111*).

Organization of the weather service of Mexico, E. E. Schulz (*Rev. Cient. Bol. Met.*, *4* (*1901*), *No. 1–2*, *pp. 33–37*).

WATER—SOILS.

The retention of bacteria in ice, H. W. Clark (*Massachusetts State Bd. Health Rpt. 1901*, *pp. 509–524*).—Chemical and bacteriological studies were made with ice gathered in different localities in Massachusetts. The results show that ice contains less of both suspended and dissolved matter than the water from which it is formed. The same is true as regards bacteria, particularly if there is a considerable depth of water under the ice, and the water is quiet during the process of ice formation. "When, in order to thicken ice, the ice already formed on a pond or river is flooded and the entire volume of water over the ice is frozen, bacteria will undoubtedly be retained in this ice." It is stated that when *Bacillus coli* and *B. typhosus* are frozen in the ice they retain their vitality for a number of weeks, the exact limit not having been determined. It is also stated that "if there is a considerable depth of water in portions of a somewhat polluted pond or river, and the ice is formed in these portions in comparatively quiet water, with but little matter in suspension, this ice will probably be entirely satisfactory for domestic use, although considerable drainage may enter the body of water upon which it forms. On the other hand, ice formed in shallow portions of such ponds or rivers, even during still weather, or in any portion if there is a considerable movement of the water by currents or wind while it is forming, may be rendered by these conditions entirely unfit for domestic use."

Ice supplies (*Massachusetts State Bd. Health Rpt. 1901*, *pp. 92–103*).—Statements are made concerning the quality of the ice supplied to different cities and towns in

Massachusetts. The purity of natural ice in relation to its source, and of artificial ice in relation to the process of manufacture followed, is discussed.

A soil study. III, The soil, W. P. Headden (*Colorado Sta. Bul. 65, pp. 56*).—Previous bulletins (parts I and II) contain the results of observations on the effects of the mechanical condition, the alkalis contained in, and the general properties of the soil of a plat on the college farm, upon the crops grown on it. This bulletin reports a continuation of this investigation, but deals exclusively with the chemical and physical study of the soil used in the previous experiments. The soil, which "varies in its character from a loamy soil with a calcareous, clayey subsoil, to a fine alluvium resting upon a stratum of gravel, separated from it by a rather compact clay, but with no proper hardpan," was chosen because "it was considered to be the most strongly alkalized plat to be found on the college farm." Examinations of this and other soils of the eastern slope of the Rocky Mountains and of the plains lying to the east in Colorado are reported, which show that these soils are in general very similar in chemical (mass analysis) and mineralogical composition, the principal variations in the latter respect being in the ratio of the quantities of the minerals present. "The surface soils of this section of Colorado probably owe their mineral constituents to a common source, the schists and granites of the Colorado range." Feldspar (orthoclase) is an almost universal constituent, and according to the sand cultures with oats reported "serves as a source of potash and also of hydrous silicates under ordinary cultural conditions. . . . This fact is of great importance to our western agriculture, especially to the agriculture of the eastern slope of the Rocky Mountains and eastward to the State line, as the irrigable lands are composed largely of granitic materials and consequently contain a more or less considerable quantity of feldspar, whose decomposition yields, slowly it may be, but a continuous supply of this very important compound. . . . The theory of the formation of zeolitic minerals, to serve as conveyors of the potash, etc., from the more stable minerals to the plant, can not very well be appealed to, at least as necessary. My experiments do not show that zeolitic compounds are not formed, but they do show that if they are formed their formation takes place so rapidly that perfectly fresh, but finely pulverized, feldspar becomes an available source of potash in the short period required for the growth of the oat plant. . . .

"The alkali salts in the soils and waters of Colorado are essentially mixtures of the sulphates of lime, magnesia, and soda. . . . Relative to the origin of such quantities of sulphates in these rocks and soils, the possible supply is abundant, for throughout the mountain masses we find sulphids disseminated everywhere, and we have an almost inexhaustible source of sulphuric acid for the formation of alkali in the gypsum which is so abundant in our Jurassic and other formations."

It is shown that by the analyses reported that the composition of the water-soluble portion of the soil studied differs both from that of the incrustations of alkali formed on the surface and from that of the portion in solution in the ground water. "The incrustations are formed by the evaporation of water from the surface of the soil, which, owing to the deportment of the solutions of these salts toward capillary action, and the chemical instability of the hydrated salts themselves, effects their separation from the soil solutions. . . . The predominant soluble salt in the soil is calcium sulphate, that in the alkali which effloresces from this ground is sodium sulphate, with magnesium sulphate second in quantity, while the calcium sulphate is but little greater than the sodium chlorid. . . .

"The formation of these incrustations effects a rough separation of the markedly efflorescent salts, sodium and magnesium sulphates, from the permanent calcium sulphate. Ordinary salt, sodium chlorid, which is present, is also concentrated in the alkali, but not nearly to a like extent, as those already named. The highest figure obtained for the sodium sulphate in any sample of the water-soluble is in the first 2 in. of a soil in which it amounts to 27 per cent. In the alkalis it is practically

54 per cent, or twice as much. The highest percentage of magnesium sulphate in the water-soluble is 24 per cent, found in the first 2 in. of soil, while the average for the 2 samples of alkali is 28 per cent. The decrease of the calcium sulphate from the amount present in the water-soluble to that present in the alkali, is more marked than the increase in the sodium sulphate in the alkali given above. The minimum of the calcium salt found in the water-soluble is 34 per cent, the maximum 67 per cent, while the amounts in these alkalis are 7.5 and 3.3 per cent, respectively. . . .

"The water-soluble in the soil is not identical with ground water solutions, probably due to reactions dependent upon the relative masses, which react upon each other within the soil and during the extraction. The reactions near the surface of the soil are quite different from those more remote. This is indicated by the solutions yielded by samples taken to depths of 2 and 4 in."

The efflorescent alkalis are quite different from the residues left by evaporating bodies of water; such residues seem to be intermediate between those obtained by evaporating ground waters to dryness and the salt brought to the surface by capillarity and separated as efflorescences on the ground."

Other conclusions from the studies reported are as follows:

"The readiness with which the chemical reactions take place and their character, as indicated by the salts present in the ground waters, probably have a direct and important bearing upon the fertility of the soil. The loessial soils of the plains agree with the ordinary prairie soils in the chemical composition of their mass and in the general results of the agricultural analysis, but not in the mechanical analysis.

"The analyses of the whole soil mass and of the different portions of the fine earth suggest important differences between the unchanged rock particles in the soil and the finer portions which have suffered change or are the products of alteration.

"The aggregate amount of soluble salts per acre whose movement is effected by the water falling on or supplied to the surface, or by its evaporation from the surface, is large; we make it 9 tons in one instance. The application of water, irrigation, may carry the soluble salts so deep into the soil that a long time may be reauired for them to come near to the surface again.

"There is in the samples of soil examined both free ammonia and ammoniacal salts, which we interpret as indicating unfavorable biological conditions, which view is materially strengthened by the nitrates in the ground waters.

"There is a significant gain in the total soil nitrogen during the time of the experiment which may have been favored by, but was not dependent upon, the application of manure.

"The nitrates in the first 2 in. of this soil are from 9 times to 200 times as great as in the second 2 in., corroborative of the suggested reduction in certain zones of the soil.

"Air-dried soil samples can be kept for a year or more with ordinary precautions without material change in their nitrogen content.

"The humus in this soil is nearly as abundant as in average Eastern soils, and we were unable to find anything about it markedly different from ordinary humus. It is unlike the humus of arid soils in that it is not so rich in nitrogen as they have been found to be.

"The solutions of the humus carried relatively very large amounts of silicic acid, phosphoric acid, potash, and lime. The precipitated humus did not carry much lime.

"The effect of the cultivation, manuring, etc., for three seasons, may be summed up by stating that the store of plant food in the surface soil, taken to a depth of 10 in., was actually increased. This, however, was the lesser part of the improvement, the greater part lay in the betterment of the general conditions, whose best features can not be shown by chemical analysis or expressed in any formula."

Soil survey around Imperial, Cal., T. H. Means and J. G. Holmes (*U. S. Dept. Agr., Bureau of Soils Circ. 9, pp. 20, figs. 2*).—This is an account of an examination of soil conditions (alkali content and mechanical analysis), usually to a depth of 6 ft., occasionally to a greater depth, over 6 townships in that part of what is known as the Colorado Desert, which is now being irrigated by means of a canal from the Colorado River. The Colorado Desert "is undoubtedly the site of an old inland sea which has long since dried up, leaving a basin, at the bottom of which is the Salton Sink, at a depth of 280 ft. below the present sea level, with a surface heavily incrusted with salts which are mined for domestic purposes. The rim of this basin is composed of soils which have been considerably modified by the occasional overflow of the Colorado River, which runs into this area for a short time every few years."

Five types of soil are described and mapped—namely, dune sand, which covers 27.7 per cent of the area; sand, 1 per cent; sandy loam, 21.9 per cent; loam, 28 per cent; clay, 21.4 per cent. All of these types are "in places excessively alkaline, and even where the surface 6 ft. shows no accumulation, the soil is underlaid by an alkali-bearing clay subsoil." The composition of this alkali is reported to be as follows: Calcium sulphate, 9.91 per cent; magnesium sulphate, 9.02 per cent; sodium sulphate, 0.33 per cent; potassium chlorid, 30.02 per cent; sodium bicarbonate, 9.59 per cent; sodium nitrate, 8.91 per cent, and sodium chlorid 32.22 per cent. The determinations of the alkali at 1 ft. intervals to a depth of 6 ft. in the different borings are reported in detail and the distribution of the alkali in the soil is mapped.

The results of the survey show "that of the 169 square miles surveyed about 51 per cent is either too rough for economical irrigation or contains too high a salt content for any but the most alkali-resistant plants to withstand. The remaining 49 per cent of the area it is believed can be safely cultivated, provided suitable precautions are taken in the use of a proper amount of irrigation water, in the adoption of careful methods of cultivation, and, where necessary, in the installation of underdrainage to carry off the excess of seepage waters and alkali. . . .

"The claims for the fertility of this country are based upon the experience gained from irrigation along the Colorado River below Yuma. An examination of the country reveals the fact that the conditions below Yuma are very different from those in the Imperial area, and the agriculture of the two areas is not comparable. The soils of the bottom lands below Yuma are lighter in texture, more pervious to water, contain less alkali, and are, many of them, well adapted to alfalfa."

Alkali lakes and deposits, W. C. KNIGHT and E. E. SLOSSON (*Wyoming Sta. Bul. 49, pp. 71–123, fig. 1, map 1*).—This bulletin gives a general discussion of the occurrence of alkali deposits in Wyoming, and a special treatise on their chemistry, geology, mineralogy, and origin. As regards the origin of the alkali salts, the conclusion has been reached that "primarily the alkali has been produced by the decomposition of the various rocks containing these elements. These salts appear to have been formed extensively during the Mesozoic and Cenozoic eras, but in place of being stored in deposits were carried down with the sediments. Later through the mountain-making agencies these formations were brought to the surface, and through the influence of decomposition and erosion have been converted into soil. The salts have remained in the soils so formed, since there has not been sufficient water to leach them out. The decomposition of the rocks is still in progress, and from this source and the storage already accumulated in the soils the deposits of alkali have been formed and are being increased."

Eight groups of deposits in the State are described in detail, viz, "Downey, Union Pacific, Rock Creek, Rankin, Bothwell, Morgan, Independence, and Gill. These are all located in the southeastern part of Wyoming, and are confined to Albany, Carbon, and Natrona counties." The chemical composition of only those deposits in which the alkali is of considerable depth and purity, i. e., the so-called "soda lakes," is considered in this bulletin. "The salts found in the soda lakes are the same as those which occur in the soil of the surrounding region and form alkali crusts as they are drawn up from below with the water and left on the surface as this evaporates. Of these salts the most abundant in Wyoming is sodium sulphate." The next in importance is magnesium sulphate. There are also found sodium carbonate and chlorid, as well as other salts in small amounts. A number of original and compiled analyses of samples from the deposits referred to above are reported.

The rise of alkali salts to the soil surface, E. W. HILGARD (*Science, n. ser., 15 (1902), No. 373, pp. 314, 315*).—Accumulations of alkali at and near the surface in California are considered to be largely due to leaky ditches. The difficulty of leaching out alkali is referred to.

The chemical exploration of Belgian soils, A. PETERMANN (*Bul. Agr. [Brussels], 17 (1901), No. 6, pp. 975–1006*).—The results of chemical and physical examination of 15 samples of soil are reported.

Investigations on the physical properties of soils, A. MITSCHERLICH (*Landw. Jahrb., 30 (1901), No. 3, pp. 361–445, charts 4*).—The author briefly describes the principal methods of soil analysis commonly employed in Europe, discussing the physical and chemical properties of soils and other factors of plant growth, and calling attention to the importance of studying the volume and nature of the soil spaces with reference to the water supply rather than the soil particles themselves. In treating the latter subject he distinguishes between the total surface area of the soil, which is defined as the sum of the surface areas of the soil particles, and the surface area of the soil aggregates or *micellæ*. The utilization of the determination of heat evolved when soils are moistened (*Benetzungswärme*) (E. S. R., 10, p. 423) in estimating the volume of space and water capacity, hygroscopicity, capillarity, etc., of soils is explained and tables and curves are given showing the relation between these properties in different kinds of soil, the data being calculated by a formula based on Rodewald's hypothesis.[1] The general physical characteristics, productiveness, and the *Benetzungswärme* of a large number of soils are given, showing a certain relation between the last two properties.

A comparison of the results obtained by different methods of mechanical soil analysis, H. BUCHNER (*Landw. Vers. Stat., 56 (1901), No. 2–3, pp. 141–148*).—The results of a comparison of the Hilgard, Fadejeff-Williams, Kühn, and Meyer methods on very clayey, medium clayey, and sandy soils are reported. The wide differences in the results obtained indicate that the analyses made by these methods are not comparable.

Silting flask and sieves for the mechanical analysis of soils and clays, A. GAWALOWSKI (*Ztschr. Analyt. Chem., 40 (1901), No. 12, pp. 776–781, figs. 2*).—A simple apparatus for the mechanical analysis of soils, etc., by elutriation, and a device consisting of concentric sieves of different degrees of fineness for the quick separation of the different grades of soil particles are described, with results of a comparison of these pieces of apparatus with the Nöbel apparatus.

The temperature of the soil and the surface of the ground, D. A. SEELEY (*Mo. Weather Rev., 29 (1901), No. 11, pp. 501–503*).—Observations with minimum thermometers are reported which show that the temperature on the bare ground was 2.5° lower in a swale than on a hilltop about 15 ft. above; 4.2° lower in a swale without air drainage than in one having good air drainage; 4° lower in clover 2.5 in. high, and 10° lower in grass 6 in. high than on bare ground, the temperature being apparently more dependent upon the height of the plant and its thickness on the ground than on its kind; and 1.5° lower in dark-colored grass on a lawn than on light colored, and 10° lower than on a hard gravel roadbed near by.

"Temperatures taken on dark colored muck, a lighter colored loam, and a very light clay during an afternoon in summer were, respectively, 110°, 101.5°, and 97°. Readings were also taken early the next morning, and the corresponding temperatures were 61.5°, 60°, and 63.5°.

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[1] Ztschr. Physikal. Chem., 33 (1900), p. 593.

"Another important difference in temperature was observed to result from cultivation. Temperatures were taken on soil that had been newly cultivated for seeding and upon soil that had not been worked for several days. Thermometers were placed at the surface of the ground, and at 3, 6, and 12 in. below the surface. These were read at 2.30 p. m. and 2.30 a. m. the following day. The readings are given in the table below:

Temperature of cultivated and uncultivated soil.

	Surface.		3 inches.		6 inches.		12 inches.	
	a. m.	p. m.	a. m.	p. m.	a. m.	p. m.	a. m.	p. m.
	°	°	°	°	°	°	°	°
Cultivated soil	63	108	65	72	65	68	64	61
Uncultivated soil	60	102	64	77	64	68	62	60

"The table shows, first, that the newly cultivated soil was 6° warmer at the surface of the ground than the uncultivated; second, that the temperature 3 in. below the surface was 5.5° higher on the uncultivated soil. These facts show that the newly cultivated soil conducts heat much more slowly than the uncultivated, probably because it is less compact. The amount of evaporation from each is probably about the same for a short time after cultivation, hence this can not be considered as a cause of the difference in temperature. When cultivation is carried on continuously, the surface of the soil is warmer, and the first few inches below the surface cooler, than upon the same soil uncultivated; while at a depth of 6 in. the cultivated soil has the same or a higher temperature than the uncultivated. These are all desirable conditions during the growing season. The warmer surface soil hastens the process of growth in the plant and is a protection against frost. The soil just below the surface being cooler, retards capillarity and thereby retains the soil moisture, while the temperature about the roots of the plant 5 or 6 in. below the surface is the same or a little higher than on the uncultivated soil. The plan of cultivating the soil about growing crops during the afternoon of a day when the conditions are favorable for frost at night is often recommended, and the table shows that there is much to be gained by so doing. The temperature at the surface of the cultivated soil was 3° higher than on the uncultivated at 2.30 a. m., hence the danger of frost was materially lessened. The heat absorbed during the day is held near the surface of the ground in the cultivated soil, instead of being conducted to lower depths, and the air becomes more moist from the rapid evaporation at the surface, which is a condition unfavorable for the occurrence of frost."

On a modification in the method of using the electric thermometer for determining underground temperatures at the Museum of Natural History, H. BECQUEREL (*Compt. Rend. Acad. Sci. Paris, 133* (*1901*), *No. 21, pp. 800–803*).

The soil cover of forests and the rôle of earthworms (*Gaea, 37* (*1901*), *pp. 634, 635*).

FERTILIZERS.

Report on fertilization, C. F. ECKART (*Rept. to Hawaiian Sugar Planters' Assn., 1901, Nov., pp. 45*).—This article summarizes the results of determinations at the Hawaiian Sugar Station of total and available (soluble in aspartic acid) fertilizing constituents in Hawaiian soils, and of the amounts of these constituents lost in the drainage waters, taken up by the sugar cane crop, and returned in the cane refuse (E. S. R., 10, p. 525; 11, p. 507). The total and available fertilizing constituents in the soils of the different islands of Hawaii are given as follows:

Total and available fertilizing constituents in Hawaiian soils.

Island.	Lime.		Potash.		Phosphoric acid.		Nitrogen.
	Total.	Available.	Total.	Available.	Total.	Available.	Total.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Oahu	0.380	0.01568	0.342	0.00256	0.207	0.00012	0.176
Kauai	.418	.01367	.309	.00249	.187	.00013	.227
Maui	.395	.01764	.357	.00312	.270	.00012	.388
Hawaii	.185	.00789	.346	.00156	.513	.00014	.540

It is estimated from analyses reported that a crop of cane producing 5 tons of sugar per acre requires 158.7 lbs. of lime, 509.2 lbs. of potash, 74 lbs. of phosphoric acid, and 164.7 lbs. of nitrogen. On this basis it appears that lime is the only ingredient present in the soil in sufficient quantity for the needs of the crop. Potash and phosphoric acid are much too low.

To determine the relative retentive power for fertilizers and water of the so-called "sandy soils," consisting mainly of fine coral particles, four of these soils "varying in their proportions of lime carbonate from 71.25 per cent to 91.07 per cent were placed in iron pipes 2 ft. 6 in. long and 1 in. in diameter, the pipes being filled to within 6 in. of the top. One gram each of amonium sulphate, nitrate of soda, and muriate of potash were dissolved in a liter of water and 500 cc. of this solution holding ½ gm. each of the salts mentioned were poured upon the soils and allowed to drain through. It was found in regard to the nitrate of soda that practically none was retained by any of the soils, while the other compounds were fixed in an inverse proportion to the lime carbonate content of the medium through which they filtered. . . . When the nitrate is lost from the land through the over-saturation of its soil, not only so much nitrogen is lost, but likewise a large amount of lime. . . .

"To observe the action of nitrate on lime, as well as the relative action of different salts in the same particular, tests were made at the experiment station in connection with other lysimeter investigations. Nitrate of soda, chlorid of potash, ammonium sulphate, and sulphate of potash were applied to the rows of cane growing over the lysimeter drains, and 48 hours later these rows were irrigated with 102 gal. of water, of which quantity 33 gal. leached out and was analyzed," with the following results:

Lime in drainage water of soils receiving different salts.

Drain.	Salt applied.	Lime lost.
		Grams.
No. 1	None	1.72
No. 2	Nitrate of soda	26.52
No. 3	Chlorid of potash	23.49
No. 4	Sulphate of ammonia	5.49
No. 5	Sulphate of potash	2.73

In the experiments with sandy soils in tubes referred to above none of the chlorid or sulphate of potassium was lost in the soil containing the least amount of calcium carbonate, while in the soil containing 91.07 per cent of this substance there was a loss of 65 per cent of the chlorid and 28 per cent of the sulphate. "The absorption of potash by these peculiar soils is influenced chiefly by their content of lime carbonate for several reasons. The higher the percentage of lime carbonate the lower must be that of the double silicates in the respective soils. . . . and these silicates are particularly instrumental in holding potash. . . . On account of the basic nature of Hawaiian soils, and their smaller content of double silicates as compared with American soils, as a rule, potassic fertilizers are much more readily disseminated throughout the soil mass by means of rain or irrigation water."

The methods of fertilizing practiced on the different islands is briefly explained, special attention being given to the use of sodium nitrate, which, when applied in large amounts, "has been observed in many instances to induce an abnormal and undesirable growth, which retarded the ripening of the cane, and resulted in juices of low purity and low sugar content. On the other hand, this selfsame stimulating property has been of the greatest service to yellow and 'nitrogen-hungry' cane, and with the application of small amounts of this material wonderful tonic effects have been produced in an extremely short space of time." It has also proved useful as a means of delaying tasseling.

The value of some city wastes as fertilizers (*Maryland Agr. Col. Quart., 1901, No. 14, pp. 2-6*).—The wastes considered are night soil, garbarge, street sweepings, and ashes. The method of utilizing the contents of Baltimore sinks and cesspools for fertilizing purposes is described, and analyses of 4 samples of the material are reported. "The absence of a sewage system in Baltimore renders necessary the use of sinks and cesspools. When these are filled the contents are pumped out into tank wagons and barrels made especially for the purpose. It is then hauled to the wharf and emptied into covered barges holding from 100 to 200 tons. The barges are towed to various points where reservoirs have been built, into which they are emptied by means of a powerful steam pump. The rule is to locate the receiving reservoirs on a bank at such an elevation that they may be emptied by gravity on merely opening a gate, or, at most, by only elevating the material to a trough near the top of the reservoir. The reservoirs are simply excavations in the ground, the removed earth being used to elevate the edges, and clay from the bottom lining the sides. . . . Each patron of the system has his own receiver and uses the contents when convenient. The contents of the reservoirs are drawn off into tank wagons and distributed on the land before the crop is planted. The material is locally called 'soup,' and its application 'souping.' The ease of application and ready response to this fertilizer cause it to be highly esteemed by those who are using it."

The average composition of the samples examined was as follows: Water, 97.32 per cent; phosphoric acid, 0.07 per cent; potash, 0.13 per cent; and nitrogen, 0.44 per cent. Analyses of street sweepings compiled from a bulletin of the Division of Chemistry of this Department are given and briefly discussed, and the fertilizing value of ashes is referred to.

The bacteria occurring in manure and their rôle in its decomposition, S. SEVERIN (*Centbl. Bakt. u. Par., 2. Abt., 7 (1901), No. 11, pp. 369-386*).—The author here reports a continuation of previous studies (E. S. R., 10, p. 35) on the rapidity with which certain organisms found in manure set free carbon dioxid and ammonia from a mixture of horse manure and urine (150 gm. fresh excrement, 15 gm. straw, 50 cc. urine, and 50 cc. water). The oxidation of the manure was most rapid in fresh manure in the first stages of decomposition, the process being here due almost entirely to aerobic organisms found in the manure at the beginning of the process. After the first stages of decomposition the aerobic organisms remain more or less inactive and the process is continued by anaerobes, the activity of the latter being promoted by conditions which are unfavorable to the activity of the aerobes, such as the covering of the heap with a fresh layer of manure or the accumulation of carbon dioxid in the manure. The evolution of ammonia was as active during the last half of the period of the experiment as during the first. The total amount evolved during 7 months in the 265 gm. of manure mixture referred to above was 0.0424 gm. The activity of the different organisms in this respect was very variable.

Experiments with precipitated calcium phosphate, II. G. SÖDERBAUM (*K. Landt. Akad. Handl. Tidskr., 40 (1901), No. 2, pp. 109-121*).—The author conducted pot experiments with Probsteier oats under different systems of fertilization, for the purpose of determining the value of precipitated calcic phosphate prepared electrolytically from apatite, as compared with Thomas slag and superphosphate. The phosphate, the method of manufacture of which was invented by the Swedish chemists Wiborgh and Palmaer, forms a pure white light powder without crystalline structure. Chemical analysis showed its composition to be as follows: Hygroscopic moisture, water, fluorin, etc., loss on ignition, carbon dioxid, 12.15 per cent; phosphoric acid, 35.73 per cent; lime, 48.83 per cent; soda, 1.57 per cent; insoluble residue, 1.71 per cent.

By treating 1 gm. of the phosphate with 200 cc. 2 per cent citrate solution at 17.5° C. for 30 minutes in a rotary apparatus and determining the phosphoric-acid content of the clear filtrate, a citrate solubility of 90.96 per cent of the total phosphoric-acid content was found, thus showing a great similarity to bone meal. In a sample of steamed bone meal treated by the same method of analysis 94.76 per cent of the phosphoric acid was soluble in citrate solution. The chemical analysis of the phosphate also shows it to stand near bone meal, as it is essentially a tricalcium orthophosphate.

The pot experiments were conducted with a poor sandy soil of the kind previously used at this station in the experiments with Wiborgh phosphate (E. S. R., 10, p. 32), giving up on treatment with hot hydrochloric acid of 1.15 sp. gr. only 0.044 per cent phosphoric acid, 0.037 per cent potash, and 0.404 per cent lime. In addition to small quantities of finely-powdered marble, sodium chlorid, sulphate of magnesia, sulphate of potash (at the rate of 300 kg. potash per hectare), and nitrate of soda (at the rate of 100 kg. nitrogen per hectare), phosphates were added in three series, in the form of precipitated calcium phosphate, Thomas slag, and superphosphate, at the rate of 100, 150, and 200 kg. of citrate-soluble phosphoric acid per hectare in each case. The yields of oats obtained in these trials compared with those obtained without application of phosphoric acid (this being equal 100) are shown below:

Comparative yields of oats with different phosphates.

	Relative yield of oats with—		
Phosphoric acid applied per hectare.	Precipitated phosphate.	Thomas slag.	Superphosphate.
Kilograms.			
None.	100.0	100.0	100.0
100	111.1	401.7	417.2
150	138.9	411.7	401.7
200	107.2	432.2	417.2

In earlier comparative fertilizer experiments with bone meal and Thomas phosphate, conducted under similar conditions,[1] bone meal gave the following relative yields, when applied at the rate of 100, 150, and 200 kg. per hectare (no phosphoric acid=100): 101, 142, and 172, and Thomas slag, 427, 500, and 542. The new precipitated phosphate is therefore more like bone meal in its action than Thomas slag, and according to our present limited knowledge may be considered of approximately the same value as bone meal.—F. W. WOLL.

Comparative experiments with nitrogenous fertilizers, C. PFLAUMER (*Wchnbl. Landw. Ver. Bayern, 1901, pp. 398, 434, 437, 489; abs. in Centbl. Agr. Chem., 31 (1902), No. 1, pp. 3, 4*).

Refuse molasses solutions as a fertilizer, BARTOS (*Oesterr.-Ungar. Ztschr. Zuckerind. u. Landw., 30 (1901), p. 754*).

Phosphate rock, E. W. PARKER (*Mineral Resources of the United States. Dept. Interior, U. S. Geol. Survey, 1900, pp. 803–814*).—The production of phosphate in the United States during 1900 was 1,491,216 long tons against 1,515,702 tons in 1899, a

[1] K. Landt. Akad. Handl. Tidskr., 1892, p. 302.

decrease of 24,486 tons. "Notwithstanding this decrease in production, the total value of the product increased from $5,084,076 to $5,359,248, a gain of $275,172." There was a marked decrease in production in Florida and South Carolina and a slight increase in Tennessee. "In Florida the decreased production was in the output of hard rock and river pebble, there being an increase of about 44,000 tons in the production of land pebble. This increase in the production of land pebble was not sufficient, however, to overcome the decreases in the other two grades of rock. There has been no production of soft rock reported from Florida since 1897. In South Carolina the production of land rock increased from 223,949 long tons in 1899 to 266,186 long tons in 1900, while the production of river rock fell off 50 per cent—from 132,701 long tons in 1899 to 62,987 long tons in 1900. Tennessee's production increased from 430,192 long tons to 454,491 long tons. No production was reported from North Carolina in 1900, and the output in Pennsylvania decreased from 2,000 tons in 1899 to 900 tons in 1900. Two States, Alabama and Arkansas, each reported a small production of phosphate rock in 1900, the former having an output of 344 tons and the latter an output of 75 tons. These amounts are insignificant, and of interest only as indicating a possibility of further developments."

Gypsum, E. W. PARKER (*Mineral Resources of the United States. Dept. Interior, U. S. Geol. Survey, 1900, pp. 827–833*).—The production of gypsum has increased steadily since 1896. In 1900 it amounted to 594,462 short tons, valued at $1,627,203, as against 486,235 tons worth $1,287,080 in 1899.

The use of commercial fertilizers, P. WAGNER (*Anwendung künstlicher Düngemittel. Berlin: Paul Parey, 1901, 2 ed., pp. 172*).

Analyses of commercial fertilizers, J. HAMILTON and W. FREAR (*Pennsylvania Dept. Agr. Bul. 83, pp. 132*).—A report on fertilizer inspection in the State, including analyses of samples collected from January 1 to August 1, 1901.

Phosphates and fertilizers, E. WILLIS (*News and Courier [Charleston], 1901, Sept. 30, p. 5*).—Statistics of the production, domestic consumption, and export of phosphates and fertilizers for the United States during the year ended August 31, 1901.

FIELD CROPS.

Results obtained in 1901 from trial plats of grain, fodder corn, field roots, and potatoes, W. SAUNDERS (*Canada Cent. Expt. Farm Bul. 39, pp. 56*).—Cooperative variety tests in continuation of those previously reported (E. S. R., 13, p. 34) are recorded. The method of conducting the tests has been uniform throughout the seven years the work has now been in progress. The yields of each crop at the various experimental farms are tabulated. The varieties producing the largest crops in 1901, taking the average results obtained on all the experimental farms, were as follows:

Oats.—Lincoln, Abundance, Improved American, Wide Awake, American Triumph, Danish Island, American Beauty, Banner, Holstein Prolific, Mennonite, Early Maine, and Golden Beauty. Average yield per acre, 82 bu. 3 lbs. *Two-rowed barley.*—Standwell, French Chevalier, Nepean, Beaver, Canadian Thorpe, and Logan. Average yield per acre, 45 bu. 12 lbs. *Six-rowed barley.*—Mansbury, Odessa, Claude, Mansfield, Excelsior, and Royal. Average yield per acre, 50 bu. 30 lbs. *Spring wheat.*—Roumanian, Huron, Goose, Stanley, Hastings, Preston, Hungarian, Clyde, Australian No. 13, Speltz, Countess, and Red Fife. Average yield per acre, 39 bu. 20 lbs. *Peas.*—Gregory, Pride, Paragon, New Potter, Arthur, Nelson, Agnes, Crown, Early Britain, King, Picton, and Victoria. Average yield per acre, 43 bu. 36 lbs. *Indian corn.*—Early Mastodon, Rural, Thoro'bred, White Flint, Selected Leaming, Salzer All Gold, Pride of the North, and Cloud Early Yellow. Average yield per acre, 20 tons 330 lbs. *Turnips.*—Hartley Bronze, Hall Westbury, Imperial Swede, Carter

Elephant, Prize Purple Top, and Sutton Champion. Average yield per acre, 35 tons 365 lbs. *Mangels.*—Half Long Sugar White, Giant Yellow Globe, Giant Yellow Intermediate, Yellow Intermediate, Norbiton Giant, and Mammoth Yellow Intermediate. Average yield per acre, 31 tons 720 lbs. *Carrots.*—Half Long White, New White Intermediate, Giant White Vosges, Ontario Champion, Mammoth White Intermediate, and Improved Short White. Average yield per acre, 25 tons 357 lbs. *Sugar beets.*—Red Top Sugar, Danish Red Top, Improved Imperial, and Royal Giant. Average yield per acre, 25 tons 894 lbs. *Potatoes.*—Sabean Elephant, Burnaby Seedling, Uncle Sam, Late Puritan, I. X. L., Hale Champion, Money Maker, Clay Rose, Dreer Standard, Holborn Abundance, Carman No. 1, and American Giant. Average yield per acre, 496 bu. 1 lb.

The average results of the various crops for the last 4 to 7 years are also reported. The following varieties, taking the average of the results obtained on all the experimental farms, have given the best yields.

Oats.—Banner, American Beauty, Mennonite, Holstein Prolific, Bavarian, Buckbee Illinois, Golden Beauty, Columbus, Golden Giant, Early Golden Prolific, Abundance, and American Triumph. Average yield per acre, 72 bu. 24 lbs. *Two-rowed barley.*—French Chevalier, Beaver, Danish Chevalier, Canadian Thorpe, Nepean, and Newton. Average yield per acre, 43 bu. 27 lbs. *Six-rowed barley.*—Mansbury, Odessa, Trooper, Common, Royal, and Oderbruch. Average yield per acre, 47 bu. 34 lbs. *Spring wheat.*—Preston, Wellman Fife, Monarch, Goose, Huron, Red Fife, White Fife, Hungarian, White Connell, White Russian, Rio Grande, and Pringle Champlain. Average yield per acre, 32 bu. 36 lbs. *Peas.*—Crown, Pride, Carleton, Early Britain, King, New Potter, Paragon, Duke, Perth, Agnes, Archer, and Arthur. Average yield per acre, 34 bu. 41 lbs. *Indian corn.*—Cloud Early Yellow, Red Cob Ensilage, Rural Thoro'bred White Flint, Selected Leaming, Early Butler, and Giant Prolific Ensilage. Average yield per acre, 18 tons 1,655 lbs. *Turnips.*—Purple Top Swede, Perfection Swede, Halewood Bronze Top, Hall Westbury, Hartley Bronze, Bangholm Selected. Average yield per acre, 30 tons 853 lbs. *Mangels.*—Yellow Intermediate, Giant Yellow Intermediate, Gate Post, Selected Mammoth Long Red, Mammoth Yellow Intermediate, and Giant Yellow Half Long. Average yield per acre, 30 tons 1,771 lbs. *Carrots.*—Half Long White, Giant White Vosges, Improved Short White, Mammoth White Intermediate, Iverson Champion, and Green Top White Orthe. Average yield per acre, 20 tons 1,840 lbs. *Sugar beets.*—Danish Red Top, Red Top Sugar, Danish Improved, and Improved Imperial. Average yield per acre, 23 tons 1,075 lbs. *Potatoes.*—Seedling No. 230, Everett, Seedling No. 7, Irish Daisy, American Wonder, American Giant, Late Puritan, Carman No. 1, Carman No. 3, Rose No. 9, Seattle, and Empire State. Average yield per acre, 376 bu. 34 lbs.

In summarizing the results, the author calls attention to the importance of selecting the best and most productive varieties as demonstrated by these tests.

Report of the agriculturist, J. D. TOWAR (*Michigan Sta. Rpt. 1901, pp. 101–109*).—The results of a fertilizer experiment with sugar beets conducted under the supervision of the agriculturist by a private party showed that the use of fertilizers decidedly increased the yields. Nitrogen seemed to be most needed, followed closely by potash. Applications of lime slightly increased the yield. The sugar content of the beets was only 10.7 per cent. A general report is given on growing sugar beets on muck land, but no definite conclusions are drawn. The results obtained on the College farm indicate that wood ashes, barnyard manure, and upland soil are the best applications for the improvement of muck soils. Applications of lime were indifferent in all muck experiments.

Variety tests with wheat are reviewed. All varieties grown were injured by the Hessian fly. Dawson Golden Chaff, Poole, Jones Square Head, Gold Coin, and Early Genesee Giant gave the best results, yielding 32.73, 32.33, 32.25, 30.75, and 30.50

bu. per acre, respectively. Sowing wheat October 1 gave best results as compared with other dates. Of 7 varieties of oats, Big Four yielded 67.70 bu. per acre, the highest yield by weight. By measure the yield amounted to 63.72 bu. Hot-water treatment for the prevention of smut in oats seemed to have been effective.

Fall sowing of winter or sand vetch (*Vicia villosa*) was practiced with success. The vetch sown alone or in a mixture with wheat on light sandy and sandy loam soils gave satisfactory yields. Sand lucern (*Medicago media*) is described and the results of culture tests are reported. A plat of sand lucern was pastured with sheep and the results led to the conclusion that this crop furnishes abundant pasture, and that pasturing is not injurious to the plant. On another plat a total of 12,310 lbs. of cured hay per acre were obtained in four cuttings this season. In 1901 this same plat had yielded 4,265 lbs. of cured hay per acre by June 15. These results were obtained on a light sandy soil.

The experiments undertaken with barley, hops, clover, and sugar beets as well as a test of Alinit are briefly mentioned but no results are reported.

Winter cereals and legumes, A. M. Soule and P. O. Vanatter (*Tennessee Sta. Bul., Vol. XIV, No. 3, pp. 19, figs. 7*).—The results of an experiment in seed selection with winter barley showed an average increase of 10.6 bu. per acre obtained by the use of large grains for seed as compared with small grains. In connection with making the selection of seed it was found that in the material at hand the large heads contained on an average 53.8 grains, the medium heads 33.2, and the small heads 25.5. It required 753 grains from large heads to weigh an ounce, and 876 from small heads. A test of seeding winter barley at different dates resulted in a yield of 30.4 bu. per acre from the seeding of September 17, and of only 8.8 bu. from the seeding made November 15. Intertillage experiments with this crop indicated that sowing in narrow rows without subsequent cultivation is the most satisfactory method.

Winter barley and Fulcaster wheat grown on good soil yielded 71.1 and 44.58 bu. per acre, respectively. On poor soil the respective yields were 27.1 and 37 bu. per acre.

Among a number of varieties of winter oats Culberson was the most productive and also the earliest, ripening fully 2 weeks before any other variety. The highest yield produced by this variety was 73.7 bu. per acre. It is described as a fine, strong, thrifty grower, standing up well and producing a well-filled grain of superior quality. A seeding made October 3 matured earlier and gave better returns than seedings made later. Of 3 varieties of winter rye, Twentieth Century gave the best returns, the total weight of crop being 8,170 lbs. per acre and the yield of grain 42.5 bu. Seeding October 4 gave much better results than seeding October 25. The yields of 3 winter cereals, wheat, barley, and rye, are compared. The rye produced the heaviest total crop, 7,218 lbs. per acre.

Hairy vetch as a winter crop, grown singly, yielded 7.68 tons of green forage, or 1.85 tons of cured hay per acre. When grown with barley the yield of cured hay per acre was 3.28 tons, with wheat 3.72 tons, and with oats 1.60 tons. The experience of the station is that it combines well with oats, wheat, and barley for pasture and hay, and that it is in general of easy cultivation.

The amounts of digestible nutrients per ton of the different kinds of hay are tabulated. The cost of making a ton of hay from the different crops varied from $4.73 with wheat to $10.65 with oats and vetch. The value and expediency of growing winter cereals and legumes for hay making and pasturage is dwelt upon throughout the bulletin.

Soil improvement and forage experiments, R. L. Bennett (*Arkansas Sta. Bul. 68, pp. 51–60, fig. 1*).—Corn and cowpeas were grown on a number of plats, and when the corn was ripe the ears were harvested, and then steers fed on cotton seed were grazed on the remainder of the crop. On corresponding plats a crop of corn was cut and the stover removed from the soil. The following year cotton, corn, and oats were grown on these different plats for the purpose of determining the benefits to the soil resulting from these methods. The plats grazed by the steers produced 626.5 lbs. more seed cotton, 14 bu. more corn, and 1,188 lbs. more oat hay per acre than the rest of the plats. "The profit from the grazing paid the cost of the cowpea seed and of planting them, also the cost of the cotton seed, and a good profit besides. The manure from the cotton seed and cowpeas was therefore furnished free to the soil." In another test cotton grown 2 years in succession after peanuts, chufas, and soy beans grazed by pigs was compared with cotton following a corn crop which was cut and the stover removed. The yields in both years were in favor of the plats which had been grazed.

A comparative test of corn, cowpeas, and Spanish peanuts resulted in yields of 1,863, 3,040, and 4,460 lbs., respectively, of thoroughly dry fodder per acre. The value of these different crops for forage and soil improvement is discussed.

The relative merits for forage purposes of crops with different drought-resisting qualities were studied. Sorghum, Kafir corn, and Indian corn compared in this test yielded 7,012, 5,412, and 2,835 lbs., respectively, of dry fodder per acre. The advantages of the different crops for forage are outlined, and the method of harvesting them by means of corn binders and shredders is described.

Wheat, hairy vetch, Virginia Winter Gray oats, crimson clover, and winter vetch were tested as winter crops for soil covering and early hay. The wheat and crimson clover were cut May 25, and the other crops June 5. Wheat produced the largest yield of hay, 2,340 lbs. per acre, and crimson clover the smallest, yielding only 945 lbs.

A broken and unbroken seed bed for corn and cotton were compared. In one case the crops were simply listed on an unplowed ridge of cowpea stubble, and in the other they were planted with a planter on the same kind of land, but well prepared with the plow and harrow. The well-prepared plats yielded 4.7 bu. more corn and 268.8 lbs. more cotton per acre than the unbroken plats.

Report on certain economic experiments conducted in connection with the botanic station, Antigua, F. Watts and W. N. Sands (*Barbados: Imp. Dept. Agr. West Indies, 1901, pp. 14*).—Variety tests with millet, corn, leguminous crops, including velvet beans, cowpeas, soy beans, sweet potatoes, yams, cassava, tanniers and eddoes, castor beans, sesame, and cotton are briefly reported.

Green crops for winter fodder, P. Quirk (*Agr. Gaz. New South Wales, 12 (1901), No. 7, pp. 784–786*).—Notes on the culture of sorghum, corn, barley and vetches, oats and rape, and millet for green forage for winter feeding.

Substitutes for clover (*Wallaces' Farmer, 26 (1901), No. 40, p. 1138*).—A note on the uses of alfalfa, cowpeas, soy beans, and vetches as substitutes for clover.

Broadcasting and drilling grain, Bachmann (*Landw. Wchnbl. Schleswig-Holstein, 51 (1901), No. 38, p. 567*).—A brief report on a comparative test of sowing rye broadcast and in drills. The results were largely in favor of drilling. Hoeing the drilled crop twice during the season gave very profitable returns.

Contributions to the Alinit question, C. Schulze (*Landw. Jahrb., 30 (1901), No. 3, pp. 319–360*).—This article reviews the experiments made with Alinit by different investigators, discusses the growth of Alinit bacteria in nitrogen-free media as shown by various experimenters, and reports the results of laboratory, pot, and field experiments in 1898 and 1899. In discussing the laboratory work, the author briefly describes the apparatus employed and the process of disinfecting the grains used for seed. The effects on the germination of disinfecting the grains of wheat and barley with corrosive sublimate solutions and alcohol are given in a table. The results of the different experiments showed that the application of Alinit in no case had produced an appreciable increase in the yield of the cereals grown in connection with the tests, and that the claims of Stoklasa that the addition to the soil of suitable carbohydrate substances such as xylose and dextrose insure the effectiveness of

Alinit can not be confirmed. Chemical analyses of the solutions and soils which had produced plants subsequent to inoculation with Alinit did not reveal an increased nitrogen fixation or assimilation.

The effect of secondary growth on the chemical composition of chicory roots, E. Carpiaux (*Bul. Inst. Chim. et Bact. Gembloux, 1901, No. 70, pp. 17–21*).—Chicory roots were studied 2 years in succession to determine the effect of secondary growth on the chemical composition of their reserve material. The results of analyses are shown in tables. The figures obtained show that 20.6 per cent of the inulin of the root was used in the production of the second growth. It is stated that levulose resulting from the saccharification of the inulin is formed in the roots in sufficient quantity for the requirements of the plant before growth begins. The quantity of potash used in the growth of the sprouts was greater than of any other mineral element. This fact is considered as evidence that potash is a transporting agent of the carbohydrates in the plant organism.

The albuminoid and nonalbuminoid nitrogenous substances in the root diminished appreciably during the growth of the sprouts. It is further stated that the nitrogenous matters do not undergo an appreciable modification during the growth of the sprouts and that they are transported from the root to the young growth without any transformation of the amid bodies into albumin. The new growth was found to have drawn only slightly on the reserve of phosphoric acid. The lime content of the root increased to an appreciable extent during the activity of the growing portion, and this is explained as due to the lime taken up from the soil by the root for the purpose of neutralizing the organic acids formed during the hydrolysis of the inulin.

Corn culture, R. J. Redding (*Georgia Sta. Bul. 55, pp. 97–118*).—This work is a continuation of previously reported experiments (E. S. R., 13, p. 39). Meteorological data for the years 1890 to 1901 are tabulated. Among 17 varieties of corn tested in 1901, Marlboro, Cocke Prolific, Sanders Improved, Gedding Improved, Bradberry Improved, and Tennessee Yellow, given in the order of their productiveness, yielded from 20.69 to 27.38 bu. of shelled corn per acre. All other varieties yielded less than 20 bu. per acre, Shaw Improved ranking last with a yield of 14.32 bu. The average yield for all varieties was 19.73 bu.

It was observed that the varieties producing the largest ears were not necessarily the most productive. In this test Marlboro, Cocke Prolific, and Sanders were the earliest varieties. In a special test of 4 early varieties, Hickory King gave the highest yield, followed by Weekley Improved, Blount Prolific, and Golden Dent in the order given. The yields for these varieties ranged from 22.74 to 30.46 bu. of shelled corn per acre, with an average of 27.49 bu. Hickory King required the smallest weight of ear corn, 63.8 lbs. to shell a bushel. The difference in the yields obtained in the 2 tests is considered as possibly due to the closer planting of the 4 early varieties. A comparison of several methods of harvesting showed that the greatest value of total product was obtained on the plats where the leaves were harvested August 8, and the stalks cut when dry and shredded. The differences in the yield of shelled corn for the various series of plats was in all cases less than 1 bu.

Applying 672 lbs. of fertilizer per acre broadcast produced only 2.95 bu. more than half this quantity applied in the drill. This increase was produced at a cost of $1.08 per bu. From the results of this and previous tests, the author infers that heavy applications should be applied broadcast in view of probable droughts, and applications of less than 300 or 400 lbs. should be made in the drills.

As in previous years, nitrate of soda, cotton-seed meal, and dried blood were compared as sources of nitrogen. The results this season were in favor of nitrate of soda, but the differences in the yields were inconsiderable. Even in the general average for 4 seasons the dried-blood plats yielded only 0.15 bu. more than the nitrate plats, and these only 0.91 bu. more than the cotton-seed meal plats. "For all practical purposes it may be safely concluded that the corn plant has no preference as to the source of the nitrogen, as between nitrate of soda, cotton-meal and dried blood." Fertilizer formulas for corn on different Georgia soils are given.

Planting corn in the water furrow as compared with planting on the bed did not prove advantageous, due, to a large extent, to a heavy rainfall shortly after planting. Deep planting gave slightly better yields than shallow planting, although the weather conditions were unfavorable to this method. A test of thorough and ordinary soil preparation is reported. Ordinary preparation consisted in plowing under on February 14 a catch crop of rye after cotton to the depth of 6 in., and harrowing the soil; while for thorough preparation the soil was again plowed 10 in. deep and harrowed on March 14. The results showed an increase of only 1.10 bu. per acre in favor of thorough preparation. In a tillage test cultivating thrice in succession every 3 weeks, twice every 2 weeks, and once every week, resulted in yields of 32.65, 31.25, and 32.55 bu. of shelled corn per acre, respectively. From a number of 2-eared stalks both ears were used for seed to determine the influence of position of the ears on the stalks on the progeny. The plats planted with seed from the lower ears produced the larger number of ears, and, therefore, the larger proportion of 2-eared stalks. The yield of these plats was 0.85 bu. per acre greater than the yield of the plats planted with seed from the upper ears.

Effects of renewing the humus in continuous corn culture, W. C. Latta (*Indiana Sta. Rpt. 1901, pp. 22–25*).—An experiment in restoring humus was conducted on soil which had its humus supply reduced by growing corn and entirely removing the crop for 10 successive years. The methods of restoring humus to the soil consisted in (1) passing the corn stover through a feed cutter and returning it to the soil at the time of plowing, (2) applying wheat straw equal in weight to the stover produced, and (3) sowing crimson clover in the fall, to be turned under the following spring. The results obtained on the different plats from 1894 to 1900, inclusive, are given in tables. Taking the yields obtained on the plats during the 3 years preceding these experiments as a base, the stover, wheat straw, and crimson clover increased the production of grain during the last 3 years of this test by 39.78, 18.19, and 17.92 per cent, respectively, as compared with the yields of the check plats.

Corn culture, G. d'Utra (*Bol. Agr. São Paulo, 2. ser., 1901, No. 5, pp. 298–303*).—A report on culture and fertilizer experiments with corn.

Fertilizers for corn, C. Giner (*Abono del maiz. Valencia: La Agricultura Española, 1900, pp. 28*).—A brief treatise on corn culture, with a report on fertilizer experiments.

Cotton and cotton oil, D. A. Tompkins (*Charlotte, N. C.: Author, 1901, pp. 500, figs. 100*).—This work treats of the planting, cultivation, harvesting, and marketing of cotton; the organization, construction, and operation of cotton-seed oil mills, and the uses of cotton seed in cattle feeding and soil fertilization.

Cowpea experiments, C. L. Newman (*Arkansas Sta. Bul. 70, pp. 85–123, figs. 2*).—This bulletin contains a discussion on the value and importance of cowpeas and a report on a number of experiments in their culture.

Fourteen varieties were grown for 2 and 3 years in succession, and their yearly and average yields are given in a table. The average yields for 1899, 1900, and 1901 were 12.58, 22.84, and 29.53 bu. per acre. New Era produced the largest average crop of peas, 39.95 bu. per acre, and Lady the largest average yield of hay, 4,919 lbs. per acre. The proportion between peas and hay varied from 22.4 lbs. to 128.2 lbs. of peas to 100 lbs. of hay in Red Ripper and Old Man, respectively. The proportion of hay to total weight of the dry plant ranged from 36.62 to 76.49 per cent and of peas to the entire pods from 65.6 to 75.6 per cent.

The results of sowing at different rates show that 12½ lbs. of seed per acre gave heavier yields of hay and peas than 18¾ lbs. or more. The author recommends 10 to 20 lbs. of seed per acre for peas and 30 to 60 lbs. for hay, ensilage, pasturage, or green manuring. Heavy seeding gives a greater proportion of hay and light seeding a greater proportion of peas and a heavier total yield. In 1900 and 1901 cowpeas were planted the first week in May, June, July, and August. The results for the May and June plantings were practically the same, and the July plantings gave 5.15 bu. of peas and 448 lbs. of hay per acre less than the plats planted in June. Less than one-half the quantity of hay and less than one-third the yield of peas produced by the early plantings was obtained from the crop planted in August.

A number of experiments were made to test the value of the cowpea for soil improvement. Cowpeas were drilled and broadcasted between the rows of corn at the time of the last cultivation. The best yield of peas and hay was obtained from the drilled seed. The cowpeas had no appreciable effect on the corn crop growing at the time, but the next year's crop was increased by 3.2 bu. per acre. The results of experiments showing the fertilizing effects of plowing under cowpea stubble or cowpea vines upon crops of wheat and oats, and the yield and value of cowpeas and other crops planted after oats were harvested, are republished from former bulletins (E. S. R., 12, p. 1034; 13, p. 545). The value of cowpea culture for eradicating weeds, such as nut grass and Johnson grass, is briefly discussed.

Breeding flax, W. M. Hays (*Farm Students' Rev., 6 (1901), No. 6, pp. 85, 86, fig. 1*).

Hemp (Cannabis sativa), a practical treatise on the culture of hemp for seed and fiber, with a sketch of the history and nature of the hemp plant, S. S. Boyce (*New York: Orange Judd Co., 1900, pp. 112, figs. 13*).

Assimilation in the oat plant as affected by different conditions of soil moisture and fertilization, L. Langer and B. Tollens (*Jour. Landw., 49 (1901), No. 3, pp. 209–229; abs. in Deut. Landw. Presse, 28 (1901), No. 82, pp. 688, 689, figs. 3*).—For the purpose of experiments here reported oats were grown in 36 pots divided into 9 groups of 4 pots each, receiving the elements of plant food in different combinations, with the exception of the check group, which received no fertilizing elements. Nitrogen and phosphoric acid were supplied at the rate of 1 gm. per pot, in the form of nitrate of soda and calcium phosphate, respectively, and potash was given in the form of potassium carbonate, the quantity being 1 gm. calculated as potassium oxid. Lime was furnished in the form of marl, supplying 2.652 gm. of calcium oxid per pot, and magnesia was given as magnesium sulphate in solution, the quantity being 0.5 gm. of the sulphate per pot. In each group the plants from 2 of the pots were harvested when the grain was in the milk stage, and from the remaining 2 when it was fully ripe. As regards plant food, the pots in each group were treated alike. Each pot contained 15.475 gm. of dry soil, having a water-holding capacity of 22.8 per cent. In 2 pots of each group the quantity of water in the soil from April 15 to May 15 was brought down from 59.43 and 47.19 per cent of saturation; from this time until the 5th of June it remained stationary, and then was held at 53.29 per cent until the plants were harvested. The soil in the other 2 pots of each group contained from the 15th to the 26th of April about 59.43 per cent of the quantity of water held at complete saturation, and from this time until harvest, 83.90 per cent. The results are given in tables and discussed.

The increase in the water content of the soil caused an increase in the plant substance, affecting the quantity of grain as well as the quantity of straw and chaff. The percentage of phosphoric acid in the grain, straw, and chaff was increased by an increase in soil moisture, while the percentage of nitrogen was decreased. The quantity of potash in the plants was subject to greater fluctuations than the quantity of phosphoric acid. An application of phosphoric acid alone, when no nitrogen had been given, increased the yield of grain, straw, and chaff in the pots which had received the larger quantity of water. The percentage of potash in these same parts of the plant increased with the moisture supplied to the soil, but only when this element was present in considerable quantity; otherwise the percentage of potash in the plant was lowered. A surplus of lime in the soil in connection with a high-water content increased the production of straw and chaff, but decreased the yield of grain. The percentage of lime in the plant was highest where the quantity of potash in the soil was high, and lowest where it was low. The quantities of nitrogen, potash, and phosphoric acid removed from the soil by the plants were increased by increasing the soil moisture. It was further shown that the amount of soil moisture has a marked influence on the development of the roots, for an increase in soil moisture favored root development, while a decrease retarded it. The percentage of phosphoric acid in the roots seemed to increase with the water content of the soil, but the percentage of nitrogen decreased. Heinrich's conclusions that the lack of plant food is indicated by the roots were confirmed in general by the results of these experiments. The authors also state that the conditions of soil fertility may be determined in some cases as well or even better by the analyses of the oat plants grown than by an analysis of the soil itself. In these experiments, owing to the difference in weight of the plants harvested, the percentage of phosphoric acid was the highest in the plants which had received no phosphoric acid in the fertilizer.

The potato crop, O. M. Morris (*Oklahoma Sta. Bul. 52, pp. 1-14*).—A general discussion on commercial potato growing, including notes on planting, cultivation, harvesting, and storing is given, and the results of experiments in different lines are briefly reported. The yields of 37 varieties tested in 1900 and 1901 are given in a table. The first year Early Six Weeks headed the list with a yield of 213 bu. per acre, and the second year Early Fortune, with a yield of 111 bu.

The results of several experiments at the station confirmed the opinion of practical growers in that region that the land should be plowed in the fall before the potatoes are planted in the spring. It was further observed at the station that potatoes planted March 14 came up as early and matured as early as potatoes planted February 27. Comparisons of yields from cultivated and mulched plats were largely in favor of the mulched plats. Of a number of methods of keeping potatoes, mulching with straw and leaving them in the soil till fall, proved most effective. In tests made of this method the losses due to decay were nearly 5 per cent in one instance and about 15 per cent in another.

Culture of the potato in field experiments at Grignon in 1900, P. P. Dehérain (*Ann. Agron., 27 (1901), No. 2, pp. 90-94*).—In 1900, 3 varieties of potatoes, Richter Imperator, Prof. Maercker, and Peach Blow, were grown after different crops and received different fertilizer applications. Entire tubers and sets were used for seed. The detailed results are shown in a table. Richter Imperator yielded 21,500 kg., Prof. Maercker, 19,300 kg., and Peach Blow, 18,400 kg. of tubers per hectare. The starch content of the tubers of Richter Imperator was 22.6 per cent; of Prof. Maercker, 25.6 per cent; and of Peach Blow, 18.8 per cent, with a total yield of 5,758, 5,438, and 4,902 kg. of starch per hectare, respectively.

Old potatoes made new (*Florida Agr., 28 (1901), No. 37, p. 607*).—Description of a California process of renovating old potatoes so that they have the appearance of new potatoes.

The international ramie congress, Paris, 1900 (*Congrès international de la ramie, Paris, 1900. Paris: Bureaux de la Revue Cultures Coloniales, 1901, pp. 107, figs. 14*).—This publication contains the proceedings of the international ramie congress held in Paris at the Exposition of 1900. The culture, preparation, and utilization of ramie are discussed. The preface to the proceedings is written by M. Cornu, president of the congress.

Rice growing in the Logan district and its preparation for market, F. W. Peek (*Queensland Agr. Jour., 9 (1901), No. 2, pp. 231-238, pls. 4, fig. 1*).—This article is a general discussion on the culture of rice and its preparation for market. The prospects of the rice industry in Queensland are considered.

Rice culture, G. D'UTRA (*Bol. Agr. São Paulo, 2. ser., 1901, No. 5, pp. 281–291*).—A report on culture experiments with several varieties of rice.

The rice industry in Queensland, F. W. PEEK (*Queensland Agr. Jour., 9 (1901), No. 4, pp. 414, 415*).—This article discusses the soil and climatic conditions of Queensland in their relation to rice culture.

Saltbushes, R. W. PEACOCK (*Agr. Gaz. New South Wales, 12 (1901), No. 7, pp. 791–793*).—General notes on the culture of saltbushes, with brief descriptions of several species.

The sugar beet in Indiana, H. A. HUSTON (*Indiana Sta. Rpt. 1901, pp. 89–106*).—This report summarizes the sugar-beet tests in Indiana from 1888 to 1900. The conditions necessary for the success of a beet-sugar factory and the requirements for the profitable culture of the sugar beet are discussed. Meteorological data for different sections of the State are tabulated, and the average sugar content and purity of the samples grown in different countries are given, with brief comments on the results.

Chemical changes in the composition of the sugar beet during the period of ripening, K. ANDRLIK (*Vestnik III Sjezdu Ceske. Prir. Lék Praze, 1901, p. 310; abs. in Chem. Ztg., 25 (1901), No. 70, 256*).—The variations in the sugars and other organic substances and the ash constituents during the ripening period of the sugar beet are shown in tables.

The growth of the German sugar industry from 1850 to 1900, E. O. VON LIPPMANN (*Die Entwickelung der deutschen Zuckerindustrie von 1850 bis 1900. Leipsic: Hesse & Becker, 1900, pp. 341*).—A treatise published on the occasion of the fiftieth anniversary of the German Association for Sugar Industry.

Work of the Hawaiian [Sugar Planters'] Experiment Station, R. E. BLOUIN (*Honolulu: Hawaiian Gazette Co., 1901, pp. 25*).—Fertilizer, culture, and irrigation experiments are reported. Fertilizers were applied in different quantities and various combinations to a rattoon crop of Lahaina and Rose Bamboo varieties of sugar cane. The quantity of nitrogen used varied from 179 to 227 lbs. per acre, and the phosphoric acid from 145 to 194 lbs. The quantity of potash was kept constant at 255 lbs. per acre. One-third of the fertilizer application was applied at each of 3 different times, July 26 and October 10, 1899, and March 29, 1900. The highest average yields of sugar were obtained from the use of nitrogen and potash. The lowest average yield was produced by the unfertilized plats. Similar results were obtained the year before with a crop of plant cane. Taking the results with each variety of cane separately, the Rose Bamboo plant which received nitrogen and phosphoric acid gave the highest yield in weight of cane and amount of sugar. Nitrogen and potash applied together in this case gave next to the lowest yield. With Lahaina cane the nitrogen and potash gave the highest yield, both in weight of cane and sugar. Where these elements were used singly they produced but a small increase, but in combination the results were very pronounced.

Cane trash used as a fertilizer increased the yield of both cane and sugar. A test was also made of planting cane in rows 4, 5, 6, and 8 ft. apart, with the result that the plat with the rows 5 ft. apart produced about 4 tons of sugar more per acre than any other plat, followed by the 4, 6, and 8 ft. rows in the order given. The 5 ft. rows also gave a juice of higher purity than any of the other plats.

Irrigation experiments were carried on with special attention to the time of applying the water and the quantity used. Water was applied at the rate of 1, 2, and 3 in. per week, 2 in. every 2 weeks, and 3 in. every 3 weeks. The results were decidedly in favor of applying 2 in. of water weekly. The application of 2 in. every 2 weeks produced a good yield of cane, but with a markedly low sugar content which brought the yield of sugar below that of other plats receiving the same amount of water. The results indicate that the intervals between irrigation should not be more than one week.

The results of experiments in previous years are compared with this season's results, and the treatment of the rattoon and the plant crops considered separately. It is shown that the amount of water used ranges from 93.5 in. for the crop of 1897–98 to 283.46 in., the maximum amount used for the crop of 1899–1900. In the rattoon crop of this season 75.2 gal. of water were required to produce 1 lb. of sugar. This was the maximum sugar production from a limited supply of water, but it was shown that the use of over 5,500,000 gal. per acre, which represent 101 gal. per pound of sugar produced, was much more profitable.

Distance and fertilizer experiments with sugar cane, J. D. KOBUS (*Meded. Proefstat. Oost Java, 3. ser., 1901, No. 28, pp. 23*).—The experiments here reported were cooperative. The results of the distance experiments showed that on heavy soils rows 3½ ft. apart produced the largest yield and the highest percentage of sugar. Four ft. between rows gave nearly as good results, but 3 or 4½ ft. were distinctly less satisfactory distances. On light soil the influence of distance was less marked but the results were again in favor of 3½ ft. between rows.

The fertilizer tests confirmed previous results in indicating sulphate of ammonia to be the most advantageous source of nitrogen for sugar cane. A test was also made with superphosphate and potash on lands not subject to flooding and hence not supplied with these substances by sediment. The tabulated results show that the use of fertilizers improved the quality of the cane and increased the yield by 40 per cent.—H. M. PIETERS.

Cane-sugar industry of Australia, W. MAXWELL (*Brisbane, 1901, pp. 16*).—This publication is a report upon some factors relating to the cane-sugar industry of the country, and deals mainly with labor and factory problems.

Proceedings of the sugar cane and cassava convention held at Brunswick, Ga., April 9, 1901 (*Atlanta: Foote & Davies Co., 1901, pp. 48*).

The sunflower, A. FRIEDRICH (*Die Sonnenblume. Leipsic: W. Friedrich, 1900, pp. 19*).

Studies on the culture and biology of tobacco, C. J. KONING (*Der Tabak; Studien über seine Kultur und Biologie. Leipsic: W. Engelmann; Amsterdam: J. H. & G. Van Heteran, 1900, pp. 86, figs. 15*).

The production of tobacco in Italy from 1890 to 1899 (*Rappresentazione grafica della produzione del tabacco in Italia, 1890–1899. Rome: Ministry of Finance, pls. 19*).—This is a series of plates illustrating graphically the tobacco production of Italy for the years 1890 to 1899, inclusive.

Wheat culture, I. GIGLIOLI (*Ann. Regia Scuola Superiore Agr. Portici, 2. ser., 1901, No. 2, pp. 159*).—This publication presents the results of culture and fertilizer experiments with wheat on the experiment field of the agricultural school at Portici.

Studies and researches on the wheat grain, and a process of sterilizing and bleaching cereals and their flours, E. FRICHOT (*Études et recherches sur le grain de blé, suivies d'un procédé de stérilisation et de blanchiment des céréales et de leurs farines. Dreux: Author, 1899, pp. 235, figs. 24*).

HORTICULTURE.

Cyclopedia of American horticulture, L. H. BAILEY (*New York: The Macmillan Co., 1900–1902, vol. 1, A–D, pp. XXII + 510, pls. 9, figs. 743; vol. 2, E–M, pp. XIV + 511–1054, pls. 10–19, figs. 744–1453; vol. 3, N–Q, pp. XV + 1055–1486, pls. 20–30, figs. 1454–2059; vol. 4, R–Z, pp. XXX + 1487–2016, pls. 31–50, figs. 2060–2800*).—This cyclopedia, recently completed, presents the status of American horticulture at the close of the nineteenth century. There have been many publications in this country on particular phases of horticulture, and in 1881 Henderson's one-volume cyclopediac work entitled Handbook of Plants and General Horticulture appeared, but the present work is the first and only publication to treat exhaustively of American horticulture in its entirety as it exists to-day. The matter included in the work deals with the culture of fruits, shrubs, flowers, and vegetables; with all plant species known to be in the horticultural trade in North America or that are mentioned prominently in horticultural writings of other countries; with the possibilities of horticulture in the different States, Territories, and provinces; and gives the biographies of men who have contributed most to the horticultural development of North America. All general subjects related to horticulture, like insects, spraying, landscape gardening, manures, soils, etc., are also treated. All the plant species cultivated horticulturally in this country, from Alaska to Florida, are compared, contrasted, and described; and whenever the genera consist of several species they have been classified and keys given. Brief notes are also given on the more important farm crops and such economic plants as cinchona and India rubber. Forage and medicinal plants are noted only incidentally. Special attention has been paid to tropical fruits and vegetables. The word horticulture has been interpreted broadly.

All prominent subjects in the cyclopedia have been written up from different standpoints, usually 2 or more authors contributing who represent different sections of the country and different climatic and cultural conditions. These articles are signed by the authors, thus giving credit and fixing responsibility. More than 450 persons, including the more prominent botanists, horticulturists, and specialists in the country have contributed to the cyclopedia. There are 4,357 separate articles, and 2,255 genera are described, including 8,793 species. The total number of plant names accounted for is 24,434. The articles are fresh. They are written from the standpoint of the growing plants. In general, the broader spirit of the outdoor commercial plant culture, which is the dominating characteristic of American horticulture, has been clearly presented. References to the prominent literature on the different subjects are cited freely. A cut is seen wherever the book is opened; most of these are new.

The cyclopedia marks an epoch in the horticultural literature of this country. The author hopes it may never be revised but be supplemented with annual volumes of the same size pages as the cyclopedia, which will record the progress made each year. These volumes are promised if there is sufficient demand for them. The manuscript for the first 2 is already prepared.

In the making of this cyclopedia the author has had associated with him Dr. Wilhelm Miller, who has had particular charge of indexes, trade lists, bibliographical matter, and the editing of manuscripts.

Gardening for the South, or how to grow fruits and vegetables, W. N. WHITE, revised by P. H. MELL (*Richmond: B. F. Johnson, 1901, pp. 683, pls. 20, figs. 280*).—This is a revised and enlarged edition of this work on Southern gardening, which was first issued in 1856. The second edition was issued in 1868. This makes the third edition. It purports to take into account the changes and development along horticultural lines during the last 30 years, bringing the work up to present ideas and methods. Recommendations of the experiment stations and the results secured in experiment-station work are seen throughout the book. In its revised form it will undoubtedly take a prominent place in the literature of Southern gardening.

Some portions of the work might profitably have been revised more thoroughly. The statements allowed to stand that squashes, melons, cucumbers, and pumpkins readily cross and contaminate each other when planted together, when considered in the light of the crossing experiments made with cucurbits at the New York Cornell, Iowa, and Nebraska experiment stations (E. S. R., 2, p. 509; 4, p. 726; 12, p. 449), need modification. The old exaggerated idea of the value of common salt as a fertilizer for different vegetables and fruits is frequently seen throughout the work, as evidenced by the following statement: "From the analysis of the stones, bark, leaves, and wood, it is evident that common salt is one of the most essential manures to apply to the soil in which the plum is cultivated." In the revision of plums, the valuable work of Waugh and other station investigators with this fruit seems not to have been taken into account.

Gardening for beginners, a handbook to the garden, E. T. Cook (*London: George Newnes Ltd., 1901, pp. VII + 496, pls. 89, figs. 80*).—More than half this elementary garden book is devoted to the description and culture of flowers and shrubs. Different chapters deal with the flowers most suited for different purposes, as the mixed border, annuals, climbing plants, bulbous plants, roses, ferns, rock gardens, etc. The care and management of the small greenhouse and conservatory, and of the flowers and plants that grow in them are considered; methods of fruit growing, including orchard fruits, grapes, and small fruits, are described at some length, and directions given for the culture of all the more common vegetables. Chapters on manures and soils, insects and fungus pests, town gardening, monthly work, etc., are also given. A compact gardening chart of useful information completes the work. The book is profusely illustrated. It is particularly adapted to English gardening, and in America to the use of flower growers.

Report of the horticulturist, L. R. Taft (*Michigan Sta. Rpt. 1901, pp. 110–115*).—This is an outline of the work of the central station and South Haven Substation for the year. The best early crops of tomatoes were secured by pruning to single stems and training to stakes. Oats seeded alone as an orchard-cover crop grew 15 to 18 in. high. They held snow and leaves well during the winter, lessened the freezing and thawing of the soil, and also prevented the soil from freezing to as great a depth as on uncovered soils. The lessening of the injury from frost is considered one of the most vitally important results to be secured with orchard-cover crops. Where oats were used as a cover crop the ground in the spring was practically free from weeds and remained moist considerably longer than where other crops were used. The oats were easily worked in with a disk harrow, and it is estimated that the cost of cultivating the orchard when oats were used was fully one-third less than when crimson clover was sown. Rape and turnips used as cover crops, while fairly satisfactory, were unsightly during the winter and gave off an offensive odor. Crimson clover seeded with oats was less satisfactory than either sown alone. Cankerworms and the tent caterpillar were controlled in the orchard by spraying with Paris green and white arsenic boiled with lime.

Use of commercial fertilizers in vegetable growing, J. Aeby (*Cong. Nat. Agr. Namur, 1901, Sec. 2, pp. 15, pls. 4*).—The results are here given of some cooperative experiments at 10 different horticultural schools and institutions in Belgium in the use of nitrate of soda, superphosphate, and sulphate of potash, for growing 16 of the more common garden vegetables. In each experiment 1 plat was used as a control, 1 received all 3 fertilizers combined, and on 3 plats 1 of the elements of a complete fertilizer was omitted. The plats were duplicated in another series, except that like amounts of barnyard manure were used on each plat in connection with the commercial fertilizers. Each plat occupied an area of 10 meters square. The results secured with the different vegetables are tabulated and the good effects of supplementing barnyard manure with commercial fertilizers shown in a series of illustrations. The best yields were obtained when a complete commercial fertilizer was used with barnyard manure. Where the barnyard manure was used alone, not nearly so good results were obtained, but they were about equal to the yields secured when commercial fertilizers were used alone. Both exceed considerably the yield on the control plat. It is concluded that in order to obtain the largest yield of vegetables chemical fertilizers should be employed simultaneously with barnyard manure.

The service of soils, F. A. Huntley (*Idaho Sta. Bul. 30, pp. 39–51, pl. 1, figs. 3*).—Sugar beets, parsnips, and onions were grown on fertilized and unfertilized soil and the results here recorded were obtained during the third and fourth seasons following the application of barnyard manure on the fertilized plats. The chemical analyses of the soil from the fertilized and unfertilized plats are reported. The results with sugar beets showed but little difference in the richness of the beets in favor of the unfertilized plats. Where parsnips were grown on unmanured soil the growth of the plants almost ceased during the driest part of the season, owing to the cracking of the soil along the line of the row, while on the manured plats well supplied with humus the soil did not crack and the plants continued to grow. Experiments with onions indicated that a well-manured soil, early planting, and good cultivation produce a bulb typical of the variety, while a poor soil and late planting tend to produce bulbs poor in quality and of undesirable forms. Irrigation increased the yield in 2 out of 3 instances over 100 bu. per acre. A general note on tomato culture concludes the bulletin

Some muskmelon experiments, E. Walker (*Arkansas Sta. Bul. 69, pp. 63–80*).—Herewith are reported the detailed experiments and results of transplanting muskmelons, the different methods of manuring the crop, and a test of various cultural methods and of varieties. The results secured along these various lines with muskmelons at other stations are given throughout the work and the methods of growers generally noted, thus making the bulletin quite a complete guide as regards muskmelon culture.

In the transplanting test, 6 seeds were sown April 18 in 5-in. pots and these placed in frames. The plants were thinned from time to time and transplanted to the open field May 13, and 2 plants finally left in each hill. On the same day that the plants were set in the field seed of the same varieties was also sown in hills, thus making the difference between the dates of sowing the seed for transplanting and seeding in the open field 25 days. Three hills of each variety were used for the transplanted melons, 2 of which in each case were manured with a couple of shovelfuls of well-rotted manure, and the third left unmanured. With the field-planted melons, only 2 hills were used for each variety and but one manured.

The transplanted manured melons on the whole averaged 20.82 days earlier than the manured field-planted melons. The transplanted nonmanured melons averaged 8.88 days earlier than the manured field-planted melons. It required 90 days from the time the seed of the transplanted melons was sown until the first fruits on the manured plats were gathered, and 85.6 days from seed sowing to the first gathering of the crop in the case of the field-planted seed, thus showing that transplanting had no hastening but rather a retarding effect on the period of growth of the melons. In every instance with the transplanted plants, manuring increased the earliness of the crop and on the average about 12 days.

In these tests, while the earliness of the crop was hastened, the greatest number of melons per hill and the largest melons were obtained from the field-sown seed. Thus, the unmanured transplanted plants averaged 5.21 melons per hill, weighing 24.11 oz. each, the manured transplanted plants 7.11 melons per hill, weighing 20.88 oz. each; and the field-grown plants 8.43 melons per hill, weighing 31.1 oz. each.

The earliest melons grown were Golden Netted Gem, Rockyford, Emerald Gem, Paul Rose, and Jersey Belle. These vines matured on the average in 82.57 days, whether transplanted or field grown. The first 4 matured fruit by July 11. Emerald Gem and Paul Rose are considered less desirable shipping sorts than the others.

In the fertilizer experiment 37 plants of 8 hills each were used and 34 different varieties grown. Thoroughly mixed well-rotted barnyard manure was used. Two hills in each plat had the manure applied in a circular trench, leaving a worked space of soil in the center of the hill 18 in. across and free from manure. Two had the manure applied on the surface and well worked into the soil. With 2 others a hole spade-deep was dug and manure placed in the bottom to within 4 in. of the surface and covered 4 to 5 in. with soil. Two other hills were left unmanured. The data obtained are summarized in the following table:

Effect of different methods of manuring muskmelons.

Method of manuring.	Time to maturity.	Average number of fruits per hill.	Average weight of fruits.
	Days.		*Ounces.*
Manure in circular trench	95.35	7.92	32.97
Manure well worked into the soil	85.60	8.22	29.63
Manure placed under the hill	89.62	7.27	30.00
Unmanured	103.11	5.33	32.54

The table shows that the earliest melons and the largest number per hill were obtained when the manure was applied to the surface of the ground and well worked into the soil. This method of manuring is also the most feasible for commercial growing, since, instead of hills, continuously manured furrows 8 to 10 ft. apart can be used and the manure thoroughly worked into the soil with a bull-tongue or single-shovel plow passing back and forth. The furrows should finally be thrown into a low, broad ridge with a light plow and thoroughly dragged and harrowed. Melons can be planted on this ridge about 18 in. apart in the row. Placing the manure in circular trenches or underneath the hills is too expensive except for limited areas.

The necessity of warm, light sandy soil for commercial muskmelon growing and the use of vegetable nitrogenous manures are pointed out by the author, and citations given from various writers on muskmelon growing to substantiate these views.

For commercial purposes netted melons are most in demand. The smooth-skinned, green-rind types are considered undesirable for culture in the region of the station on account of their greater liability to sun scald. Productiveness, firmness, high quality, uniformity in size, attractive appearance, and keeping quality are the points necessary to consider in good shipping melons. The following melons are considered best for shipment: Golden Netted Gem, Rockyford, New Jersey Improved Button Strain of Extra Early Jenny Lind, Early Netted Gem. For local market the varieties Early Hackensack, Emerald Gem, Paul Rose, Kinsman Queen, Montreal Green Nutmeg, Bay View, and New Orleans Market are considered preferable.

Additional notes are given on harvesting and shipping melons.

Indoor tomato culture with chemical fertilizers, W. STUART (*Indiana Sta. Rpt. 1901, pp. 26–50, pl. 1*).—A study was made with chemical fertilizers to determine the particular element or elements of plant food necessary to the development of a maximum crop of fruit. The crop was grown in both benches and pots indoors. Subwatering was practiced in both cases and a black loam soil of medium fertility used. The phosphoric fertilizers used were mixed with the soil before setting the plants; other fertilizers were either lightly stirred into the surface soil or applied in solution by the subwatering method. The Stone, Lorillard, and Sutton Best of All varieties were used. The plants were trained to a single stem and the blossoms pollenized by jarring the flowers over a piece of glass $2\frac{1}{2}$ by 5 in., and touching the stigmas to the pollen collected on it or by transferring the pollen by means of a camel's-hair brush to the stigmas.

In the bench experiments the 3 essential fertilizer elements were used alone and combined in 2's and 3's. The average product obtained in 3 years on an area of $3\frac{3}{4}$ by $4\frac{2}{3}$ ft., when no fertilizers were used, was 18 lbs.; when nitrate of soda was used, $21\frac{3}{4}$ lbs.; nitrate of soda and acid phosphate, $27\frac{5}{16}$ lbs.; nitrate of soda, acid phosphate, and muriate of potash, $29\frac{1}{4}$ lbs.; and acid phosphate and muriate of potash, 21 lbs.

In the pot experiments the addition of nitrate of soda increased the yield 16 per cent over the control pot; nitrate of soda and muriate of potash, 35 per cent; nitrate of soda and acid phosphate, 70 per cent; and nitrate of soda, muriate of potash, and acid phosphate, 325 per cent. When raw bone meal was substituted for acid phosphate, the increase over the controls for 2 seasons averaged 345 per cent. When sulphate was substituted for muriate of potash, the yields were slightly decreased. The addition of raw bone meal alone increased the yield over the checks 32 per cent, or was nearly as effective as a combination of nitrate of soda and muriate of potash.

In these experiments the average yield per square foot of bench space with complete fertilizers was 3.4, 3.1, and 3 lbs. for the first, second, and third crops respectively, and 2.6, 2.9, and 3.2 lbs. for the first, second, and third years' crops, respectively, in pots.

In a study of the relation of the percentages of small fruits to the chemical fertilizers applied, it was found that in all instances save one the greatest percentage of small fruits occurred on the control plats, and in general it is stated that the proportion of small fruits decreased according to the completeness of plant food supplied.

The Stone variety proved more desirable in cloudy weather than the Lorillard, owing to its maturing more pollen than the Lorillard. It was used in later experiments in preference to that variety. In a comparison of Stone with Sutton Best of All, the yield on a certain area was 178 fruits, averaging 4 oz. in weight each for the Stone variety, as compared with 238 fruits of but 3 oz. each of Sutton Best of All. The total weight of the product, however, was about the same in both cases. The Stone is a rougher fruit than the Sutton Best of All, and for pot experiments the latter is believed to be the more satisfactory of the two.

In a test of surface *vs.* subwatering there was 6.5 per cent increase in yield of fruit in favor of subwatering.

Forcing dwarf tomatoes under glass, F. W. RANE (*New Hampshire Sta. Bul. 84, pp. 59–68, figs. 2*).—The purpose of this bulletin is to emphasize the value of dwarf varieties of tomatoes for forcing. The methods of growing dwarf tomatoes under glass and the yields obtained with 3 varieties are recorded. Seed was sown in the greenhouse September 27 and the plants transplanted and kept in pots until December 27, when they were set 18 in. apart each way in beds in the forcing house. They were pruned to single stems and trained to stakes. Although dwarf varieties, under this treatment they grew to the height of the house—7 ft. or more. Dwarf tomatoes are shorter jointed and produce fruit clusters much closer together on the stem than the taller growing or standard sorts. They also grow slower and therefore do not reach the glass as quickly, thus prolonging the period of fruit production. Hand pollination was practiced by taking the corolla from the flower as soon as it began to lose its bright yellow color, cutting it along one side, and turning it inside out, thus exposing the pollen, which was readily dusted on the stamens. This method of pollination does away with the necessity of a receptacle to catch the pollen. One blossom was sufficient to pollinate a number of flowers. The size and yield of the fruits obtained with the 3 dwarf varieties used in this test are shown in the table below.

Yield of dwarf tomatoes under glass.

Variety.	Average number fruits per plant.	Average weight fruit per plant.	Average weight of individual fruits.	Weight of fruit to May 1.	Weight of fruit from May 1 to June 15.	Total weight to July 15.
		Pounds.	*Ounces.*	*Lbs. oz.*	*Lbs. oz.*	*Lbs. oz.*
Dwarf Champion	$28\frac{1}{3}$	5.4	3.0	34 9	50 7	98 0
Golden Dwarf Champion	$19\frac{7}{9}$	4.3	3.5	11 7	34 6	80 0
Lacross Seedling	$26\frac{3}{11}$	5.6	3.4	31 4	45 12	124 6

The results secured in this test are compared with results secured in tests with tall-growing or standard tomatoes at the Maine station (E. S. R., 7, p. 863), and the number of fruits per plant and the weight of the product per plant are shown to be about double those secured with the tall-growing or standard varieties. It is noted, however, that the dwarf varieties had $2\frac{1}{4}$ sq. ft. of soil-surface space each, while with the tall-growing sorts the range was from $1\frac{1}{2}$ to 2 sq. ft.

Aleyrodes, or "white flies," were present to some extent during the test, and it is predicted that they might be very destructive if allowed to become well established early in the season.

From these tests the conclusions are drawn that dwarf tomatoes mature fully as early and bear longer than tall-growing or standard sorts, and that where the tall sorts like the Lorillard can be produced profitably the dwarf tomatoes under like conditions will bear more, area for area, and be more profitable.

Variety tests of cabbage, O. M. MORRIS (*Oklahoma Sta. Bul. 52, pp. 15, 16*).—Tabulated data are given for the yields of 35 varieties of cabbage for the 2 seasons of 1890 and 1891, with brief descriptive notes on some of the more important varieties.

Some points on fruit culture, C. B. WALDRON (*North Dakota Sta. Bul. 49, pp. 23, figs. 7*).—Fruit conditions in North Dakota differ from those in the eastern United States in the winters being colder, the growing season shorter, and the rainfall less. These conditions necessitate different cultural methods. Instead of stopping cultivation of the orchard in August to ripen up wood, as is done in the East, it should be continued much longer during the season, in order to retain the moisture in the soil. Mulching the trees in late fall to maintain moisture during the winter has been found to be of the greatest importance. South slopes for orchards, where the sun is hot and the drying process active, must be avoided. It is stated that only one species of plum (*Prunus americana*) can be grown at present with any success in the State. For general cultivation De Soto, Forest Garden, Weaver, Cheney, Wolf, Rolling Stone, and Wyant are recommended. Directions are given for the culture of plums, apples, currants, gooseberries, raspberries, and strawberries. Currants and gooseberries are quite successfully grown. Raspberries require winter protection, and should be bent over in the fall and covered with manure. The strong drying winds of early spring are a serious drawback to the culture of strawberries, and it is thought that these may be successfully cultivated with the protection of windbreaks.

Apple growing in Addison County, F. A. WAUGH and M. B. CUMMINGS (*Vermont Sta. Bul. 90, pp. 31–36, figs. 3*).—A farm-to-farm canvass of the orchardists of Addison County was made, and data secured as to the number of fruit trees, yield of fruit, cultural methods employed, etc. Addison County produces more apples than any other county in the State. The number of bearing trees approximated 26,500. The crop in 1900 was 30,660 bbls. and in 1901 it was 10,870 bbls. Methods of apple culture observed throughout the county were found to be rather slack. Out of 42 representative apple growers whose orchards were personally examined, only 8 practiced any cultivation of the soil. The remainder grew their orchards in grass. Ten out of the 42 growers used some fertilizers on their orchards, but only 2 or 3 in adequate amount. Only 4 sprayed their orchards. Five or 6 orchards were protected in a measure by windbreaks, but the windbreaks were there accidentally and not by design. A very large number of varieties of apples were found to be grown throughout the county.

The authors offer many suggestions regarding improved methods of apple growing. Proper cultivation "consists of plowing the land early in the spring and in following this with a surface cultivation with spring-tooth or cutaway harrow every 10 days till July 1. By that time the wood is done growing and cultivation should be stopped. Then a cover crop of clover, 8 lbs. to the acre, or of peas, 2 bu. to the acre, or of buckwheat, 1 bu. to the acre, should be sown. The cover crop holds its place untouched till the following spring, when it is turned under at the annual plowing."

Annual applications of good barnyard manure at the rate of 20 loads per acre are advised. Where barnyard manure is not available an application of 400 lbs. each of ground bone, acid phosphate and muriate of potash per acre is recommended for full bearing orchards. The varieties Baldwin, Rhode Island Greening, Northern Spy, Ben Davis, and Fameuse are especially recommended for market purposes. Where an orchard is made up of a large number of varieties it is recommended that these should be grafted over with 3 or 4 of the better sorts.

Apple growing on grassy hillsides (*Rural New Yorker, 60 (1901), No. 2702, pp. 753, 754*).—An account is given of the successful culture of apples on hillsides near Syracuse, N. Y. The trees are grown in sod and no cultivation given. With this method of treatment 11-year-old trees were found bearing 15 to 18 bu. of fruit, and apple trees bearing paying crops at 6 years from setting. The first 10 years the trees are mulched with the hay cut between and around the trees; after that the grass is allowed to lie where cut. The trees are headed low, 18 to 24 in. from the ground. No pruning is practiced. The advantages of this method of culture are briefly summed up as follows: Early bearing, easy picking, easy spraying, easy to fumigate if necessary, high color, annual crops on young trees, a short fall for the fruit upon a mulch, almost all windfalls salable as picked apples, less labor and attention.

Plum culture, F. A. Waugh (*Vermont Sta. Bul. 89, pp. 19–28, figs. 5*).—In this bulletin the author has summarized his extensive investigations with plums as applied to the cultural practices, varieties, etc., best suited for Vermont. Practically all portions of the State are suited to plum culture. Strong 1-year-old trees are satisfactory, but 2-year-old trees are generally advised, especially of Domesticas and Damsons. Spring setting is generally recommended, and trees should be set 15 ft. apart each way, with the exception of Burbank, which should have 20 ft. or more. When the trees come from the nursery the loose and broken roots should be cut off, the top pruned to a straight whip, and the whip cut back to a height of 2 or 3 ft. The first year 4 to 6 of the side branches, which come out and are well distributed around the trunk, are preserved, while the remainder are removed. The tips of these branches are cut back late in August or the first of September to stop growth and harden them up. All water sprouts are removed. The second spring the branches should be cut back to a length of 6 to 18 in., the pruning being closest with the weaker trees. From 1 to 3 new branches are allowed to grow on each primary branch. The third year the trees should bear a moderate crop. The orchard should be thoroughly cultivated by plowing the soil between the trees every spring and keeping it thoroughly cultivated until the middle of summer and then sowing to some cover crop or allowing weeds to grow. A moderate amount of barnyard manure should be applied every other year, and wood ashes used on soils deficient in lime. The work of the station has shown that it is absolutely essential, in order to secure good crops of plums, to mix 2 or 3 varieties in the orchard. Most plums are self-sterile to their own pollen, and in order to secure pollination of the blossoms and a set of fruit this mixing of varieties is necessary. Black knot should be cut out of the orchard as soon as it appears. Brown rot or ripe rot of the fruit can be controlled by spraying. For shipment to distant markets the 6-basket carrier is recommended. For market purposes Burbank, Abundance, Red June, Lombard, Bradshaw, and Chabot are recommended for planting in the Champlain and lower Connecticut valleys. For the colder portions of the State Stoddard, Hawkeye, Smith, De Soto, American Eagle, Cheney, and Surprise are recommended.

Prunes and prune culture in Western Europe, with special reference to existing conditions in the Pacific Northwest, E. R. Lake (*U. S. Dept. Agr., Division of Pomology Bul. 10, pp. 23, pls. 10*).—Some 50,000 acres of prune orchards are now under cultivation in the States of Oregon, Idaho, and Washington. About 20 per cent of the trees belong to the Agen (California, Petite, or French) variety, while the remainder are largely Italian prunes.

With a view to ascertaining whether there were any European varieties possessing better qualities than the Italian, and adapted for culture in the Northwest, a study was made of the prune industry of France, Germany, and Austria. The report covers European varieties and methods of culture, evaporating, utilizing, and marketing prunes. The following table, showing the chemical composition of French and Oregon prunes, is appended:

Composition of evaporated prunes grown in France and Oregon.

Variety.	Country.	Number per pound.	Flesh.	Pits.	Moisture.	Ash.	Acid as sulphuric.	Reducing sugar.	Cane sugar.	Total sugar.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*		*P. ct.*	*P. ct.*	*P. ct.*
Agen	France	65–70	84.7	15.3	27.92	1.65	0.99	35.73	1.69	37.32
Agen	France	50	87.8	12.2	25.14	1.75	.56	38.25	3.31	41.56
Agen	Oregon	128	78.0	22.0	25.78	2.35	1.51	33.28	1.87	35.15
Italian *a*	Oregon	38	84.8	15.2	27.24	1.95	1.51	32.54	Not determined.	
Italian *b*	Oregon	38	87.6	12.4	26.46	1.88	1.20	30.83	2.32	33.15
Willamette	Oregon	21	88.3	11.7	25.96	2.06	1.66	34.00	1.18	35.18

a Steamed, and packed hot. *b* Not steamed.

In general, Europeans give much less attention to the culture of their prune trees than is observed on the Pacific coast. The trees are mixed with other fruits and crops, planted along roadsides and in isolated patches. Only in Bohemia do large orchards of 20 acres or more occur. All the prunes in France, Germany, and Austria are grown on plum stock instead of the peach, as is common in the Northwest. St. Julien is the usual stock. The universal European practice is to head plum trees high so that some crop may be grown underneath. The leading plums of France are the Agen and Mirabelle; of Germany, the common German prune, Mirabelle, and Italian; and of Austria, the common German prune. The Italian seems to be grown only to a limited extent in any place.

The Mirabelle type is held in high esteem in France and is believed to be worthy of more attention by Pacific coast growers. With the exception of the Reine-Claude type, which is grown for consumption in both the fresh and conserved state, the Mirabelle is the type receiving most attention by French growers. It is dried and canned and used in preserves, jams, and jellies, and distilled to make plum brandy.

Europeans prefer prunes preserved in jars, cans, or bottles to the evaporated product, and there is a steadily growing demand for pitted prunes, especially of the larger sorts like the Italian. As in America, there is a large quantity of second-grade fruit unfit for drying. Nine-tenths of this low grade fruit is distilled and put upon the market as "Prunelle" or "Quetsche" liquors (plum brandy). This low grade of fruit also enters into jams, jellies, marmalades, and fruit butters, either alone or mixed with other fruits.

The European methods of marketing are described. The plan of having large factories rather than small evaporators is favored by the European dealers. A more uniform grade and better use of the crop can be made at less cost. An objection to the prune product of the Northwest is that it is not uniform in size, quality, or pack. The use of better packages and cleaner methods of handling are advocated. One feature in which European plum growers excel American commercial growers is in the better provisions made for utilizing all the inferior fruit, and the preparation of various secondary products, as noted above.

The fig: Its history, culture, and curing; with a descriptive catalogue of the known varieties of figs, G. Eisen (*U. S. Dept. Agr., Division of Pomology Bul. 9, pp. 317, pls. 15, figs. 93*).—This is an exhaustive account of the fig. The history of this fruit in various Old World countries is traced from the earliest times, and an account given of its introduction and cultural development in America. Methods of fig culture and commerce now observed in Smyrna and Asia Minor, Greece, Northern Africa, Italy, Portugal, Spain, France, England, Southern United States, Mexico, and California are given in detail. Methods of caprification are explained at length; the necessity of this practice with some varieties, especially Smyrna varieties, pointed out, and the life history of *Blastophaga grossorum* explained. Different chapters are devoted to climatic conditions under which figs will thrive, methods of fig propagation, planting the orchard, pruning, irrigation, diseases and insect injuries, drying and curing, packing, shipping fresh figs, and describing figs. All the known varieties of figs, including Smyrna and caprifigs, are catalogued alphabetically and briefly described, synonyms being noted and illustrations given of some varieties. Following this are chapters on the chemical analysis of a large number of fig soils and food analysis of figs, statistics on the production and importation of figs, together with tables of temperature, precipitation, and humidity in the principal fig regions of the world; and household recipes for preparing and using figs. The bulletin closes with a bibliography consisting of 173 references to fig literature.

The fig in Australia (*Queensland Agr. Jour., 9 (1901), No. 4, pp. 405, 406*).—The writer states that a few trees of the Smyrna fig have been planted in Australia, two of which at least have borne fruit. Relative to the caprification of Smyrna figs the article states as follows:

"The blastophaga being so minute, it is impossible for it to carry sufficient pollen into the fig to cause fertilization. Its entrance simply causes decay or premature ripening, such as a grub will do when it has entered a pear or apple, producing decay by its own death. The custom of caprification is fast becoming a thing of the past. According to the investigations of modern science, it is proved to be not only unnecessary but positively injurious to the fig. May not the cause of figs falling off the trees before they reach the stage of maturity be improper kinds, unsuitable localities, and, last but not least, the absence of knowledge of proper and judicious pruning? And the cause of not placing them upon the markets equally as good as those imported is the want of knowledge and experience as to their proper treatment during the process of drying."

Notes on fig drying, C. H. Gorman (*Agr. Gaz. New South Wales, 12 (1901), No. 3, pp. 367–369; abst. in California Fruit Grower, 26 (1901), No. 676, p. 3*).—The experience of the author in drying figs in New South Wales is recorded. The figs are cut from the trees and placed on trays similar to raisin trays as soon as the figs begin to milk and show small white seams. They are dried in the sun and turned every day like raisins. The crop is considered sufficiently dry when the figs have the same appearance in the morning as in the evening. Should they show a swelled appearance in the morning they require further drying. They must not, however, be over dried, as this gives them a cooked and earthy taste which can not be removed and which greatly injures their value. It requires from 5 to 12 days to dry the figs, according to the weather. After the figs are dry they may be dumped in sweat boxes, but it is desirable to pack as soon as possible. Before packing, the figs are dipped in a kettle or tub of boiling water in which has been dissolved coarse rock salt. Sea water may be used if available. About 3 big handfuls of rock salt per gallon is considered enough. Immediately after dipping the figs are thumbed, working the eye of the fig downward and the stalk upward, to give the appearance of Smyrna figs as packed in 1 lb. boxes.

Grafting with summer shoots, K. Fetisch (*Deut. Landw. Presse, 28 (1901), No. 68, pp. 584, 585*).—The author states that the general opinion that grafting is suited only for spring operations and that budding must be practiced in summer instead, needs qualification. In his own experience summer-grafted trees have not only united well, but have produced an especially good growth the following season. Apples and pears are especially suited to summer grafting, but good results have also been obtained with stone fruits, more particularly Mirabelle and Reine-Claude plums. Caution is advised in summer grafting apricots and peaches. These do not succeed well. Summer grafting often enables a better distribution of time than spring grafting, when all farm work is pressing. In summer grafting, the scions should be taken from good healthy wood, preferably the under portion of the summer's growth. Any of the usual methods of grafting may be practiced. As soon as the scion is cut it should be wrapped in moist cloth to prevent the bark from drying out. All the leaves should be removed from the scion as in budding. Usually no more leaves will be put out during the season. August is considered the best time for summer grafting. Earlier grafting is not recommended, since the hot weather of July is apt to seriously injure the young grafts and force new growth, which seldom ripens up before winter sets in, and is almost certain to be destroyed.

Second report on grapes, A. L. QUAINTANCE (*Georgia Sta. Bul. 53, pp. 35–70, pls. 13*).—The earlier report of the station on grapes was largely concerned with the culture and pests of grapes (E. S. R., 7, p. 767). The present bulletin includes the results of tests of 302 varieties, with notes on the specific and varietal parentage of each variety, State of origin, vigor, blooming period, condition of stamens as to whether upright or reflexed, size and compactness of bunch, size of berry, color, susceptibility to black rot, date of ripening, and average yield of fruit per vine in 1900. A succession list of 12 red, 18 black, and 13 white varieties recommended for cultivation in Georgia is given. These varieties are described, their self-fertility or sterility noted, and the effect of ringing on the size, earliness, and quality of the fruit, as determined by experiments, recorded in tabular form.

The succession list of grapes recommended for Georgia is given below:

Succession list of grapes for Georgia.

Variety.	Ripe.	Variety.	Ripe.	Variety.	Ripe.
RED.		BLACK.		WHITE.	
		Early Ohio	July 4		
Presly	July 8	Janesville	July 8		
		Moore Early	July 12		
		Hartford	July 16		
Brighton	July 18	Ives	July 20	Winchell	July 20
Delaware	July 24	Cambridge	July 28	Bell	July 22
Brilliant	July 26	Concord	Aug. 1	Annie M	July 24
Agawam	Aug. 2	Beacon	Aug. 2	Moore Diamond	July 25
Rochester	Aug. 7	Liney	Aug. 9	Grein Extra Early	July 28
Venango	Aug. 9	Norton Virginia	Aug. 11	Rommel	July 29
Lindherbe	Aug. 10	Carman	Aug. 12	Niagara	July 30
Catawba	Aug. 14	W. B. Munson	Aug. 15	Lightfoot	Aug. 4
Goethe	Aug. 14	Perry	Aug. 15	Guinevra	Aug. 6
Diana	Aug. 15	Herbemont	Aug. 18	Gold Coin	Aug. 7
		Thomas	Aug. 20	Triumph	Aug. 12
Roanoke Red	Aug. 25	Eden	Aug. 25	Pocklington	Aug. 25
		Neva Munson	Aug. 29	Scuppernong	Aug. 27
		Flowers	Sept. 1		

Of the varieties above recorded, the best for market purposes are Presly, Delaware, Agawam, and Catawba, of the red varieties; Early Ohio, Moore Early, Ives, Concord, Carman, and Neva Munson, of the blacks; and Bell, Moore Diamond, Rommel, Niagara, Triumph, and Pocklington, of the white varieties. For red wine, Norton, Virginia, Lenoir, Clinton, Concord, Ives, and Thomas are recommended; and for white wines, Missouri Riesling, Catawba, Delaware, Elvira, Herbemont, Noah, and Scuppernong. In the station tests the varieties Maxatawney, Whitehall, and Salem were found completely self-sterile, and Goethe was practically so, and hence these varieties should never be planted alone.

One of the 2 canes of each of the varieties in the above table was ringed 3 or 4 joints distant from its base, thus leaving 3 or 4 shoots to support that part of the vine the fruit of which was removed. The ripening period of Diana, Lindherbe, Neva Munson, and Rommel were not hastened at all by ringing; the other varieties matured from 1 to 18 days earlier. With 16 varieties the size of the berry was not increased by ringing, while with 21 others the size was increased from 5 to 40 per cent, averaging 18 per cent. The quality of fruit does not appear to have been injured in a single instance by ringing.

Rubber planting in the West Indies, J. H. HART (*West Indian Bul., 2 (1901), No. 2, pp. 100–113, figs. 6*).—This article discusses the subject of rubber culture in the West Indies, the best kind of rubber trees to grow, cost of establishing a plantation, the best methods of planting the trees, harvesting and marketing the product, etc. Some trees of *Castilloa elastica*, planted in the Royal Botanic Gardens of Trinidad 25 or 30 years ago, are reported as having a height of 75 ft. with a girth of 6 ft. 3 ft. from the ground. A tree planted in 1888 now measures 40 ft. in height and 55 in. in girth. These trees produce quantities of good seed from April to June. The best 5 trees of a group planted in 1898 now average 18 ft. in height and 12 in. in girth. One of the largest trees in the garden was tested by tapping. It yielded 2.14 lbs. of rubber fluids and 0.69 lb. or 32 per cent of clean rubber. The rubber produced was of excellent quality. The fluid taken from young trees gave 25 per cent of rubber; this was hard and brittle and of a very inferior quality.

The bleeding of Castilloa trees by light wounds is reported to be tedious and expensive, and is believed to be economically performed only on large trees when planted closely together. In order to make the cultivation of this rubber tree profitable, the author believes that it will be necessary to grow it on large areas by itself.

Para rubber trees (*Hevea brasiliensis*) also grow well at the botanic gardens. Trees planted in 1898 averaged in 1901 6½ in. in girth 3½ ft. from the ground, and most of them were over 18 ft. high. One of the largest trees in the garden has a girth of over 5 ft. and is 50 ft. high. It is supposed to have been planted over 25 years ago. The rubber made of this species is of excellent quality and it appears to keep better than any other kind and may be taken from the trees at less expense than from the Central American rubber trees. Several trees of *Hevea confusa* have been planted at the gardens, but the rubber of the young trees is of poor quality. Ceāra rubber (*Manihot glaziovii*) seems suitable only for dry hillsides or mountain lands. In its later stages it grows slowly and seems to produce but little rubber. Another species growing in the garden which promises well is the West African, Iré, or Lagos silk rubber tree (*Funtumia elastica*). The trees planted in 1898 are now 13½ ft. high and average 7 in. in girth. Even now these trees bleed freely and the rubber made from the fluids obtained is of good quality, approaching Para in value. The species grows well either in the shade or in the sun. It has not been sufficiently long under observation to warrant conclusions regarding it.

A number of other rubber plants are mentioned which will also grow in the West Indies, but the Central American rubber tree appears to be the one best suited for general cultivation. Para, it is thought, while taking longer to grow may prove more profitable in the end than Central American trees. Thick, close planting, to secure straight stems, is advised. The cost of planting has varied between $30 and $40 per acre. Relative to yield, the author states as follows:

"Our trials show that at least half a pound of dry rubber can be taken at one time from a single tree of Castilloa, without affecting the seed-bearing powers of the tree. Trees of *Hevea brasiliensis*, still more carefully treated, and operated on within easy reach of the hand when standing on the ground, have given a gross weight of 2.26 lbs. of rubber, the major portion of which, weighing 15.8 oz., is of excellent quality."

Further notes on the growth of rubber trees, particularly *Castilloa elastica*, are given in an appendix by M. Short, together with a general discussion of the subject.

Rubber culture in Nicaragua, G. WALDRON (*U. S. Consular Rpts., 67 (1901), No. 254, pp. 431–433*).—The methods of growing rubber trees in Nicaragua and the cost of growing are briefly noted and suggestions given to intending rubber planters. Rubber in Nicaragua is grown entirely without shade. Trees are set from 6 to 20 ft. apart, but opinions seems to be fixing on 10 ft. as the best distance for a permanent plantation. In clearing a plantation for rubber, the primeval forest is felled during March and April. When the whole has become dry enough, it is fired and everything burned but the trunks and larger branches. No attempt is made at logging or clearing away the remains of the forest; neither is the land plowed nor cultivated any way except by repeatedly cutting down the weeds and vegetation, so as to allow the foliage of the young rubber to be completely exposed to the sun. Many trees grown from seed planted in June, 1898, measured in August, 1900, 17½ in in circumference. A few of these same trees measured in July, 1901, showed an increased diameter of from 1 to 2½ in. It is believed that trees carefully grown and cared for will be large enough to bleed safely and profitably at 5 years of age. It is calculated that the cost of a large plantation for the first 5 years is about 50 cts. per tree, taking into account land, administration, labor, buildings, and equipment. Owing to excessive bleeding of rubber trees in Nicaragua since 1855, but few good native trees can now be found. The author states that sane and modest rubber planting enterprises in Nicaragua promise well.

The artificial cultivation of the rubber tree for industrial purposes, E. Brown (*Sci. Amer., 85 (1901), No. 19, p. 293, figs. 2*).—Methods of rubber culture observed by a San Francisco company operating in Mexico are outlined. In planting, only the underbrush is cleared away, the larger trees being left to afford shade, which is considered essential to the growing rubber trees. The nursery trees are set out 14 ft. apart, or 200 to the acre. The young trees are grown from native seed. The planting season lasts from May to January. The temperature of the region seldom rises above 93° or falls below 60°. The rainfall is from 100 to 150 in. annually.

Mexican rubber plant, F. de François (*Agr. Prat. Pays Chauds, 1 (1901), No. 1, pp. 105–109, figs 2*).—A technical description of *Parthenium argentatum*, known in Mexico as "Guayule."

Ornamentals for South Dakota, N. E. Hansen (*South Dakota Sta. Bul. 72, pp. 97–206, pls. 26*).—Following some introductory remarks on reasons for planting ornamentals, the financial aspect of the problem, and right methods of ornamental gardening is an extensive list of deciduous ornamental trees, shrubs, and evergreens that have been grown at the station. A list is also given of native species of plants worthy of cultivation, with notes on the outdoor flower garden and plants best suited to it in South Dakota, followed by a list of trees, shrubs, and hedge plants best suited to South Dakota conditions.

The replanting of bulbs that have once flowered, W. T. Thiselton-Dyer (*Gard. Chron., 3. ser., 30 (1901), No. 759, p. 22*).—The author states that at Kew the bulbs are lifted while still green to make room for bedding plants and "heeled in" in beds of ashes. This allows the foliage to slowly ripen off. The nutriment contained in the leaves is gradually transformed to the bulbs. The process is considered complete when the leaves have dried up to the consistency of thin paper. The bulbs are then lifted again, cleaned, and placed on shelves in a dry and airy shed, where they remain until they are planted in the autumn.

A new tender Nymphæa, H. S. Conrad (*Amer. Gard., 22 (1901), No. 358, p. 745*).—A description is given of a new hybrid water-lily obtained by crossing *Nymphæa cærulea* with *N. zanzibariensis*.

Directions for the culture of saffron (*Crocus sativus*) (*Bol. Agr. y Granadería, 1 (1901), No. 13, pp. 28, 29*).—Soils, preparation, cultivation, harvesting, etc., are considered.

Report on the culture of roses in the Balkan Mountains, J. Gravereaux (*Bul. Min. Agr. [France], 20 (1901), No. 3, pp. 585–593*).—The author visited Austria and Turkey, and made a collection of the wild roses of these countries, more particularly in the Balkan region. A horticultural and industrial study was also made of perfume roses and of the production of rose essence in Bulgaria. An account and outline is given of this work. The manufacture of rose essence in Bulgaria is carried on by the peasants in a crude manner, and it is believed that the industry can be profitably extended in France and her colonies under more scientific methods. It is proposed to undertake experimental work along this line.

Different methods of making rose cuttings, VIVIAND-MOREL (*Rev. Hort.*, *73* (*1901*), *Nos. 15, pp. 357–360; 17, pp. 413, 414; 18, pp. 435, 436; 19, pp. 459, 460*).—The various methods of propagating roses by means of cuttings are described from a practical standpoint.

The sweet pea and its failings (*Amer. Florist*, *17* (*1901*), *No. 691, pp. 161, 162*).—The opinions of several prominent sweet-pea growers and seedsmen are given as to the cause of the failures in recent years in growing sweet peas, especially in Massachusetts. W. T. Hutchins is of the opinion that the failure is due largely to loss in the vigor of the seed, and that before success can be obtained a new race of peas must be bred up which will be more hardy and vigorous than those now in cultivation. W. Atlee Burpee & Co. have tested the sweet-pea seed from France, England, Germany, Oregon, California, and northern New York, and have been able to detect absolutely no difference in the growth of vines from these seeds of widely different origin, and are of the opinion that the trouble is due to some blight disease. Peter Henderson & Co. have had similar results with seed from different localities, and attribute the failure to local conditions, complaints coming from some sections and not from others. R. & J. Farquhar & Co., of Boston, are of the opinion that the blight can be prevented by injecting bisulphate of carbon at the roots whenever the first sign of the blight appears. The method of use suggested is to bore a few holes around the roots of each plant, drop in the bisulphate, and cover up the hole again so that the fumes permeate all through the soil.

Intensive horticulture in California, C. H. SHINN (*Land of Sunshine*, *14* (*1901*), *Nos. 2, pp. 96–110, pls. 6, figs. 6; 3, pp. 182–189, pl. 1, figs. 4; 4, pp. 276–289, pls. 6, figs. 4*).—A biographical sketch of Luther Burbank, noting in some detail many of the more important fruit, flower, and vegetable creations originated by him by hybridization and selection; and of Carl Purdy, the California specialist on the culture and botany of Pacific Coast bulbs. This article is also reprinted as a separate.

FORESTRY.

A planter's notes on trees and shrubs, E. A. POPENOE (*Industrialist*, *28* (*1901*), *No. 5, pp. 60–62*).—Notes are given on the behavior of trees and shrubs drawn from nearly 20 years' experience in planting, chiefly on the trial grounds of the Kansas Agricultural College and Experiment Station. Among the trees the tulip tree or poplar is said to have proved fairly satisfactory, while other trees of the same family, among them several magnolias, have been unable to withstand the climatic and other conditions. Notes are given on the coralberry, moonseed, Akebia, and various barberries, all of which are more or less adapted to the conditions existing in the region covered by this report.

The use of nitrate of soda in sylviculture (*Bul. Soc. Cent. Forst. Belg.*, *8* (*1901*), *No. 3, pp. 144–149, figs. 8*).—The use of nitrate of soda in seed beds for growing seedlings of a number of forest trees is strongly recommended. In the case of black pine, ash, maples, birch, hornbeam, and ailanthus, seedlings grown with and without nitrate of soda were compared. Those receiving nitrate at the rate of 200 to 300 kg. per hectare were decidedly in better condition of growth than those not receiving the fertilizer.

The succession of cuttings for deciduous high forests, PILZ (*Allg. Forst u. Jagd Ztg.*, *67* (*1901*), *Oct., pp. 341–348*).—Discusses the relative value of different periods of cuttings upon the maximum production of oak and beech forests.

The reconstitution of forests in Ardennes, J. Pollet (*Bul. Soc. Cent. Forst. Belg., 8 (1901), No. 8, pp. 461–474*).—The author accounts for the deforestation of parts of the country and offers suggestions for its reforestation. It is recommended that plantings should be made of beech as an undergrowth for Scotch pine, beech plantings for coppice, and the planting of beech and spruce in mixtures.

The disappearance of beech in the forest of Cambre, C. Bommer (*Bul. Soc. Cent. Forst. Belg., 8 (1901), Nos. 4, pp. 181–189; 5, pp. 247–255, figs. 4*).—In accounting for the disappearance of beech from the forest in question, the author believes that this tree is not adapted to grow under the system of forestry pursued, which is that of high forest and coppice. The beech seems to be especially liable to disease, which also accounts for the destruction of many trees. Among the enemies to which it is particularly subject, mention is made of *Nectria ditissima* and an insect (*Cryptococcus fagi*). The old trees are also subject to other fungi such as *Phycomyces nitens, Armillaria mellea*, etc.

The Picardy poplar, N. I. Crahay (*Bul. Soc. Cent. Forst. Belg., 8 (1901), No. 6, pp. 342–347, pl. 1*).—A description is given of what is called the Picardy poplar, a variety of white poplar (*Populus alba*). The tree is of rapid growth and adapted to various situations. The wood is said to be of better quality than that of ordinary forms of poplar.

Fire lines and their use in the pine forests of Germany and Gascony, P. Buffault (*Rev. Eaux et Forêts, 40 (1901), No. 22, pp. 673–683*).—An account is given of the methods pursued in Germany and Gascony in the construction and care of fire lines in pine forests. Different kinds of fire lines are described, a common form being from 40 to 60 meters wide, which is planted in vineyards, cultivated crops, or some deciduous tree. For trees to plant in such regions the pedunculate oak, locust, ailanthus, ash, and maples are recommended.

On the use of white pine, du Pré de St. Maur (*Bul. Soc. Cent. Forst. Belg., 8 (1901), No. 3, pp. 155–162*).—The author gives a discussion of the white pine (*Pinus strobus*) as a forest tree for different situations in Europe. A number of plantations are described and the rate of growth indicated. The distribution of white pine in the United States and Canada is indicated and notes given upon the utilization of its timber.

Suggestions for increasing the value of nonagricultural lands in Belgium, J. Huberty (*Bul. Soc. Cent. Forst. Belg., 8 (1901), No. 6, pp. 322–331*).—The author suggests, for the utilization of the nonagricultural lands of Belgium, that they be planted to Austrian pine. From estimates based on plantations which are already in existence, it is believed that these lands will pay an income amounting to between 6 and 7 per cent annually upon the investment.

Experiments in wood preservation, W. von Knieriem (*Balt. Wchnschr. Landw., 38 (1900), p. 475; abs. in Centbl. Agr. Chem., 30 (1901), No. 7, pp. 486–488*).—Experiments are reported in which the relative efficiency of a number of substances was tested for preserving wood. In the winter of 1892 spruce blocks 46 by 13 by 14 cc. were cut, and on August 27 to 30 were submitted to treatment with various tar products. The products used were carbolin oil, creosote oil, creosote tar, carbolineum, and copper sulphate. After treatment the blocks were dried, and on October 8, 1893, were placed in sand and covered with earth. After $3\frac{1}{2}$ years they were taken up and examined, at which time it was found that the blocks treated with the first 4 preparations were still sound, the fifth showed s me decay, and a control block treated in a similar way was beginning to show considerable rot. The blocks were again buried for a year and a half, when they were taken up and reexamined. The one treated with carbolineum was the soundest, followed by those treated with creosote oil, carbolin oil, and creosote tar, in the order named. The block which had been treated with copper sulphate was badly decayed, and the one which had not been given any treatment was almost entirely destroyed.

The wood pulp industry of Canada (*Bul. Soc. Cent. Forst. Belg., 8* (*1901*), *No. 5, pp. 292–305*).—A description is given of the wood pulp industry of Canada, and the forest resources of that country are compared with other regions. Each province of Canada, with the exception of Manitoba and the Northwest Territories, produces great quantities of spruce timber which is particularly adapted to the production of wood pulp. The increase in the use and production of wood pulp for the last 10 years is shown, and the possibilities of Canada for supplying this material are pointed out.

SEEDS—WEEDS.

A report on cooperative seed testing, F. NOBBE (*Landw. Vers. Stat., 56* (*1901*), *No. 2–3, pp. 177–185*).—A report is given on the fifth cooperative experiment in testing red clover, sainfoin, perennial rye grass, meadow fescue, and beet seed. The seeds used in this experiment were from single lots which were thoroughly mixed and then distributed to the 30 stations in the seed control union of Germany. The different kinds of seeds were to be tested at the different stations under identical conditions as to temperature, moisture, light, etc. Reports were received from about half of the stations, which show wide variation between the maximum and minimum percentages obtained by the several observers. In the case of the clover seed there was a variation of 2.27 per cent in purity and 7.61 per cent intrinsic value. The variation of sainfoin seed reported was 1.62 per cent in purity and 21.15 per cent in intrinsic value. The perennial rye grass gave a maximum and minimum range of 3.63 per cent purity and 14.40 per cent intrinsic worth. Meadow foxtail gave 19.99 per cent as a range of purity determination and 12.38 per cent intrinsic value. The beet seed samples showed a variation of 3.43 per cent purity and 11.5 per cent in actual value. While there appears to be a wide range in these figures, except in the purity of the meadow foxtail and the intrinsic value of the sainfoin, the figures fall within the limits allowed by the regulations of the seed control union. In the results of tests of soft grass and blue grass seed departures from the normal, while large, fall within the limit of 8 per cent, which is allowed by the seed control regulations.

Report of the Göteborg and Bohus Seed Control Station for the year ended June 30, 1901, J. E. ALÉN (*Red. Göteborgs och Bohus läns frökontrollanst., 1900–1901. Göteborg, 1902, pp. 12*).—A report is given on the seed investigations conducted at the station during the year 1900–1901. In all, 356 lots of seed were inspected and the analytical data are given in detail. A schedule of charges for seed investigation is appended to the report.

Studies in weeds, W. CARRUTHERS (*Jour. Roy. Agr. Soc. England, 62* (*1901*), *pp. 249–256, figs. 8*).—Brief notes are given on a number of more or less troublesome weeds, among them *Ononis arvensis*, *Ægopodium podagraria*, *Carduus acaulis*, dog camomile, ragwort, etc. Notes are also given on the relative value of different brome grasses and bent grasses for forage and pasture.

The horse nettle and buffalo bur, J. C. ARTHUR (*Indiana Sta. Rpt. 1901, pp. 9–19, pls. 3, fig. 1, map 1*).—A description is given of the horse nettle (*Solanum carolinense*) and the buffalo bur (*S. rostratum*). The relationship of these weeds is pointed out and the distribution throughout the State is indicated. One or both species have been reported from about one-third the counties of the State. Suggestions are given for their eradication, and attention is called to the fact that the horse nettle being perennial, particular care will have to be given to prevent the multiplication of the individual plants. This weed may be eradicated by continued growing of hoed crops or by some thickly growing crop which will smother it out. The buffalo bur is an annual plant and for its extermination only requires that it be kept from seeding, which can be done by cutting or pulling plants during the early part of the season.

Destruction of prickly pear (*Queensland Agr. Jour., 9 (1901), No. 5, pp. 460–462*).—An experiment is reported in which an attempt was made to clear 145 acres of land infested with a dense growth of prickly pear. The plants were cut down and afterwards sprayed with a number of solutions, the best results being obtained where sodium arsenite was used at the rate of 5 to 8 oz. per gallon of water. Ordinarily the cutting of this plant does not destroy it, but 3 or 4 days after spraying the green succulent stems had wilted and turned brown and were drying up. Not only were the so-called leaves destroyed but the spray penetrated the stumps to the ends of the roots, causing them to rot. The application of this herbicide, while very destructive to the cactus, had no effect on the grass, and in a comparatively short time the area was covered with an excellent stand of pasture grasses. The other materials experimented with were iron sulphate, hydrochloric acid, coal tar, creosote oil, ammonium sulphocyanid, calcium sulphid, and solutions of copper sulphate, sodium nitrate, and potassium chlorate. None of these gave results at all comparable to those secured by the use of sodium arsenite.

DISEASES OF PLANTS.

An attempt to secure immunity of plants to fungus diseases, J. Beauverie (*Compt. Rend. Acad. Sci. Paris, 133 (1901), No. 2, pp. 107–110*).—An account of experiments with *Botrytis cinerea* is reported, in which a form of the fungus was sought which would secure various plants immunity from attacks by the fungus. This fungus, which is said to be very common in greenhouse soils, exists in 3 forms. The ordinary form exists as a saprophyte developing upon decomposing plants. This form is the well-known normal conidial stage of the fungus. The parasitic form of the fungus is said to be completely sterile, and a third form between the two, which appears to be a sort of a transition stage, is also recognized. The author claims that by sowing sterilized soil with the spores from the conidial stage of the fungus and allowing them to grow for some time, it is possible to produce a growth of the fungus in the soil which will not interfere with the growth of seeds or cuttings, and especially with cuttings of begonia, which is ordinarily quite subject to attack by the sterile form of the fungus. In this way he claims to have secured immunity from attack. By extending this method of culture to the soils of greenhouses the author says it will be found possible to secure immunity from the very common and sometimes destructive occurrence of the sterile form of the fungus.

Cultures and attenuated forms of fungi which cause diseases of plants, J. Ray (*Compt. Rend. Acad. Sci. Paris, 133 (1901), No. 5, pp. 307–309*).—A summary is given of recent investigations relative to attenuated cultures of fungus parasites of plants, with studies of rusts and smuts of cereals and other plants. The author claims to have been successful in obtaining pure attenuated cultures of the smuts of wheat and oats, and rusts of eglantine and *Euonymus europæus*. By using these artificial cultures it is believed possible that immunity to disease caused by them may be secured.

A bacterial disease of the tomato, F. W. T. Hunger (*Meded. 'S Lands Plantentuin, 1901, No. 48, pp. 57, pls. 2*).—The tomato disease caused by *Bacillus solanacearum* (E. S. R., 8, p. 895) is reported as prevalent at and about the botanic gardens at Buitenzorg, Java. The diagnosis of the disease is given for the parts of the plants above as well as for those below ground. The author describes the germ and its behavior on different culture media, and records a number of experiments with pure cultures to determine the method of infection. In connection with the diseased conditions produced by the germ, the normal anatomy of *Lycopersicum esculentum* is described. Under the discussion of species of Solanaceæ susceptible to this disease, the writer expresses the belief that the slime disease of tobacco is caused by the same germ as that which causes the tomato disease, and that this disease also occurs in *Capsicum annum*, although neither of these cases has been confirmed by inoculation.

A series of experiments to determine the manner in which *Bacillus solanacearum* finds entrance resulted in the conclusion that uninjured tomato plants can not be infected, and that when the bacteria do gain an entrance by way of the water pores, they get no farther than the air spaces immediately below the water pores. The germ gains entrance most commonly by means of injuries to the roots caused by the attacks of parasites or by careless planting. For this reason the author considers the bacillus to be a secondary rather than the primary cause of the tomato disease. A wound of some kind is believed to be in every case the primary cause. This may be caused by (1) careless planting, (2) climatological influences, (3) chemical and physical condition of the soil, and (4) attacks of parasites. In the last class are included all attacks by fungi, insects, and nematodes. Infection most commonly follows the attacks of nematodes. As preventive measures, greater care in planting and the destruction of the Heterodera are urged. Since the latter is, however, almost impossible, it is suggested that the tomato be grafted on a solanaceous stock that is resistant to the attacks of Heterodera.—H. M. PIETERS.

A bacterial disease of potatoes, G. DELACROIX (*Compt. Rend. Acad. Sci. Paris, 133 (1901), No. 9, pp. 417–419*).—Attention is called to a bacterial disease of the potato which has been observed in central and western France, being more or less widely distributed through 13 departments. The disease, which is described, is believed to be that caused by *Bacillus solanacearum*, an account of which was given in U. S. Dept. Agr., Division of Vegetable Physiology and Pathology Bul. 12 (E. S. R., 8, p. 895). This disease is said to be quite distinct from that described by the author under the name gangrene, which is said to be caused by *Bacillus caulivoris*. As suggested methods of treatment the author recommends the rotation of crops in which potatoes or allied plants shall not occupy the soil for a number of years.

A bacterial disease of beets, M. C. POTTER (*Centbl. Bakt. u. Par., 2. Abt., 7 (1901), Nos. 8, pp. 282–288; 9–10, pp. 353–362, figs. 6*).—This article has been previously noted from another source (E. S. R., 13, p. 467).

The finger-and-toe disease of turnips (*Trop. Agr., 20 (1900–1901), p. 258*).—The occurrence of the finger-and-toe disease, or club root, of turnips is mentioned and the writer states that its ravages seem to be increased by the use of superphosphate manures or upon soils subject to short rotations. In his experience, land which had been sown to grass for 8 or 9 years, and afterwards cultivated in turnips, grew a crop without any diseased roots. Where the fields had been in grass for but 3 years the turnip crop was practically ruined, showing that the fungus remains in the soil for a longer time than 3 years.

Observations on root rot (Dongkellanziekte), J. D. KOBUS (*Meded. Proefstat. Oost Java, 3. ser., 1901, No. 25, pp. 11*).—Formerly many diseases were known by this name, but since 1897 the use of the name has been confined to a single well-characterized disease. At the East Java station it has been proved that the trouble is not due to differences in the chemical composition of the soil, and that the disease is not inherited. The method of working the soil is, however, of importance. Shallow planting or planting in loose soil tends to increase the disease, while a heavy application of nitrogenous fertilizer delays or prevents its appearance. Irrigation after the west monsoon has likewise been found helpful in overcoming the disease. The mud deposited from the irrigating water appears to exert a beneficial effect, but the reason for this is not understood since the amount deposited is too small to have any appreciable influence either on the fertility or on the mechanical structure of the soil. One of the most promising fields of work is the development of resistant varieties. Some varieties are already known to be nearly or quite free from the root rot, but these are poor in sugar content.—H. M. PIETERS.

Apple scab, G. P. Clinton (*Illinois Sta. Bul. 67, pp. 109–156, pls. 4, figs. 34*).—In a previous bulletin of the station (E. S. R., 11, p. 258) an account was given of investigations for the prevention of apple scab. The present bulletin records the results of botanical studies made during the years 1898 to 1900. The author has demonstrated the relationship between the parasitic form which causes the well-known apple scab and the saprophytic fungus found upon the decaying leaves. As a result of his investigations the author is led to believe that the saprophytic form is the one in which the fungus is carried through the winter. The Fusicladium or parasitic stage is described at some length, with the results of experiments in the germination of the spores and experiments with artificial cultures. The Venturia or saprophytic stage is also described at length. After the scab-infected leaves fall from the trees in the autumn they lose their green color and the mycelium contained in them undergoes slow changes. The rounded cells enlarge and gradually assume a reddish olive color and give rise to similarly colored mycelium filaments that penetrate into the interior of the leaf. In this way the Venturia stage is produced from the mycelium of the scab stage. The Venturia stage was found most abundant in the spring of the year, when the apple scab was the worst. In an especially severe winter the cold apparently destroyed many of the perithecia, as few of them were found to come to maturity. The perithecia show on the leaves as small black pustules, generally scattered about on grayish spots, which mark the place of the fall scab colony. When mature they are more or less loosely embedded in the leaf tissues, and at the time of their disappearance infected leaves often show numerous small holes where they have been embedded. The microscopical appearance of the fungus and germination of its spores are described and the results of artificial cultures, in which the 2 forms are connected, are given. In this way the author has established the identity between the 2 forms, and it is claimed that the name given to the fungus should be derived from the mature form, and this should be *Venturia inæqualis*. Moreover, should the fungus occurring on the pear prove different from that upon the apple, the specific name of the apple-scab fungus would then be *V. pomi*. An extended bibliography of apple-scab literature completes the bulletin.

On the power of some peach trees to resist the disease called yellows, E. W. Morse (*Bul. Bussey Inst., 3 (1901), I, pp. 12*).—A brief résumé is given of the various factors which have been hitherto attributed as causes of the disease known as peach yellows, and an account given which seems to show the varying susceptibility of varieties to serious injury from this cause. According to the author a seedling variety known as the White Magdalene has been grown for 150 years without showing any tendency towards disease. The author believes that the principal causes of peach yellows will be found in the atmospheric influences rendering plants more susceptible to disease, while the active agent he believes to be enzyms which may be carried from one plant to another by pollen when the plant is fertilized, and which only manifests itself after a number of years' development.

Silver-leaf in peaches (*Gard. Chron., 3. ser., 30 (1901), Nos. 769, p. 220; 770, pp. 247, 248*).—This disease of peaches, nectarines, etc., has been known in England for at least a quarter of a century. The leaves retain their normal form and are neither spotted nor blistered, but are deprived of a large portion of their chlorophyll, assuming a silvery appearance, and the whole tree becomes sickly and unproductive. No spots or pustules of any kind are detected on the leaves, nor has any fungus been found in any of the tissues, but at the same time the disease seems to be communicable. It is believed that this disease is closely allied to that known as the peach yellows in this country, and is possibly a modification of it. In a subsequent communication an account is given of this disease occurring on nectarine trees. The writer states that the disease appeared on one branch of the tree from which all the affected leaves were removed and a heavy application of liquid manure, to which half an ounce of iron sulphate per gallon was added, given to the roots of the tree. The following winter the usual dressing of air-slaked lime was given the soil about the trees. The next season the trees seemed to be affected to a greater extent than the previous year but the treatment was repeated with the result that the third year no indication of disease was observed.

The injury of fungicides to peach foliage, S. M. BAIN (*Science, n. ser., 14 (1901), No. 345, pp. 221, 222*).—The author has been conducting investigations for a number of seasons on the injury produced by fungicides to peach foliage, and a preliminary report of his observations is here given. It was found that pure copper hydroxid, copper oxid, or metallic copper placed on leaves is injurious to the foliage of the peach, but without visible injury to that of the apple or the grape. A solution of copper sulphate 0.00005 normal proved fatal to water cultures of the apple, while grapes and peaches under like conditions were not seriously injured. Peach foliage protected from rain and dew, as in a greenhouse, sustains no external visible injury from spraying with Bordeaux mixture or copper hydroxid. Under normal orchard conditions, leaves sprayed with Bordeaux mixture in situations so as to be partially protected from rain or dew are the last to show injurious action of the copper salts. The presence of deliquescent salts, such as calcium nitrate and calcium chlorid, appears to accelerate the injurious action of copper hydrate on the foliage of the peach. When grown in saturated atmosphere, peach seedlings were not injured by Bordeaux mixture, and only slightly by pure copper hydrate. Peach leaves growing in such an atmosphere possess a thinner, more easily permeable cuticle than those growing in dry or less moist atmospheres. The presence of a certain excess of lime accompanying the copper hydrate retards or possibly may entirely prevent the injurious action of the fungicide. This is true of lime applied either as hydrate or as a carbonate. The author is led to believe that the results obtained will serve to explain some of the conflicting testimony of different investigators regarding the effect of Bordeaux mixture upon peach foliage. A practical application of the results obtained is suggested in the recommendation that spraying with Bordeaux mixture be followed with one or more sprayings of milk of lime, thus preventing injury which would otherwise occur. Experiments inaugurated by the author during the present season have thus far showed this method of treatment to be successful; whether it will remain so to the end of the season is yet to be determined.

Investigations on the mulberry dwarf troubles, U. SUZUKI (*Bul. Col. Agr. Imp. Univ. Tokyo, 4 (1901), No. 4, pp. 267–288*).—In a previous publication (E. S. R., 13, p. 61) the author described the disease of mulberry, which is said to be the cause of very extensive injury. He has continued his investigations which are reported at some length, the effect of oxidizing enzyms, influence of cutting upon the decay of roots, and the quantity of reserve starch as affecting the disease being reported upon. His former views on the primary causes of the disease are confirmed and it has been shown experimentally that the poor development and ultimate decay of the roots is caused by cutting back the plants during the growing season. The small rootlets which have just begun developing lose their activity and decay, and new ones are not developed for 2 or 3 months after the cutting. The new shoots appearing depend upon the reserve materials of the roots until that time, and a deficiency of reserve material is not only a result of the disease but is considered the principal cause of its further development. There was observed an abnormal increase of oxidase and peroxidase in the diseased leaves, and at the same time the migration of starch and nitrogenous compounds was greatly retarded. It is believed that the oxidizing enzyms present exert an inhibiting action upon the diastatic and proteolytic enzyms, and thus become one of the principal causes in the retardation of growth in the diseased plants. A second cause has been lately found to be an insufficient development of the transportation tissues. These phenomena are analogous to those causing variegation or albinism in plants. The production of oxidizing enzyms in such abnormal quantity is believed to be due, to some extent at least, to the partial starvation of the cells. As the cutting of the mulberry plants in the growing season causes deficiency in the nutriment for the newly developing shoots, this seems to afford a strong support for the above assumption.

The appearance of white rot of grapes in Algeria, J. D. CATTA and A. MAIGE (*Compt. Rend. Acad. Sci. Paris, 133 (1901), No. 10, pp. 444, 445*).—The occurrence in Algeria of white rot, caused by *Charrinia diplodiella*, is reported. It seems to be more severe in its attack on some varieties of grapes than others, causing the destruction of two-thirds of the crop of Aramon and Alicante, and about one-third of the crop of Carignan. For its prevention the authors recommend the thorough use of Bordeaux mixture.

Black rot and mildew, G. CAZEAUX-CAZALET (*Rev. Vit., 16 (1901), Nos. 408, pp. 393–397; 409, pp. 419–424; 410, pp. 452–458, figs. 4*).—The results of observations on the period of invasion of black rot and mildew are given. The time of appearance of these diseases in a number of localities in France have been under investigation for a number of years, and with some allowance for climatic conditions the first invasion may be noted upon the vines about the first of May; the second, about the middle of May; the third, the first of June; the fourth, about June 25; and the fifth, about July 20 to 25. The appearance of these attacks is preceded by infection about 2 weeks previous, and in treating the disease by spraying or use of sulphur advantage should be taken of these rather definite periods.

The treatment of vineyards for the prevention of mildew, N. PASSERINI and P. FANTECHI (*Abs. in. Ann. Agron., 27 (1901), No. 6, p. 294*).—On account of the high price of copper salts, the authors have investigated means for protecting grapevines against the downy mildew. A number of fungicides were experimented with and the conclusions show that a 1 per cent solution of Bordeaux mixture is efficient in preventing the attacks of the mildew. For the first treatment, when the leaves are small and tender, it may be reduced to 0.5 per cent with good results. In connection with the above experiments the authors found that spraying with a 2 per cent soap mixture containing lime was efficient in destroying insects of the genera Cochylis and Eudemis.

Table grapes and fungicides, E. CHUARD (*Chron. Agr. Canton Vaud, 14 (1901), No. 18, pp. 445–447*).—In reply to numerous correspondents, the author states that the use of properly prepared fungicides upon table grapes need not be followed with any serious consequences. During the present year, on account of a severe attack of mildew, it was necessary to spray the grapes later than usual. Examination of a large number showed that while slight traces were present upon the outside of the grape, the author failed to find any trace of copper in the pulp. The very small quantity that is found on the skin of the grape is not sufficient to be a source of any danger. In wine made from sprayed grapes in which fermentation has been completed, the copper is said to be in an insoluble and innocuous state.

A means for the prevention of shelling of grapes, H. DAUTHENAY (*Rev. Hort., 73 (1901), No. 17, p. 402*).—The author describes a disease of grapes in which the fruit falls from the cluster, similar to the disease known in this country as shelling or rattles. For the prevention of this disease he recommends the pinching or cutting off of the shoots after the development of 6 to 8 leaves where grapes are borne, or 12 to 15 on those shoots not carrying any grapes. In this way the material elaborated by the vine is carried to the grape clusters instead of being utilized for greater growth of shoots. This method has been employed a number of times with complete success.

A tea eelworm disease in South India, C. A. BARBER (*Dept. Land Records and Agr., Madras, Vol. II, Bul. 45, pp. 227–234, pls. 3*).—A nematode disease of tea plants was first called to the author's attention as occurring on a single estate in Madras. The plants were badly attacked by the nematode *Heterodera radicicola*, and the disease has proved a very destructive one for tea seedlings. So far the attack appears to be confined to nurseries, and the disease is believed to be of recent origin. In addition to the tea seedlings, a number of weeds and other plants were attacked, and it is believed that the nematodes have been upon the plantation for a long period, being established on other plants, but only recently have found the young tea plants as suitable hosts.

A contribution to the knowledge of slimeflux of trees and some of its causes, W. Holtz (*Centbl. Bakt. u. Par., 2. Abt., 7 (1901), Nos. 4, pp. 113–128; 5–6, pp. 179–189; 7, pp. 229–238; 8, pp. 274–281; 9–10, pp. 338–350, pls. 2, figs. 6*).—The author gives results of studies made upon *Oidium ludwigii*, and a number of bacteria and other fungi associated with it which are considered the cause of slimeflux on oak, maple, birch, aspen, and other trees.

The slimeflux of trees, F. Ludwig (*Centbl. Bakt. u. Par., 2. Abt., 7 (1901), No. 9–10, pp. 350–352*).—A report is given upon observations made during the years 1899 and 1900 upon various forms of slimeflux observed by the author. The brown flux is reported as having been observed upon apple trees in various parts of Germany; upon aspen, chestnut, elm, and birch trees in parks; and upon beech and white fir in forests. The author is led to believe from correspondence that this same disease occurs in a number of parts of the United States and other parts of Europe. The white slimeflux of oaks was commonly observed upon oak trees, and there seemed to be some relationship between the phenological conditions of its appearance and that of the first flowering of elder and rye. Observations covering 15 years seem to indicate that the slimeflux and flowering of these plants occur at about the same time. Another form to which the name musk flux is given has been observed as white or reddish masses upon linden or maple trees. It is believed to be due to a fusarium form of *Nectria aquæductum*.

ENTOMOLOGY.

Proceedings of the thirteenth annual meeting of the Association of Economic Entomologists (*U. S. Dept. Agr., Division of Entomology Bul. 31, n. ser., pp. 103, pls. 2, figs. 4*).—At this meeting, held in Denver, Colo., August 23 and 24, 1901, the following papers were read:

Life history studies on the codling moth, C. P. Gillette (pp. 5–20).—The author made a careful study of the life history of this insect with special reference to the determination of the number of broods per year. In Colorado it is found that the time occupied by the codling moth for a complete cycle in the summer averages about 7 weeks. In early spring the insect was always found in a larval condition. The larvæ begin to pupate just before the apple blossoms open. The length of the pupal state of the first brood varied from 13 to 68 days. Notes are given on the numbers of larvæ taken by different people under bands of apple trees previous to time of blooming. It was found that a small percentage of larvæ seek a place for pupation in the spring after having passed through the winter in a larval condition. At Ft. Collins the earliest moths were captured April 26, and moths continued to appear in breeding cages until July 24. The moths lived but a few days. The earliest time at which eggs were observed was June 9, and by July 21 it was almost impossible to find unhatched eggs. The time between the emergence of the moth and the laying of the eggs averaged 6.7 days and the number of eggs laid by each moth varied from 2 to 50, nearly all of which hatched. The incubation period of the eggs was found to be from 6 to 8 days. The earliest date at which larvæ of the summer brood were observed was June 28, and the earliest date for the appearance of larvæ of the second brood was August 3. The first brood reached its maximum on July 25 and the second on September 12. Of 414 larvæ taken under bands 353 came to the bands during the night and the remainder during the day. The duration of the larval period varied from 12 to 24 days. Of 526 wormy apples, 424 were found to have worm holes at the blossom end, while 84 had holes at the side and 18 at the stem end. The earliest date for the appearance of a moth of the second brood was July 13 and the latest date September 16. The first eggs of the second brood were observed July 24 and they were most abundant on August 12. The time between the broods according to these observations is about 54 days. The author concludes that the codling moth is definitely two-brooded throughout Colorado and that there is no reason for assuming the existence of a partial third brood.

Jarring for the curculio on an extensive scale in Georgia, with a list of the insects caught, W. M. Scott and W. M. Fiske (pp. 24–35).—The curculio is reported as causing great annual damage to peaches and plums in Georgia, 25 per cent of the crop being destroyed. The adult beetles are also instrumental in disseminating brown rot fungus. Jarring experiments were conducted in a large orchard containing 200,000 peach trees and 50,000 plum trees. These trees were all jarred several times between April 18 and June 1, some of the trees being jarred 6 days per week. The jarring was done from 3 a. m. until 9 a. m. and from 2 p. m. until dark. The best results were obtained in the morning. The beetles were caught on rectangular frames covered with canvas. The total cost of the work for the season was $1,000. Of the 325 species of insects which were thus caught, a list of which is given, over 67 per cent were curculios, the total number of curculios being 137,000. The amount of curculio damage on the jarred trees was 4 per cent, while in an adjacent orchard of 130,000 trees where no jarring was done, the damage was 40 per cent.

A simple form of accessions catalogue, E. D. Ball (pp. 37–39).—According to the scheme proposed by the author an accession catalogue is recommended containing one entry for each trip or special collection, this entry being in the form of a date giving the year, month, and day. Every specimen as it is labelled bears the place of capture and the date on a single small label. The advantage of the system lies chiefly in the great saving of time.

A preliminary report on the San José scale in Japan, C. L. Marlatt (pp. 41–47).—Evidence is presented supporting the conclusion that the San José scale is not native to Japan but was introduced from America. A related species, *Diaspis pentagona*, is native to Japan and is prayed upon by a beetle, *Chilocorus similis*, which also feeds to some extent on the San José scale. The latter species is attacked by a fungus disease and by one or two parasitic insects.

Further notes on crude petroleum and other insecticides, E. P. Felt (pp. 49–51).—Trees were not injured by spraying with 20 or 25 per cent mixtures of oil. Experiments with a 10 and 15 per cent mixture of crude petroleum in combination with a mixture of whale-oil soap containing 1 lb. to 4 gals. showed that no injury was done to the trees and the San José scale was thoroughly checked. Spraying with whale-oil soap solutions gave good results, but it was not quite so effective as crude oil.

Notes on some Colorado insects, C. P. Gillette (pp. 51–55).—Notes on the habits, life history, and means of combating *Nysius minutus*, *Aspidiotus howardi*, *Chermes abietes*, grain plant louse, the apple aphis, beet army worm, cabbage Plutella, bean ladybird, cabbage aphis, and a species of Phytoptus which attacks cottonwoods.

A preliminary note on a new species of aphis injurious to plums and peaches in Georgia, W. M. Scott (pp. 56–60).—A brief account is given of a species of aphis believed to be new and reported as injurious to plums and peaches in different parts of Georgia. Observations were made on a part of the life history of the insect.

Fighting insects with fungus diseases, L. Bruner (p. 59).—The author reports that a fungus was received from this Department supposed to be a South American locust disease, but which proved to be a species of Mucor. The material was distributed in Nebraska, but was not found to be effective. In the author's experiments none of the locust diseases proved successful.

Insects detrimental and destructive to forest products used for constructing material, A. D. Hopkins (pp. 60–62).—Brief notes on *Eupsalis minuta, Lymexylon sericeum, Prionus laticollis*, and other injurious insects.

Observations on forest and shade tree insects in New York State, E. P. Felt (pp. 63–68).—Short notes on *Anisota senatoria, Cacœcia argyrospila, Chalcophora virginiensis, C. liberta, Dentroctonus terebrans, Tomicus calligraphus, T. balsameus, Monohammus confusor*, elm-leaf beetle, forest tent caterpillar, carpenter moth, and other species.

Review of the white-fly investigations, with incidental problems, H. A. Gossard (68–74).—*Aleurodes citri* is reported as infesting 75 per cent of the orange groves in Manatee County. Two fungus diseases were observed on the insect. The white fly is not always fatal to orchards, as is shown by the fact that one grove has been infested for at least 10 years and is still in a vigorous condition. Notes are given on the life history of the insect and on treatment with resin wash, kerosene, and hydrocyanic-acid gas. It was found that when 1 oz. of sulphuric acid and 1 oz. of water mixed together and cold were added to 1 oz. of potassium cyanid, 428.4 cu. in. of gas were produced, while the same quantity of water and acid mixed and added immediately to the cyanid of potash yielded 467.9 cu. in. of gas. Fumigation was done at all hours of the day and in sunshine and cloudy weather. Little injury was done to trees or foliage if fumigated at night or during cloudy weather, but when trees were fumigated in sunshine during the middle of the day some injury resulted. Observations were made on the affect of fumigation on ladybirds and it was found that the majority were destroyed.

Hydrocyanic-acid gas notes, C. P. Lounsbury and C. W. Mally (pp. 75–80).—This insecticide has been successfully used in destroying lice and other insect pests in railroad coaches, jails, and private houses. Experiments showed that when 1 oz. of potassium cyanid was used to 450 cu. ft. of space it was uniformly fatal to scale insects. Cockroaches were destroyed by 12 hours' exposure to the gas, when 1 lb. of potassium cyanid was used to every 100 cu. ft. of space. Bedbugs and various species of ticks were found to be most resistant to the action of this gas. In treating infested grain, 1 oz. of potassium cyanid to 12 cu. ft. of space was found inefficient in the destruction of *Calandra oryza* and *C. granaria*.

The use of hydrocyanic-acid gas for exterminating household insects, W. R. Beattie (pp. 80–84).—From experiments with gas in combating cockroaches (*Periplaneta americana*), it is concluded that 0.1 gm. of 98 per cent cyanid of potassium per cubic foot is sufficient to kill all roaches within a period of 3 hours.

Insects of the year in Ohio, F. M. Webster and W. Newell (pp. 84–90).—Notes on chinch bug, Hessian fly, strawberry weevil, cankerworm, western corn-root worm, pea louse, cabbage bug, San José scale, southern turkey gnat, and various other insects, together with a brief report on the use of arsenate of lead, green arsenoid, Paris green, whale oil soap, and tobacco dust.

Summarizing the results of experiments with *Sporotrichum globuliferum* since 1894, it is stated that this fungus gives no evidence of its value in protecting the country from an annual recurrence of an attack of chinch bugs. Observations on the spread of San José scale from infested fruit indicate that infestation from such sources takes place slowly.

Fruits seriously injured by moths, C. W. Mally (90–93).—A report is made on the injury to apples, pears, plums, grapes, peaches, figs, citrus, and other fruits by a moth (*Ophiuza lienardi*). The moth was observed making punctures in fruits by means of its proboscis, through which the juices were sucked.

Notes on four imported pests, A. H. Kirkland (pp. 93–97).—Observations on the distribution and injurious attacks of the gypsy moth, brown-tail moth, imported elm-leaf beetle, and imported willow weevil (*Cryptorhynchus lapathi*). During the year a new colony of gypsy moth was discovered at Providence, R. I. The colony extended over an area of about 2 square miles. During 1900 it is stated that practically no damage by the moth occurred throughout the whole infested district. The numbers are increasing, however, and more serious damage is expected. Many complaints were made of the brown-tail moth, partly on account of the poisonous effect of the hairs of caterpillars when coming in contact with the skin.

Drought, heat, and insect life, Mary E. Murtfeldt (pp. 97-99).—During the unusually dry season of 1901 in the vicinity of St. Louis it was observed that cutworms, plum curculios, bollworms, codling moths, horseflies, and grasshoppers were very badly affected by the excessive drought and heat and rapidly disappeared as the season advanced. A few other insects seemed to be favorably affected by these conditions. Among these, mention may be made of ants, crickets, and *Lepisma domestica.*

The codling moth, W. W. Froggatt (*Agr. Gaz. New South Wales, 12 (1901), No. 2, pp. 1354-1365, pl. 1*).—Notes are given on the habits and life history of this insect and on its distribution in New South Wales. In combating the pest the author recommends scraping the loose bark from the trunks of trees, spraying with Paris green, painting the trees, destruction of windfalls, and removal of all rubbish from infested storehouses. Notes are given on legislation adopted against the codling moth in Tasmania, South Australia, Victoria, Queensland, and West Australia.

A report is given on experiments extending over 2 years in combating the codling moth. The trees upon which the experiments were made were 335 in number and some of them were also attacked by canker and woolly aphis. All orchards in the vicinity were badly infested with codling moth. Paris green was applied soon after the blossoms fell and later the trees were banded with burlap and the bands removed and examined at regular intervals. The number of larvæ killed under the bands during the 2 years is tabulated, showing the dates of the different inspections. During the first year 18,505 larvæ were captured under the bands, and during the second year 25,796 were captured in this way. The maximum number of larvæ captured under the band of a single tree for the season was 673.

Codling moth, G. Quinn (*Jour. Agr. and Ind., South Australia, 5 (1901), No. 4, pp. 327-329*).—Brief notes on the habits and life history of this insect, together with recommendations regarding insecticide treatment. The remedies recommended for the codling moth include destroying the eggs and young caterpillars by kerosene emulsion, by scraping the stems of trees, applying bands to the trunks of trees, collecting infested and foreign fruits, destruction of rubbish in orchards, disinfection of fruit houses and packing cases, and spraying with arsenites.

Insects injurious to the muskmelon, E. Walker (*Arkansas Sta. Bul. 69, pp. 81-84*).—The melon louse (*Aphis gossypii*) is considered the most important injurious insect on muskmelons. When the vines are sprayed with a strong decoction of tobacco before the leaves have become badly curled the insect may be effectively checked. In the author's experiments the tobacco decoction was applied with a knapsack sprayer to which a bent extension pipe was attached; the under surface of the leaves could be readily sprayed. No injurious effects from tobacco decoctions were observed. It is suggested that weedy areas in the vicinity of melon patches should be burned over.

The striped cucumber beetle appeared in considerable numbers in 1900, but was not early enough to affect young melons badly. In combating this insect a number of repellent substances are recommended, including air-slaked lime, tobacco dust, land plaster impregnated with kerosene, and Bordeaux mixture. Brief notes are also given on the habits and life history of the melon worm and pickle worm, and the usual remedies for these insects are recommended.

The pickle worm (Margaronia nitidalis), A. L. Quaintance (*Georgia Sta. Bul. 54, pp. 71-94, pls. 3*).—While the pickle worm is injurious to a number of cucurbit plants, special attention is given in this bulletin to treatment of muskmelons to prevent its injuries to this plant. The insect is injurious in the larval stage only. The larvæ bore cylindrical holes into the fruit during any stage of its growth. Flowers are frequently attacked, especially in squashes. The vines may also be injured, long cavities being eaten up or down in the stem, sometimes beneath the surface of the ground. The food plants of the insect include nearly all of the cultivated cucurbits. It is a species of American origin and is quite widely distributed throughout the United States. A description is given of the various stages of the insect. The moth is probably strictly nocturnal, flying mostly after midnight. Oviposition occurs also at night. The eggs are laid, either singly or sometimes in clusters of from 3 to 8, on flowers or flower buds or on young and tender parts of the plant. On hatching the larvæ work their way down through the stem or leaves, eating out channels. When the eggs are laid on flower buds of squash the larvæ may remain in the plants until fully grown. The older larvæ crawl about from one plant to another and attack the fruits; a number of larvæ may be found in a single muskmelon. Several broods appear during the summer and fall until checked by cold weather. The length of the life cycle in the months of July and August is from 24 to 27 days. No parasite was bred by the author from this insect. In preventing the injuries of pickle worm to muskmelons it is well to remember that early muskmelons largely escape injury on account of the late appearance of the moth. In general, a serious attack may be expected only upon late muskmelons. After harvesting the plants should be removed and destroyed, or if it is not done at that time, all plants and rubbish should be raked up and burned in late fall or winter, in order to destroy the pupæ of the insect in such situations. The use of Paris green, arsenate of lead, and other arsenical poisons is of little value in combating this insect. The pickle worm shows a decided preference for squash blossoms, and the most successful remedy for the insect consists in planting rows of squashes through the melon fields and removing the squash blossoms after the larvæ of the insect begin to appear. In 1900 1,640 larvæ were captured in this way on an experimental plat, and in 1901 5,519 larvæ were taken in the same manner. It is believed that by planting squashes at different times, so as to have a succession of flowers from the middle of June until the first of August, and by carefully removing wilted squash blossoms from time to time, the majority of the larvæ of the pickle worm may thus be captured and destroyed.

Asparagus beetles, K. Sajó (*Prometheus, 13 (1901), No. 635, pp. 166–171, figs. 3*).—Notes are given on the habits, life history, and means of combating the common species of asparagus beetles, including *Crioceris asparagi, C. 12-punctata, C. 14-punctata, and C. 5-punctata.*

Three orchard pests, E. D. Sanderson (*Delaware Sta. Bul. 53, pp. 19, figs. 11*).—The apple-bud borer (*Stenagoptycha pyricolana*) injures the terminal shoots of young apple trees in orchards and nursery stock, and attacks the tips of water sprouts on old trees. A description is given of the larvæ and moth. The insect winters in a larval condition in the terminal twigs. The moths appear about the middle of May, another brood late in August, and probably another early in October. The whole life cycle apparently occupies about 6 weeks, and it is believed there are 4 broods. The worst injury is done by the second and third broods, especially in August. The eggs are probably laid singly among the unfolding terminal leaves. Many of the larvæ are found to be parasitized. Arsenical sprays are of little value in combating the insect. The most effective preventive remedy consists in removing infested water sprouts and terminal twigs of orchard and nursery trees; all such prunings should be gathered and burned in order to destroy the larvæ.

Fruit-tree bark borer (*Euzophera semifuneralis*) bores beneath the bark of apple, pear, plum, and other fruit trees. It gains entrance in the cracks of the bark on the trunk or at the stumps of pruned branches. In some cases the trees are badly girdled and killed. The insect hibernates in cocoons beneath the bark. The adult moths appear late in May or early in June, and a second brood of larvæ appears in September. A description of the insect in its larval and adult conditions is given.

The remedies recommended for this species consist in painting abrasions in the bark, with a slight addition of Paris green; scraping loose bits of bark from the trunk and applying a wash of whale-oil soap, caustic soft soap, or other substances in winter; in the summer the borers may be cut out.

Brief notes are given on the periodical cicada with special reference to the brood which will appear during the present season. It is urged that orchards should not be pruned too closely, and that where possible budding and grafting should be postponed until after the appearance of the cicadas.

The cherry fly, K. Sajó (*Prometheus, 12 (1901), No. 614, pp. 663–668, fig. 1*).—Detailed notes are given on the habits and life history of *Spilographa cerasi.* In breeding experiments with this insect it was found that the species lives over in the pupa condition until the second year, and it is believed that in some cases it may remain in that state until the third year. It was found impossible to secure the emergence of the adult insect from the pupa during the first year, although the temperature and moisture conditions were made as favorable as possible. As a result of the author's observations it is recommended that the soil around infested trees should be removed to a depth of a few inches and covered in such a manner that the insects can not escape. This soil should be left undisturbed during the summer of the second year in order to make it certain that all insects contained in it are destroyed. Infested cherries when detected should be thoroughly cooked or otherwise treated so as to destroy the fly larvæ contained in them.

Remedies for the cankerworm, C. M. Weed (*New Hampshire Sta. Bul. 85, pp. 69–76, figs. 5*).—The cankerworm is reported as having done an unusual amount of injury in the past 2 or 3 years. Brief notes are given on the habits and life history of this insect. In combating the cankerworm, banding the trees and spraying with arsenicals are recommended. Good results are reported from the use of Bodlime in painting trees. This substance is placed around the trunks of old trees and is removed after danger from the cankerworm is past. Brief directions are given for applying arsenicals for destroying the cankerworm. Mention is made of arsenate of lead, Paris green, and Scheele's green in this connection.

Currant aphides (*Jour. Bd. Agr. [London], 8 (1901), No. 3, pp. 306–312, figs. 2*).—Descriptive, biological, and economic notes are given on species of plant lice affecting currants, including *Rhopalosiphum ribis, Myzus ribis* and *M. cerasi.* Brief mention is made of the natural enemies of these insects. As a treatment for currant-plant lice it is recommended that infested bushes should be cut back and the pruned twigs be destroyed. A caustic alkali wash may be applied for destroying the eggs of the plant lice. Besides this wash, kerosene emulsion and a decoction of quassia, alone or in combination with kerosene emulsion, are recommended.

Thrips on cacao trees, H. Maxwell-Lefroy (*West Indian Bul., 2 (1901) No. 3, pp. 175–190, figs. 3*).—It is reported that cacao trees in Barbados suffer to a greater or less extent from the attack of thrips. The insect injured the leaves of young and old trees and attacked pods in all stages. The pods turned to a deep brown color as the result of injury from thrips. It is suggested that not all of the damage to cacao trees which has been attributed to thrips is really due to these insects. In controlling the thrips it is recommended that after the beans are removed infested pods should not be allowed to remain on the ground where the young thrips mature, but should be burned, or otherwise destroyed. Pods and leaves may be sprayed with kerosene emulsion, resin wash, or other similar insecticides. Other native food plants of the insect in the vicinity of cacao plantations should be destroyed. Formulas are given for the preparation of resin wash, resin compound, kerosene emulsion, resin and whale-oil soap combined, and whale-oil soap.

Combating the coffee borer (*Rev. Agr. Réunion, 7 (1901) No. 10, pp. 412–417*).—Notes are presented on the habits, life history, and appearance of *Botys coffealis.* The insect slightly resembles in its life history the codling moth, and it is recommended that coffee plants be sprayed with Paris green, beginning with the first application about 20 days after flowering. One application is usually not sufficient.

The caprification of figs, K. Sajó (*Prometheus, 12* (*1901*), *Nos. 622, pp. 788–792; 623, pp. 807–811; 624, pp. 823–827, figs. 11*).—In this article the author gives a general account of the agency of the fig insect in the fertilization of Smyrna figs. The discussion is based partly on publications of this Department.

Experiments in the destruction of Diaspidæ injurious to fruit trees, P. Marshal (*Ann. Inst. Nat. Agron., 24* (*1897–1900*), *No. 16, pp. 587–598*).—The species of scales upon which these experiments were made were *Aspidiotus ostreæformis* and *Diaspis piricola*. Experiments with undiluted kerosene were made under a number of conditions. On February 26, 5 apple trees were sprinkled with kerosene. All of the scales were destroyed and no injury was done to the trees. On March 25 plum, apple, and pear trees were sprinkled with crude petroleum. The trees were not infested with scales and the experiment was made for the purpose of determining the effect of the oil on the trees. The trees were in bloom at the time of the experiment. No injury was done to the trees except to the inflorescence of the pears. The flowers of the apple appeared not to be injured. Similar experiments were made on other trees, with like results. In one experiment made on April 9 the leaves of apples were somewhat burned by the use of pure kerosene. An experiment with Russian oil of naphtha, which was applied to pear and plum trees on March 25, showed that this substance was very injurious to the trees. A kerosene emulsion was used in the following proportions: Boiling water 1,500 parts, black soap 400 parts, petroleum 1,000 parts. This mixture was sprayed on apple trees on April 9, with the result that nearly all of the scales were killed and only a few of the apple blossoms were injured. Crude vaselin diluted with kerosene was sprinkled upon apple trees on April 8. It formed a thick and persistent coat on the trees and killed all the scales, but greatly injured the tree. An experiment with pure oil of sesame showed that this substance, while destructive to the scales, was very injurious to vegetation. An emulsion of oil of sesame and kerosene was made in the following proportions: Black soap 200 parts, water 600 parts, oil of sesame 150 parts, and kerosene 100 parts. This mixture was sprinkled on apple trees on April 8. All of the scales were destroyed and little injury was done to the trees. Experiments were made with mixtures containing heavy oil of coal tar. One mixture was prepared in the following proportions: Water 1,500 parts, heavy oil of coal tar 900 parts, black soap 400 parts. Pear trees sprayed with this mixture diluted in 6 parts of water, on April 22, were uninjured, but the mixture had no effect upon the scales. Similar negative results were obtained from a mixture prepared as follows: Heavy oil of coal tar 1 kg., brown naphthalene 1 kg., quicklime 6 kg., and water 25 kg. Another mixture was prepared in the following manner: Heavy oil of coal tar 1 cc., brown naphthalene 1 cc., quicklime 6 cc., water 20 cc., black soap 50 gm. A considerable proportion of the scales were destroyed by this mixture and vegetation was uninjured. An experiment with black soap mixed with water in the proportion of 250 gm. of soap to 500 gm. of water showed that this substance caused no injury to the trees and destroyed a considerable proportion of the scales. Pure pyroligneous acid was sprinkled on apple trees on April 1; nearly all of the scales were killed and the tree was not seriously affected. Several experiments with hot water were also conducted by the author. It is considered that kerosene and crude petroleum are the most efficient insecticides in the destruction of scale insects, and do not seriously injure apple or pear trees, even in bloom. Heat is effective in the destruction of scales, if the superficial parts of the trees can be brought to a temperature of 60 to 65° C., but the difficulty of applying water to all parts of the tree at this temperature is so great that this method for the destruction of scales is practically impossible.

Certain European species of Lecanium and species collected from introduced plants, G. B. KING and L. REH (*Bot Mus., Abt. Pflanzenschutz, Hamburg, 3 (1900–1901), pp. 9*).—Descriptive and biological notes on each species of this genus. A table is presented showing the food plants of different species.

Inspection and certification of nursery stock, W. M. SCOTT (*Georgia State Bd. Ent. Bul. 3, pp. 12, figs. 3*).—In this bulletin instructions are given to Georgia nurserymen concerning the requirements of the Georgia law and rules and requirements of the board governing inspection and transportation of nursery stock. Information is also furnished to outside nurserymen who desire to sell stock in the State of Georgia. Brief notes are given on woolly aphis and crown gall, which are considered dangerous and prevent the issuance of certificates.

How to make a fumigating house so as to distribute the gas, E. D. SANDERSON (*Rural New Yorker, 60 (1901), No. 2699, p. 707, figs. 3*).—A brief description is given of some details of structure of a fumigating house designed for the purpose of distributing the gas as equally as possible throughout the space.

Report on the work of the Section for Plant Protection from January 1, 1900, to March 31, 1901, C. BRICK (*Bot. Mus., Abt. Pflanzenschutz, Hamburg, 3 (1900–1901), pp. 10*).—Of the apples which were introduced from America during this period 4 barrels, 1 basket, and 931 crates were found to be infested with San José scale. Tables are given showing the localities from which the apples were shipped and giving the comparative infestation of different varieties of apples. San José scale was found for the first time in Hamburg on apples shipped from Canada. Besides the San José scale, *Chionaspsis furfuris*, *Aspidiotus camelliæ*, *A. forbesi*, and *Mytilaspis pomorum* were found on apples. Two crates and one basket of pears were found infested with San José scale, and other scale insects were also found on this fruit. Brief notes are given on the importation of dried fruit from California, Eastern United States, and South America, with notes on the condition of this fruit and parasites found upon it. Large quantities of living plants imported from Japan and the United States were inspected. The San José scale was found on a number of species from Japan, but was not discovered on living plants coming from America.

The use of calcium carbid in the destruction of phylloxera, F. VASSILLIERE (*Bul. Min. Agr. [France], 20 (1901), No. 2, pp. 222–228*).—The author carried out a series of experiments in combating phylloxera by applications of pure calcium carbid mixed in various preparations with lime and the residues of calcium carbid. In one series of experiments the residues alone were used; in the second, a mixture was used containing 80 per cent of residues and 20 of calcium carbid; in the third, a mixture containing 80 per cent of lime and 20 per cent of calcium carbid; and in the fourth, a mixture containing 25 per cent of residues, 25 per cent of lime, and 50 per cent calcium carbid. The various experiments indicate conclusively that phosphorated hydrogen and ammonia are the insecticides and fertilizing constituents of calcium carbid. The pure carbid was found to be less effective than the residues from its manufacture for the destructiou of phylloxera. It was found that as much as 2,000 kg. of the residues per hectare were applied without injury to the vineyards. It is recommended that 500 kg. per hectare be adopted as a safe and effective treatment.

During these experiments it was found that success or failure from the use of calcium carbid and its residues depended largely upon the condition of the soil with regard to moisture. Treatment was successful only when the soil was in a normal state of humidity, and failed when the soil was very dry and also when it was excessively moist. This treatment was found to be equally applicable to all soils. The results obtained from these experiments were fully as satisfactory as those obtained from the use of bisulphid of carbon, and the treatment does not in any way endanger the life or vitality of the grapevine.

Important details of spraying, A. V. STUBENRAUCH (*Illinois Sta. Bul. 68, pp. 157-188, figs. 15*).—The author presents a detailed description of certain points in the preparation and application of spraying materials frequently not considered in bulletins on this subject. A classification of spraying mixtures is given, together with brief notes on the nature of parasitic fungi and the action of fungicides upon them. Spraying mixtures are arranged in 3 classes, (1) in which insoluble substances are held in suspension, (2) simple solutions, and (3) emulsions and mechanical mixtures. Paris green and Bordeaux mixture are the chief representatives of the first class, ammoniacal carbonate and sulphate of potash of the second class, and mechanical mixtures of kerosene with water of the third class. Directions are given for the selection and use of proper agitators, the placing of pumps on barrels, and the method of applying the spray. In spraying with Paris green it is urged that the liquid should be thrown in a fine mist, and that the leaves should be covered with small globules which do not run together. When too much fluid is used the individual drops run together and fall off the leaves; a portion of the poison is thus lost and the leaves may be injured where large drops accumulate. The same directions apply to the use of simple solutions, except where they are used for insecticide purposes. In the use of emulsions and mechanical mixtures the author obtained better results with larger nozzles than those used for simple solutions. Especial discussion is given to the proper character of Paris green, Bordeaux mixture, and ammoniacal copper carbonate solution. It is stated that Paris green has proved very unsatisfactory and sometimes harmful in Illinois. The requirements for good Paris green are mentioned, together with the usual tests, including that of color, ammonia, and with a microscope. The objections to Paris green are generally so serious that the author recommends the use of home arsenicals to replace Paris green. Arsenate of lead and arsenite of lime are especially recommended. Detailed notes are given on the method of preparing the liquid constituents of Bordeaux mixture and of combining these constituents in order to make a stable mixture. It is urged that the concentrated solutions of lime and copper sulphate should never be mixed, but that these materials should be combined only after being diluted and being allowed to cool. Precipitation is much less apt to take place under these conditions. Directions are also given for the preparation and use of ammoniacal copper carbonate.

The fowl tick (Argas americanus), W. W. FROGGATT (*Agr. Gaz. New South Wales, 12 (1901), No. 11, pp. 1349-1353, pl. 1*).—A brief account is given of the geographical distribution of this insect, and the literature of the subject is discussed in connection with a detailed bibliography. According to the author's observations, this tick avoids damp places and is usually not found in wood on the ground, but rather in dry nesting boxes or in cracks of the building. In order to prevent attacks of this pest it is recommended that chicken houses be built in such a manner that they may be easily cleaned. The house might profitably be painted with coal tar in order to prevent the tick from securing a foothold. Old unused sheds loosely constructed should be destroyed or removed to some distance from occupied chicken houses. Tree trunks in the neighborhood of chicken quarters should be scraped and sprayed with kerosene in order to kill any ticks which may be hidden under the bark.

Silk culture, G. MCCARTHY (*Bul. North Carolina State Bd. Agr., 22 (1901), No. 11, pp. 7-29, figs. 6*).—In this article the author gives a brief popular discussion of the history of silk culture; the habits, life history, and food plants of the silkworm; and various details concerning the rearing of silkworms; the preparation of the silk threads from the cocoon; and on the possibilities of silk raising in the United States.

Wintering of bees, U. GUBLER (*Rev. Internat. Apicult., 23 (1901), No. 12, pp. 238-242*).—A general discussion is given to the subject of hibernation of bees. Experiments have shown that bees subjected to a temperature of 7 to 8° C. can live but a short time. The 3 means by which heat is lost from colonies of bees are by conduction, radiation, and by currents of air. Honey is known to be a poor conductor of heat and gives off very little heat by radiation. It is considered, therefore, that loss of heat from the hive takes place largely by currents of air. In providing for a successful wintering of bees it is urged that special attention be given to securing a proper amount of fresh air with the least loss of heat by air currents. In order that bees may be successfully hibernated it is necessary that the colonies be of sufficient size to produce the required degree of heat without special effort, that the bees be not subjected to any disturbance from outside interference, and that a proper amount of food be readily accessible.

Foul brood, C. D. SMITH and J. M. RANKIN (*Michigan Sta. Spec. Bul. 14, pp. 11, fig. 1*).—The authors give a general discussion of this disease, based mainly on the investigations of N. E. France, W. McEvoy, and F. C. Harrison. A copy of the Michigan law relative to foul brood is given.

FOODS—NUTRITION.

The cost of food: A study in dietaries, ELLEN H. RICHARDS (*New York: John Wiley & Sons; London: Chapman & Hall, 1901, 1. ed., pp. 161*).—The principles of nutrition are discussed, and also the diets suited to persons of different ages and occupations and under different surroundings. Sample diets are given, costing from 10 to 60 cts. per day, a method of computing dietary studies is explained, and a dietary made at the School of Housekeeping reported. From her previous publications, the author quotes the results of 4 dietary studies of workingmen's families[1] and other investigations.

The volume also contains a glossary of terms and a selected bibliography.

Douglas's encyclopædia (*London: W. Douglas & Sons, Ltd., [1901], pp. 403, ill.*).—As stated in the subtitle, this is designed as a reference book for bacon curers, bacon-factory managers, bacon agents, meat purveyors, meat inspectors, meat salesmen, abattoir superintendents, city, county, or local authority officers, cold-storage proprietors and managers, sausage and pork-pie makers, and all other industries associated with the meat, pork, provision, and general food trades.

The digestibility of pentosans, J. KÖNIG AND F. REINHARDT (*Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 3, pp. 110–116*).—Experiments with man are reported in which materials rich in pentosans were added to a simple mixed diet. The articles selected were canned green peas, dried peas, purple cabbage, canned string beans, army bread, Graham bread, zwieback, and beer. The conclusion was reached that pentosans are very thoroughly assimilated and utilized.

The effect of mastication upon the digestibility of foods, LEHMANN (*Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), No. 24, p. 1168*).—Experiments by methods of artificial digestion showed that finely divided proteid material was much more thoroughly digested in a given time than large pieces of the same material. Tests are also reported with raw and cooked apples, and raw and cooked potatoes. The finely divided material digested more thorougly than that which was coarser, and the cooked more thoroughly than the raw. These experiments were reported in a paper presented at the seventy-third meeting of German Naturalists and Physicians at Hamburg, September, 1901.

Foods, feeding, and prepared foods, H. ZELLNER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), No. 24, pp. 1173, 1174*).—In a paper presented at the seventy-third meeting of the German Naturalists and Physicians held at Hamburg in September, 1901, the author describes and discusses a number of peptones and similar preparations.

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[1] Rpt. New Jersey Bd. Health, 17 (1893), p. 425.

Observations on the digestion of proteids with papaïn, L. B. MENDEL and F. P. UNDERHILL (*Reprint from Trans. Connecticut Acad. Arts and Sci., 11 (1901), Oct., pp. 14*).—In the authors' opinion the observations reported by them "indicate that papaïn belongs to a class of enzyms which differ somewhat in type from the two proteolytic enzyms that have received most careful investigation in the past, viz, pepsin and trypsin. While the products of the papaïn digestion of proteids resemble quite closely those of pepsin so far as these have been examined in detail, the enzym differs from ordinary animal pepsin in that it acts readily in both neutral and alkaline media. On the other hand, although papaïn is comparable with trypsin in exerting a solvent action in fluids of various reactions, the failure to form leucin, tyrosin, and tryptophan in appreciable quantities—at least under conditions in which they are readily formed in large quantities by other tryptic enzyms—places it in a class of its own for the present."

Bread made from sorghum, J. FINKELSTEIN (*Wojenna Med. Jour., 79 (1901), pp. 309–327; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 1, p. 31*).—Bread made from sorghum seed was fed to soldiers from 15 to 24 days. It was not very readily eaten, and in a few cases caused digestive disturbances. No definite effect on the weight of the men was observed.

Some specimens of flour and bread from the Russian famine district, A. MAURIZIO (*Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), No. 22, pp. 1017–1020*).—Analytical data are reported. To the article are appended analyses of similar materials by J. Bettels and A. Olig.

The composition and nutritive value of Russian famine bread, ERISMANN (*Ztschr. Untersuch. Nahr. u. Genussmlt., 4 (1901), No. 24, pp. 1166, 1167*).—The composition of a number of sorts of bread in use in Russia in times of famine was reported and discussed by the author in a paper presented at the seventy-third meeting of German Naturalists and Physicians at Hamburg, September, 1901.

The densimeter as a means of determining the value of flour for baking purposes, E. FLEURENT (*Compt. Rend. Acad. Sci. Paris, 132 (1901), pp. 1421–1423*).—A method of estimating gliadin is described, which consists in determing the specific gravity of an alcoholic extract of flour. An apparatus for this purpose, called a gliadimeter, is described, which, according to the author, gives satisfactory results.

Determining the quality of wheat gluten, L. LIEBERMANN (*Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), No. 22, pp. 1009–1016, figs. 5*).—A method of determining the quality of gluten by measuring its increase in volume on heating is described.

Analyses of oat meal, B. DYER (*Analyst, 26 (1901), No. 303, pp. 153–155*).—A number of analyses of fine and coarse oat meal and rolled oats are reported.

Concerning banana flour (*Jour. Agr. Trop., 1 (1901), No. 5, pp. 143–145*).—A number of articles on this subject are briefly abstracted. Analyses of banana flour, manioc flour, etc., are quoted.

Analyses of Jamaica honey, H. H. COUSINS (*Jour. Jamaica Agr. Soc., 5 (1901), Nos. 10, p. 407; 11, p. 450*).—The composition of 3 samples of honey is reported, the corrected figures appearing in the later publication.

The composition of a number of Coniferæ seeds, E. SCHULZE (*Landw. Vers. Stat., 55 (1901), No. 4–5, pp. 267–307*).—Proximate analyses are reported of the seeds of *Picea excelsa*, *Abies pectinata*, *Larix europæa*, *Pinus silvestris*, *P. maritima*, and *P. cembra*. Studies were also made of the constituents of the different groups.

Alcohol as a protector of protein, R. O. NEUMANN (*Arch. Hyg., 41 (1901), No. 2, pp. 85–118, dgm. 1*).—Experiments which are described and discussed in detail led the author to the conclusion that alcohol may act as a protector of protein.

A new method for measuring body temperature, F. G. BENEDICT and J. F. SNELL (*Arch. Physiol. [Pflüger], 88 (1901), No. 9–10, pp. 492–500*).—An electric thermometer is described with which a continuous record of body temperature may be obtained. According to the authors this instrument, which may be inserted for long periods in the rectum, under the arm, etc., gives very accurate results.

ANIMAL PRODUCTION.

Concentrated commercial feeding stuffs in Pennsylvania, W. Frear (*Pennsylvania Dept. Agr. Bul. 81, pp. 135*).—Cotton seed, linseed, wheat, rye, barley, oat, corn, and buckwheat products are discussed, together with special poultry feeds and condimental feeds. The bulletin also contains information of a general nature regarding different feeding stuffs, reprints a table of the composition of a number of feeding stuffs, and summarizes the laws which have been enacted in various States regulating their sale.

Analyses of commercial feeding stuffs, J. L. Hills, C. H. Jones, and B. O. White (*Vermont Sta. Bul. 88, pp. 16*).—In the execution of the State feeding-stuff law 386 samples of feeding stuffs collected in 1901 were analyzed. These included cotton-seed meal, linseed meal, gluten meal, gluten feed, oat feed, corn-and-oat feed, corn-and-oat provender, calf and poultry feeds, corn and oats, ground oats, wheat bran, wheat middlings, and mixed wheat feed.

"No cases of adulteration were found among the cotton seed or gluten products, although some brands do not grade as high as others and are open to improvement. In many cases the guaranties of the manufacturers were not made good. One linseed meal was found to be adulterated.

"Some brands of oat feeds, corn-and-oat feeds, provenders, and the like were found to contain considerable quantities of oat hulls, more than they should carry were the goods made from 'pure grains ground together.' A few brands were found to be extremely low in protein. Such feeds are of inferior quality, and their purchase is of doubtful advisability. Two adulterated mixed (wheat) feeds were found.

"It is thought that on the whole the grade of goods, particularly the provenders, is better than it was prior to the enactment of the law."

The composition of molasses made from light-colored peat, H. Bornträger (*Ztschr. Analyt. Chem., 40 (1901), No. 12, pp. 787–789*).—Molasses made from peat is briefly described and 3 analyses reported.

Pepton feed, A. Shmid (*Fühling's Landw. Ztg., 50 (1901), No. 22, pp. 808–811*).—Feeding tests with horses and draft oxen are reported, which the author believes show the high feeding value of "pepton feed."

The harmful effects of cotton-seed meal as a feeding stuff, L. Namêche (*L'Ing. Agr. Gembloux, 1900, p. 712; abs. in Centbl. Agr. Chem., 30 (1901), No. 5, pp. 328, 329*).—Experiments with young cattle, rabbits, a goat, cow, and pigs led the author to the conclusion that cotton-seed meal in itself is not harmful. He attributes the poisonous properties which have been observed to carelessness on the part of the feeders, ignorance in the use of cotton-seed meal, or a lack of cleanliness.

Removing spines from prickly pear (*Agr. Gaz. New South Wales, 12 (1901), No. 6, p. 697*).—In a brief note on the subject it is stated that when prickly pear is ensiled, the spines soon become soft and harmless. The silage is regarded as nutritious and palatable.

Ricinus-oil cake, O. Nagel (*Jour. Soc. Chem. Ind., 21 (1902), No. 1, pp. 30, 31*).—The author proposes the following method for removing the poisonous properties of castor pomace, which is based upon the fact that ricin or ricinin is soluble in 10 per cent cold solution of sodium chlorid, and is precipitated out of this solution by heating: Mix the powdered castor pomace with 6 to 7 times its weight of 10 per cent salt solution and allow to stand for 6 to 8 hours, with thorough stirring. Remove the solution by means of a filter press, washing with 10 per cent salt solution until a sample of the filtrate heated in a test tube shows no precipitate. Remove the cakes from the filter press and dry. The filtrate is heated to boiling to precipitate the ricin and the filtered salt solution may be used again. Attention is called to the fact that ricin has no poisonous effect on chickens, as shown by experiments in which they were fed exclusively on castor pomace for 8 days without injury.

The cost of shredding fodder (*Wallaces' Farmer, 26 (1901), No. 43, p. 1241*).—Estimates of $2.28 and $3.08 per acre and $2.50 per ton are given by practical farmers. The estimate of $2.50 per ton is accompanied by the statement that an acre of corn yields about 2 tons of shredded fodder.

Chemistry of the animal body in relation to cell life, especially the blood, L. H. Warner (*Dietet. and Hyg. Gaz., 18 (1902), No. 1, pp. 17–19*).—A discussion summarizing some of the general principles of the subject.

On the resorption of substances insoluble in water, H. Friedenthal (*Arch. Physiol.* [*Pflüger*], *87 (1901), No. 8–9, pp. 467–472*).—Fatal results showing the characteristic symptoms of quicksilver poisoning followed the administration of metallic quicksilver to rats and cats. In the author's opinion the quicksilver must have been absorbed. This investigation was discussed in relation to the passage of fat through the intestinal wall.

The passage of protein through the intestinal wall, O. Cohnheim (*Ztschr. Physiol. Chem., 33 (1901), No. 5–6, pp. 451–465*).—Experiments by the author led to the conclusion that the disappearance of peptone when in contact with the intestinal wall as observed by Hofmeister, Neumeister, and Salvioli, does not depend upon assimilation or rebuilding of albumen, but rather upon its cleavage to simpler products. This cleavage, the author believes, is brought about by a ferment secreted by the mucus membrane of the intestine for which the name erepsin is proposed. This acts upon peptone and some albumoses, but not upon albumen itself.

The formation of glycogen from protein, B. Schöndorff (*Arch. Physiol.* [*Pflüger*], *88 (1901), No. 6–8, pp. 339–345*).—A controversial article.

The influence of gall on metabolism, A. Landauer (*Math. u. Naturw. Ber. Ungarn* [*Berlin u. Budapest*], *15 (1897), pp. 75–114*).—Experiments with dogs are reported, also a bibliography of the subject given.

The feeding of animals, W. H. Jordan (*New York and London: The Macmillan Company, 1901, pp. XVII+450, figs. 10*).—This volume includes a summary of the principles of nutrition with special reference to the feeding of farm animals. It contains chapters discussing the composition and requirements of the animal body, nutrients, feeding stuffs, digestion and assimilation, rations for growth, meat and milk production, production of force, the management of farm animals, and related topics. Tables showing the composition and digestibility of the more important American feeding stuffs are included, as well as the commonly accepted feeding standards, and a comprehensive index is a noteworthy feature. The author has embodied in this work the conclusions drawn from investigations made at European and American experiment stations, as well as the results of his own extended experience as an investigator and teacher, and the work constitutes a valuable summary for students and for general readers. The chapter on the feeding of poultry was contributed by W. P. Wheeler.

Stock feeding in the South, D. R. Pillsbry (*Tradesman, 46 (1902), No. 9* [*23. annual*], *pp. 131–133, figs 3*).—A discussion with reference to local conditions.

Study of breeds in America; cattle, sheep, and swine, T. Shaw (*New York: Orange Judd Co., 1901, pp. 371, pl. 1, figs. 53*).—The available information regarding the different breeds of cattle, sheep, and swine is arranged in systematic order and supplemented by much information regarding the general subject of breeds and breeding. The volume is especially designed to suit the needs of students of agriculture.

Methods of steer feeding, G. C. Watson and A. K. Risser (*Pennsylvania Sta. Bul. 57, pp. 11; Pennsylvania Dept. Agr. Bul. 84, pp. 16*).—Continuing previous work (E. S. R., 12, p. 875) on different methods of confining steers, as well as different methods of supplying drinking water, 2 tests with steers are reported, which were carried on by the State department of agriculture in cooperation with the Pennsylvania station. The first test was made with 3 lots. Lot 1 consisted of 10 animals kept in a large box stall, 20 by 21½ ft.; lots 2 and 3 each contained 6 steers, all of which were kept in separate stalls. Lots 1 and 2 were supplied with water by means of automatic water basins. Lot 3 was turned out for an hour or two each day in yard and watered at a large trough. All the steers were fed a ration consisting of corn meal and wheat bran, 9:1, in such quantities as were readily consumed, and were given native hay and corn stover in addition. The average daily gains per steer in the 3 lots during the 104 days of the test were as follows: Lot 1, 2.05 lbs.; lot 2, 2.18 lbs., and lot 3, 1.89 lbs. Lot 1 consumed 3.62 lbs. hay, 1.46 lbs. stover, and 8.39 lbs. grain per pound of gain. Similar values for lot 2 were 3.21, 0.94, and 7.82 lbs., respectively, while the values for lot 3 were 3.47, 0.79, and 8.39 lbs. Caring for the steers in lot 1 required on an average 7.96 hours per steer; for lot 2, 14.8 hours, and for lot 3, 15.55 hours.

A second test was made with 3 lots of 2 steers each, under practically the same conditions as noted above. The average daily gain per steer in the 3 lots was 2.71, 2.92, and 2.70 lbs., respectively. The amount of hay consumed per pound of gain in the 3 lots was 4.44, 3.76, and 3.45 lbs., the corresponding amounts of grain being 5.91, 5.24, and 4.95 lbs.

As regards gains in weight and food required per pound of gain, the authors note that neither method gave markedly superior results.

"It was observed in each experiment that those animals which had a supply of water before them all the time had a somewhat better appetite and consumed their food with greater relish than did those that were turned into the yard to water once each day. Any advantage that one method may show over another is chiefly due to the difference in the amount of labor of attendance."

Practically the same amounts of straw were required for bedding under the different experimental conditions.

Shorthorn cattle (*Kansas State Bd. Agr. Quart. Rpt., 1901, Mar. 31, pp. 216, figs. 36*).—This bulletin contains a series of articles on the origin, history, and characteristics of the Shorthorn breed of cattle and related topics, as well as a report of the meeting of the Kansas State board of agriculture in January, 1901.

Hereford cattle (*Kansas State Bd. Agr. Quart. Rpt., 1901, Dec. 31, pp. 233, figs. 154*).—A number of papers on the history of Hereford cattle in America, their proper management, and related topics are included in this bulletin, as well as statistics bearing upon the general subject.

Cattle rearing, C. M. BRUCE (*Jour. Khediv. Agr. Soc. and School Agr., 2 (1900), Nos. 4, pp. 176–181; 6, pp. 261–268; 3 (1901) No. 2, pp. 77–82*).—A general discussion with special reference to local conditions.

Feeding cotton-seed meal to hogs, F. C. BURTIS and J. S. MALONE (*Oklahoma Sta. Bul. 51, pp. 15*).—To study the effect of feeding cotton seed, 16 pigs, 11 weeks old at the beginning of the trial and weighing from 25 to 67 lbs., were divided into 4 equal lots. Each lot was fed in pens with small yards for 126 days. Lot 1 received corn meal, lot 2 corn meal and middlings 1:1, and lot 3 corn meal and cotton-seed meal 4:1. Lot 4 was fed the same ration as lot 3 alternated with a ration of corn meal only, the feeding periods being respectively of 4 and 2 weeks duration. The grain ration was heavy at the beginning of the trial and lighter at the end. In addition to grain, all the pigs were fed about 2 lbs. per head daily of sugar beets and were supplied with a mixture of charcoal, ashes, and salt. Two pigs in lot 3 and 1 in lot 4 died shortly after the first month of the trial. The average daily gain of the pigs in the 4 lots was 0.62, 1.15, 1.07, and 1.06 lbs., respectively. The corresponding grain eaten per pound of gain, was 4.7, 3.7, 3.57, and 3.68 lbs. The cost of food per pound of gain, taking into account the grain only, was 2.61, 2.87, 2.24, and 2.14 cts. According to the authors, the pigs which were fed cotton-seed meal and survived were fattened with most excellent results.

"The amount of grain required to produce a pound of gain was practically the same with the pigs getting cotton-seed meal as it was with the pigs getting middlings, but was much less than that required by the pigs getting corn meal. The pigs getting one-fifth cotton-seed meal and four-fifths corn meal alternating with corn meal required 34.5 per cent less grain to produce a pound of gain than the pigs did that were getting only corn meal for their grain.

"More economical gains, disregarding losses caused by death, were obtained by feeding rations containing cotton-seed meal than by feeding either corn meal or a mixture of corn meal and wheat middlings. . . .

"The gain of the pigs getting one-fifth cotton-seed meal and four-fifths corn meal alternating with corn meal cost 23.5 per cent less than the pigs getting two-thirds wheat middlings and one-third corn meal (84 days). The cost of the gain of the corn meal fed pigs was a trifle more than that of those getting middlings in their ration, but the outcome of the former should be considered a failure and unprofitable while the latter was a success and profitable."

The authors emphasize the fact that a light ration of cotton-seed meal should be fed, and that it should be alternated with a ration free from it. The advisability of allowing the pigs to range and of supplying them with some green feed is also noted.

Pig-feeding experiments with Ohlendorff's meat meal, Lilienthal (*Deut. Landw. Presse, 27 (1900), Nos. 41, p. 510; 42, p. 519; abs. in Centbl. Agr. Chem., 30 (1901), No. 5, pp. 329, 330*).—Pigs fed meat meal made greater gains than those fed ground barley in a comparative test.

Pork production in Tunis, P. Robinet (*Bul. Dir. Agr. et Com., 6 (1901), No. 21, pp. 327–358*).—This industry is discussed with special reference to local conditions. Many statistics are quoted.

The substitution of maize for oats in the ration of horses, H. Blin (*Jour. Agricole [Paris], 12 (1901), No. 139, pp. 173–177*).—In an article quoted from *L'Acclimation*, the author discusses maize which he regards as inferior to oats for horses, though of value when properly fed.

Fatigue in army horses, J. Kryembiehl (*Ann. San. Med. Buenos Aires, 1901, July; abs. in Sanitarian, 47 (1901), No. 384, pp. 455, 456*).—Favorable results were obtained when sugar was added to the ration of horses subjected to unusual strain.

Feeding horses and cattle with carob beans, J. F. Audibert (*L'Art de nourrir et engraisser chevaux et bestiaux par la caroube. Marseilles: Author, 1901, 5. ed.; rev. in Ann. École Nat. Agr. Montpellier, n. ser., 1 (1901), No. 2, p. 186*).—This volume treats of the cultivation of the carob bean and its employment as a feeding stuff and for the manufacture of alcoholic beverages.

Ostrich farming in New Zealand (*Agr. Jour. Cape Good Hope, 19 (1901), No. 10, pp. 648–651*).—In an article quoted from the *Pastoralists' Review*, ostrich farming and management in New Zealand are described.

Recent progress in feeding fish, Knauthe and Guntz (*Centbl. Agr. Chem., 30 (1901), No. 8, pp. 537–539*).—A brief summary of some of the recent literature of the subject.

Concerning carp feeding at Sunder in the summer of 1899, E. von Schrader and F. Lehmann (*Hannover Landw. u. Forstw. Ztg., 1900, p. 216; abs. in Centbl. Agr. Chem., 30 (1901), No. 5, pp. 330–333*).—Feeding experiments are reported which led to the conclusion that maize is not satisfactory for fattening carp, and that too much or too concentrated feed should not be supplied when it is desired to produce carp cheaply.

DAIRY FARMING—DAIRYING.

Individual differences in the value of dairy cows, W. J. FRASER (*Illinois Sta. Bul. 66, pp. 95–108, figs. 5*).—A weekly record for 1 year is given of the food consumed and the milk and butter fat produced by each of 2 grade cows. The cows were fed the same ration and were otherwise treated alike in every respect. During the year one cow (Rose) consumed 6,477.92 lbs. of digestible dry matter and produced 11,329 lbs. of milk and 564.82 lbs. of butter fat; and the other cow (Nora) consumed 6,189.06 lbs. of digestible dry matter and produced 7,759.4 lbs. of milk and 298.64 lbs. of butter fat. "Reduced to a like feed basis, for every 100 lbs. of milk given by Nora, Rose gave 139.5 lbs., and for every 100 lbs. of butter fat produced by Nora, Rose produced 180.7 lbs." On the same feed basis the difference in the value of the butter produced was $47.09. The cow Rose also made a greater gain in live weight.

In discussing briefly a profitable standard of production the author states that in general cows producing less than the equivalent of 250 lbs. of butter annually can not be kept at a profit in Illinois. Methods of testing cows and grading up dairy herds are also discussed.

The production of milk and butter—variations in the fat content of milk, L. MALPEAUX and E. DOREZ (*Ann. Agron., 27 (1901), No. 10, pp. 449–461*).—The results of experiments on the influence of breed, individuality, time of milking, heat, stage of lactation, and atmospheric conditions upon the fat content of milk are reported and the different subjects are discussed at some length. The breed is considered as having a very marked influence upon the percentage of fat in milk. Records of cows in the same stage of lactation, fed the same ration, and giving approximately the same yield of milk are given to show variations in the fat content of milk considered due to individuality. The last milk drawn was much richer in fat than that obtained at the commencement of milking, but was slightly poorer in other elements. During 6 days one cow, milked 3 times a day, gave 82 liters of milk containing 36.5 gm. of fat per liter, and during the following 6 days the same cow milked twice a day gave 76 liters of milk containing 34 gm. of fat per liter. When cows were milked morning, noon, and evening the milk was richest at noon and poorest in the morning, and when milked morning and evening, the milk was generally slightly richer in the evening. Only a slight diminution in the yield of milk and fat was observed in 4 cows during the period of heat. A mild humid atmosphere was the most favorable for milk and butter production.

The production of milk and butter—the influence of food upon the fat content of milk, L. MALPEAUX and E. DOREZ (*Ann. Agron., 27 (1901), No. 12, pp. 561–593*).—The influence of carbohydrates, fats, and proteids in foods upon the fat content of milk was studied in a number of experiments here reported, and numerous feeding stuffs were tested. The results of experiments with sugar and molasses showed no marked increase in the fat content of milk due to an excess of carbohydrates. The addition of linseed meal to the ordinary ration in an experiment with 4 cows in no case increased the fat content of the milk. In an experiment with 1 cow sesame cake was fed for 3 months in quantities increasing from 1 to 5 kg., during which time the fat content of the milk decreased from 32.1 to 23.8 gm. per liter. Cotton-seed cake and linseed cake were also used in other experiments. The authors conclude that foods rich in fat produce no appreciable increase in the fat content of the milk. Rations having nutritive ratios varying from 1:8 to 1:3 were compared, the nutritive ratio of 1:6 giving the best results.

Considerable tabulated data are given for the feeding tests with the various forage and root crops, grains, and by-products. Among the conclusions drawn are the following: Succulent forage like beet leaves, fodder corn, and mustard should form only a small part of the ration for dairy cows. Potatoes are ot to be recommended. Carrots are superior to beets, but the increased yield of butter due to carrots is not sufficient to pay for the cost. Oats and wheat bran are satisfactory feeds. Horse beans are not suitable for butter production. Malt sprouts and brewery residue may enter into the dairy ration, the latter to be fed with concentrated feeds. Sugar-beet pulp, well ensiled, may be fed without inconvenience to the animals and without bad effects on the quality of milk and butter. Of the oil cakes, cotton seed, cocoanut, linseed, sesame, colza, and poppy rank in the order named.

Danish experiments on the feeding of dairy cows, A. Mallèvre (*Ann. Inst. Nat. Agron., 24 (1897–1900), No. 16, pp. 217–240*).—This is a review of investigations in Denmark on the feeding of dairy cows based largely on reports of the laboratory of agricultural experiments of the Royal Veterinary and Agricultural High School of Copenhagen. Methods employed in feeding experiments with dairy cows are described in detail, and résumés are given of experiments on the addition of root crops to ordinary rations for dairy cows, the substitution of root crops for concentrated feeding stuffs, and the effect of root crops on the quality of butter.

The physiology of milk secretion, A. W. Bitting (*Indiana Sta. Rpt. 1901, pp. 51–88*).—The author discusses this subject in detail under the following headings: The characteristics of milk, quantity and quality of milk secreted, influences affecting milk production, influence of food upon milk secretion, and comparisons of grains and by-products. The article includes compiled data relating to the composition and properties of milk and a review of considerable experiment-station work.

Different theories of milk formation are given. "The latest theory is to regard milk as a product of metabolism of the cells of the mammary gland. It is in all essential characters a secretory product, and not an excretory product. In reviewing the physiology of the formation of milk in such a light, it is only regarding it in the same way as saliva, gastric and pancreatic juices. It may be argued that these glands secrete a special product to be used in the animal economy, while milk is not so used. All excretory glands, as the kidneys, liver, and sweat glands, find their material already prepared in the blood, the result of activity in other parts of the body, and they serve as a means of eliminating it. Secretory glands, as the pancreas, salivary glands, etc., do not find their active principles in the blood, but construct them within their own especial cells. The mammary gland does not find fat, casein, and lactose in the blood, but constructs them within its own tissues. The recognition of the mammary gland as an organ having a special function will explain fully all the difficulties met in trying to reconcile all other theories with the facts as they are observed."

Under the influences affecting milk production are considered breed, heredity, age, pregnancy, and food. In this connection are given brief summaries of the results of experiments at a number of stations considered typical of the work done to determine the effect of food upon the quantity and quality of milk. "In all cases the influence is within narrow limits, and can all probably be accounted for by the general effect upon the body, or by one food being more palatable than another and therefore more agreeable to the animal. The effect upon milk is probably no greater than it is upon the body as a whole The discrepancy between the results obtained by different experimenters may often be accounted for by the difference in the method of conducting the experiments. The usual length of time given to each period in a feeding experiment is 10 days or 2 weeks. Many foods have a temporary stimulating effect, which food naturally shows in such short period experiments, and which would disappear if the period were continued for a longer time."

The author also discusses milk secretion as affected by drugs, certain foods containing volatile substances, watering, weather conditions, methods of milking, exercise, excitement, abortion, sickness, tuberculin, dehorning, and spaying.

The composition of milk, H. D. Richmond (*Analyst, 26 (1901), No. 309, pp. 310–318*).—The average composition of 13,798 samples of milk analyzed during 1900 was as follows: Specific gravity 1.0323, total solids 12.57 per cent, fat 3.64 per cent, and solids-not-fat 8.93 per cent. The lowest fat content occurred during May and June and the highest during October and November. The fat was determined usually by the Gerber method and the solids-not-fat calculated. Results obtained in this way agreed closely in comparative tests with results obtained by the Adams method for fat and the asbestos method for total solids. The chrysotile method of Macfarland (E. S. R., 4, p. 983) was found unsatisfactory.

Determinations were made of the milk sugar, proteids, and ash in a large number of samples of milk to ascertain if an excess or deficiency of solids-not-fat is due to an excess or deficiency of any one of these constituents. The following conclusions were reached: "Any deficiency of solids-not-fat below 9 per cent is chiefly due to a deficiency in the milk sugar. Any excess of solids-not-fat above 9 per cent is chiefly due to an excess of proteids. The ash may be deduced with very fair accuracy from the proteids by the formula $A = 0.36 + 0.11\ P$."

A study was made of the relation between the proteids and salts of milk. The average results of analyses of whole milk, milk serum obtained by filtration through porcelain which removed all the proteids, and of whey produced by the action of rennet are reported and discussed. The author considers that one-third of the base with which casein is combined in milk is soda, and also that casein forms a molecular compound with calcium phosphate.

Daily variations in the fat content of milk, M. Siegfeld (*Molk. Ztg., 15 (1901), No. 50, pp. 907–910*).—Determinations made almost daily for 1 year of the fat content of the mixed milk of 10 dairies, which delivered during that time from 18,000 to 140,000 liters of milk each, are reported in tabular form. The most common daily variation was from 0.1 to 0.3 per cent. The daily variation in the milk of the two largest dairies did not exceed 0.45 per cent during the year. The greatest and most frequent daily variations were observed in the milk of the smallest dairies, amounting in some cases to 1 per cent and over. Causes of variations in the fat content of milk, such as the health of the cows, heat, weather conditions, changes in feeding and attendants, etc., are discussed.

Causes of variation in the butter-fat percentages of milk and cream, G. S. Thomson (*Jour. Agr. and Ind. South Australia, 5 (1901), No. 5, pp. 445–450*).—The author points out that variations in the yield and quality of milk may be due to methods of feeding cows, irregularity in milking, rough treatment, exposure to cold, stage of lactation, etc. Results of experiments in substantiation of some of these points are given. Factors affecting the separation of milk, such as temperature, degree of acidity, etc., are noted. The butter returns of cream are shown to be seriously affected by the age of the cream and by the mixing of sweet and acid samples. Practical suggestions are given throughout the article.

The relation between specific gravity, fat, and solids-not-fat in milk, N. Leonard (*Analyst, 26 (1901), No. 309, pp. 318, 319*).—The author has deduced a new formula for calculating fat from specific gravity and total solids, which, however, is not considered as accurate as the formula previously noted (E. S. R., 12, p. 186).

A method of determining the specific gravity of milk serum and fat, E. Gutzeit (*Milch Ztg., 30 (1901), No. 33, pp. 513–515*).—From the specific gravity and fat content of whole milk and of the skim milk the author has deduced formulas for determining the specific gravity of milk serum and of fat.

Pasteurization and sterilization of milk, H. de Rothschild (*Pasteurisation et stérilisation du lait. Paris: Octave Doin and Ch. Béranger, 1901, pp. 91, figs. 33*).—The different phases of this subject are discussed in detail in chapters entitled: The chemistry and bacteriology of milk production and rational treatment of milk, pasteurization of milk, sterilization of milk, and the value of sterilized milk—its digestibility and objections which have been raised against its use. A bibliography of the subject is appended.

Pasteurization of milk for butter making, H. H. DEAN and F. C. HARRISON (*Ontario Agr. Col. and Expt. Farm Bul. 117, pp. 16, dgms. 2*).—Methods of pasteurization are briefly discussed and 6 series of experiments are reported, the results of which are embodied in the following summary:

"(1) Milk as ordinarily delivered at a creamery may be successfully pasteurized. The milk used in these experiments was largely furnished by patrons who had but ordinary facilities for taking care of it. In the winter we receive our milk but three times a week; in summer it is delivered daily.

"(2) On but two occasions was the acidity of the milk over 0.2 per cent. The acidity averaged about 0.17 per cent. There is danger of the milk coagulating when heated, if it contains more than 0.2 per cent of acidity.

"(3) It was noticed that the lots heated at from 185 to 195° produced more foam than those heated to the lower temperatures of 140 to 160°. This was most noticeable in the samples heated to 195°. At 185° the foam was not sufficient to cause much trouble in handling.

"(4) By cooling the skim milk with water to a temperature of about 65° immediately after it comes from the separator we were able to return it to the patrons in excellent condition for feeding, even in hot weather.

"(5) The use of 10 to 15 per cent of culture in the pasteurized cream enabled us to ripen the cream without any difficulty. The culture used was a lactic-acid bacillus.

"(6) Pasteurization of milk at 185° and the use of a pure culture is the best method of securing uniformity, keeping quality, and the mild flavor requisite for export butter.

"(7) The cooked flavor which was present in the butter made from milk heated from 185 to 195° usually disappeared at the end of about 2 weeks. In one or two lots heated to 195° the cooked flavor remained for some time. There is apparently no danger of cooked flavors on butter made from milk pasteurized at 195° at the end of 2 weeks, or by the time it would reach the British markets.

"(8) The species of bacteria present in the milk when the animals were kept in the stable were very undersirable. Many putrefactive and fecal bacteria were present, hence the necessity of keeping the stable walls and rafters well cleaned. A good coat of whitewash increases the amount of light, and gives a general clean effect to the stables.

"(9) The average number of bacteria per cc. found in milk pasteurized at 140° F. was 631,046, at 160° was 12,848, at 185° was 81, and at 195° was 40."

The influence of high temperatures on tubercle bacilli in milk, C. BARTHEL and O. STENSTRÖM (*Centbl. Bakt. u. Par., 1. Abt., 30 (1901), 11, pp. 429-432*).—The authors briefly review the literature on this subject and report upon a number of different experiments which they have carried out. For this purpose a cow in the last stages of tuberculosis of the udder was obtained and the secretion from the anterior or badly affected half of the udder was mixed with the milk from the posterior quarters of the udder, which were not as yet badly attacked by tuberculosis. It was found that a temperature of 65° C. for periods of 5, 10, and 20 minutes was not sufficient to destroy the tubercle bacillus. Milk maintained at 70° C. for periods of 5, 10, and 15 minutes remained in each instance tuberculous. The same results were obtained with experiments at a temperature of 75° C. At a temperature of 80° C. the milk remained tuberculous after exposure for periods of 1, 5, and 10 minutes. The milk upon which these experiments were made, on account of the advanced stage of tuberculosis, had already suffered great physical and chemical changes. The reaction was decidedly alkaline, and this probably accounts for the fact that tubercle bacilli resisted the highest temperature for such long periods. Attention is called to the well-known fact that tubercle bacilli show greater resistance to heat in a neutral or alkaline solution than in an acid solution. It was found that in milk which had not yet suffered any chemical changes a momentary exposure to a temperature of 80° C. was sufficient to kill tubercle bacilli. It is urged that in order to reduce the results of all experiments along this line to a standard, attention should be given to the reaction of the milk before the experiment is made, in order to determine whether it is alkaline, neutral, or acid.

Report of the Chemical Control Station at Christiania, Norway, for 1900, H. GREGG (*Aarsbr. Offent. Foranst. Landbr. Fremme, 1900, pp. 208–246*).—The report gives accounts of routine analytical work done at the station during the year and of investigations of more general interest. Among the latter that of the composition of Norwegian creamery butter is more fully described. The investigation was begun in 1898, bi-weekly examinations of the products of nine different creameries being made. The samples examined were taken by authorized agents of the station and were in all cases genuine butters. Limits so far observed were: Specific gravity (at 100° C.) 0.8636 (minimum), Reichert number 21.1 (minimum), and refractive index 43.7 (maximum), while Hübl numbers ranged between 28.8 and 45.1. The influence of the season on the composition of the butter fat is shown in the Reichert numbers, iodin numbers, and refractive index. In general, maximum figures were obtained for Reichert number from November to February, and a decided minimum in June.—F. W. WOLL.

Payment for milk and cream according to the yield of butter, J. FROST (*Milch Ztg., 30 (1901), No. 35, pp. 545–547*).

The manufacture of Gruyère cheese, M. BEAU (*Jour. Agr. Prat., n. ser., 2 (1901), Nos. 27, pp. 12–14; 29, pp. 71–73; 30, pp. 105–108*).—A description of methods employed in the manufacture of this cheese.

Common-sense ideas for dairymen, G. H. BLAKE (*Elgin, Ill.: The Elgin Dairy Report, 1900, pp. 281, figs. 27*).—The subtitle states that this is "an exposition of the methods pursued by the most practical and successful dairymen in the Elgin district." The book is largely compiled and is designed to present in a simple and concise manner the most important principles underlying successful dairy farming and dairying. Chapters are devoted to the following: Selection of dairy stock, feeding and care of dairy stock, corn and clover culture, milk and cream testing, care of milk, butter makers and butter making, cheese making, creamery building, farmers' dairy clubs, and miscellaneous facts.

Bibliography of milk, second supplement, 1901, H. de Rothschild (*Bibliographia lactaria, deuxième supplément, 1901. Paris: Octave Doin, 1902, pp. 106*).—This second supplement to de Rothschild's extensive bibliography of milk is similar to the one previously noted (E. S. R., 13, p. 690) and contains a classified list of 1,578 titles of papers which appeared during 1901 or have been discovered since the first supplement was issued. Many of the papers noted are not recent, a considerable number dating back from 10 to 25 years, and several to the seventeenth and eighteenth centuries.

VETERINARY SCIENCE AND PRACTICE.

The toxin of tapeworms, E. MESSINEO and D. CALAMIDO (*Centbl. Bakt. u. Par., 1. Abt., 30 (1901), Nos. 8, pp. 346, 347; 9, pp. 374, 375*).—The authors undertook experiments to determine whether the injurious effects from the presence of tapeworms were due to chemical irritation or to the production of a poisonous substance. Extracts were made from tapeworms which were ground up in a mortar with distilled and sterilized water, and rabbits, guinea pigs, and dogs were inoculated with samples of this extract. In all cases poisonous effects of uniform character were produced. These effects included trembling of the body, paralysis, especially of the hind legs, and lowering of the body temperature. As a rule the animals recovered from the effects of the injections after about 24 hours. It is believed, therefore, that the injurious effects of tapeworms are to be ascribed to the action of a special toxin which is produced by the worms.

Further experiments were conducted for the purpose of isolating, if possible, the toxin which was believed to be present in the extract obtained from crushed tapeworms. Experiments were made for this purpose with a large number of chemical substances, and precipitates were obtained in a number of these experiments. All precipitates were amorphous without any indication of crystalline forms. The precipitate which was obtained from the treatment of the extract with sulphate of magnesia produced certain lowering of the temperature, paralysis of the hind legs, and contraction of the muscles in the rabbits and guinea pigs, even when administered in small doses. Experiments with these precipitates were made for the purpose of determining their hæmolytic action. It was found that the red blood corpuscles of rabbits and guinea pigs maintained at a temperature of 37° C. were entirely dissolved within 10 hours by the action of precipitates. When a small quantity of the precipitate was injected directly into the substance of the liver of rabbits and guinea pigs, a fatty degeneration of the liver was noted within 48 hours.

The three species of armed palisade worm, A. STICKER (*Deut. Tierärztl. Wchnschr., 9 (1901), Nos. 33, pp. 333–336; 34, pp. 346, 347, figs. 9*).—The author gives detailed notes on the life history, habits, and parasitism of *Sclerostomum edentatum, S. bidentatum,* and *S. quadridentatum.* From a critical review of the literature on this subject it appears that the points requiring further study at present are as to which of the 3 species occur in any given region, in what numbers and in what month are they found, at what time do they become mature, and what is the proportion between the numbers of the 2 sexes.

Tetanus infection supposed to follow the absorption of toxin by the intestinal wall, RÉMOND (*Rec. Méd. Vét., Paris, 8. ser., 8 (1901), No. 13, pp. 412–414*).—The author gives a description of a case of well pronounced tetanus in a horse in which the symptoms were characteristic. The animal was given an injection of antitetanic serum, but died within 20 hours after the first marked symptoms were observed. A careful post-mortem examination indicated rather conclusively that the infection in this case had taken place by means of the alimentary tract. The author believes that this mode of infection must be taken into consideration in accounting for epidemics of tetanus.

Cerebro-spinal meningitis, J. WILSON (*Vet. Jour., 53 (1901), No. 313, pp. 34–37*).—The author discusses briefly the symptoms ordinarily manifested in cases of this disease. According to the experience of the author, recovery will not take place in more than 40 or 50 per cent of the cases. After recovery from the disease, where there is a loss of coordination of muscular movements, with atrophy of the muscles, good results were obtained by the application of cantharides to the loins and the administration of small doses of nux vomica.

Agglutination reaction in infections of various grades, S. J. GOLDBERG (*Centbl. Bak. u. Par., 1. Abt., 30 (1901), No. 16, pp. 605–617*).—The significance and value of the agglutination test as proposed by Widal has been thoroughly interpreted by different authors, and the present study was made for the purpose of gaining more evidence on some of the doubtful points concerning this problem. The results of inoculation experiments and blood tests indicate that in a fatal infection the reaction of agglutination remains the same as before infection. When non-fatal doses of the virus were given, an increase of the agglutinating power of the blood was noted, but this reaction was by no means the same in different animals. While in the rabbit the agglutinating power became much more pronounced, no such reaction was observed in guinea pigs. The reaction increases gradually in intensity, reaches a certain maximum, and then returns to the normal. The increase of the agglutinating power of the blood is to be regarded as an indication of successful self-protection on the part of the animal.

Artificial production of experimental spore material of a fixed degree of resistance to living steam, for the purpose of testing the value of disinfection methods, R. WEIL (*Centbl. Bakt. u. Par., 1. Abt., 30 (1901), Nos. 13, pp. 500–504; 14, 526–536*).—For the purpose of testing the influence of various disinfecting materials anthrax spores have been extensively used. The author calls attention, however, to the great difficulty of obtaining a sufficient number of anthrax spores for such experiments and to the practical impossibility of maintaining any quantity of spores at the same degree of resistance to unfavorable influences. Even when anthrax spores of a known degree of resistance are protected from the light and kept at a constant low temperature, they gradually lose their resisting power, and thus become useless for the purpose of continued tests with known strengths of various germicide substances. Better results were obtained by the author in making use of the spores of *Bacillus mesentericus ruber*. Spores of this bacillus which were maintained at a boiling temperature for ¼ hr. did not show a sufficient reduction in their resisting power. After being maintained at the same temperature for ½ hr. the desired degree of reduction in resisting power was obtained. After such exposure the spores were found to withstand the action of living steam for about 10 minutes. In some cases, however, spores were much more resistant, and it was found, therefore, that for the most resistant examples of these spores an exposure to a boiling temperature for ¾ hr. was too short and for 1½ hr. was slightly too long in order to obtain the desired results. After determining the fact that spores of a known degree of resistance could be produced by artificial means, it was desirable to ascertain whether these spores were modified by desiccation or other external influences to such an extent that they could not be depended upon to maintain the same degree of resistance for any considerable period. Experiments along this line showed that for seven months spores were unchanged in their resisting power by desiccation. Experiments were undertaken for the purpose of determining whether cultures made from spores in which the resisting power had been artificially reduced would develop spores of a correspondingly weakened resisting power. It was found that such was the case to a considerable degree, and it is believed that this fact may help to explain the existence in nature of races of the same bacillus of varying degrees of virulence.

The technique of micro-biology and serotherapy, A. BESSON (*Technique microbiologique et sérothérapique. Paris: J. B. Baillière & Sons, 1902, 2. ed., pp. 686, figs. 289*).—This volume contains an elaborate discussion of sterilization, culture media, isolation of bacteria, incubation, bacteriological microscopy, staining of spores, capsules and cilia, inoculations, observations of inoculated animals, technique of autopsies, and demonstration of pathogenic bacteria in the fluids and organs of the body. A large portion of the volume is devoted to a special study of the more important bacteria which are concerned in the production of infectious diseases in man and animals. Special chapters are occupied with the study of the organisms of anthrax, blackleg, swine erysipelas, fowl cholera, hog cholera, tetanus, glanders, tuberculosis, and protozoan parasites.

Morphology of the blood of the fœtus of the rabbit and guinea pig and the influence of infection of the gravid female on the blood of the fœtus, N. TSCHISTOVITSCH and YOUREWITSCH (*Ann. Inst. Pasteur, 15 (1901), No. 10, pp. 753–768*).—In a study of the normal blood of the rabbit fœtus it was found that the various white blood corpuscles exist in the following proportions: Polynuclear eösinophilous corpuscles, from 41.3 to 62.7 per cent; ordinary leucocytes, from 2.9 to 12 per cent; large mononuclear corpuscles, from 11.8 to 28 per cent; lymphocytes, from 4.2 to 5 per cent. In the normal fœtus of the guinea pig the proportions of the different kinds of leucocytes were as follows: Polynuclear leucocytes with granular protoplasm, 0.7 to

9.9 per cent; polynuclear leucocytes with clear protoplasm, 0 to 6.7 per cent; large mononuclear corpuscles, 9.9 to 42.5 per cent; lymphocytes, 53.2 to 88.2 per cent. Inoculation experiments were conducted with bouillon cultures of the diplococcus of Fränkel, *Staphylococcus aureus*, and with diphtheria toxin. As a result of the authors' experiments it was found that as a rule pronounced morphological modification of the fœtal blood at the time when under the influence of infection or intoxication, the blood of the mother showed the hypoleucocytes or hyperleucocytes were absent. The absence of these modifications is explained by the fact that there is no passage of the bacteria or toxin into the blood of the fœtus. The pure cultures of toxin were introduced directly into the blood or into the lymphatic system of the mother. These materials were rendered harmless in the blood of the mother, or at least did not pass through the placenta. Occasionally intra-uterine death of the fœtus occurs during the infection of the mother, and in such cases the toxin or bacteria effected a passage into the blood of the fœtus. The number of leucocytes found in the blood of the fœtus was small and the authors believe that the defense of the organism by means of phagocytes is not well developed until after birth.

The group of Pasteurella, J. LIGNIÈRES (*Rec. Méd. Vét., Paris, 8. ser., 8 (1901), No. 13, pp. 414-416*).—This article is of a controversial nature, the purpose being to justify the establishment of a systematic group of ovoid bacteria which produces various forms of hemorrhagic septicæmia. It is not considered that the generic name adopted by the author is of vital importance, but the objections to its use are not considered of great weight.

Contagious diseases of animals and man, L. BAILLET (*Rec. Méd. Vét., Paris, 8. ser., 8 (1901), Nos. 13, pp. 417-423; 17, pp. 553-561*).—Special attention is given to a discussion of glanders and tuberculosis, as being among the most important contagious diseases which are common to man and animals and which may be transmitted from one to the other. The use of mallein and tuberculin for detecting incipient cases of glanders and tuberculosis is considered of great importance from the standpoint of general hygiene, since by this means the existence of the diseases in animals may be made known and precautions may be taken to prevent their transmission to man.

Diagnosis of tuberculosis in animals during life, DEWAR (*Vet. Jour., 53 (1901), No. 314, pp. 92-96*).—An elaborate discussion is presented of the tuberculin test, its efficiency, and the means of arriving at a practical judgment concerning the significance of reactions which are obtained by its use. Statistics are given from the experiences of the author and other writers relating to the percentage of tuberculous animals in different herds. The rules for the application of tuberculin laid down by the author are as follows: The tuberculin must be thoroughly reliable; the herd to be tested must be kept quiet and undisturbed, without great change of food, pasture, surroundings, or management during the experiment; and all special conditions which influence the reaction in individual cases must be taken into consideration. The author considers all animals which react with an elevation of temperature of more than 2½° F. as tuberculous.

Relation of bovine to human tuberculosis. Tuberculin tests of the college herd, G. H. GLOVER and B. C. BUFFUM (*Colorado Sta. Bul. 66, pp. 26, pls. 3*).—A large portion of this bulletin is of a controversial nature. An attempt is made to summarize evidence which tends to disprove the contention of Koch that human and bovine tuberculosis are distinct diseases. The tuberculin test was applied to the college herd for the purpose of determining whether or not any of the animals were affected with tuberculosis. The tuberculin test was made on 31 head of cattle, and of this number 10, or 32¼ per cent, reacted. Of the 31 head, 11 were Jerseys and 20 Shorthorns, and 5 of each breed reacted, with 2 additional doubtful cases among the Shorthorns. Post-mortem examinations were made on 5 of the animals and the details of pathological changes are given. It is concluded that while tuberculosis may be less common in Colorado than in humid States, it is nevertheless present and should receive attention.

Tuberculosis of man is transmissible to cattle, THOMASSEN (*Rec. Méd. Vét., Paris, 8. ser., 8 (1901), No. 17, pp. 529–538*).—A critical review of the recent literature of this subject is presented by the author. Inoculation experiments were made on 2 calves and 2 two-year-old heifers, during which tubercle bacilli of human origin were used. The bacilli came from cases of tubercular meningitis, tubercular arthritis, and tuberculous kidneys. Hypodermic intraperitoneal and intratracheal inoculations were made. Great care was exercised to be certain that the animals were not infected with tuberculosis before the experiments began. In only one case was a generalized form of tuberculosis developed. In one other of the 4 experiments local tubercular lesions were produced. The author concludes from these experiments that it is difficult but not impossible to produce tuberculosis in cattle by means of pure cultures of tubercle bacilli from man. It is considered, therefore, that tuberculosis of man and of cattle are identical. The author believes that the transmission of tuberculosis from cattle to man is much easier than that from man to cattle, on account of the greater virulence of tubercle bacilli of bovine origin. It is urged, therefore, that the precautions which have usually been recommended should still be observed in preventing the transmission of tuberculosis to man through the medium of infected milk and meat of tuberculous cattle.

The communicability of human tuberculosis to cattle, S. DELÉPINE (*British Med. Jour., 1901, No. 2130, pp. 1224–1226*).—The author undertook inoculation experiments for the purpose of determining whether tuberculosis could be transmitted from man to animals. The material which was used for inoculation was prepared by mixing the sputum of 6 tuberculous patients. The bacilli in the sputum from different patients were of different types, including long slender forms, thick, uniformly staining forms, and short forms in clumps. As experimental animals the author made use of 4 calves which were apparently healthy, but which were not previously tested with tuberculin. One of the calves was inoculated directly into the lung, the second subcutaneously, the third into the peritoneum, and the fourth was fed 2 qts. of milk containing ten times as much tuberculous material as the other calves had received by inoculation. The first calf, which was inoculated in the lung with 5 cc. of mixed tuberculous sputum, died on the sixth day of generalized tuberculosis, which was not due to the inoculation. The second calf, inoculated with the same amount of sputum, subcutaneously, died on the sixth day with a conspicuous enlargement of the gland at a distance of 5 in. from the point of inoculation. This experiment was considered of doubtful result. The third calf, which received 5 cc. of mixed sputum in the body cavity, showed no definite reaction after 26 days, but reacted 68 days after inoculation and exhibited, on post-mortem examination, marked tuberculosis of the peritoneum. The fourth calf, fed with 50 cc. of mixed sputum with its food, died 26 days afterwards with tubercular lesions along the alimentary tract, but no evidence of tuberculosis in any other organ.

Detailed notes are given on the history of each of these experimental animals. It is stated that there was no evidence of any tendency toward resolution in any of the tubercular lesions. They were all fresh and in a progressive condition, and the evidence was considered conclusive by the author that the disease, in 2 of the 4 cases, was communicated by feeding and inoculation into the peritoneum respectively.

Tuberculosis in dairy cattle, J. E. DEAN (*Queensland Agr. Jour., 9 (1901), No. 1, pp. 122–124*).—The author discusses the relationship of tuberculosis in dairy cows to the disease in man. Attention is again called to the fact that 36 out of the 40 cows which composed the dairy from which the queen and her household obtained milk were found to be tuberculous. The milk of this dairy was used freely, but no cases of tuberculosis developed in any persons who used the milk. Cases are cited from the literature of the subject which indicate the general healthful effect upon man and animals from drinking milk freely, whether such milk comes from tuberculous or nontuberculous animals. The author believes that the good results which are supposed to accrue from a free use of the tuberculin test are much exaggerated by the advocates of this process for exterminating tuberculosis. It is considered that the losses occasioned by the application of the tuberculin test and the enormous expense, in connection with serious doubts as to the necessity for guarding against the transmission of tuberculosis from animals to man, are serious obstacles to the general use of tuberculin. The author suggests a method by which veterinary surgeons are appointed in control of specified districts for the purpose of inspecting all cattle, and destroying or quarantining those which show outward signs of tuberculosis.

Tubercle bacilli in cows' milk as a possible source of tuberculosis disease in man, J. McFadyean (*Vet. Jour., 53 (1901), No. 314, pp. 83–91*).—The author presents a review of the subject, calling attention especially to the arguments which tend to prove the identity of bovine and human tuberculosis. An attack is made upon the arguments of Koch before the British Medical Association, and it is urged that no relaxation should be allowed in the measures to prevent the transmission of tuberculosis from lower animals to human beings. It is admitted that tuberculosis of cattle is usually contracted from tubercle bacilli of bovine origin, while that of man is similarly transmitted, for the most part, by means of bacilli of human origin, but the identity of human and bovine tuberculosis is still maintained as highly probable.

Tuberculosis and the milk supply, J. A. W. Dollar (*Vet. Jour., 53 (1901), No. 314, pp. 100–106*).—The literature of this subject is carefully reviewed, with especial reference to the extent to which tubercle bacilli are found in the milk of dairy cattle. The author believes that milch cows and goats should be placed under regular and periodical inspection, that the sale of milk from tuberculous animals for human use should be forbidden in all cases where physical evidence of tuberculosis is present and in cases of tuberculosis of the udder.

Tuberculosis in the State of Victoria, G. Pentland (*Vet. Jour., 53 (1901), No. 315, pp. 176–183*).—The author reviews the history of the origin and distribution of tuberculosis in Victoria. Statistical tables are presented showing the extent of tuberculosis. No indemnity has been granted for condemned animals, but no trouble in this line has been experienced, since the owners have considered such animals valueless. The present districts over which inspectors have charge are considered too large for the most effective inspection and quarantine.

Legislation suggested for controlling and eradicating tuberculosis in animals, D. McEachran (*Vet. Jour., 53 (1901), No. 314, pp. 116–131*).—In this article the author discusses heredity, diagnosis of tuberculosis, tuberculin test, its reaction, various objections which have been urged against the tuberculin test, the different methods of making the test adopted by different countries, quarantine regulations for breeding stock, fat cattle and settlers' cattle, State legislation with reference to bovine tuberculosis in the United States, the danger from milk and meat of tuberculous animals, means for preventing the introduction of tuberculosis into the herd, disinfection of premises, and the payment of indemnities for condemned animals.

The relationship of tubercle bacillus to other acid-proof bacteria and actinomyces, A. Moeller (*Centbl. Bakt. u. Par., 1. Abt., 30 (1901), No. 14, pp. 513–523*).—It has for some time been considered impossible to definitely identify the tubercle bacillus by a simple microscopic examination, for the reason that this bacillus can no longer be considered the only acid-proof and alcohol-proof species of bacteria. Similar properties are possessed by the smegma bacillus, leprosy bacillus, and the organisms which cause tuberculosis of cold-blooded animals and of birds. It has been shown, furthermore, that the tubercle bacillus is not always acid-proof, even when taken directly from sputum or from tubercles of bovine origin. The author isolated a bacillus from the tubercles taken from an animal suffering from a typical form of pearl disease, and found that this organism was absolutely acid-proof and alcohol-proof. The bacillus differed in some respects from the ordinary tubercle bacillus, but produced the pearl disease when inoculated into guinea pigs. Attention is called to the acid-proof bacteria which have been found in considerable abundance in milk and butter, and which differ in several particulars from the true tubercle bacillus. The butter bacillus, however, is ordinarily acid-proof. When inoculated into the common experimental animals, the acid-proof bacteria have the one common characteristic, that they produce tubercles. The tubercles produced by the true tubercle bacillus may a ways be distinguished, however, by careful examination from those caused by the bacillus of pseudotuberculosis. The latter tubercles show a less active proliferation and are more of an exudative character, with a tendency to the formation of an abscess. A bibliography of the subject is appended to the article.

Staining tubercle bacilli and spores by means of percarbonate of lime and peroxid of hydrogen, A. Müller (*Centbl. Bakt. u. Par., 1. Abt., 29 (1901), No. 20, pp. 791–794*).—As a result of the use of these substances as decolorizers the author comes to the conclusion that the use of acids in treating cultures for identification of tubercle bacilli stained with fuchsin may well be avoided, and replaced to good advantage by the use of percarbonate of lime, or, still better, with alkaline peroxid of hydrogen. Preparations of tubercle bacilli were not injured by prolonged exposure to these decolorizing materials. The method is recommended as especially adapted to the demonstration of tubercle bacilli when they exist in unusually small numbers. For staining and demonstrating the presence of tubercle spores it is recommended that the percarbonate of lime and alkaline peroxid of hydrogen be used to replace the ordinary method with acids. The method as adopted by the author includes the making of cover-glass preparations, staining with fuchsin, and then subjecting to the action of percarbonate of lime in a 5 to 10 per cent solution for 15 minutes or longer. The preparation is then washed with water and stained with methylene blue. The process of decolorizing with peroxid of hydrogen is much more rapid than with percarbonate of lime, and occupies only a few minutes.

Studies on cattle plague, M. Nicolle and Adil-Bey (*Ann. Inst. Pasteur, 15 (1901), No. 9, pp. 715–733*).—Observations on this disease by the authors indicate that infection may pass from the mother to the young before birth. It was found that inoculation with virulent cultures was uniformly fatal to high-bred cattle and black races of cattle, but was not fatal to native races of cattle. The latter race was able to resist inoculation, whether by the subcutaneous, intravenous, or intratracheal methods. It appears, therefore, that a considerable difference of susceptibility to the disease exists between different races of cattle. A buffalo which was inoculated failed to develop the disease. With regard to the virulence of various fluids from infected animals, it was found that aqueous humor produced the disease when inoculated in quantities of 1 cc., and sometimes when used in smaller doses of from $\frac{1}{4}$ to $\frac{1}{2}$ cc. The serum from the brain and spinal cord was of similar virulence. Serum from the body cavity produced a fatal disease in quantities of $\frac{1}{4}$ cc. Of the various methods of inoculation it was found that the most severe and rapidly fatal cases were produced by inoculation into the brain cavity. Several experiments were tried in testing the influence of dilution upon the virus. It was found that $\frac{1}{50}$ cc. of blood diluted in 1.5 cc. normal salt solution produced fatal disease when hypodermically injected. It was found that the virus of cattle plague was not very susceptible to the action of acids and was not readily attenuated under their influence. On the other hand, desiccation reduced the virulence rapidly. When the virus was maintained for four days at a temperature of 37° C. it was found by experiment on calves that 1 cc. of virus thus treated produced no infection, but was not sufficient to cause any immunity. Experiments with Asiatic races of sheep showed that ordinary inoculations in these animals produced only a slight fever reaction, but no serious infection. Experiments with inoculation of the bile of diseased animals gave results which varied to such an extent that no definite conclusions could be drawn. The application of serum treatment for curative purposes was successful in about 50 per cent of cases. When the serum was employed for preventive purposes it was found that a subsequent exposure to the disease or direct inoculation produced merely a slight fever without a regular course of the disease.

Contribution to a study of Texas fever, J. Lignières (*Rec. Méd. Vét., Paris, 8. ser., 8 (1901), No. 15, pp. 478–483*).—During extended studies of this disease the author discovered 2 forms of the blood parasite which causes the disease, and it was shown that these forms vary to such an extent that vaccination with blood from an animal infected with one form of the parasite does not produce immunity against an attack of the other form. Both forms of blood parasite may be carried in the same species of tick (*Rhipicephalus annulatus*). Several inoculation experiments were made to gain evidence on this point, and the experiments were quite conclusive in demonstrating the two forms of blood parasites. The author concludes that these forms are not merely variations in the virulence of one variety of blood parasite, but are distinct varieties. This would offer an explanation for the observed fact that immune animals when moved to other localities may become infected with a fatal form of the disease. In such cases it would be only necessary to assume that the animal had become immune to one form of the parasite, and that upon being removed to another location became infected with the other form. Further studies along this line are promised by the author.

Anthrax and preventive inoculation in Louisiana, W. H. Dalrymple (*Jour. Comp. Med. and Vet. Arch., 22 (1901), Nos. 10, pp. 613–618; 11, pp. 708–713*).—This paper was read before the thirty-eighth annual meeting of the American Veterinary Medical Association. The author devotes special attention to a discussion of the various methods by which anthrax becomes disseminated. Among these means of distribution, mention should be made of horseflies and animals that feed on carrion. The necessity of destroying all carcasses of animals dead of anthrax is urged by the author.

Spore formation of anthrax bacillus in an atmosphere of nitrogen, E. Jacobitz (*Centbl. Bakt. u. Par., 1. Abt., 30 (1901), No. 6, pp. 232–239*).—Experiments were undertaken by the author to test the soundness of conclusions which had been stated by Klett that spore formation is a regular phenomenon in cultures of anthrax bacillus maintained in an atmosphere of nitrogen. The author conducted his experiments with great precaution so as to prevent the possible introduction of hydrogen, oxygen, or other gases during the period of the experiment. All these experiments showed uniformly that the anthrax bacillus in an atmosphere of pure nitrogen never forms spores, at least when grown on agar, but that spores are readily formed when oxygen is allowed to gain entrance.

The danger of anthrax from the manipulation of horsehair, and its prevention, A. Scott (*British Med. Jour., 1901, No. 2116, pp. 136, 137*).—The author reports several cases of anthrax which arose from handling infected horsehair from Russia. Attention is called to the necessity for great precaution in handling hair which may possibly be infected. The disease may be transmitted by the dust which arises from the hairs by discharges which may be dried on infested hairs, and such hair is a constant source of danger, even when all the processes of manipulation have been completed and the hair is made up into various articles of furniture. In order to prevent the development of this disease among employees in furniture factories, it is suggested that all operators should wear overalls or other outside garments which may be removed upon leaving the factory; that no one with any cut or abrasion of the skin should be allowed to work unless such abrasions may be perfectly protected from contamination; that all suspicious cases of illness be immediately reported to competent physicians in order that proper diagnosis may be made, and that bales of hair should be immediately immersed in water upon being received, and should be boiled for about 30 minutes in order to destroy anthrax germs which may be upon the hair. It is also recommended that all dust and refuse from such factories be burned in order to prevent further spread of the disease.

Immunity of pigeons and guinea pigs vaccinated against anthrax, and the properties of their serum, J. DE NITTIS (*Ann. Inst. Pasteur, 15 (1901), No. 10, pp. 769–784*).—Successful vaccination of both of these animals was accomplished, in spite of the fact that the pigeon is especially refractory to anthrax, and guinea pigs are so susceptible that it has been considered impossible to vaccinate them. The vaccination of the pigeon offers no difficulties on account of its possession of natural immunity. An actual vaccination was accomplished, however, as proved by the fact that vaccinated pigeons survived an injection of a fatal dose of anthrax culture. The vaccination of guinea pigs was found to be a long and difficult operation. By means of a method in which two attenuated vaccines were used the desired result was obtained, only after two or three months, and many animals were lost in spite of all precautions. The chief difficulty was in passing from one vaccine to another, and especially from the second vaccine to virulent anthrax cultures. As the result of numerous experiments it was found that the anthrax bacillus introduced hypodermically in vaccinated pigeons preserved its virulence. The virulence of the bacillus when grown in immune serum was found to be diminished. The serum of vaccinated pigeons protects guinea pigs and mice against death by anthrax. The anthrax bacillus, when introduced hypodermically in vaccinated guinea pigs, is attenuated, but when grown in the serum of vaccinated guinea pigs seems to preserve its virulence. The serum of strongly vaccinated guinea pigs is without action on mice and guinea pigs inoculated with anthrax.

Parturient paresis, R. C. HILL (*Amer. Vet. Rev., 25 (1901), No. 4, p. 281*).—A summary is given of the results of applying the Schmidt treatment to 12 cases of this disease. Directions are given for preparing the udder previous to making the infusion. Under this treatment 75 per cent of the cases recovered, and all but one of these were able to walk within 6 hours after treatment.

The Schmidt treatment for parturient paralysis, J. J. REPP (*Jour. Comp. Med. and Vet. Arch., 22 (1901), No. 9, pp. 545–556*).—A brief account is given of the history, distribution, causes, pathological anatomy, symptoms, course, and treatment of this disease. Circular letters were sent to practicing veterinarians in Iowa for the purpose of obtaining statistics regarding the prevalence of the disease and the results of treatment by various methods. The statistics thus obtained are carefully tabulated. From these reports it appears that 76.5 per cent of cures was obtained by the use of iodid of potash.

Experiments to prove the immunity of cattle to glanders, M. PRETTNER (*Centbl. Bakt. u. Par., 1. Abt., 30 (1901), No. 2, pp. 80–82*).—Previous experiments had indicated that cattle were immune to glanders, but the author undertook further experiments in order to demonstrate the fact more absolutely. Two calves were chosen for the experiment. One calf received 10 gm. of a bouillon culture of glanders bacilli in the auricular vein. A slight elevation of temperature was noted in the animal, but after 3 days the animal had entirely recovered from the inoculation. The calf was killed 2 months later, and upon a post-mortem examination no evidence was found of any pathological changes of a glanderous nature. The second calf received the same quantity of bouillon culture in the body cavity. No infection was produced. Since, however, it had previously been shown that the glanders bacillus loses a part of its virulence in artificial culture, one more experiment was made in which material for inoculation was taken directly from virulent glanderous pus. This experiment was conducted on a young calf, and the same result was obtained as in the other two experiments. The author believes, therefore, that cattle may be considered absolutely immune to glanders.

Dehorning of stock, C. F. DOANE (*Maryland Sta. Bul. 78, pp. 39–49, figs. 3*).—A general account is given of the history of dehorning, its various advantages and disadvantages, together with a summary of the results obtained in dehorning at different experiment stations. A report is made on dehorning a number of cattle at the station. In the first experiment 15 milch cows were dehorned. The effect of the operation on the yield of milk is shown in tabular form. A loss in the quantity of milk was observed in 11 cows and a gain in 2. The average loss during the 4 days after dehorning was 4.5 per cent. In another experiment 9 cows were dehorned, and the decrease in the quantity of milk in the 4 days after dehorning was much greater, averaging 30.8 per cent. The cows failed to regain the normal flow of milk for about 8 days. The reason for the unusual decrease in the quantity of milk after dehorning in this case was not apparent.

A description is also given of the details of the operation for preventing the growth of horns in young calves by means of caustic potash.

Forage poisoning: Ergotism, J. HELMER (*Jour. Comp. Med. and Vet. Arch., 22 (1901), No. 7, pp. 446–449*).—An outbreak of forage poisoning occurred in a herd of 38 head of cattle. The pulse became frequent and weak. The animals plunged considerably and the legs were stiffened. There was a noticeable vertigo and delirium at intervals. An examination of the surroundings, water supply, and food indicated that the cause of the trouble was feeding fermented and moldy cornstalks. When this food was withheld no further cases of the disease developed. The author investigated 3 cases of ergotism, in which the usual symptoms of this disease were developed. Samples of redtop hay (*Agrostis alba*) were submitted for examination and proved to be infested with species of ergot (*Claviceps microcephala*).

Parasites in New Zealand live stock (especially sheep), J. A. GILRUTH (*Vet. Jour., 53 (1901), No. 313, pp. 26–34*).—Notes are given on the life history, habits, and injurious effects of *Œstris ovis*, *Strongylus*, *filaria*, *S. ovis pulmonalis*, *S. contortus*, *S. cervicornis*, *Amphistoma conicum*, and species of tape and fruit worms. The most injurious animal parasites of sheep in New Zealand are considered to be the lung and stomach worms. Several predisposing causes of infestation by these worms are enumerated, including stagnant drinking water, swampy undrained lands, excessive raintall, improper or insufficient forage, acquired or congenital weakness of lambs, and overstocking. The preventive remedies named are the use of pure water, salt and iron tonics, and careful attention to dietaries. Several experiments were tried in direct treatment for these worms. While apparently satisfactory results were obtained by intratracheal injections of turpentine in warm milk, equally good if not better results were secured by a complete change of diet to hay, other dry food, and pure water. In the experiments of the author nearly all lambs, including badly infected ones, recovered after being put upon a proper diet, and the author believes that in infestation by lung and stomach worms the change of diet is more important than any system of treatment.

Brief notes are also given on botflies of horses. Several proprietary medicines were experimented with. It was found that the bots remained alive for days in saturated solutions of these medicines.

Investigations of swine diseases in Arkansas, R. R. DINWIDDIE (*Arkansas Sta. Bul. 67, pp. 25–47*).—It is sometimes suggested that the native half-wild hogs of the State might be used as a basis for breeding a race of hogs more resistant to infectious diseases. This idea is discredited by the author. Studies of infectious hog diseases have been made for a number of years at the station. The bacillus of hog cholera was isolated from the spleen of an infected hog, and was fed in milk to healthy hogs for the purpose of determining its agency in the production of the disease. The experimental hogs became sick within a few days and died soon afterwards of hog cholera. Similar tests with the same results were made with pure cultures of hog-cholera bacillus obtained from other sources. Subcutaneous inoculation of hogs with pure cultures gave results which indicate that the disease when thus induced is less acute than when caused by injection of the bacillus into the alimentary tract. In some cases subcutaneous inoculations did not cause death until after a period of 4 weeks, or rarely produced any effect whatever. It was shown that artificial cultures of the hog-cholera bacillus may become attenuated after several months growth on nutrient media in the laboratory. With regard to the problem of possible recurrence of the disease in hogs which have recovered from one attack, it is suggested that tests should be made in exposing recovered animals to infection from fresh sources. No such tests, however, have thus far been made. It was found impossible to produce the disease artificially in a hog which had recovered from an attack, and the evidence is in favor of the belief that one attack produces immunity. Hog cholera and swine plague are usually combined in the same attack. In bacteriological studies made by the author no cases were found in which it was possible to assert that hog cholera was not combined with swine plague, but in some cases the organism of swine plague was found unassociated with that of hog cholera. In several cases the bacillus of swine plague was found where the hog cholera bacillus could not be demonstrated. It is possible, however, that one disease may partly run its course, but later be obscured by the predominance of the other associated disease. The author considers it unsafe, therefore, to assert that swine plague occurs in Arkansas as an independent disease, spreading by contagion like cholera.

Notes are given on the occurrence and injurious effects of lung worms, Ascarides, and Echinorhynchi. Attention is called to the difficulties of diagnosing hog diseases from the symptoms on account of the fact that such great variations in symptoms are observed and on account of the similarity of symptoms in different diseases. With regard to the treatment of hog diseases the author found all direct remedies unsatisfactory. Even in treatment of hogs for worms the use of vermicides, such as naphthaline, santonine, and various purgatives, were not effective. The chief effort of hog raisers should be in the line of prevention of hog diseases. The application of the vaccine method in the control of infectious hog diseases has been tried and favorably reported upon by this Department. With the author, however, this method yielded no results whatever. It was also found that the vaccine which protected against hog cholera had no effect against swine plague. A double vaccine was therefore introduced which fulfilled all requirements of a vaccine in tests on laboratory animals. No opportunity, however, has been had for proper testing of the matter in natural outbreaks of hog cholera.

The influence of cold on the development of pneumonia of the horse, J. Bourgès (*Rec. Méd. Vét., Paris, 8. ser., 8 (1901), No. 16, pp. 336–340*).—Observations on the prevalence of pneumonia in horses in various countries were made for the purpose of determining the influence of cold on the etiology of pneumonia. As a result of observations on 2,850 horses and mules it is concluded that cold has no effect on thoracic diseases. The prevalence of long periods of severe cold may weaken the animal to some extent, provided a corresponding increase in fodder is not given to the animals. The practice of protecting horses to too great extent against cold in winter is condemned. In order to secure artificial heat it is frequently necessary to maintain the animals in quarters which are not as well ventilated as they would be if less attention were given to the temperature.

Report on the surra disease of horses, Schilling (*Centbl. Bakt. u. Par., 1. Abt., 30 (1901), No. 15, pp. 545–551*).—The author gives a detailed description of the symptoms of this disease in a horse suffering from a natural infection. A purulent discharge was noted on the eyelids and in the nasal cavity, and an œdematous swelling extended from between the forelegs backwards for some distance on the inferior surface of the body. The animal had a ravenous appetite until shortly before death. The hemoglobin content of the blood was determined at from 25 to 30 per cent; body temperature varied between 38.2 and 40° C. Two other cases were observed with slightly different symptoms. Inoculation experiments were made on horses, an ass, cattle, goats, hogs, and dogs. Hogs were refractory to the disease, but the other animals became infected. Trypanosoma was found in large numbers and in an active condition in the blood of affected animals. The various stages in the development of the parasite are described in detail.

"Staggers" among horses in the northeastern counties of North Carolina, T. BUTLER (*Bul. North Carolina State Bd. Agr., 22 (1901), No. 9, pp. 25–35*).—During August and September about 500 horses died in the northeastern part of the State from this disease. An investigation was made of the symptoms, cause, and pathological changes of the disease. The author considers the disease to be the same as what is commonly referred to as cerebro-spinal-meningitis, mold poisoning, or forage poisoning. The cases which were studied indicated that the disease was caused by poisons produced by molds or bacteria in decomposing vegetable matter, and gained entrance to the animals in their food or water supply. In a few cases moldy corn fodder was plainly indicated as the cause of the trouble. Other cases seemed to be developed as the result of eating moldy oats, and it is stated that oats were generally moldy during the season throughout the State. A detailed description is given of the clinical symptoms and post-mortem findings in cases of the disease. Treatment is usually unsatisfactory for the reason that the exact nature of the poison which causes the disease is still unknown and the disease ordinarily runs its course too rapidly to allow effective administration of medicines. Aloes or calomel may be given during the first stages of the disease, in conjunction with cold applications to the head and internal administrations of bromid of potash or iodid of potash. In preventing the development of this disease, attention is called to the desirability of avoiding the use of moldy fodder. The author gave some attention to the supposed connection between mosquitoes and the disease, which has been suggested by some stock owners. No foundation was discovered for this belief. It appears also quite improbable that any poisonous wild plants were concerned in producing the trouble.

Chickens and their diseases in Hawaii, T. F. SEDGWICK (*Hawaii Sta. Bul. 1, pp. 23*).—In the introduction by J. G. Smith attention is called to the high prices demanded for eggs and poultry in the Honolulu markets. The cause of these high prices is chiefly the prevalence of a number of diseases among poultry. The most important disease among poultry in the Hawaiian Islands is chickenpox, locally known as sorehead. The symptoms of the disease are described in detail and attention is called to the difficulty of recognizing it in its earlier stages without careful examination. In treating the chickenpox the use of disinfectants is recommended, among which mention may be made of carbolic acid, Bordeaux mixture, turpentine, and whitewash. Infected fowls may be treated with local applications of potassium permanganate, nitrate of silver, sulphur, sulphate of copper, carbolic ointment, or oxid of mercury. A discussion of the subject of chickenpox by J. J. Green is reprinted in the bulletin. Brief notes are given on diarrhea, cholera, colds, distemper, roup, intestinal worms, and lice. A historic account of the origin and introduction of domestic fowls into Hawaii is given, and it is suggested that by improvement upon the native chickens valuable breeds could be obtained which would have some resisting power to chickenpox and other local diseases. Brief suggestions are made regarding the kind and quantity of food and suitable shelter for chickens.

Bacteriological studies on the etiology of an epidemic disease among chickens in Tyrol, A. LODE and J. GRUBER (*Centbl. Bakt. u. Par., 1. Abt., 30 (1901), No. 16, pp. 593–604*).—A serious outbreak of an infectious disease among poultry was observed in a number of small towns and an investigation of these outbreaks seemed to indicate that the disease was introduced from Italy. The death rate in outbreaks of the disease was very high, reaching, in some cases, 95 per cent. The course of the disease was in most cases run very rapidly, the fowls sometimes dying within a few minutes after the first symptoms were observed. After a thorough disinfection of infected chicken quarters, a practical control was obtained over the disease. The authors undertook a bacteriological study of material from fowls which had died of this disease, but were unable to isolate any specific organism. The symptoms are described as fairly well marked. A striking weakness is observed about 24 hours after infection, the wings are allowed to droop, and the birds appear sleepy. Occasionally a discharge from the nose is observed. The body temperature exhibited a wide range during the progress of the disease, reaching 43° C. in some cases and falling as low as 27.5° C. shortly before death. One of the most characteristic symptoms is a dark blue color of the comb and wattles, and from this symptom the authors propose the name cyanolophiea gallinarum. An organism was isolated, but it was shown afterward that this had nothing to do with the disease. Experiments demonstrated that the organism of the disease easily passes through a Berkefeld filter.

Text-book of veterinary medicine, J. LAW (*Ithaca: J. Law, 1896, Vol. I, pp. 411; 1900, Vol. II, pp. 574; 1901, Vol. III, pp. 601*).—In this general treatise the purpose of the author is to present a compendium of veterinary medicine with special reference to animal industry in America. In Vol. I the subjects treated are general pathology and diseases of the respiratory and circulatory organs, including the lymphatic system, in all domesticated animals. In Vol. II a discussion is given of the diseases of the digestive organs, liver, pancreas, and spleen. In Vol. III the diseases of the urinary and generative organs, skin, eye, and nervous system are considered. The fourth volume is in preparation and will discuss the subjects of parasites and parasitism. The volumes thus far published contain a discussion of all the important diseases which affect the various domesticated mammals and birds.

AGRICULTURAL ENGINEERING.

Irrigation in the United States, F. H. NEWELL (*New York: T. Y. Crowell & Co., 1902, pp. XIX + 417, pls. 62, figs. 94*).—This book is one of the Library of Economics and Politics series and is stated to be "a somewhat elementary and popular description of irrigation and of the devices for obtaining and distributing water, including details of interest to persons who are beginning to give attention to the subject. More space is devoted to the crude but effective home-made contrivances than to the elaborate or expensive machinery purchased from manufacturers, for the success of irrigation depends most largely upon the rough-and-ready ingenuity of the first settlers in a new country in adapting their ways to the environment." It includes a summary of the author's twelve years' study and experience in various fields of irrigation inquiry.

The book treats of the reclamation of the public lands; precipitation, frosts, and grazing and cultivated lands of the arid region; surface waters and their measurement; conveying and dividing stream waters; construction, management, and use of reservoirs; methods of irrigation; underground waters; pumping water; advantages and disadvantages of irrigation; irrigation law; accounts of irrigation in the States and Territories of the arid and semiarid regions; and irrigation in the humid region.

Irrigation of the Delta of the Colorado, W. W. CAMPBELL (*Sci. Amer., 85 (1901), p. 358*).—The areas which it is estimated may be irrigated in this region from the waters of the Colorado River are 150,000 acres in Arizona, 300,000 acres in Lower California, 500,000 acres in southern California. There are also stated to be 50,000 acres in southern California which may be irrigated from artesian wells.

Hydrography in the United States, H. GRAVELIUS (*Ztschr. Gewässerkunde, 4 (1901), pp. 143–157*).

Irrigation works in Egypt (*Rev. Sci. [Paris], 4. ser., 17 (1902), No. 2, p. 61*).—A brief note.

The regeneration of Egypt. The Assouan dam, A. RIEFFEL (*Rev. Sci. [Paris], 4. ser., 17 (1902), No. 9, pp. 268–272*).

Hydrology of Sahara, LAHACHE (*Rev. Sci. [Paris], 4. ser., 17 (1902), No. 9, pp. 272, 273*).

Irrigation in South Alberta, Northwest Territories, J. McCaig (*Farmers' Advocate, 36 (1901), No. 527, pp. 332, 333*).

A few remarkable artesian wells and the uses to which they are put, E. H. Barbour (*Sci. Amer., 85 (1901), No. 2, p. 21, figs. 4*).

Graphical solution of hydraulic problems, F. C. Coffin (*New York: John Wiley & Sons, 1901, pp. 79, dgms. 34*).

A comparison of the cut-away disc harrow and the spring-tooth harrow, C. A. McClelland (*Agr. Student, 8 (1901) No. 3, pp. 49, 50*).—Comparative tests are reported in which the results favored the disc harrow as regards draft and amount of soil stirred.

The complete harvester (*Jour. Agr. and Ind. South Australia, 5 (1902), No. 6, pp. 542, 543*).—Comparative tests of 8 different kinds of combined harvesters and threshers are reported.

The pressing of fodders, M. Ringelmann (*Ann. Inst. Nat. Agron., 24 (1897-1900), No. 16, pp. 203-216*).—This article discusses the general objects, principles, and methods of pressing fodders, and reports tests of a number of hay presses.

MISCELLANEOUS.

Fourteenth Annual Report of Georgia Station, 1901 (*Georgia Sta. Rpt. 1901, pp. 119-128*).—This includes the organization list of the station, brief reports of the board of directors and the director of the station covering the operations of the station during the calendar year, and a financial statement for the fiscal year ended June 30, 1901.

Fourteenth Annual Report of Illinois Station, 1901 (*Illinois Sta. Rpt. 1901, pp. 17*).—This contains a list of station publications, an enumeration of the principal lines of station work, text of a bill providing for appropriations for the equipment of the college and the extension of the work of the station, and a detailed financial statement for the fiscal year ended June 30, 1901.

Fourteenth Annual Report of Indiana Station, 1901 (*Indiana Sta. Rpt. 1901, pp. 112*).—This includes the organization list of the station, a report of the director on the work and publications of the station during the year, several articles noted elsewhere, a list of acknowledgments, and a financial statement for the fiscal year ended June 30, 1901.

Fourteenth Annual Report of Michigan Station, 1901 (*Michigan Sta. Rpt. 1901, pp. 95-310*).—This includes a financial statement for the fiscal year ended June 30, 1901, reports of the director and heads of departments reviewing the work of the station during the year, meteorological observations, and reprints of Bulletins 186-192 and Special Bulletin 14 of the station on the following subjects: First report of the Upper Peninsula Experiment Station (E. S. R., 13, pp. 224, 233, 240, 259, 264, 290), report of South Haven Substation (E. S. R., 13, p. 349), experiments with sugar beets (E. S. R., 13, p. 343), notes on strawberries (E. S. R., 13, p. 456), vegetable tests for 1900 (E. S. R., 13, p. 452), shrinkage of farm products (E. S. R., 13, p. 548), fertilizer analyses (E. S. R., 13, p. 540), and foul brood (see p. 877).

Papers by directors of New England agricultural experiment stations (*Rhode Island State Bd. Agr. Rpt. 1900, pp. 85-178*).—The work of the Rhode Island Station during 1900 is reviewed at some length by A. A. Brigham, the work of the Connecticut Storrs Station by R. D. Milner, the Connecticut State Station by E. H. Jenkins, the Maine Station by C. D. Woods, the Massachusetts Station by H. H. Goodell, and the Vermont Station by J. L. Hills.

Annual Reports of the Department of Agriculture, 1901 (*U. S. Dept. Agr. Rpts. 1901, pp. CXV+344*).—Executive reports.

Report of the Agricultural Chemical Experiment and Seed Control Station of Riga, G. Thoms (*Ber. Landw. Chem. Vers. und Samen-Control-Stat., Riga, No.*

10, pp. 258).—This is a detailed account of the operations of this station during the years 1897–98 and 1899–1900, including articles on the importance of nitrate of soda for Baltic agriculture, a contribution to the knowledge of the wood of the yew (*Taxus baccata*), as well as a discussion of the results of the fertilizer control conducted by the station and reviews of recent literature relating to the subject of fertilizers. A table of contents of Nos. 1 to 9 of the reports of this station is also given.

Papers selected from those read at farmers' institutes and other meetings during the year (*Pennsylvania Dept. Agr. Rpt. 1901, pt. 2, pp. 119–335*).—Following are some of the subjects treated: Ideal standards in farming, nature study in the public schools, botany on the farm, education for the adult farmer, the silo an economic, the relation of the wholesomeness of the stable to the health of its inmates, the soil our partner, soil improvement the keynote of agriculture, management of dairy cows on the farm, farm fences and ways over the farm, hygiene on the farm, nature study, the birds and the farmers, some suggestions for furnishing and decorating country homes, curing clover, lighting, heating, and ventilating the home, intensive farming, public roads, live stock in western Pennsylvania, floriculture as a profession, progressive poultry raising, our farm garden, farming on a large scale, a plea for better live stock in Pennsylvania, geological relation of soils, the Holstein-Friesian breed, Ayrshires, the Jersey cow, growing *Primula chinensis* for exhibition, twelve best herbaceous plants for the amateur, culture of *Calceolaria hybrida*, the cultivation of sweet peas, how to prepare and plant a permanent asparagus bed for private use, report of general fruit committee, strawberry culture, is it advisable to grow small fruits in young orchards, some points in door-yard planting and decoration, advancement of floriculture in Allegheny County the past forty years, Pennsylvania as a fruit-growing State, ornamental horticulture, the packing and shipping of fruit from a commission merchant's standpoint, some points in potato culture, and selection of varieties, how to plant, pick, and store the apple.

Changes in the rates of charge for railway and other transportation services, H. T. Newcomb, revised by E. G. Ward, jr. (*U. S. Dept. Agr., Division of Statistics Bul. 15* (*rev.*), *misc. ser., pp. 86*).—Statistics for the years 1898–1900 are added to the original bulletin, which was noted in E. S. R., 10, p. 298. "Perhaps the most notable fact established by the addition of data for the last three years is the great increase in the aggregate volume of traffic movement."

Agricultural statistics for Belgium in 1900 (*Statistique de la Belgique recensement agricole de 1900. Brussels: Ministry of Agriculture, 1901, pp. 223*).

NOTES.

California University and Station.—The summer school at Berkeley this year will include lectures in agriculture, horticulture, entomology, irrigation, and animal feeding. Prof. W. A. Henry, of Wisconsin, will go to the coast to deliver a course of lectures on the latter subject. M. E. Jaffa, of the college of agriculture and the experiment station, has been granted a year's leave of absence for study. He will spend several months in studying the methods of food investigation under Prof. W. O. Atwater at Middletown, Conn., and later will spend some time in Europe studying the institutions for agricultural research and instruction.

Connecticut Storrs College and Station.—C. S. Phelps, agriculturist in the college and station, has resigned. At a recent meeting of the board it was decided to concentrate the work of the station at Storrs and to discontinue the work done at Middletown, this to take effect during the coming summer.

Illinois University and Station.—H. W. Mumford, recently elected professor of animal husbandry in the university and animal husbandman of the station, has been spending considerable time at the Union Stock Yards, Chicago, securing photographs and descriptions of the market grades of beef cattle. The results of this investigation will be used in the preparation of a bulletin. R. S. Woodrow, field assistant in sugar-beet investigations, has severed his connection with the station. A. V. Stubenrauch has been elected assistant horticulturist and inspector of substations at the California Station. He will enter upon his duties early in July.

Iowa College and Station.—The general assembly of the State has given the college a one-fifth mill tax to run for five years, which is expected to realize about \$600,000. This money is to be used for the erection of buildings. An additional appropriation of \$135,000 was made for the biennial period—\$35,000 annually for general maintenance, \$10,000 annually for the experiment station, \$5,000 for live stock, \$35,000 to begin the erection of the main central building to take the place of the building destroyed by fire about a year and a half ago, and \$5,000 to begin the erection of a barn for the station to replace the one destroyed by fire. The contract has been awarded for this barn, to cost \$17,280, the balance to be paid from other funds.

Kansas College and Station.—H. M. Cottrell, agriculturist in the college and station, has resigned his position to accept the superintendence of a large farm near Trenton, Mo. Professor Cottrell will enter upon his new position about July 1, in the meantime preparing the results of his experimental work for publication. C. L. F. Paull has been appointed assistant botanist, and E. H. Webster, assistant in dairying. The station has leased for five years a large bearing apple orchard in the vicinity in order to conduct certain experiments on a commercial scale. During the last half of the winter term the college conducted a very successful judging school, one week being given to each of the following subjects: Poultry, swine, dairy cattle, beef cattle, and horses. In addition to the stock belonging to the college many valuable animals were loaned by their owners. The instruction in judging each class was given by some expert of the State. The term's work closed with the slaughter of six steers which had been fed for beef during the winter, the object being to demonstrate the difference in the character of the meat. The animals were bought in the Kansas City market. A grade Shorthorn and a grade Angus represented the beef type, a grade Holstein and a Jersey the dairy type, and two others the scrub type of mixed breeds. The full results of this demonstration will be presented in a bulletin, but it may be mentioned that the best beef was produced by the Shorthorn, and that of the Jersey ranked next.

Maine Station.—Arthur B. Foster, a member of this year's graduating class of the university, has been appointed assistant chemist.

Massachusetts College.—The State legislature has appropriated $35,000 for a central lighting and heating plant for the college, $35,000 for the erection of a boarding house, and $1,000 annually for the maintenance of the latter.

Mississippi Station.—The land for the new substation at McNeill, including about 2,000 acres, has been donated and work undertaken on a small tract. Much of this land is still in woods and only a small portion will be used. It is planned to study at this station the use of fertilizers to determine the requirements of common crops on soils of that region, economy in the use of fertilizers, and similar questions. Work will also be done in fruit growing and in gardening, the region about McNeill being especially adapted to trucking. E. B. Ferris, formerly assistant chemist, has been appointed assistant director, in charge of the McNeill station.

Nebraska University.—At a recent meeting of the board of regents of the University of Nebraska the Omaha Medical College was affiliated with the university. Two years of the medical work will be given at the university and the clinical work will be carried on at Omaha as before. It is planned to materially strengthen the course with a view to furnishing better opportunities for medical study. Dr. Henry B. Ward, of the university, has been elected dean of the medical school.

New Hampshire College and Station.—Lucian A. Hill, B. S., of the University of West Virginia, has been appointed assistant chemist of the station, in place of H. A. Clark, resigned. At the April meeting of the board of control the following new investigations were authorized: (1) A series of experiments on crop rotation, including various leguminous crops, some of which may be plowed under and others removed from the land, barnyard manure being applied to cultivated crops. The object is to discover a cheap way to restore the fertility to worn-out soils, if possible, without the use of chemical fertilizers. (2) Variety tests of some early maturing kinds of corn, with the view to discovering the varieties best adapted to the climate and soil of the State. (3) Comparative yield of dry matter and digestible nutrients in corn as compared with hay. (4) Loss of nutrients in corn fodder in different methods of storing. (5) Draft and efficiency of surface-working implements. (6) Comparative feeding value of corn meal and corn-and-cob meal in milk production. (7) Comparative feeding value of timothy hay, clover hay, and corn stover in milk production. The foundation is being laid for the new agricultural building, which it is estimated will cost $30,000.

New York State Station.—The barns of the station were destroyed by fire May 7. The buildings included cattle, horse, storage, and tool barns, and 2 small poultry houses. All of the live stock was removed except 2 bulls, a young heifer, and 3 calves. Some of the vehicles and wheeled tools were saved, but the plows, cultivators, and other implements were lost. At one time the greenhouses and the new dairy building were in danger, but the fire was checked before any serious damage to them was done. The origin of the fire is unknown. The loss is estimated at about $20,000; the property was insured for about $13,000. The buildings will be replaced at once, the State authorities having authorized their reconstruction. Plans for them are now in process of preparation. The governor has appointed Jens Jensen, of Binghamton, a member of the governing board, vice A. C. Chase, of Syracuse (term expired), and Thomas B. Wilson, of Halls, *vice* Frank O. Chamberlain, deceased. The branch office on Long Island has been discontinued. F. A. Sirrine, previously in charge of the work there, has purchased a farm near Riverhead and as special agent of the station will conduct and oversee numerous experiments on his own farm and others throughout the Island, while considerable work will be under direct supervision of heads of departments at the station.

Cornell University.—The large horticultural barn, one of the oldest structures at the university, was entirely destroyed by fire early in April. Many specimens of trees, plants, and shrubs stored there by Professor Bailey were lost. At the recent session of the State legislature an appropriation of $35,000 was made to the college of agriculture for the purpose of continuing the agricultural extension work, which has grown so popular during the past five years.

North Dakota College.—The college has added a two years' course in pharmacy and a four years' course in pharmaceutical chemistry. Charles H. Kimberly, of the Ohio State University, has been elected instructor in pharmacy.

Ohio Station.—The State legislature has made the following appropriations to the station for the two-year period, 1902 and 1903: For expenses of the board of control, $783; bulletin illustration, $800; special work in entomology, botany, horticulture, and chemistry, $14,000; substations, $10,000; general repairs, labor, and supplies, $14,000; investigation of tuberculosis (unexpended balance reappropriated), $2,859; special work in animal industry, $3,000; library equipment and care, $750; general construction, $3,000; total, $49,192. At the request of the board of control of the station the legislature has transferred to the State board of agriculture the work of orchard and nursery inspection, and made a special appropriation of $15,000 for two years. The legislature has also transferred to the board of agriculture the powers and duties of the State Live Stock Commission, under a law enlarging the responsibilities of that commission. The appropriation to the station for the investigation of tuberculosis is continued. By this legislation the station is freed from inspection or police work of every description, and its province as an organization for research is more clearly defined than ever before, while at the same time its facilities for research are largely increased, the appropriations for this purpose being 60 per cent greater than for any similar period before. A. F. Burgess, who has acted as first assistant inspector of nurseries and orchards for the past two years, is continued as chief inspector under the new management. Miss Ida L. Feiel, Ph. B., has been appointed assistant botanist.

Rhode Island College and Station.—Dr. J. H. Washburn, who has been president of the college since its establishment thirteen years ago, has resigned his position to take effect at the close of this year. The State has made an appropriation of $1,500 for dormer windows, flooring, and general repairs to the chemical laboratory building of the station; also an appropriation of $1,400 for the erection of an addition and for repairs to the barn used in connection with the field experiments. This addition will furnish storage for tools and a floor for thrashing and for mixing fertilizers.

South Dakota College and Station.—James W. Wilson, son of Secretary Wilson, has been elected director of this station, and will have charge of the work in animal husbandry in the college and station. He will enter upon his duties at once.

Tennessee Station.—A very successful meeting of the East Tennessee Farmers' Convention was held at Knoxville, May 21–23, under the auspices of the college and station. The programme was a comprehensive one, and a number of prominent speakers were present from abroad. The afternoon of the last day was given up to an inspection of the university farm and the dairy school, the latter being in operation.

Texas College and Station.—David F. Houston, formerly professor of political science at the University of Texas, has been elected president of the college and will assume charge July 1. E. P. Stiles has been appointed superintendent of the new substation at Troup. About 150 acres of land near the town has been donated for this station, part of which is cleared. A station building will be erected there, and work has already commenced on the field operations. Experiments in fruit raising and general farming will be carried on. Funds have been raised by the local community for the maintenance of the station another year, as appropriation was made by the legislature for only one year. C. H. Alvord, assistant in agriculture in the college, will withdraw at the close of this session, as will also E. A. White, assistant horticulturist, who has been elected botanist at the Connecticut Agricultural College.

Vermont Station.—Extensive alterations are being made in the station building, which will provide the director and the horticulturist with more conveniently located and spacious quarters.

Wisconsin Station.—Prof. E. S. Goff, horticulturist in the college and station, died June 6, after a short illness.

Summer School of Agriculture.—Interest in this school, to be held at Columbus, Ohio, beginning July 7, is very widespread, and students from different sections of the country have announced their intention of attending. Over 70 students have already registered, and its success from point of numbers seems already assured. A programme of the school is now in preparation and will be issued shortly.

U. S. Department of Agriculture.—The University of Missouri recently conferred the honorary degree of doctor of laws upon Secretary James Wilson and B. T. Galloway, of the Bureau of Plant Industry.

W. H. Evans, of this office, has returned from Porto Rico, where he has been in conference with F. D. Gardner, in charge of the Porto Rico Station, with reference to the selection of a permanent site and the development of the station there.

O. F. Cook, of the Bureau of Plant Industry, has returned from a three months' trip to Guatemala and southern Mexico, where he was engaged in studying the methods and the problems of coffee and rubber culture.

B. M. Duggar, botanical physiologist, has been elected to the chair of botany in the University of Missouri and will enter upon his new duties in September. He will continue to carry on some of his present lines of investigation as collaborator of the Bureau of Plant Industry.

Ernst A. Bessey, in charge of seed and plant introduction, will start early in July on a trip to Russia and Turkestan for the purpose of securing seeds of certain forage and cereal plants, especially the Turkestan alfalfa. He will then proceed to Germany, where he will spend a number of years in botanical study. He will be succeeded in charge of the seed and plant introduction by A. J. Pieters of the seed laboratory, who in turn will be succeeded by Edgar Brown.

Miscellaneous.—The New York Horticultural Society has completed arrangements for holding an international conference on plant breeding and hybridization September 30, October 1 and 2, of the present year. The meeting will be held in New York City. Papers will be read by prominent men from this country, Canada, England, Scotland, Ireland, and elsewhere. In connection with the conference an exhibition of hybrid plants and their products will be made, to which every one is invited to contribute. Awards of the society in the form of medals, diplomas, and certificates will be made for plants and plant products of hybrid origin, illustrating some particular phase of this work. Thirty papers have already been promised.

The Massachusetts Institute of Technology announces a new summer school for nature study, known as the Sharon Summer School, named for the town of Sharon, where most of the field work will be carried on. Its object is to furnish teachers and lovers of nature with thorough training in the principles of natural science and a practical knowledge of the more common forms of living things. The curriculum provides for elementary work in physiography and general biology, with elective courses on trees, wild flowers, birds, insects, mammals, and seashore life. The laboratory facilities of the institute will be utilized, and opportunity for out-door study and experimentation will be afforded by the control of 300 acres of natural country in the town of Sharon. The school will open July 9 and will continue for 4 weeks.

An interesting pamphlet has been issued by Prof. F. B. Mumford, of the University of Missouri, entitled Some Lessons from European Agriculture. The article is a reprint from the Annual Report of the Missouri State Board of Agriculture for 1902, and is based upon the author's observation and study during recent travels in Holland, Germany, Switzerland, Great Britain, and other European countries. Among the lessons which the author suggests may be drawn from European agriculture are greater care in the conservation, handling, and application of farm manures, economy in feeding, and the utilization of all the products of the farm, including many which in this country are often regarded as waste products.

The Imperial Department of Agriculture for the West Indies has begun the publication of a fortnightly review, to be known as *Agricultural News*, the first copy of which appeared late in April. The publication is a quarto sheet of 16 pages. Its object is to supply, in popular form, information of an agricultural character suited to the requirements of the West Indies, with a view to instructing and assisting all classes and to promoting the agricultural interests of the colonies. It will be sold through the local agents of the department at 1d. per number, or 4s. 4d. per annum. The initial number contains contributed articles on cane cultivation, diseases and insects, preparation of commercial papain, and cassava poisoning; agricultural news items, original and quoted, on topics of interest to the islands; department news; a number of book notices; a directory of the agricultural institutions in the West Indies, and market quotations.

A new semimonthly journal for dying and textile chemistry (*Zeitschrift für Farben- und Textil-Chemie*) appeared at the beginning of this year. It is devoted to color and textile chemistry, including the related subjects of organic chemical industry and the textile industry. The journal is edited by Dr. A. Buntrock, of Karlsruhe, with the assistance of a large number of English and European collaborators.

Nature notes that the Lawes Agricultural Trust Committee has appointed A. D. Hall, principal of the Agricultural College at Wye, to succeed the late Sir Joseph Henry Gilbert as director of the Rothamsted Experiment Station. Mr. Hall is a graduate of Oxford, and has distinguished himself by his successful development of Wye College as a center of agricultural education. Although little known in the field of agricultural research, Mr. Hall's selection to succeed Dr. Gilbert appears to meet with approval.

The German Association of Naturalists and Physicians will hold its seventy-fourth annual congress at Carlsbad September 21–28. As on former occasions, papers may be presented in any of the modern languages and foreign visitors will be accorded the same privileges as the members of the association. It is estimated that between 6,000 and 8,000 men of science and physicians will attend the meeting of this famous association.

According to a note in *Forestry and Irrigation*, the officials of the Illinois Central Railroad have decided to begin planting catalpa trees along their lines from Chicago to New Orleans, a distance of about 900 miles, for the purpose of producing railroad ties. The contract for the planting has already been let.

Science states that a committee has been formed, under the presidency of Professor von Zittel, for the erection in Munich of a memorial to the late Prof. Max von Pettenkofer.

A recent number of *The Tradesman* reports that there will soon be in operation at Kenilworth Plantation, Louisiana, a mill for making wrapping paper out of bagasse. This is stated to be the first mill of its kind in Louisiana, although one has been in operation for some time at Sugarland, Texas. The mill will have a capacity of about 25 tons of paper per day.

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EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Assistant Director*.

EDITORIAL DEPARTMENTS.

Chemistry, Dairy Farming, and Dairying—The Editor and H. W. Lawson.
Meteorology, Fertilizers and Soils (including methods of analysis), and Agricultural Engineering—W. H. Beal.
Botany and Diseases of Plants—Walter H. Evans, Ph. D.
Foods and Animal Production—C. F. Langworthy, Ph. D.
Field Crops—J. I. Schulte.
Entomology and Veterinary Science—E. V. Wilcox, Ph. D.
Horticulture—C. B. Smith.
With the cooperation of the scientific divisions of the Department and the Abstract Committee of the Association of Official Agricultural Chemists.

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EXPERIMENT STATION RECORD.

VOL. XIII. No. 10.

The recent successful meeting of the American Association of Farmers' Institute Workers in this city demonstrates the widespread interest felt in this form of popular education, and the earnestness and enthusiasm with which it is being carried on. The meeting was quite a representative one, delegates being in attendance from the Pacific coast, the Gulf States, and Canada, as well as from the Middle and Eastern States.

The discussion of methods employed in different States brought out many valuable suggestions, and altogether the sessions were full of interest and encouragement for those engaged in this work. The breadth of scope which the work has taken in some of the States, and the practical results which it has already achieved, were an inspiration to delegates from States where the work is not so well established. The personal contact and the mutual sympathy and inspiration which come from such a gathering are among its most important results.

The association indorsed the plan for the National Department of Agriculture to act as a central bureau for the promotion of institute work, to assist it in organization, by publications, and in various ways. An account of the meeting will be given in the next number of the *Record*.

At various stages of the meetings the discussion turned on the personnel of the institute force—the kind of men best adapted to the work and those available. At the present time this is probably one of the most important problems. Success in farmers' institute work requires a special order of ability. It is undoubtedly one of the most difficult forms of educational work, calling for intimate knowledge of both theory and practice, ability to command the attention of farmers and to present a subject with clearness and force, and the exercise of originality, frankness, and tact. The practical and the scientific or theoretical must be blended so thoroughly as to appeal to the unread farmer without repelling his better-posted neighbor, and, above all, the institute should set the average farmer to reading and thinking more for himself.

It was agreed that the institute speakers should be men thoroughly abreast of the times, who keep themselves well posted by reading, but there was some difference of opinion as to whether or not college-trained men are especially desirable. The fear that such men will be too technical and not sufficiently in sympathy with practice has led to the employment of practical farmers or breeders in many States, selected for their intelligence and success along some special lines. It was generally agreed that a certain number of speakers of this class are a valuable acquisition to the institute corps, but the advantage of thorough training in the principles underlying agriculture was recognized as greatly strengthening the man for his work. The speakers are called upon to explain the latest theories of science regarding the assimilation of nitrogen, the ripening of cheese, the changes in silage making, the breeding of plants, and similar subjects, as well as to use charts presenting scientific data. Unless they themselves clearly and correctly understand these things they are likely to fall into error and to make unwarranted deductions and applications.

As a general rule, the experiment station worker has been voted a leading place as an institute speaker the country over. Very little real objection has developed on the ground of his being too technical in his presentation or unable to make the application of his knowledge to everyday practice—a theoretical objection which is occasionally still heard in some quarters. But with the growth of the stations and colleges the experiment station worker and the college instructor are becoming less and less available for institute work, and can be relied upon only for special occasions, such as round-ups or meetings in the vicinity of the college.

As the work develops and funds for it increase, a special class of educated institute workers will be needed, who will couple with an agricultural education a certain amount of experience and a wide knowledge of agricultural conditions in the region where they work. These men will be used in addition to a certain number of workers selected from among the best farmers and breeders of the locality, the latter confining themselves to the more strictly practical considerations. Some provision might well be made by which the trained institute workers could more readily come in contact with the college and station at frequent intervals, and literature especially adapted to their needs might be provided by State or national agencies. More men are needed to make institute work their business and to give its development and methods serious consideration and study. Then it will be practicable, with more adequate support, to systematize the work to a greater degree, to make it less fragmentary in character, and to reach the great masses of our farmers who are as yet untouched by the experiment stations and the farmers' institutes.

The establishment of a system of experiment stations in Victoria. Australia, is under consideration, and a recent official publication from that country indicates that steps in that direction are likely to be taken soon. The agencies for agricultural experimentation and demonstration in the colony at present embrace the Department of Agriculture at Melbourne, the Agricultural College and Experimental Farm at Dookie, and numerous demonstration fields.

The Department of Agriculture has a staff of some 12 experts, engaged in carrying on investigations and giving itinerant instruction throughout the colony in the various branches of agricultural practice. In addition, it has the supervision of the School of Horticulture at Burnley and the Viticultural College at Rutherglen, at both of which places a limited amount of experimental work is conducted. The Agricultural College at Dookie, in connection with its educational work, conducts experiments on a large scale on wheat and other cereals, fodder plants, and vegetables, together with more restricted experiments in olive culture, in drying and preserving fruit, and in animal husbandry. The experimental farms, as they are often spoken of, which are in reality only demonstration fields, are under the control of the Department of Agriculture. They are cooperative in character, and are distributed throughout Victoria, where they have been in operation for some 12 years.

These experimental farms have led up to the present agitation for a system of institutions of a higher class, i. e., of experiment stations. They have demonstrated the great value of experimental work in promoting agricultural science and in bringing about its application in practice. As a recent article puts it, "the power of science to assist agriculture has spoken so plainly in the growing experimental crops of the many farms throughout the State that an agitation for further developments in experimental work, too complicated and continuous for the individual farmer to undertake, is now growing on all sides. As a result, we have the Minister's promise of the establishment of a number of permanent experiment stations. It is the most progressive step that has yet been taken."

The same article mentions an apprehension on the part of some farmers that the development of the experiment stations will do away with the demonstration plats as at present carried out on the farms throughout the country. This fear, however, is declared to be groundless, and the work which the farms have done seems to be highly appreciated by the officials of the Department of Agriculture.

"The purpose of the present fields must be clearly understood. They are really demonstration as much or more than experimental fields. They are necessary, both for answering the hundred and one little questions arising from local differences of soil and climate, as well as for the dissemination of facts, not as spoken words, but as truths visible in the growing crop of the farm. Instead of diminishing in numbers in countries where the experiment stations are already numerous, they are continually increasing; for, as the discoveries of an experiment station multiply, so the necessity for the expression of such facts in the demonstration field on the farms throughout the country becomes all the more obvious. The work already accomplished by them has in certain parts of our State almost revolutionized farming, and no agricultural teacher could regard their discontinuance with anything but the strongest regret."

Experiment stations were formerly thought to be especially necessary in old countries, where more intensive farming was practiced, and where the conditions of the soil and the practice of stock raising made experiments necessary to answer the many problems which were constantly presenting themselves with the development of more rational feeding and manuring. Subsequent developments have shown, however, that the experiment station is no less valuable for the new, undeveloped country, where there are no traditions to guide the farmer and where agriculture itself is necessarily of a more experimental character. The recognition of the necessity of experiment stations in the different colonies of Australia is a demonstration of this, and the form which the stations thus far established have taken is convincing evidence of the fact that in the evolution of the experiment stations the system of no European country can be taken as a model, but there must be an adaptation of the stations to the conditions prevailing in the country or State for which they are primarily intended.

The decision of Governor Hunt and Commissioner Elliot regarding a site for the agricultural experiment station in Porto Rico has been announced in favor of the Carmen estate, adjoining the town of Mayaguez. This action is in accordance with the act of the insular legislature, which made the appropriation of $15,000 for the purchase of a suitable site as a permanent location for the station. Advertisements were made for offers of approximately 200 acres of land, and twenty-three responses were obtained.

Most of the sites offered were visited and inspected by Messrs. Frank D. Gardner, special agent in charge of the Porto Rico Station, and Walter H. Evans, of this Office, who went to the island for that purpose. A report was made to the proper officials, in which the merits of the different tracts were fully set forth, and acting upon the recommendations made the above estate was selected. It adjoins the town of Mayaguez, and embraces about 230 acres, each of the principal types of land being well represented.

The purchase price of the estate was considerably in excess of the amount of the appropriation, but the city of Mayaguez has assumed the remainder.

At present most of the land is in grass and pasture, with some scattered fruit and a few acres of coffee. The place is well provided with buildings, which will probably suffice for the present needs of the station, and the whole tract is fenced. The Mayaguez River bounds it on one side, and running water is to be found in a number of places over the farm, making it especially adapted to stock raising. Adjoining the new site is the old agronomic station which was established by the Spanish Government and abandoned in 1897. The latter is now under the control of the Quartermaster's Department of the Army, but efforts will be made to have the land added to that just purchased.

The region in which the station will be permanently located is generally recognized over the island as the best for diversified agriculture, and it is sufficiently near the larger cane and coffee regions to permit of cooperative experiments being undertaken under the immediate supervision of the station officers.

Agriculture in the New World is the title of a pamphlet recently received, which records the observations made by Prof. F. B. Smith, of the Southeastern Agricultural College at Wye, on a visit to the United States and Canada. Professor Smith will be remembered at many of the colleges and stations where he visited during the summer of 1900.

The report gives a review of the systems of agricultural education and experimentation in the United States and Canada, and descriptions of the colleges and stations which were visited, together with a discussion of some of the features of the agricultural instruction and station work in this country. It is written in a vigorous and enthusiastic style, and is an unusually satisfactory and accurate presentation of the aims, methods, and work of the American institutions for agricultural education and experimentation. The writer evidently caught the spirit of American institutions, and, while he occasionally finds things to criticise, he has not been sparing in his appreciation and praise.

Speaking of this Department, he says: "The more I learned of this wonderful Department the more was I impressed with the amount of work which it was performing and with the downright practical services which it was rendering to the farmers of the country." He has the following to say regarding the experiments and publications of the stations: "There are several points in this connection which I should like to bear testimony to, and they are, firstly, the care and exactitude with which the experiments are conducted. Referring more particularly to work upon the farm, I have never seen trials carried out with such respect for practical details, and with such scrupulous regard for accuracy in every particular, as those in progress at the different stations which I visited. Secondly, to the precautions taken to avoid publishing hasty or misleading results; and, thirdly, to the definite and precise form in which they are issued to the public. In some cases, as at Geneva, the stations engage an official for the special purpose of editing the bulletins and reports."

The writer finds the efforts which are being made to develop agricultural instruction in the secondary schools "full of interest and worthy of our close attention;" and he expresses the belief that "if such education can be carried on successfully anywhere, it will be in Canada and the United States of America."

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

The development of chemistry, F. W. Clarke (*Jour. Amer. Chem. Soc., 24 (1902), No. 2, pp. 117–138*).—The presidential address delivered before the meeting of the American Chemical Society at Philadelphia, December 30, 1901.

Report on progress in agricultural chemistry, A. Hebebrand (*Chem. Ztg., 25 (1901), No. 92, pp. 1024–1027*).—A brief review of progress in this field with numerous references to literature.

The status of agricultural chemistry at the beginning of the twentieth century, T. Pfeiffer (*Chem. Ztschr., 1 (1901), Nos. 1, pp. 10–12; 2, pp. 28–30*).—A brief review of what are considered the most important recent developments along the line of plant and animal production.

Annual report on the progress in animal chemistry, M. von Nencki and R. Andreasch (*Jahresber. Thier. Chem., 30 (1900), pp. 1139*).—This volume contains abstracts of the literature of animal chemistry, physiological and pathological, for 1900, with a subject and author index. The abstracts are arranged in chapters dealing with proteids, fats, carbohydrates, miscellaneous substances, blood, milk, urine and perspiration, digestion, liver and gall, bones and cartilage, muscles and nerves, other organs, lower animals, oxidation and respiration, metabolism, pathological chemistry, enzyms and other ferments, and bacterial products.

A few of the recent advances in biochemistry, A. Kossel (*Chem. Ztschr., 1 (1901), No. 6, pp. 149–151*).

Text-book of agricultural chemistry, A. Mayer (*Lehrbuch der Agrikulturchemie. Heidelberg: Carl Winters, 1901, 5. rev. ed., vol. 1, pp. 16+442, pl. 1, figs. 35; vol. 2, pt. 1, pp. 6+174, figs. 6*).—A fifth revised edition of this well-known work.

Methods of standardizing acid solutions, C. G. Hopkins (*Jour. Amer. Chem. Soc., 23 (1901), No. 10, pp. 727–740*).—The author made a study of 6 methods of standardizing acid solutions, which are designated as follows: The silver chlorid, the ammonium sulphate, the sodium, the borax, the copper sulphate, and the iron permanganate methods. The following conclusions were reached: A skilled analyst can easily and quickly make determinations of hydrochloric acid by the silver chlorid method, within a limit of error of 0.5 mg. of silver chlorid on 2 gm. of precipitate. The ammonium sulphate method of standardizing sulphuric acid is exceedingly accurate, while simple and rapid. The results obtained by the sodium method were higher than those by the two previous methods, this being due, the author states, to impurities of carbon and iron in the sodium. The results, however, agree closely with those obtained by the ammonium sulphate and the silver chlorid methods. With the borax method the results obtained at the same time agree within themselves, but the indications are that the borax is not constant. The copper sulphate method gives fairly satisfactory results, but it is considered inferior to the silver chlorid method and the ammonium sulphate method in accuracy. The iron permanganate method gave fairly accurate results in standardizing oxalic acid and it is no less accurate than the copper sulphate method. From the results of his work the author concludes that the silver chlorid method, slightly modified as described, and the ammonium sulphate method are extremely accurate and satisfactory, the former for standardizing solutions of hydrochloric and the latter of sulphuric acid.

The determination of available plant food in soils by the use of weak acid solutions, A. D. HALL and F. J. PLYMEN (*Jour. Chem. Soc. [London], 81 (1902), No. 470, pp. 117–144*).—"The authors have compared the amounts of phosphoric acid that could be extracted from 19 different soils by a 1 per cent solution of citric acid, by equivalent solutions of hydrochloric acid and acetic acid, by a saturated solution of carbonic acid, and by an ammoniacal solution of ammonium citrate, respectively. Seven of these soils were from plats on the Broadbalk Field, Rothamsted, which had been continuously manured in the same manner for 42 years previously; the remaining 12 were soils of very varied origin, which had been the subject of crop experiments and whose reaction to phosphatic manuring was well marked.

"In the same 7 soils from the Broadbalk Field, the authors determined the potash extracted by the same dilute solvents with the exception of ammonium citrate; five other soils of different origin, whose response or otherwise to potash manuring had been tested by experiment, were also examined in the same way.

"Determinations were also made of the phosphoric acid and potash dissolved after long digestion with strong hydrochloric acid, of the loss on ignition, and of the earthy carbonates present in each soil.

"The authors conclude: (1) That no sharp line of distinction can be drawn between 'available' and nonavailable phosphoric acid and potash in the soil, and that any process of determining the 'available' constituents is an empirical one, dependent on the strength and nature of the acid used.

"(2) That the weak solvents give information as to the requirements of a given soil for mineral manures of a far more trustworthy nature than that which is afforded by such a solvent as strong hydrochloric acid.

"(3) That of the acids examined, the 1 per cent solution of citric acid gives results most in agreement with the recorded history of the soil, although there is evidence that the same interpretation can not be put on results obtained from all types of soil."

Methods of analysis adopted for soils, fertilizers, feeding stuffs, wheat and flour, and some miscellaneous substances, F. B. GUTHRIE (*Agr. Gaz. New South Wales, 12 (1901), No. 8, pp. 905–915*).—Details are given of the methods which have been in use for several years in the laboratory of the New South Wales department.

A simple rapid eudiometric method of determining chlorin in chlorids and hydrochloric acid, silver and phosphoric acid, E. RIEGLER (*Ztschr. Analyt. Chem., 40 (1901), No. 10, pp. 633–638; abs. in Chem. Centbl., 1902, I, No. 1, p. 70*).—The method is based on the principle that when silver chlorid is treated with hydrazin sulphate and sodium hydroxid solution the silver separates out in metallic form and nitrogen is set free according to the following equation: $4AgCl+N_2H_4.H_2SO_4+NaOH=4Ag+4NaCl+Na_2SO_4+6H_2O+N_2$. The method of procedure in case of phosphates is as follows: Dissolve the phosphate in water strongly acidulated with nitric acid. To a quantity of this solution corresponding to from 0.15 to 0.16 gm. of phosphoric acid, diluted if necessary to 50 to 60 cc., first add 1 to 2 gm. of silver nitrate dissolved in about 10 cc. of water, then drop by drop a 10 per cent solution of sodium hydroxid until the silver phosphate precipitate is not completely redissolved. Add in the same manner a 10 per cent solution of ammonia until the solution is alkaline, and boil for about 5 minutes. Cool the solution, collect the precipitate on a small filter, and wash with water, removing it to a flask by breaking the filter and washing it out with about 50 cc. of water. Add about 3 cc. of concentrated nitric acid and 1 gm. of sodium chlorid dissolved in water, close the flask and shake vigorously for ½ minute, collect the precipitate of silver chlorid on a small filter, and wash until it is free from acid. Roll up the filter and contents and place in a Knop-Wagner azotometer, adding about 30 cc. of water, 0.5 gm. of crystallized hydrazin sulphate, and 10 cc. of a 10 per cent solution of sodium hydroxid. The collection and measurement of the gas evolved is carried out in the usual way.

A contribution to the determination of phosphoric acid in organic substances, F. RIEGER (*Ztschr. Physikal. Chem., 34 (1901), pp. 109–113; abs. in Chem. Centbl., 1902, I, No. 1, p. 67*).

Colorimetric method for determining oxygen dissolved in water, W. RAMSAY and IDA HOMFRAY (*Jour. Soc. Chem. Ind., 20 (1901), No. 11, pp. 1071–1074, fig. 1*).

A method for estimating fat, G. ROSENFELD (*Chem. Ztg., 24 (1901), Repert., p. 250; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), No. 22, p. 1030*).—Chloroform is recommended instead of ether for extracting fat. The author states that 6 hours' extraction gives values which are comparable with those obtained by predigesting the material and then extracting with ether. Higher values were obtained if extraction was preceded by boiling in alcohol for a short time. After evaporating the chloroform the material remaining is placed for a short time in a drying oven, thoroughly dried in a desiccator, and taken up with cool absolute ether as long as any material is dissolved. On evaporating the ether only true ether extract remains for weighing. The fats obtained by this and the ordinary method have different iodin values.

A test for the coloring matter of butter, J. VANDRIKEN (*Ann. Pharm., 7 (1901), pp. 110–117; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), No. 21, pp. 978, 979*).—The author gives a method for testing the coloring matter contained in butter by amyl nitrite. Butter without any artificial coloring matter is discolored, while with a number of artificially colored fats, with one exception, the color was not changed by the test. The manipulation was made as follows: Two cubic centimeters of filtered butter and a like amount of ether is treated with 6 to 10 drops of amyl nitrite.

On the temperature reaction of oils with sulphuric acid—Maumené's test, H. C. SHERMAN, J. L. DANZIGER, and L. KOHNSTAMM (*Jour. Amer. Chem. Soc., 24 (1902), No. 3, pp. 266–273*).

On the relation of the heat of combustion to the specific gravity in fatty oils, H. C. SHERMAN and J. F. SNELL (*Jour. Amer. Chem. Soc., 24 (1902), No. 4, pp. 348–353*).—"In fresh fatty oils the heat of combustion is a property quite as constant as the specific gravity, to which it bears a certain definite relation. Oxidation resulting from exposure to air decreases the heat of combustion to practically the same extent that it increases the specific gravity."

A note on the use of the Bechi or silver nitrate test on olive oils, L. M. TOLMAN (*Jour. Amer. Chem. Soc., 24 (1902), No. 4, pp. 396, 397*).—Before applying the test the author recommends treating the sample successively with 95 per cent alcohol, 2 per cent nitric acid, and water.

A study of the Bechi test for cotton-seed oil, A. H. GILL and C. H. DENNISON (*Jour. Amer. Chem. Soc., 24 (1902), No. 4, pp. 397, 398*).—Experiments seemed to indicate that the test might be due to the presence of sulphur compounds.

A study of some cotton-seed oils, J. B. WEEMS and H. N. GRETTENBERG (*Reprint from Proc. Iowa Acad. Sci., 8 (1900), pp. 2*).—The results are reported of the chemical examination of 9 grades of cotton-seed oil, the figures representing 3 determinations for each sample. The specific gravity ranged from 0.9003 to 0.9006, and averaged 0.90045. The saponification equivalent varied from 192.1 to 198.6, averaging 194.6, the better oils possessing the higher and the common oils the lower values. The better grades of oils gave lower iodin absorption numbers than the common, and crude oils gave high results.

The determination of starch in the cereal grains, LINDET (*Bul. Soc. Chim. Paris, 3. ser., 25 (1901), No. 24, pp. 1055–1057*).

Researches on cellulose, C. F. CROSS and E. J. BEVAN (*London, New York, and Bombay: Longmans, Green & Co., 1901, pp. VII+175*).—An outline of the chemistry of the structural elements of plants with reference to their natural history and industrial uses.

The determination of sulphur in plants, G. S. FRAPS (*Jour. Amer. Chem. Soc., 24 (1902), No. 4, pp. 346–348*).—The author found a considerable loss of sulphur in the preparation of ash with calcium acetate as compared with the nitric acid method. In the latter method it was found convenient to heat 5 gm. of the material with 20 cc. of nitric acid in a porcelain dish, add 10 cc. of a 5 per cent solution of potassium nitrate, evaporate, and ignite.

On the detection of small quantities of arsenic in foods, especially in beer, J. C. BERNTROP (*Chem. News, 85 (1902), No. 2207, p. 122*).—The arsenic in 1 liter of beer is precipitated as ammonium-magnesium arsenate and after the destruction of albuminoids by nitric acid is determined by the Marsh or Gutzeit test.

The titration of arsenious acid with potassium permanganate, O. KÜHLING (*Ber. Deut. Chem. Gesell., 34 (1901), pp. 404–406; abs. in Analyst, 26 (1901), No. 306, p. 247*).—The author has devised the following method: In a flask cleansed with permanganate and sulphuric acid the arsenious acid is dissolved in hot 30 to 40 per cent sulphuric acid. The solution is diluted to 100 cc. and heated to the boiling point. Potassium permanganate solution is introduced, rapidly at first, and then more slowly. After each addition the liquid is heated for 1 to 2 minutes nearly to boiling, this process being continued until the red color no longer disappears. By this method $2KMnO_4(=50)$ correspond to $\frac{5}{2}As_2O_3$. The results reported by the author with this method are quite concordant.

A hydrolytic derivative of the globulin edestin and its relation to Weyl's albuminate and the histon group, T. B. OSBORNE (*Jour. Amer. Chem. Soc., 24 (1902), No. 1, pp. 28–38*).

The basic character of the protein molecule and the reactions of edestin with definite quantities of acids and alkalis, T. B. OSBORNE (*Jour. Amer. Chem. Soc., 24 (1902), No. 1, pp. 39–78, dgms. 2*).

A type of reaction by which sodium carbonate and hydrochloric acid may be formed in the animal organism, T. B. OSBORNE (*Jour. Amer. Chem. Soc., 24 (1902), No. 2, pp. 138, 139*).

Sulphur in protein bodies, T. B. OSBORNE (*Jour. Amer. Chem. Soc., 24 (1902), No. 2, pp. 140–167; translated by V. Griessmayer in Ztschr. Analyt. Chem., 41 (1902), No. 1, pp. 25–35*).—The above four articles have been noted from another source (E. S. R., 13, pp. 520, 521).

Methods of estimating caffein, BEITTER (*Chem. Ztg., 25 (1901), No. 81, p. 869*).—A study of the various methods with different substances. The author cites the Keller method, with certain modifications, as the most efficient.

A new method of determining manganese, G. VON KNORRE (*Ztschr. Angew. Chem., 14 (1901), No. 46, pp. 1149–1162*).

Miscellaneous chemical work, R. H. SHAW (*Wisconsin Sta. Rpt. 1901, pp. 285–288*).—Analyses of 17 samples of feeding stuffs, 4 of fertilizing materials, 7 of lime rock, 3 of dairy salt, 4 of tobacco extract, 1 of clam shells, and 1 of oyster shells are reported.

An apparatus facilitating the analysis of sugar beets, R. H. SHAW (*Wisconsin Sta. Rpt. 1901, pp. 281–284, fig. 1*).—The author describes an apparatus designed to facilitate the determination of the specific gravity of the juice and its preparation for the polariscope.

A new form of alkalimeter, C. B. DAVIS (*Jour. Amer. Chem. Soc., 24 (1902), No. 4, pp. 391, 392, figs. 2*).

A new design for potash bulbs, J. N. TERVET (*Chem. News, 85 (1902), No. 2206, pp. 112, 113, fig. 1*).—The apparatus consists of 4 bulbs through which the potash is caused to circulate by the current of gas.

A nitrogen apparatus, J. A. WESENER (*Jour. Amer. Chem. Soc., 24 (1902), No. 4, pp. 388–390, pl. 1, fig. 1*).—The alkaline mixture is distilled in a current of steam, the method being considered as accurate and far more rapid than the ordinary method.

A digestion stand for nitrogen determination, R. WOY (*Chem. Ztg., 26 (1902), No. 3, pp. 28, 29, fig. 1*).—A rack for holding Kjeldahl digestion flasks is described.

New apparatus, C. B. WILLIAMS (*Jour. Amer. Chem. Soc., 24 (1902), No. 3, pp. 246–248, figs. 2*).—A device for marking volumetric flasks and a modified bulb tube for nitrogen apparatus are described.

New laboratory apparatus, F. JANDA (*Chem. Ztg., 26 (1902), No. 3, p. 28, figs. 2*).—A quick-filter funnel and a calcium chlorid desiccator for use in balance cases are described.

BOTANY.

Investigation of flower buds, E. S. GOFF (*Wisconsin Sta. Rpt. 1901, pp. 304–316, figs. 15*).—In continuation of previous investigations on the date of flower formation in fruit plants (E. S. R., 13, p. 18), the author has reported on the time of formation of flowers in the currant, gooseberry, and cranberry; the variation in the period of flower formation between different varieties of apples growing in the same orchard; the influence of irrigation on the formation of flower buds; and the extent to which flowers are formed the season before their expansion, in those plants in which no flower buds can be distinguished in autumn. The buds of the Pomona currant showed an early stage of flower formation July 8, those of the black Victoria currant on August 3, and those of the Downing gooseberry August 30. Buds of the latter taken October 20 showed ovules. This is one of the few instances that have been observed where ovules have been formed in autumn. The buds of the cranberry taken August 31 showed no positive evidence of flowers, while samples taken September 16 showed flowers well started.

Considerable differences were observed in the formation of the flower buds in different varieties of apples, the buds being formed between August 1 and September 3. After abundant autumn rains which began about September 10, there appeared to be no further formation of flowers.

The application of 2 bbls. of water per week about an apple tree during a severe drought apparently had no effect in causing the earlier production of flowers, nor did it appear to change the percentage of the buds on the fruit spurs from which the flowers were developed. It did, however, appear to reduce the size of the flower buds, and also the total number.

There seems to be evidence to show that in such plants as the quince, raspberry, blackberry, and grape, in which no flower buds can be distinguished in autumn, these plants unquestionably form their flower buds during that season.

Biological investigations on the ripening of the wood of the grape, F. KÖVESSI (*Rev. Gén. Bot., 13 (1901), Nos. 149, pp. 193–211; 150, pp. 251–264; 151, pp. 307–325, pls. 7, figs. 2, dgms. 8*).—The author has made a study of the anatomical differences which characterize well-ripened shoots of the grape, and the influence of various external characters, such as humidity, temperature, light, climate, diseases, etc., on the ripening of the shoots. The phenomena of ripening, from an anatomical point of view, consist of a differentiation of the tissues of the plant, producing cork, browning of the bark, development of annual rings, thickening of cell walls, and the formation of starch. The degree of ripening may be measured by the extent of the preceding phenomena. A well-ripened shoot always has the annual wood well developed, the pith is reduced, starch grains are abundant and of large size, and the cell walls are well thickened. In comparison to volume, well-ripened shoots contain more dry matter than those poorly ripened. The presence of a large amount of water in the tissues explains why poorly ripened branches are easily injured by cold. The existence of a large amount of starch is an indication of ripeness and may be of service in determining the value for grafting and budding.

The different factors influencing the ripening of grape shoots are discussed at some length, and among the phenomena described the effect of age, soil, fertilizers, and diseases is shown. Humidity of the soil is opposed to the well ripening, as is the excessive use of fertilizers which contain an abundance of nitrate. On the other hand, lime, phosphates, and sulphates are favorable to maturity. Among the diseases mentioned, most of those which attack the branches, leaves, and roots are unfavorable for the perfect maturity of the grapevines, but those diseases which principally attack the fruit, such as the black rot, etc., have little or no effect upon the maturity of the shoots. The author's investigations were carried out in France and in Hungary, and comparisons made with the different factors of soil, climate, variety, etc., the results in all cases being practically the same. In practical application a chemical analysis or microscopical study of stems will show their degree of ripeness. It was found that shoots of *Vitis rupestris*, grown in humid regions of northern France or under the same conditions in Hungary, are not adapted to use in other parts of the country for replanting vineyards destroyed by phylloxera. It was also found that shoots produced upon 3-year-old vines in the south of France were equal in all respects to those produced upon 4-year-old vines in the north, the climate of the two regions having this influence upon their development.

The influence of formalin on the germination of oats, F. CRANEFIELD (*Wisconsin Sta. Rpt. 1901, pp. 327–335, figs. 6*).—The results of laboratory and greenhouse experiments with formalin solutions for the prevention of grain smut are reported, together with the effects of the treatment on the germination and subsequent development of plants. Seed oats were immersed for 20 minutes in a solution of 1 pt. of formalin to 50 gals. of water, after which 40 samples of 100 seeds each were placed in the Geneva seed tester and a daily record kept of their germinations. Similar lots were planted in the greenhouse in shallow boxes, filled with soil, and their germination determined. The average germination in each case showed some injury due to the treatment. In the seed tester the injury amounted to from 1 to 20 per cent, while in the soil test the range was from 4 to 42 per cent. In a few instances the treated seed germinated better than the untreated, but the averages of the different lots showed a detrimental action. The effect of different strengths of solution was also tested, in which the stronger solutions were shown to be highly injurious. The effect of treating seed for longer periods than 20 minutes was studied, and while slight differences were observed there was no appreciable increase in injury due to the longer soaking of the seed. The growth of the plants is shown in a number of instances to have been checked by the treatment, the untreated lots being in every case more vigorous than the treated. In conclusion, attention is called to the fact that these trials were all conducted within doors, and it is possible that field conditions might prove more favorable to germination and growth.

The effect upon seedling plants of certain components of alkali soils, T. H. KEARNEY and F. K. CAMERON (*U. S. Dept. Agr., Rpt. 71, pp. 7–60*).—A preliminary report is given of experiments conducted with clover and alfalfa in which the effect of some of the more ordinary components of alkali soils was tested. The salts used in experiments were sodium chlorid, sodium sulphate, sodium carbonate, sodium bicarbonate, magnesium chlorid, magnesium sulphate, and calcium chlorid. The salts were made up in solutions of known strengths and the seedlings were suspended in the solution for 24 hours, and the amount of injury determined from the condition of the root tips. At a certain degree of dilution all the salts appeared indifferent in their action upon plant tissues, while at still greater dilution some produced stimulating effects. The injurious action of the different salts when used in greater strength is shown. The toxic effect of the injurious salts is said to be due more to the influence of cathions (derived from the basic radicle) than to the anions (furnished by the acid radicle). The authors give extensive reviews of literature relating to this subject, and an extended bibliography of the subject completes the report.

Formation of sodium carbonate, or black alkali, by plants, F. K. Cameron (*U. S. Dept. Agr., Rpt. 71, pp. 61–70*).—A study is reported of creosote bush and greasewood, in an attempt to show the effect of these plants in causing an accumulation of sodium carbonate at the surface of the soil. It seems probable that the neutral salts are brought up from the lower depths of soil, and through the agency of the plant are transformed into the carbonates or black alkalis.

Resistance to black alkali by certain plants, F. K. Cameron (*U. S. Dept. Agr., Rpt. 71, pp. 71–78*).—Notes are given on the resistant power of a number of plants to the action of black alkali. Among those described are *Distichlis spicata*, *Suæda intermedia*, and *Atriplex bracteosa*. These plants seem to be able to make a satisfactory growth on soils containing relatively large amounts of soluble carbonates. This growth is believed to be due in a large measure to the production and exudation of considerable amounts of soluble organic acids, which are capable of decomposing the carbonates and thus protecting the root crowns from the corrosive action of the alkalis.

Can leucin and tyrosin be used as plant nutrients? E. Schulze (*Landw. Vers. Stat., 56 (1901), No. 2–3, pp. 97–106*).—The author quotes the investigations of a number of experimenters on the assimilability of these substances by plants and describes experiments of his own with lupines, vetches, and castor beans, which showed that tyrosin and leucin could be used as sources of nitrogen by phanerogams.

Organic nitrogen and cultivated plants, A. Thomson (*Sitzber. Naturf. Gesell. Univ. Dorpat, 12 (1899), pp. 307–322; abs. in Ann. Agron., 27 (1901), No. 12, pp. 602–604*).—A series of experiments with oats and barley grown in water cultures which were given various forms of organic nitrogen is reported upon. The organic compounds employed were sodium urate, sodium hippurate, and urea, comparisons being made with sodium nitrate. The results of the experiments show that the nitrogen of urea and uric acid have the same value, as far as the grasses are concerned, as nitric nitrogen; and the plants seem to be able to easily utilize these substances. On the contrary, the nitrogen in hippuric acid is detrimental to plant growth.

The bacteria of root tubercles of Leguminosæ, P. Neumann (*Landw. Vers. Stat., 56 (1901), No. 2–3, pp. 187–202*).—A report is given of studies made with the organisms taken from the tubercles of the roots of *Vicia faba*. These were carefully removed and used to inoculate a great many kinds of culture media, the object being to determine what forms of culture are adapted to the artificial growth of these organisms. In all, about 70 kinds of culture media were used, and the formula for preparation of the media and action of the organism in them are shown. The best results were obtained in nutrient media which contained urine, plant extracts, root extracts, soil leachings, and soy bean seed extract. In these the organism made good growth and produced the branching forms. In 10 days, in the soy bean plant extract, there was a decided development of the organism which was short, compact, and in some cases showing the characteristic branching which is one of the characters of the true bacteroids.

Investigations concerning the occurrence of nitrogen-assimilating bacteria in the soils, P. Neumann (*Landw. Vers. Stat., 56 (1901), No. 2–3, pp. 203–206*).—In this article the author seems to give an account of the behavior of certain inoculation materials in culture media rather than discuss the occurrence of nitrogen-assimilating bacteria in soils. Three forms of nutrient media were prepared—one from the above-ground green plant of *Vicia faba*, the second from the tubercles of the roots of the plant with its adhering earth, and the third from peat. These media were inoculated with the washings from the roots and tubercles, with the pressed juice from chopped roots and tubercles, and with juice of the above-ground parts of the plant. After 14 days' standing in room temperature of from 15 to 20° C., the results are shown. In every case but one, and that where the peat extract was inoculated with the juice from the above-ground parts of the plant, there was an increase in the amount of nitrogen present, although in all the experiments with the peat it was very slight. The experiments seem to show that the assimilation of nitrogen on the part of bacteria is dependent upon the organic nutrients offered the plant.

The North American species of Spartina, E. D. Merrill (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 9, pp. 16*).—This is a technical paper based on North American material of the genus Spartina. The various species of Spartina occur in saline soils along the coast throughout tropical and temperate regions. Two species are found in alkali soils of the interior. One species is known to thrive in soils free from alkaline or saline properties. In the present paper 9 species are recognized as growing in North America, one of which and one variety are described as new.

Inventory of foreign seeds and plants, No. 9, E. A. Bessey (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 5, pp. 79*).—This gives a catalogue of the seeds and plants received during the spring and summer of 1900, and represents the collections of the agricultural explorers of this Department and foreign countries, as well as receipts from various other sources. The numbers of the inventory are from 4351 to 5500. Brief descriptive notes are given of most of the importations.

A collection of economic and other fungi prepared for distribution, Flora W. Patterson (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 8, pp. 31*).—A list is given of species of fungi which are available for distribution to the various State agricultural experiment stations. The different State experiment stations are invited to compile their desiderata and select from the list 50 specimens, which will be forwarded upon request. This exchange is desired not only as a benefit to the stations, but also as a means for securing interesting material for this Department.

Poisonous and edible mushrooms, H. Garman (*Kentucky Sta. Bul. 96, pp. 215–222, pls. 16*).—A description is given of mushrooms in general, the different parts being defined, and a brief synopsis is given for the recognition of some of the edible species. A description is given of *Lepiota morgani*, one of the most common poisonous mushrooms occurring in Kentucky; and attention is called to a number of other poisonous species. The common edible mushroom (*Agaricus campestris*) is described at some length.

BACTERIOLOGY.

Enzyms and their application, I, J. Effront, translated by S. C. Prescott (*New York: John Wiley & Sons, 1902, pp. IV+324*).—This work is a summary of a course of lectures delivered at the Institute of Fermentations of the University of Brussels, and is designed not only for those whose interest in the subject is mainly one of scientific study, but also for those who are concerned solely in the application of fermentations to various industries. The work as a whole will consist of two volumes. The present volume treats of the enzyms of carbohydrates and of oxidases, while the second will treat of the proteolytic enzyms and toxins. The author has personally verified most of the experimental data given in this volume, and considerable hitherto unpublished information is included relative to experiments, analyses, methods of preparation, and technical processes. After discussing the general properties and action of diastases, several are given special consideration, chapters being devoted to sucrase, amylase and its industrial uses, maltase, panary fermentation, various other enzyms of carbohydrates, ferments of glycerids and glucosids, zymase, and oxidases. The translator has sought to reproduce the author's ideas and form of expression without sacrificing clearness and simplicity, and seems to have been unusually successful. To students and others in this country who are interested in enzyms and their uses, this work will prove highly valuable. For those desiring to pursue the subject further than the discussions given in the book, extensive lists of literature are appended to the various chapters.

The fermentation of tea leaves, C. R. Newton (*Indian Gard. and Plant., 9 (1901), Nos. 24, pp. 418–420; 25, pp. 437, 438*).—A study is given of the chemistry and physiology of the tea leaf, and the function of enzyms in its fermentation.

Contribution to the bacterial flora of the Sydney water supply, I, R. G. Smith (*Extr. from Proc. Linn. Soc. New South Wales, 25 (1900), pt. 3, pp. 436–462*).—An account is given of a bacteriological study made of the water supply of Sydney, New South Wales. The methods of study are given at some length and 30 species, some of which are new, are described.

Contribution to the bacterial flora of the Sydney water supply, II, R. G. Smith (*Extr. from Proc. Linn. Soc. New South Wales, 25 (1900), pt. 4, pp. 740–759*).—The author describes various methods for the separation and recognition of a number of pathogenic bacteria.

A process for inoculating the earth with soil bacteria, F. Bayer & Co. (*Bl. Zuckerrübenbau, 1901, p. 217; abs. in Jour. Soc. Chem. Ind., 21 (1902), No. 3, p. 179*).

Concerning oligonitrophilous microbes, M. W. Beijerinck (*Centbl. Bakt. u. Par., 2. Abt., 7 (1901), No. 16, pp. 561–582, pl. 1; Proc. Sec. Sci. Koninkl. Akad. Wetensch. Amsterdam, 3 (1901), pp. 586–595*).—Under this name the author proposes to group those organisms which while occurring freely in nature develop in nutrient media containing combined nitrogen or from which combined nitrogen is not carefully excluded. These organisms doubtless have the ability of assimilating and utilizing free atmospheric nitrogen. Two classes are recognized, one of which by virtue of chromophyll is able to utilize the carbon dioxid of the air, the second group being colorless must have carbohydrates supplied them in the nutrient media. A number of plants belonging to the Cyanophyceæ are described as belonging to the first group, and of bacteria as representatives of the second.

A bacteriological investigation of the roots and seeds of sulla, K. H. Nicolai (*Inaug. Diss., Erlangen, 1900, pp. 34; abs. in Centbl. Bakt. u. Par., 2. Abt., 7 (1901), No. 8, p. 301*).—A study is reported of the bacteria found in the roots of sulla, *Hedysarum coronarium*, apart from those existing in the root tubercles which are concerned with nitrogen assimilation. These different classes of bacteria can be readily distinguished by means of stains and from their action upon different culture media. They were not found present in the seeds, but were of frequent observation in the roots in which access had been gained from the soil through the root hairs of the plants.

The cleavage of butter fat by micro-organisms, O. Laxa (*Arch. Hyg., 41 (1901), No. 2, pp. 119–151*).

METEOROLOGY.

Loss of life in the United States by lightning, A. J. Henry (*U. S. Dept. Agr., Weather Bureau Bul. 30, pp. 21, pls. 4*).—This is in part a revision of Bulletins 15 and 26 of the Bureau (E. S. R., 8, p. 34; 11, p. 322), bringing the data down to the end of 1900. The purpose of the bulletin is "to furnish accurate information as to the destruction of human life annually by lightning; to point out the regions where the greatest loss of life occurs; and, so far as practicable, to call attention to the few simple precautions against danger that may be exercised by the individual. . . . In the United States, thunderstorms occur with considerable frequency over all of the territory east of the one hundredth meridian, save a narrow strip along the northern border. West of the above-named meridian, except in the Rocky Mountain region, the frequency steadily diminishes, reaching practically zero along the immediate Pacific coast. There are three regions of maximum thunderstorm frequency, viz, one in the southeast, with its crest over Florida, one in the Middle Mississippi Valley, and one in the Middle Missouri Valley. The average number of days annually with thunderstorms in the first-named region is 45; in the second, 35, and in the last 30. . . . From 700 to 800 lives are lost each year by lightning stroke. . . . The greatest number of fatal cases . . . occurred in the Middle Atlantic States, and the next greatest in the Ohio Valley and Tennessee, with the Middle and Upper Mississippi Valley a close third. The greatest number of deaths in any single State during the 5 years, 1896–1900, occurred in Pennsylvania—186—followed by Ohio with 135, and Indiana, Illinois, and New York with 124 each. . . . The greatest mortality by lightning, considering both unit area and density of population, is in the Ohio Valley and the Middle Atlantic States; if, however, density of population only be considered, it is in the Upper Mississippi Valley and the middle Rocky Mountain region. . . . The belief that the chance of injury by lightning in the cities is less than in the country is rather general. What foundation, in fact, such a belief has is hard to determine. When the combined area of the large cities is compared with the immense territory embraced in the rural districts it is not surprising that so few lightning strokes fall in cities. The modern city building, with its metallic roof and steel frame, is a fairly good conductor of electricity, and is in much less danger of receiving a damaging stroke of lightning than an isolated dwelling in the open country. The multiplication of telegraph, telephone, and electric-light wires in cities also adds to the effectiveness of silent discharges in relieving the electric tension during a thunderstorm; but should a cloud with a tremendous store of energy quickly approach, all of the wires in 10 cities would not prevent it from discharging right and left until its store of energy had been dissipated."

Report of the Chief of the Weather Bureau, 1900-1901, W. L. Moore (*U. S. Dept. Agr., Weather Bureau Rpt. 1900–1901, I, pp. 318*).—This, which is the first volume of the report of the Chief of the Weather Bureau for this year, is divided into six parts. Part 1 gives an account of the operations of the Weather Bureau during the year; part 2, a list of observing stations and changes therein during 1900, and hourly averages of atmospheric pressure, temperature, and wind from the records of automatic instruments at 28 stations; part 3, monthly and annual meteorological summaries for 174 Weather Bureau stations; part 4, monthly and annual means and extremes of temperature and dates of first and last killing frosts; part 5, monthly and annual precipitation, 1900; and part 6, miscellaneous meteorological tables and reports.

Meteorological observations, C. S. Phelps (*Connecticut Storrs Sta. Rpt. 1900, pp. 188–192*).—This is a record of observations on temperature, pressure, humidity, precipitation, and cloudiness during each month of 1900 at Storrs, and on rainfall during the 6 months ended October 31, 1900, at 23 places in Connecticut. The mean temperature for the year at Storrs was 48° F.; mean pressure, 29.95 in.; total precipitation, 48.64 in.; number of cloudy days, 94. The average rainfall for the State during the 6 months ended October 31 was 19.65 in.

"The total precipitation at Storrs for the year, 48.64 in., was about 3.2 in. more than the average for the past 12 years, but was very close to the general average for the State as computed from the records of the New England Meteorological Society covering periods of from 5 to 30 years. The rainfall was especially heavy in February and March. For the season from May 1 to October 31, the precipitation at Storrs, 19.5 in., was about 3 in. below the average for the past 12 years, and was also below the general average of observations made in different parts of the State during the same years. There was a general deficiency in the rainfall during July, August, and September, which affected all those crops that made most of their growth during that period. . . . The last killing frost, which was unusually severe, occurred May 11, with a minimum temperature of 25°. The temperature for June was about normal, while that for July and August was above the average for Storrs for the past 12 years. The first killing frost in the fall did not occur until October 18, so that the season was especially favorable for late maturing crops. The length of the growing season between May 11 and October 18, 158 days, was 12 days more than the average at Storrs for the past 12 years."

Meteorological observations (*Maine Sta. Bul. 78, pp. 189–191*).—This gives a monthly summary of observations at Orono during 1901 on atmospheric pressure, temperature, precipitation, cloudiness, and wind movement, and monthly and annual precipitation at 17 places. The mean temperature for the year was 42.81° F. (mean for 33 years 42.33°), mean pressure 29.17 in., precipitation 46.05 in. (mean for 33 years 45.30), and number of cloudy days 160.

Meteorological observations, J. E. Ostrander and H. L. Bodfish (*Massachusetts Sta. Met. Buls. 157, 158, 159, pp. 4 each*).—Summaries of observations on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during January, February, and March. The data are briefly discussed in general notes on the weather of each month.

Meteorological record for 1900 (*New York State Sta. Rpt. 1900, pp. 468–477*).—Tables are given which show the daily readings of maximum and minimum thermometers at 7 a. m. for each month of the year; the average monthly temperature and precipitation since 1882; the daily wind record for each month of 1900; a monthly summary of the direction of the wind for the year; tridaily readings of the standard air thermometer during each month of the year; and a monthly summary of maximum, minimum, and standard thermometer readings.

Meteorological observations, W. B. Alwood (*Virginia Sta. Rpt. 1901, pp. 9, 10*).—Tables are given which show monthly averages of observations at Blacksburg, Va., on temperature, precipitation, direction of wind, and cloudiness for the period from July 1, 1900, to December 31, 1901; and monthly means of temperature and precipitation during 9 years (1893–1901). The mean temperature for the year ended December 31, 1901 (calculated from monthly means), was 49.8° F., the precipitation 53.8 in.

A summary of meteorological observations at the National Institute of Guatemala, 1857-1898, D. González (*Resumen de las observaciones meteorológicas hechas en el Instituto Nacional de Guatemala desde el año de 1857 hasta el año de 1898. Guatemala, 1899, pp. 30*).

Total rainfall for 1901 (*Agr. Jour. Cape Good Hope, 20 (1902), No. 6, pp. 381–384*).—The total rainfall during the year at a large number of places in different parts of the province is reported.

Rainfall in the agricultural districts of Queensland, C. L. Wragge (*Queensland Agr. Jour., 10 (1902), No. 2, p. 130*).—A table is given which shows the total monthly rainfall at 41 places in Queensland during the year 1901.

Composition of Barbados rainfall (*Imp. Dept. Agr. West Indies, Rpt. Agr. Work 1900, p. 11*).—The total amount, and the chlorin, ammonia, nitrates, and total nitrogen contents (parts per million) of the rainfall of each month from December, 1898, to May, 1900, inclusive.

Forests and rainfall, W. L. Summers (*Jour. Agr. and Ind. South Australia, 5 (1902), No. 7, pp. 616–619*).—Tables give the annual rainfall at Adelaide and 5 other places in South Australia during a long period of years. It is stated that a study of the data affords no proof that the rainfall has decreased with the denudation of the timbered land.

On the climate of Tunis, G. Ginestous (*Bul. Dir. Agr. et Com., 7 (1902), No. 22, pp. 64–88, figs. 5, charts 4*).—This is a summary of observations since 1885 at different places in Tunis on atmospheric pressure, temperature, winds, cloudiness, relative humidity, dew, fogs, storms, evaporation, rainfall, and snow.

Frost injuries to the winter plantings of the year 1901, P. Sorauer (*Arb. Deut. Landw. Gesell., 1901, No. 62, pp. 8 + 205*).—This includes a summary of replies to circulars of inquiry distributed through the different provinces of Germany, as well as articles on The snow cover of North Germany and The temperature conditions of Germany in the winter of 1900–1901, by W. Lesz.

Text-book of meteorology, J. Hann (*Lehrbuch der Meteorologie. Leipzig: C. H. Tauchnitz, 1901, pp. XIV + 805, pls. 8, figs. 111, charts 15*).—The original purpose was to prepare a text-book suited to the needs of the German high schools (*Hochschulen*), but the completed work far exceeds these bounds, being adapted to the requirements of more advanced students of meteorology. The more important results of meteorological investigations up to the end of the nineteenth century are included. The book contains an introduction and 5 chapters, as follows: Temperature conditions of the air and the solid and liquid surface of the earth, atmospheric pressure, humidity of the air, movement of the air, and atmospheric disturbances.

WATER—SOILS.

Artesian water (*Agr. Jour. Cape Good Hope, 20 (1902), No. 1, p. 25*).—A brief note on a paper on artesian waters of Australia, read by J. P. Thomson before the Royal Geographical Society of Australia. It is stated that the greatest development of artesian water has been made in Queensland, where a very large and apparently inexhaustible supply has been discovered. While the water so developed has proved valuable for drinking purposes, it has not proved an important factor in irrigation.

The artesian wells of South Dakota, J. E. Todd (*Irrig. Age, 17 (1902), No. 1, pp. 12–15, figs. 2*).

Field operations of the Division of Soils, 1900 (second report), M. Whitney et al. (*U. S. Dept. Agr., Field Operations of the Division of Soils, 1900, pp. 473, pls. 51, figs. 47, maps 24*).—This report contains a general review of the field and laboratory work of the Division of Soils during 1900, by the chief of division; 12 detailed reports of soil surveys of districts located in Pennsylvania, Ohio, Maryland, North Carolina, Utah, Arizona, and California; reports of laboratory investigations supplemental to the field operations; and the results of experiments with tobacco conducted in various parts of the United States.

General review of the work, M. Whitney (pp. 19–60).—The purpose of the survey work and its organization and progress is reviewed. The total area mapped during 1900 was 4,465 square miles, which was surveyed at an average cost of $1.97 per square mile. The average rate of mapping was 4.4 square miles per day. The topography, geology, climate, agricultural conditions, etc., as well as the characteristics of the soil types, of the different areas are presented in the several reports. In all, 397 mechanical analyses of soils and subsoils are reported in tabular form, as well as numerous analyses of alkali and of irrigation waters. "Undoubtedly the most pressing demands for a soil survey arise from a consideration of special problems. It may be for the consideration of industries which could be introduced into a section of the country where, from the increased competition and the opening up of new areas, the specialization of crops at present grown in the area, or from various social problems, the industries have languished and new industries or new methods are desired to build up the locality. A very important consideration, however, lies in the introduction and spread of new industries, in the improvement and development of the different types of tobacco, of fruit production, of truck growing, of sugar beets, and of other special crops; also in the improvement of certain soil areas by the use of fertilizers, by the introduction of underdrainage, and in the West by the protection of soils against seepage waters and alkali and the reclamation of lands already injured by these causes."

A soil survey around Lancaster, Pa., C. W. Dorsey (pp. 61–84).—The district surveyed covers about 270 square miles, and was selected as being one of the most important tobacco-producing districts in the State and one of the most fertile regions in the country. Eleven types of soil are described, of which the Hagerstown loam and the Conestoga loam are the most important, each occupying about one-third of the area. "They are both derived from limestone rocks, the former from hard massive limestone and the latter from a softer schistose limestone, locally called a sandy limestone on account of the rough surface of the rock rather than from the amount of sand contained in it. The soil contains a quantity of very fine mica, which gives it a soapy or greasy feel." Analyses are reported which show that the first contains about 14 per cent of clay, 54 per cent of silt, 4 to 6 per cent of organic and volatile matter; the second, 7 to 12 per cent of clay, 42 to 54 per cent of silt, 5 to 6 per cent of organic and volatile matter.

Soil survey of Montgomery County, Ohio, C. W. Dorsey and G. N. Coffey (pp. 85–102).—This county, all of which was surveyed, covers 480 square miles and is also an important tobacco-producing district. The soils are all of glacial origin, 6 types being recognized. The Miami clay loam, a light soil of uniform texture and composition, is the most important soil formation and covers nearly 80 per cent of the county. "The Miami clay loam is a strong productive soil, adapted to general farm crops and to the type of tobacco most in favor at the present time for cigar fillers. The soil is a loose light loam, about 12 in. deep, resting on a sticky clay loam that dries out into small cubes, which work up like gravel when disturbed." In the analyses of this soil reported the clay varies from 11.62 to 37.37 per cent, the silt from 26.4 (in subsoil) to 65.8 per cent, the organic and volatile matter from 2.68 to 3.86 per cent.

Soil survey of Cecil County, Md., C. W. Dorsey and J. A. Bonsteel (pp. 103–124).—This district covers about 375 square miles and is divided into 2 distinct areas, in each of which are 5 types of soil varying in character from almost barren to highly productive. "It is situated in the extreme northeast corner of Maryland, and lies partly within the Piedmont Plateau of crystalline rocks and partly within the Coastal Plain formation with its gravels, sands, and clays."

Soil survey of St. Mary, Calvert, and Kent counties, Md., J. A. Bonsteel (pp. 125–186).—These counties, bordering on Chesapeake Bay, lie wholly within the Coastal Plain and have areas, respectively, of 360, 218, and 315 square miles. Nine types of soil, rarely occurring in continuous tracts, were recognized in St. Mary and Calvert counties, and 7 in Kent County. The soil types included loam, gravel, sand, clay, and swamp. The most extensive type of soil in St. Mary County (41 per cent) is the Leonardtown loam, which "consists of a silty yellow loam, fine and powdery when dry, but puddling to a plastic clay-like mass when thoroughly wet. On redrying, this mass usually bakes to a hard, firm surface, or if stirred before being sufficiently dried, it clods up into hard lumps. The subsoil consists of a brittle mass of clay lenses, lumps, and fragments separated from each other by seams and pockets of medium to fine sand." The most extensive type of soil of Calvert County (42 per cent) is the Norfolk sand, a coarse sand resting on a sandy subsoil 3 ft. or more in depth. The predominating type of Kent County is sassafras loam. "The soil proper consists of a fine brown loam, which is often slightly sandy, especially in the eastern part of the county. It extends to an average depth of about 9 in. and is underlaid by a uniform yellow loam subsoil. The subsoil varies in thickness from about 20 in. to a maximum of 5 or 6 ft."

Soil survey from Raleigh to Newbern, N. C., W. G. Smith (pp. 187–205).—This covered an area about 9 miles wide and 105 miles long in which a great variety of soils were found, 17 types being recognized. "Of these, the Cecil clay, derived from the weathering of crystalline rocks of the Piedmont Plateau, is a strong clay soil adapted to wheat and grass; the Selma silt loam, the finest type of bright tobacco soil; the Norfolk sand, a typical truck land; the Garner stony loam, a nearly worthless soil, and the Savanna and Pocoson, representing types of swamp lands which need extensive improvement in the way of drainage before they are of value for crops."

Soil survey in Weber County, Utah, F. D. Gardner and C. A. Jensen (pp. 207–242).—This district lies between the Great Salt Lake and Wasatch Mountain and has an area of about 310 square miles. Eight types of soil are described, the most important of which, agriculturally, is the Fresno fine sandy loam covering about 43 per cent of the area. A considerable portion of the district has, until recent years, been covered by the Great Salt Lake and contains excessive quantities of alkali. Chemical analyses of alkali crusts from 9 localities indicated an average composition of 59.83 per cent of sodium chlorid, 11.10 per cent sodium carbonate, 10.24 per cent sodium bicarbonate, 12.20 per cent sodium sulphate, 4.39 per cent potassium chlorid, 1.24 per cent magnesium sulphate, and 1 per cent calcium sulphate. The authors discuss the formation of a lime hardpan which occurs at a depth of about 3 ft. in some parts of the area, the injury done by seepage water from irrigation canals, etc., the reclamation of additional land by irrigation, and the nature of the water supply for irrigation.

Soil survey in the Sevier Valley, Utah, F. D. Gardner and C. A. Jensen (pp. 243–285).—The valley has an average width of about 5 miles and was surveyed for a distance of 45 miles. The soils being well drained and carefully irrigated are to a large extent free from injurious quantities of alkali. Ten types were recognized. "The soils as a rule are light in texture and well drained. They are mostly derived from the adjacent mountains, the material being often modified by stream action, and are underlaid in many places by gravel beds. The soils are derived from different kinds of rocks, and have well-defined physical characteristics, but these differences are not such potent factors in determining crop values and crop distribution as in the Eastern States." The average composition of 13 alkali crusts showed 39.06 per cent of sodium chlorid, 25.42 per cent of sodium sulphate, and other salts in smaller quantities. "The irrigation water is unusually good, except at a few points. . . . The best waters contain from 15 to 75 and average about 35 parts of solids per 100,000 parts of water. The alkali in the water contains nearly equal proportions of chlorids, sulphates, and bicarbonates, with but a trace of carbonates."

Soil survey of Salt River Valley, Ariz., T. H. Means (pp. 287–332).—The area mapped around Tempe and Phoenix and along the Buckeye canal embraced about 370 square miles and showed a variety of soils, 9 types being described. The irrigation water supply is generally good and no trouble from alkali is experienced when the soils are well drained. Numerous analyses of alkali salts are reported and the reclamation of alkali lands is discussed. The predominant salt found was sodium chlorid. An instance of the occurrence of a large amount of sodium and potassium nitrate in an alkali crust is recorded. The occurrence of a lime hardpan is noted. The surface and underground water supply for irrigation and systems of farming adapted to the region are discussed.

Soil survey around Fresno, Cal., T. H. Means and J. G. Holmes (pp. 333–384).—The area surveyed here covers about 625 square miles and includes foothills, plains, and bottom lands. Ten types of soils are described, the Fresno sand covering 40 per cent of the area and corresponding in texture and crop value to the truck soils of the Atlantic coast. About 84 per cent of the area is free from injurious quantities of alkali. In 20 samples of alkali crusts the sodium carbonate ranged from 5.72 to 93.35 per cent. Methods of preventing the rise of alkali and of reclaiming alkali lands and the nature of the hardpan and water supply of the region are discussed.

Soil survey around Santa Ana, Cal., J. G. Holmes (pp. 385–412).—The district surveyed extends from the foothills to the Pacific Ocean and comprises about 300 square miles. It is for the most part a delta plain and shows 9 types of soil. "The Fresno sand, a typical truck soil, formed of a coarse, loose, incoherent sand, 6 ft. or more in depth, naturally free from alkali, covers about 37 per cent of the district surveyed." The alkali salts consist principally of sodium chlorid and sodium sulphate, but are present in injurious quantities in only comparatively few areas.

Investigations on the physical properties of soils, L. J. Briggs (pp. 413–421).—Investigations on the physical properties of soils carried on during the year are briefly summarized. A marked difference was found to exist in the capillary movement of water in dry and in moist soils. In one instance the capillary rise in moist soil was over 4.5 times that in the dry soil. Sodium carbonate in solution was found to facilitate the rise of water in dry soil. Pure quartz sand was found to absorb 200 times the amount of carbon dioxid that would ordinarily be contained in a volume of air equivalent to that in the sand. A filter was devised for field use for obtaining clear soil solutions for chemical analysis. These investigations are to be reported in detail later.

Application of the theory of solution to the study of soils, F. K. Cameron (pp. 423–453).—The main features of this article have already been noted from other sources (E. S. R., 13, pp. 232, 428).

Results of tobacco experiments conducted in various parts of the United States, M. L. Floyd (pp. 455–473).—See p. 946.

Results of investigations on the Rothamsted soils, B. Dyer (*U. S. Dept. Agr., Office of Experiment Stations Bul. 106, pp. 180*).—This bulletin contains the lectures delivered under the provisions of the Lawes Agricultural Trust before the Association of American Agricultural Colleges and Experiment Stations at New Haven and Middletown, Conn., in November, 1900 (E. S. R., 12, p. 407). These lectures give a complete summary to date of the results of observations and experiments on the Rothamsted soils, extending over a number of years. They describe the method of soil sampling used at Rothamsted; give the results of mechanical analyses and determinations of nitrogen, carbon, chlorin, phosphoric acid, potash, and humus in soils which have been subjected to different systems of cropping and manuring; and discuss the nitrogen content of the humus of Rothamsted soils. The data reported have been partly published elsewhere (E. S. R., 13, p. 30), but by far the greater portion of the matter, including the results of the author's recent exhaustive studies on the phosphoric acid and potash contents of Rothamsted soils, is new.

A study of the available mineral plant food in soils, C. C. Moore (*Jour. Amer. Chem. Soc., 24 (1902), No. 1, pp. 79–116, fig. 1*).—The merits of the pot-test method of determining the available plant food in soils are discussed and the yields and fertilizing constituents of crops (oats and buckwheat) grown in a series of pot experiments during the past 5 years on 34 typical soils from different parts of the United States are compared with the results of various chemical methods of determining available plant food in the soils. The mineral constituents of the extract obtained by digestion of 10 gm. of each soil in 100 cc. of 1.115 sp. gr. hydrochloric acid for 10 hours, the total potash and phosphoric acid obtained by repeated digestion with hydrofluoric acid, the carbon dioxid, total and nitric nitrogen, carbon, hydrogen, and insoluble matter are reported for each soil, as well as their mechanical composition; and the results of tests of various methods of determining available potash and phosphoric acid by digesting in hydrochloric acid of different strengths, citric acid, and ammonium citrate are reported.

In the digestion of the soils a Wagner shaking machine, modified by Wiley to permit of digestions being made at definite temperatures, was used. "The modification comprises a well-fitted double wall sheet-iron chamber, in which the revolving shaft, together with the attached flasks, are encased. By use of a thermostat, and owing to the circulation of the air as caused by the revolving of the flasks, such a temperature as 40° may easily be maintained for hours with no more variation than 0.5°." A preliminary study of the effect of varying the time of digestion was made, which showed that 10 hours was apparently sufficient.

The total potash and phosphoric acid was determined by the following method: "Weigh out 2 gm. of soil into a 2-in. platinum dish, and ignite over a Bunsen burner to drive off organic matter. Get the soil as much as possible on one side of the dish and put in 1 or 2 cc. of hydrofluoric acid. Allow the soil to come in contact with the acid very slowly to avoid loss by sputtering, using a platinum stirring rod. After the violent action has ceased, place on a steam bath and evaporate to dryness. Repeat this operation one or two times and then take up with a little hydrochloric acid and water. Filter and wash into a 100 cc. flask, place the filter and contents into the platinum dish and, after drying over the flame, ignite the paper. There will be a small amount of the coarse mineral, which is transferred to an agate mortar to be ground, after which it is again digested in hydrofluoric acid until there is no insoluble residue left. Take up in hydrochloric acid and water, and add to the original washings."

The method of mechanical analysis used "was to some extent improvised, it being in the main the beaker decantation, or what is more generally known as the Osborne method. The radical change was a method devised for the disintegration of the sample. Instead of pestling with a rubber-tipped pestle, the sample was agitated in water by means of a shaking machine. Twenty grams of soil were put into a cylindrical bottle, the ordinary 8-oz. sterilizing bottle being used, with about 150 cc. of water, and the bottle shaken about one hour at the rate of 150 strokes per minute. . . Samples shaken one hour and one week gave constant results, disproving any grinding of particles. The siftings were made through sieves and bolting-cloth, the decantations controlled by the microscope. Below 0.006 mm., the decantation could be made with no accuracy, and resort was had to an arbitrary floating method. The period of 18 hours was selected."

In the studies of availability it was found that digestion for 5 hours in $\frac{1}{200}$ normal hydrochloric acid gave results more closely agreeing with the amounts of fertilizing constituents taken up by the crop in the pot tests than any other method tested. "In this method the ratio of substance to solvent was 200 gm. per liter. However, a liter flask was used in which 186 gm. of soil were placed, and the solvent added up to the mark. This varied only 1 or 2 cc. from 930, which was the ratio desired. After the digestion the whole was shaken and emptied on to a fluted filter sufficiently large. After draining, the volume of the filtrate did not vary 10 cc. from 800. This was shown in so many cases that the filtrate was no longer measured, but taken as 800 cc., corresponding to 160 gm. of the soil. This expedited the work greatly, and avoided the recording of figures and the chance for mistake. To this filtrate was always added 1 or 2 cc. of nitric acid for the double purpose of decomposing any ammonium chlorid which may have been formed in the digestion of organic matter, and also to oxidize any organic matter in solution. After evaporating to dryness, hydrochloric acid was added repeatedly and evaporated until there was no further evidence of the presence of nitrates. The residue was now transferred to a smaller porcelain dish, and diluted to about 50 cc. with water. To this was added 2 cc. of platinum chlorid, according to the method of direct estimation of potash (E. S. R., 10, p. 408). The solution was slowly concentrated until the potassium platinichlorid could be crystallized on the sides of the dish, after which it was set off to cool and solidify. It was then treated with acidified alcohol as described in the method referred to, washed onto a paper filter, and washed with plain alcohol and then with the half-saturated solution of ammonium chlorid, according to the usual method. After drying the salt, it was dissolved and washed through with hot water into small platinum dishes, evaporated to dryness, dried at 100°, and weighed. The filtrates were set aside after the washing with ammonium chlorid, stirred up and the ammonium platinum chlorid allowed to settle over night. Most of the liquid can then be decanted into porcelain evaporators. The residue is washed onto a filter with alcohol 3 or 4 times, the washings being added to the original solution for evaporation. A rather large dish should be used and the evaporation carried on slowly until the alcohol is completely volatilized. There is left a large residue of ammonium chlorid, which should be well diluted with water, and 2 or 3 cc. of nitric acid are added. The dish should be covered at first and warmed very gently to avoid loss by spurting. After the salt has been decomposed, the evaporation may be completed. The residue is taken up with water and a few drops of nitric acid, and the determination of phosphorus pentoxid made according to the usual molybdate method, titrating the yellow precipitate."

The results by Dyer's 1 per cent citric-acid method agreed quite closely with those of the crop tests in regard to potash, but there were wide discrepancies in the phosphoric acid. The phosphoric-acid soluble in $\frac{1}{25}$ normal hydrochloric acid agreed very closely with that removed from the soil by 3 successive crops of oats.

In order to gain some insight into the amount of plant food rendered assimilable in the soil during the growth of the crop "40 pots, holding about 1 pint each, were filled with the same soil, and in each pot, 18 grains of corn were planted. At the end of 2 weeks 6 pots were emptied, the corn plants and their roots freed of soil, all the soil put together as one sample, and all the plants and roots made into one sample. The roots were separated very easily, washed in a minimum quantity of water, the washings concentrated and mixed through the soil, which was then allowed to assume an air-dried condition before its moisture-free weight was obtained. The corn plants with their roots were then ashed and analyzed," *i. e.*, potash and phosphoric acid soluble in hydrochloric acid varying in strength from $\frac{1}{100}$ normal to 2 normal were determined. The same observations were repeated at 3 other periods thereafter at intervals of one week. The plants and roots contained practically the same percentages of phosphoric acid at each period, and in no case was it equal to that added in the seed. There was a steady increase of potash in the plants until about 4 times as much was removed by the plants as had been added in the seed. The results in general indicate "a condition wherein the mineral compounds are constantly undergoing a change into more soluble compounds, and with a tendency to revert before the compounds reach the point where they would leach out in drainage water. It is not seen how so great a change in the solubility of minerals can be brought about through so weak an acid as is contained in the sap of plants. In this case, a 5 weeks' growth so affected the more insoluble minerals as to bring 182 parts per 1,000,000 of the potash compounds into the range of solubility of 2-normal acid. As a mere question of solution, the weak acid of the sap could not possibly exert so strong a solvent effect as that shown. It is easier to believe that the changes in the mineral compounds of the soil are due to the action of bacteria, which are stimulated by the excretions from the roots.

"The complete chemical and mechanical analyses have no bearing on the immediately available plant food, in so far as the writer is able to interpret."

In sampling soils for analysis "a succession of similar depths should be taken in order to ascertain how deep the available food existed, and with this [should be] compared the depth to which the feeding roots of the intended crop are known to penetrate. For actual practice, the writer has constructed a very simple form of sampling cylinder, made out of 7-in. wrought-iron pipe. The pipe is cut 6 in. in length, and turned down to a thickness of $\frac{1}{16}$ in., leaving a collar on one end, to strengthen and drive upon, while the cutting edge is turned at the other end. This makes a strong cylinder weighing about 4 lbs. The cylinder is driven down to the top, and the inclosed soil taken out. The soil is dug from around the sides of the cylinder as it is driven down for the second 6 in., and so for a third 6 in. The separate portions are weighed and subsampled for analysis. . . . The more divisions into which a soil sample can be divided the more data there will be for study. . . .

However, if it is limited to two, or even one sample, let the total depth be that to which the intended crop is known to feed." The author suggests that in the study of soils by chemical methods it be assumed "that the available plant food rarely extends to a depth of more than 12 in., and that plants penetrating below that depth do so for the purpose of obtaining moisture." Such an assumption would simplify and increase the accuracy of sampling.

Development and distribution of nitrates in cultivated field soils, F. H. KING and A. R. WHITSON (*Wisconsin Sta. Rpt. 1901, pp. 210–231, figs. 5*).—In continuation of previous investigations (E. S. R., 13, pp. 24, 229) determinations of nitrates were made twice each month in the upper 4 ft. of the plats used in former experiments, "the object being to learn what differences may result with differences of season and with change of crop.

"The work with the total soluble salts as indicated by Whitney's electrical method has been discontinued because it was learned that while his method gave results which agreed fairly well with the gravimetric method for the surface foot of our soils, there was a wide disagreement when the second, third, and fourth feet were compared, the gravimetric method giving more soluble salts with the sands and less with the clays than the electrical method did, while there was an approximate agreement with the loams which are intermediate in texture."

It is shown that as an average for plats which were cropped last year there was 131.4 lbs. per acre more of nitrates in the surface 4 ft. in the spring of 1901 than in 1900, and 291.93 lbs. more at the beginning of September.

The nitrates in the plant (leaves and stems) grown on the various plats were determined at different stages by the following method:

"A sample of plants from the field was first chopped fine and mixed. From this mixture 20 gm. were weighed out, placed in a wedgwood mortar, thoroughly crushed, and finally worked up with 250 cc. of distilled water placed in the mortar; 20 cc. of this solution was drawn off into an evaporating dish and heated over a water bath for a few minutes, to partly coagulate the organic matter. It was then allowed to cool, after which 6 to 8 drops of subacetate of lead (U. S. P.) are added, with stirring to precipitate albuminoids. Then about 1 gm. of powdered animal charcoal, previously digested in sulphuric acid and very thoroughly washed, is added, allowed to stand for an hour with occasional stirring, and then filtered and washed with distilled water, making it finally up to 100 cc.

"The method of procuring a clear solution is that of A. Pagnoul (E. S. R., 8, p. 386), slightly modified. An aliquot of this solution is then evaporated and treated as described in [a previous bulletin] (E. S. R., 13, p. 230). . . .

"To determine the moisture content of the sample, for computation usually 100 gm. of the cut material was dried."

The results, together with those of determinations of nitrates in the surface foot of soil, made as a rule the preceding day, are reported in detail. They show "that in the case of the corn the nitrates, whether expressed in terms of the plant moisture or of the dry matter in the plant, have, in general, decreased with the degree of maturity in the crop; but with the potatoes or clover this relation is not so marked.

"Where the determinations have been made in the leaves and stems separately the results show a greater concentration of nitrates in the stems, as would be expected if the nitrates are broken down in the leaves or converted into organic nitrogen compounds.

"Everywhere the degree of concentration of nitrates in the sap of the plant stems is much higher than it is in the soil moisture. This appears very strange from the physical point of view and much more in harmony with the views formerly held by Berthelot and André, that nitrate of potash is continually formed in the stems of plants, but not accepted as correct by most authorities at present."

In view of the large amounts of nitrates found in the crops examined (as high as 12,317 parts per million of dry matter in potato stems), the authors tested the accuracy of the ordinary Kjeldahl method as applied to such materials and found a considerable error due to incomplete recovery of the nitrates by this method.

There was an average gain of 79.27 lbs. of nitrates in the surface foot of the soils during winter.

A study of the influence of temperature on nitrification was made by the following method: "From a large quantity of the field soil, thoroughly mixed in a tray out of doors, when the temperature was near 32°, about 2,000 gm. were taken and put into a 4-qt. tin pail, to be placed in another receptacle surrounded by water at the desired temperature." The temperatures maintained in different cases were about 35, 48, 68, and 90° F. "The soil was kept under conditions which permitted normal aeration, and the moisture content of the soil was maintained nearly constant by the addition of water at the time the samples were taken, to restore that lost by evaporation during the interval." The observations extended over 27 days, April 11 to May 8. Determinations of nitric nitrogen were made at the beginning and at about 2-day intervals in duplicate 50 gm. samples of each soil, care being taken "not to have the soil samples exposed to the temperature of the laboratory more than a few moments before the nitrates were washed out in the formalin solution to arrest both nitrification and denitrification."

The soil used "was in fairly good condition of fertility, but had received no manure or other fertilizers for more than 5 years. At the lowest temperature the mean daily rate of nitrification was 0.1594 part of nitric nitrogen per million of dry soil; or, expressed as calcium and magnesium nitrates, this is equivalent to 0.876 lb. per million pounds of dry soil. The surface 6 in. of an acre of this soil weighs about 1,370,000 lbs., and the above rate of increase would mean a production of 1.2 lbs. per day per acre and 120 lbs. in 100 days. The rate of nitrification at the highest temperature was 6.232 times more rapid than at the lowest temperature, the mean daily rates for the 4 temperatures being, in parts per million of dry soil, as follows: At 35° F. 0.1593, at 48° F. 0.1999, at 68° F. 0.4376, at 90° F. 0.9927."

These observations indicate that considerable nitrification may go on at as low a temperature as 35° F.

The results of observations on the influence of fall plowing on nitrification show that "if the total nitrates found in the plowed ground of August 19 and September 30 are compared, it will be seen that there has been a gain of 148.56 lbs. per acre during the 42 days. In the same way, comparing the total nitrates in the 4 ft. of the unplowed ground of the same dates, it will be seen that there has been a gain of 113.92 lbs. per acre, so that the effect of the plowing has been to increase the nitrates 34.64 lbs. per acre, or about 0.8 of a pound per day."

The total nitrates in soil which had been plowed in the fall just as the ground was freezing and again April 12 the succeeding spring "was 183.53 lbs. per acre, while that in the unplowed ground was 160.71 lbs. per acre, a difference of 22.82 lbs. in favor of the plowing; but on April 29 the nitrates on the unplowed ground had increased to 355.52 lbs. per acre, while that on the plowed ground contained only 327.97 lbs. or 27.55 lbs. per acre less. Accepting the figures as representing the facts, it appears that the ground not plowed has increased in its nitrate content faster than the plowed ground did, and at the rate of some 50.37 lbs. per acre. This is what should be expected if (1) nitrates are brought toward the surface by capillarity; (2) if there was greater evaporation from the ground not plowed than from that plowed, and (3) if the rate of nitrification was the same in both cases."

Studies on black marsh soils, F. H. King and A. R. Whitson (*Wisconsin Sta. Rpt. 1901, pp. 232-236, figs. 2*).—Experiments in continuation of those of previous years (E. S. R., 13, p. 27) were made in cylinders to determine the effect of turning under the crop as a means of improving the soils, and on the station farm to test the relative effectiveness of potash (sulphate), barnyard manure, and dried blood. The working of the preceding crops of oats and alfalfa into the soil had a pronounced effect in increasing the yield of corn. "The poorer soil is affected much more than the better soil, and the cylinders which had grown oats are affected much more than those which had grown alfalfa.

"These differences can not be due to lack of available nitrogen in the soil, since determinations of the nitrates in all of the cylinders made a few days before the crop was removed showed several times the amount which has been found in the soil on which heavy crops of corn were growing in the field. The indications are that one or more of the mineral elements were present in but limited amounts."

When the data obtained in the experiments with the fertilizers are expressed as per cent of increase due to each fertilizer, the results stand as follows: "On the north field, potassium sulphate, 34.4 per cent; dried blood, 20.1 per cent; manure, 29.2 per cent. On the south field, muriate of potash, 0.0 per cent; dried blood, 5.3 per cent; manure, 16.7 per cent."

Some geobotanic experiments, V. Nabokikh (*Selsk. Khoz. i Lyesor., 198 (1900), Sept., pp. 679–690*).—This article records observations since 1895 on the growth of a variety of plants, including corn, oats, potatoes, alfalfa, *Lathyrus sativa, Madia elegans, Carduus marianus, Atriplex hortensis, Dracocephalum moldavica, Datura ferox,* and *Calendula stellata,* on different kinds of soil, including gray sandy soil, alluvial clayey soil, alluvial sand, chernozem, loess clayey soil, pebbly clay soil, and marly soil, which had been filled in pits 1 meter deep and 6.4 meters square, in 1881. Partial chemical and physical analyses of the soils are given, and the behavior of different plants on the same soil and of the same plant on different soils are recorded and discussed, as well as observations on the growth of weeds and the survival of the plants on the different soils. The author especially discusses at some length the phase of the appearance of the first flower. He does not agree with the opinion shared by most horticulturists and agriculturists that as a rule on soils which are dry and poor in nutritive substances the flowering is hastened. Unfavorable soil conditions which retard the vegetative development may also retard the phase of flowering; such phenomena the author actually observed in the course of his 3 years' experience. The physiological peculiarities of different species also play a great part in the conditions of the phase of flowering. The other phases of the development of plants—the ripening of the fruit and the drying up of the above-ground organs—are subject to specific deviations from the normal as similar to those observed in the case of the flowering.—P. FIREMAN.

FERTILIZERS.

The fertilizing value of the nitrogen of stable manure and its analytical determination, T. Pfeiffer, O. Lemmermann, R. Riecke, and C. Bloch (*Mitt. Landw. Inst. Univ. Breslau, 1 (1901), No. 5, pp. 189–219*).—This is a continuation of previous investigations (E. S. R., 11, p. 134; 12, p. 734), and included pot and field experiments with 12 different kinds of manure from cattle, horses, sheep, and dogs. The experiments were made on heavy and light soils, the main object being to find an analytical method for determining the value of the nitrogen of manure. This was not attained with complete success, but there appeared to be a certain relation between the effectiveness of the nitrogen and its solubility in pepsin solution[1] after decomposition of the manure, although, as the table below shows, the results were not concordant or conclusive. The solubility in the pepsin solution was determined in the fresh manure and in the same manure after it had been kept in a

[1] See Landw. Vers. Stat., 55 (1901), p. 129.

thermostat at 38° C. for 3 months and moistened with water and soil extract to set up decomposition. The principal results are summarized in the following table:

Availability of different forms of nitrogen in manure.

Kind of manure.	Nitrogen in manure.			Plants utilized of—					
	Total.	Soluble in pepsin solution.		Total nitrogen.		Nitrogen soluble in pepsin solution at beginning.		Nitrogen soluble in pepsin solution after decomposition.	
		At time of use.	After decomposition.	On heavy soil.	On light soil.	On heavy soil.	On light soil.	On heavy soil.	On light soil.
Composted cattle manure:	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Pot test	0.605	0.163	0.212	14.2	8.9	52.6	33.2	40.5	25.6
Field test				8.6	10.4	31.9	38.6	24.5	29.6
Cattle manure, preserved with superphosphate—Pot test	.453	.271	.230	23.0	18.4	38.5	30.7	45.4	36.2
Cattle manure, preserved with kainit—Pot test	.425	.217	.193	20.0	9.0	39.2	17.6	44.0	19.8
Composted horse manure:									
Pot test	.524	.358	.260	17.9	18.9	26.2	27.7	36.0	38.1
Field test				14.8	14.5	21.6	21.2	29.7	29.2
Fresh cattle manure (1):									
Pot test	.472	.297	.188	14.3	8.2	22.8	13.0	36.0	20.5
Field test				9.2	10.2	14.5	16.3	23.0	25.7
Fresh cattle manure (2)—Pot test	.398	.223	.179	7.8	.6	13.9	1.1	17.3	1.3
Fresh horse manure—Pot test	.562	.297	.241	9.7	5.0	18.4	9.4	22.6	11.6
Fresh horse excrement—Pot test	.323	.203	.127	....	2.1	....	3.3	....	5.4
Dog manure—Pot test	.405	.305	.175	28.5	13.2	110.1	50.8	66.1	30.5
Composted yard manure—Pot test	.531	.308	.260	17.7	11.0	30.6	18.9	36.4	22.5
Sheep manure (1)—Pot test	.900	.391	.494	24.4	19.2	56.3	44.1	44.5	34.9
Sheep manure (2)—Pot test	1.279	.988	.866	22.1	19.7	28.6	25.5	32.7	29.0

From the table it appears that there is sometimes a decrease, sometimes an increase, of pepsin-soluble nitrogen as a result of decomposition, showing that the setting free of difficultly soluble and the fixation of easily soluble nitrogen compounds varies with the kind of manure.

Goat manure, D. MARTELLI (*Studi e Ricerche Ist. Lab. Chim. Agr. Univ. Pisa, 1900–1901, No. 17, pp. 19–26*).—Analyses are reported as follows:

Fertilizing constituents of goat manure.

Constituents.	Fresh manure.		Old manure.			
	Collected in the open.	Collected in stalls.	Preserved under cover.			Preserved in the open.
			1.	2.	3.	
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Nitrogen	1.512	1.540	2.198	2.156	1.974	1.519
Potash	.536	.557	1.527	1.888	1.589	.650
Phosphoric acid	.593	.634	.972	.860	.445	.423

Guano collected on islands in the Red Sea near the Colony of Eritrea, D. MARTELLI (*Studi e Ricerche Ist. Lab. Chim. Agr. Univ. Pisa, 1900–1901, No. 17, pp. 107–123*).—In the analyses reported the nitrogen varies from 0.784 to 15.029 per cent, the phosphoric acid from 11.706 to 28.083 per cent, and the potash from 0.224 to 1.781 per cent.

Vegetation experiments on the fertilizing action of different phosphates, O. KELLNER and O. BÖTTCHER (*Chem. Ztg., 26 (1902), No. 1, pp. 8, 9*).—The experiments here reported were made for the purpose of determining whether the small fertilizing effect of the phosphoric acid of bone meal found by Wagner, Maercker, and others was not due to the fact that their tests were made on soils which were naturally rich in lime or abundantly supplied with it at the time of the experiment. Three series of experiments in pots of 6 kg. content are reported. In the first two series the fertilizing effect of water-soluble phosphoric acid (superphosphate), citric-acid-soluble phosphoric acid (Thomas slag), and bone-meal phosphoric acid was compared, rye being the crop grown in one series, and mustard in the other. In every case the application of lime reduced the action of the phosphates ($\frac{1}{2}$ to $\frac{2}{3}$) and even that of the soil phosphoric acid, the yield from unlimed soil receiving no phosphate being higher than from the same soil receiving lime. The yield was nearly a third greater from bone meal applied in the fall than from that applied in the spring (on rye). In the third series of experiments bone meal of various kinds (fine and coarse) was compared with superphosphate and mineral phosphates with the following results, the yield with superphosphate without lime being taken as 100:

Relative effectiveness of phosphoric acid from different sources, with and without lime.

	Without lime.	With lime.
Double superphosphate, containing 35.43 per cent of water-soluble phosphoric acid	100	89
Chinchas guano, containing 12.56 per cent total phosphoric acid, 6.03 per cent citrate-soluble, 3.14 per cent water-soluble, and 7.65 per cent of nitrogen	46	26
Lobos guano, containing 33.19 per cent total phosphoric acid, 5.62 per cent citrate-soluble, 1.66 per cent water-soluble, and 2.29 per cent of nitrogen	35	18
Algerian phosphate, containing 28.29 per cent total and 0.23 per cent citrate-soluble phosphoric acid	39	14
Algerian phosphate, containing 26.58 per cent total and 0.41 per cent citrate-soluble phosphoric acid	35	10
Raw "Indian bone" meal, containing 23.5 per cent phosphoric acid and 4.06 per cent nitrogen	55	33
Bone meal with fat and gelatin removed (finely ground), containing 22.84 per cent phosphoric acid, 5.31 per cent nitrogen, and 21.1 per cent of particles over 0.25 mm. in diameter	52	....
Bone meal with fat and gelatin removed (coarsely ground), containing 22.72 per cent phosphoric acid, 5.28 per cent nitrogen, and 87.2 per cent of particles over 0.25 mm. in diameter	31	....
Steamed bone meal (fine), containing 25.9 per cent phosphoric acid, 4.23 per cent nitrogen, and 13.4 per cent of particles over 0.25 mm. in diameter	51	....
Steamed bone meal (coarse), containing 26.01 per cent of phosphoric acid, 4.18 per cent of nitrogen, and 95.5 per cent of particles over 0.25 mm. in diameter	28	....

The effectiveness of the bone was very largely dependent upon its fineness.

On the question of the relative value of different phosphates, D. Prianishnikov (*Landw. Vers. Stat., 56 (1901), No. 2–3, pp. 107–140, pls. 8*).—A brief review of previous investigations on the subject is given and sand and soil cultures in 4 to 5 kg. pots with different forms of calcium phosphate, and different kinds of mineral phosphates are reported. A variety of cereals and leguminous plants were grown. The mineral phosphates showing the lowest solubility in 2 per cent citric acid gave the smallest yields. The cereals in general (wheat, rye, millet, etc.) showed a very limited capacity for assimilating the crude phosphates. Buckwheat, lupines, peas, and mustard utilized them to a greater extent. Bone meal proved a much better source of phosphoric acid than mineral phosphates even in case of millet, which showed the lowest assimilative capacity. The freshly precipitated tricalcium phosphate was also very assimilable as compared with the mineral phosphates and dicalcium phosphate gave higher results than the monocalcium (or monopotassium) phosphate. The order of assimilability was mineral phosphate (phosphorite), bone meal, Thomas slag, freshly precipitated tricalcium phosphate, and dicalcium and monocalcium phosphate, all being assimilated to a greater extent by buckwheat, lupines, etc., than by the cereals. The experiments with mineral phosphates on black soil from southern Russia and on podzol soil from northern Russia showed that the phosphates were much more effective on the latter. This is ascribed to the acid character of the podzol soils. With regard to the use of phosphatic fertilizers soils are divided into 4 groups, as follows: (1) Those which are rich in assimilable phosphoric acid and do not respond to phosphatic fertilizers; (2) those containing little, easily assimilable phosphoric acid, but well supplied with other mineral constituents on which mineral phosphates increase the yield of cereals but not that of buckwheat, lupines, etc., (3) those generally deficient in phosphoric acid but not of acid properties, on which soluble phosphoric acid increases the yield of all plants but mineral phosphates are effective only on buckwheat, lupines, and similar crops; (4) soils generally deficient in phosphoric acid and decidedly acid in character, on which all phosphates, including mineral phosphates, increase the yield of all crops. Ammonium salts in connection with the mineral phosphates were very effective in increasing the yield but proved injurious when used with soluble phosphates.

The creator of the superphosphate industry and the work at Rothamsted, Maizières (*L'Engrais, 17* (*1902*), *No. 8, pp. 183, 184, figs. 2*).—A brief sketch of the life and work of Sir John Bennet Lawes, especially the experiments in continuous culture with chemical fertilizers alone.

Phosphates in Algeria and Tunis, Maizières (*L'Engrais, 17* (*1902*), *No. 9, pp. 206–208*).—A brief account of the various phosphate deposits in these countries.

Pot experiments with nitrogenous fertilizers, C. S. Phelps (*Connecticut Storrs Sta. Rpt. 1900, pp. 158–174*).—This is an account of a continuation in pots of experiments heretofore conducted mainly in the field (E. S. R., 11, p. 835). The pots used were made of galvanized iron, and were 18.5 in. deep and 10 in. in diameter, holding from 60 to 80 lbs. of the soil, sand, and gravel used. The soils experimented with were taken from the plats used in the field experiments. These soils apparently contained very little available nitrogen. The methods of filling the pots, applying the fertilizers, sheltering and caring for the plants, sampling and analyzing the crops, are described in detail. The data obtained in experiments with oats, Hungarian grass, orchard grass, and soy beans are reported in full, but without comment, since the experiments are being continued with smaller quantities of nitrogen and "it has been thought best to defer drawing any deductions until the results of the later experiments can be compared with those here reported."

Reports to the ministry of agriculture on sewage distribution at Gennevillieres and d'Achères (*Bul. Min. Agr.* [*France*], *20* (*1901*), *No. 5, pp. 965–968*).—Data are given as to the efficiency of the system of sewage farms at these places in purifying the sewage.

An experiment on soil improvement, C. S. Phelps (*Connecticut Storrs Sta. Rpt. 1900, pp. 61–65*).—This is a brief account of a continuation of experiments begun in 1899 (E. S. R., 12, p. 1025). The rotation adopted for this experiment was corn, potatoes, oats, and peas for fodder, and soy beans. The results with potatoes in 1900 are given. From these the conclusion is drawn "that clover had a high value when used to plow under as manure for potatoes. By sowing the clover seed amongst the corn in July, this crop was grown mainly between the seasons of the regular crop of the rotation. Although the clover at the time of plowing under was only 3 or 4 in. high, it proved to be a very valuable manure."

Analyses of commercial fertilizers, M. A. Scovell, A. M. Peter, and H. E. Curtis (*Kentucky Sta. Bul. 97, pp. 225–261*).—The results of analyses of 217 samples of fertilizers are reported. Of these 30 samples, representing 29 brands and 17 firms, fell below the guaranteed analyses in one, two, or all three ingredients. "The great majority of the manufacturers, however, have furnished in most instances fertilizers fully up to and often better than the guarantee."

Report of analyses of commercial fertilizers for the spring and fall of 1901, L. L. Van Slyke and W. H. Andrews (*New York State Sta. Bul. 201, pp. 103–168*).—The results of analyses of 465 different brands of fertilizers are reported. Of these, 334 were complete fertilizers in which the total nitrogen varied from 0.36 to 8.1 per cent, averaging 2.01 per cent. The water-soluble nitrogen varied from 0 to 6.4 per cent, averaging 0.87 per cent. The available phosphoric acid varied from 1.01 to 13.46 per cent, averaging 8.8 per cent. The potash varied from 0.26 to 11.59 per cent, averaging 4.47 per cent. In 70 out of the 334 brands examined the potash was in the form of sulphate free from excess of chlorids. The average amounts of nitrogen, available phosphoric acid, and potash exceeded the guaranteed averages by 0.12 per cent, 1.13 per cent, and 0.34 per cent respectively. The average retail selling price of the fertilizers was $25.71, the retail cost of the separate ingredients unmixed, $19.81.

Official report on commercial fertilizers inspected, analyzed, and licensed to be sold in the State of Ohio during 1901 (*Ohio State Bd. Agr. Rpt. 1901, pp. 92*).

The fertilizing value of citrus culls, E. W. HILGARD (*California Sta. Bul. 139, pp. 11, 12*).—It is estimated that 1,000 lbs. of oranges contain about 2.11 lbs. of potash, 1.25 lbs. of phosphoric acid, and 1.83 lbs. of nitrogen, worth from 30 to 40 cts. It is suggested that the culls may be composted with spent lime from beet-sugar factories with good results.

Compost formulas (*Bul. North Carolina State Bd. Agr., 23 (1902), No. 1, pp. 43–45*).—Formulas for composts of chemical fertilizers with barnyard manure, cotton seed, and cotton-seed meal are given, as well as precautions regarding the use of lime in composts.

Planting, fertilizing, and yield tables, VIBRANS (*Deut. Landw. Presse, 29 (1902), No. 4, p. 26*).

FIELD CROPS.

Influence of the right amount and the right distribution of water in crop production, F. H. KING (*Wisconsin Sta. Rpt. 1901, pp. 195–199*).—The distribution of rainfall at the station during the growing seasons of 1900 and 1901 are compared, and the yields of different crops under irrigation are reported. The yield of hay on 4.2 acres obtained in 4 cuttings was 20.59 tons, representing a gain of 3.4 tons due to irrigation. The increase in the yield of corn by supplementing the rainfall by irrigation amounted to 4.2 tons of silage, 1.09 tons of dry matter, and 35.16 bu. of ear corn per acre. In a test with potatoes, holding the soil moisture up to standard conditions by irrigation increased the yield of merchantable tubers 159.58 bu. per acre. The feasibility of establishing irrigation plants under certain conditions is discussed.

Field experiments with fertilizers, C. S. PHELPS (*Connecticut Storrs Sta. Rpt. 1900, pp. 34–60, dgms. 2*).—Some of these experiments have been in progress since 1888, while others have been added at different times. The work is repeated yearly with the same fertilizers on the same plats. The reports of former years, together with a description of the experiments, have been previously noted. This account is a report of progress for 1900. The results in general are the same as those reported in 1899 (E. S. R., 12, p. 1028).

Fertilizer experiments, J. SEBELIEN (*Norsk Landmandsblad, 20 (1901), Nos. 12, pp. 144–146; 13, pp. 158–161; 14, pp. 169–172*).—The work here reported consisted of fertilizer experiments with garden crops, and of pot experiments with barley. The plats used in the experiments with garden crops contained 37.5 square meters, and were fertilized at the rate of 1,216 kg. of kainit and 1,654 kg. of 20 per cent superphosphate per hectare in one series, and 1,333 kg. of kainit and 1,813 kg. of phosphoric acid in the form of potassium phosphate in the second series. Two plats were left unfertilized. The plats planted to peas had received stable manure 3 years previous, and those planted to carrots 2 years previous. Regarding the results of the check plats as 100, the average relative yield of peas on the kainit plats was 56 for the vines and 37 for the peas, and on the potassium phosphate plats 185 for the vines and 147 for the peas. The weights of the carrots harvested stood as 105.9 for the kainit plats, 121.6 for the kainit superphosphate plats, and 132 for the potassium phosphate plats. The excessive quantities of fertilizers applied exerted a very deleterious influence on the germination and retarded the growth of the plants at the beginning of the vegetative period. The peas did not seem to recover from the effect, but the carrots were able to do so. The results obtained on the potassium phosphate plats indicate that the injurious effect observed was not due to the amounts of potash or phosphoric acid applied, but to the impurities, such as magnesium salts, chlorids, and gypsum in the kainit and superphosphate. The potassium phosphate, although supplying a still larger quantity of potash and phosphoric acid than the kainit and superphosphate, produced no deleterious effects. The experiments were continued on the same plats during the following year, carrots being grown after peas and peas after carrots. Potash fertilizers again proved injurious to peas but carrots and cabbage were not injuriously affected.

In the pot experiments, potash tests with barley on a rather heavy soil showed that the increase in total yield was about the same, whether potassium chlorid or potassium sulphate was applied, but that the chlorid produced the most grain and the sulphate the most straw. In comparative nitrogen fertilizer experiments, the nitrate of soda produced considerably better results than ammonium sulphate. Considering the results from the use of potash and phosphoric acid as 100, the yields were as follows: With nitrate of soda, grain 382, straw 171, and the total yield 222; with ammonium sulphate 115, 162, and 140 for the grain, straw, and total yield, respectively.

The experiments were repeated the following year on a dark, sandy soil, under otherwise similar conditions as before. The comparative results are given below:

Relative yields of barley in pot experiments with nitrogen and potash fertilizers.

Nitrogen tests.	Grain.	Straw.	Total.	Potash tests.	Grain.	Straw.	Total.
FERTILIZERS APPLIED.				FERTILIZERS APPLIED.			
Phosphatic slag alone	100	100	100	Phosphatic slag alone	100	100	100
Phosphatic slag and sulphate of ammonia	174	156	164	Phosphatic slag and muriate of potash	111	123	118
Phosphatic slag and nitrate of soda	180	180	180	Phosphatic slag and sulphate of potash	102	125	114
Phosphatic slag and muriate of potash	100	100	100	Phosphatic slag and sulphate of ammonia	100	100	100
Phosphatic slag, muriate of potash, and sulphate of ammonia	164	143	152	Phosphatic slag, sulphate of ammonia, and muriate of potash	104	113	109
Phosphatic slag, muriate of potash, and nitrate of soda	163	153	157	Phosphatic slag, sulphate of ammonia, and sulphate of potash	102	127	115
Phosphatic slag and sulphate of potash	100	100	100	Phosphatic slag and nitrate of soda	100	100	100
Phosphatic slag, sulphate of potash, and sulphate of ammonia	175	160	167	Phosphatic slag, nitrate of soda, and muriate of potash	100	105	103
Phosphatic slag, sulphate of potash, and nitrate of soda	168	151	159	Phosphatic slag, nitrate of soda, and sulphate of potash	95	105	100

The soil was in poor fertility, as shown by the fact that the yield of grain and straw with phosphoric acid applied singly stood in the relation to that obtained in the unfertilized pots as 147:100, while with a complete fertilization the total yield was about 260 per cent of the yield in the unfertilized pots. The nitrogen fertilizers in all cases increased the yield of barley, but there was no appreciable difference between sulphate of ammonia and nitrate of soda except when applied with phosphatic slag alone. The soda supplied in the nitrate may have partially remedied the lack of potash in the soil. There was little difference in the results from the use of muriate and sulphate of potash, but they confirm previous observations that muriate of potash tends to increase the yield of grain and sulphate of potash the yield of straw. The following year the effect of the potash and nitrogen fertilizers, with or without the addition of lime, was studied with barley as a trial crop and on clay as well as on sandy soil. The clay soil contained 0.35 per cent of nitrogen, 0.03 per cent of phosphoric acid, 0.12 per cent of lime, and 0.02 per cent of potassium oxid, while the corresponding data for the sandy soil were respectively 0.13, 0.08, 0.07, and 0.01 per cent. Phosphoric acid in the presence of lime, potassium chlorid, and nitrogen increased the yield about 50 per cent, whether ammonium sulphate or nitrate of soda was applied, with slightly better results, however, in favor of ammonium sulphate. Lime with phosphoric acid, potash, and nitrogen produced better results than those alone on both kinds of soil, but the plants growing on clay soil and receiving ammoniacal nitrogen were evidently somewhat more benefited by the addition of lime than those receiving nitrate of soda. Sandy soil responded still better to fertilization with lime than the clay soil, as might be inferred from the chemical analyses of the 2 soils. A comparison of the results with muriate and sulphate of potash in the presence of lime and nitric or ammoniacal nitrogen does not indicate any appreciable difference between the 2 forms for clay soils, while on the sandy soil the muriate when given with sulphate of ammonia did somewhat better than the sulphate, the relative yields of grain being as 100:91 and the total yield as 100:94.—F. W. WOLL.

Field experiments with grain and forage plants, R. A. MOORE (*Wisconsin Sta. Rpt. 1901, pp. 237–254, figs. 2*).—These experiments were largely in continuation of work previously reported (E. S. R., 13, p. 36). The results of variety tests with oats, barley, emmer, peas, winter wheat, winter rye, and vetch, are given in a table. Swedish oats yielded 40 bu. per acre, while the common varieties averaged about 30 bu. Among 38 varieties tested during the past 3 seasons, Swedish and Siberian oats have shown the most commendable characteristics. Early Gothland and White Bedford have also given promising results. Manshury, Oderbrucker, and Silver King were the most satisfactory of 16 6-rowed varieties of barley. Silver King showed all the characteristics of Manshury. Two-rowed, hulless, and beardless barleys did not give satisfactory results. Of the 2 varieties of winter wheat grown, Turkish Red yielded 32.3 bu. per acre, and Kings Early winterkilled. Petkus and Schlansted, the only varieties of winter rye tested, gave good returns. The tests with peas were not satisfactory, owing to the seed being so badly affected by the weevil. Peas affected with the weevil showed a germinating power of 20 per cent, and those unaffected of 94 per cent. Russian vetch yielded only 2½ bu. of seed per acre.

In addition to the above experiments, tests with rape, alfalfa, clover, brome grass, soy beans, and cowpeas are reported. A test of seed of Dwarf Essex rape, grown near Puget Sound, in Washington, gave promise of a possibility of successfully growing rape seed in this country. Four pounds of Dwarf Essex rape and 3 bu. of oats per acre sown broadcast gave a yield of 32½ bu. of oats per acre and a satisfactory growth of rape for fall forage. The culture and uses of rape are briefly discussed. An instance is cited of injurious effects resulting from pasturing sheep on frozen rape. The results of a number of tests indicated that alfalfa can be sown with oats as a nurse crop. On several plats where only 1 bu. of oats was sown per acre the alfalfa made a vigorous and healthy growth and left a good stand for winter protection. As compared with American and European varieties of red clover, Turkestan alfalfa showed superior drought-resisting qualities. American red clovers and European clovers were grown to compare their quality, hardiness, and productiveness. The American varieties were medium and mammoth red clovers, and the European varieties, Hungarian, English, Steinmark, Transylvania, Russian, and German red clovers. The American varieties survived the winter, but all the European varieties, excepting Hungarian and Russian, were winterkilled. The American clovers gave the best yields, but the quality of hay was slightly in favor of the European varieties, being finer and comparatively free from dust. Experiments in growing clover with and without a nurse crop resulted in the best stand on the plats where no nurse crop was used. On plats where the nurse crop was cut for hay better results were obtained than on plats where it was allowed to ripen. A culture test of *Bromus inermis* resulted in a very heavy sod, but a rather light yield of hay. Sowing this grass at the rate of 32 lbs. per acre gave better results than sowing 16 or 24 lbs. of seed per acre. Soy beans grown at the station from Michigan-grown seed gave a yield of 22 bu. of ripe seed beans per acre. The yield of green forage determined on one plat was 4 tons per acre, equal to 2¼ tons of cured hay. Heavy fall frosts interfered with a culture test of cowpeas, and further trials will be undertaken.

Records of seed distribution and cooperative experiments with grasses and forage plants, F. Lamson-Scribner (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 10, pp. 23*).—This bulletin is a general report on the collection and distribution of grass and forage plant seeds by this Department through the office of the Agrostologist and on the cooperative work in grass and forage plant investigations with a number of State experiment stations. The manner of keeping the records of this seed distribution is explained in detail, and the plan of conducting the cooperative experiments and the line of work taken up with each station are fully described. Tables are given showing the seed distribution in detail. From 1896 to 1901, inclusive, 4,166 packages of seed were distributed to the experiment stations and 9,377 to individuals, or a total of 13,543 packages. During the fiscal year 1900–1901, 16,101¼ lbs. of seed, embracing 171 varieties, were distributed to experiment stations. The forms of the articles of cooperation under which the work is carried on and which are signed by the station officials and officials of this Department are presented.

Causes operative in the formation of silage, S. M. Babcock and H. L. Russell (*Wisconsin Sta. Rpt. 1901, pp. 177–184, fig. 1, table 1*).—The results here recorded are in continuation of work previously published (E. S. R., 13, p. 37). To determine the temperature produced, the loss in weight, and the amount of gases evolved in silage, cut field corn of average maturity was placed in 2 galvanized-iron receptacles 1½ ft. in diameter and 4 ft. high. These "silos" were hermetically sealed and remained closed for 25 days. The changes in weight and temperature, as well as the temperature of the room, were observed daily. The initial maximum temperature was reached the first day after filling. For 12 days the temperature remained above the room temperature, but from that time until the silos were opened it fluctuated with the temperature of the room. When opened the silage was in good condition and there was no evidence of mold or bacterial decomposition. Three days after opening, the temperature of the silage began to rise rapidly, reaching its maximum of about 50° C., or 20° above the initial heating after about 10 days, when the temperature again fell, but never reached that of the room. The total loss in the weight of silage before opening, representing the unavoidable losses, was about 1 per cent. After opening the silos the loss in weight was small until the temperature began to rise, when it increased rapidly and amounted to nearly 1 lb. per day as the maximum temperature was reached. In a separate experiment the rate and quality of gas evolved from 40 lbs. of cut corn was determined and the observations are tabulated.

"The fact that by far the larger proportion of gas evolved was thrown off in a period covered by the first 5 days is significant when considered with reference to the metabolic changes that occur in the tissues as a result of the activity of the plant cells themselves. If we assume that the gas evolved was CO_2, . . . the loss in weight due to the evolution of this gas would approximate 1 per cent, which is practically the same as determined by actual diminution in weight of silage in experimental silos.

"These results as to temperature change, loss in weight, and gases evolved are only explicable on the common hypothesis that the normal changes are due to . . . direct and intramolecular respiration of the plant cells themselves; and that normally . . . (bacteria and mold) only function in a detrimental way when air finds access to the mass of plant tissues."

In order to show the causal relation of plant-cell activity to silage formation immature cut corn placed in a receiver and immediately frozen to destroy the cell activity, was compared with a sample ensiled in the usual way. One frozen sample was treated with ether. After 22 days all samples were opened. Only the sample treated in the usual way had a distinctly silage aroma, while the other samples had a pronounced offensive odor suggestive of incipient putrefaction. A bacteriological examination of the samples was made and the conclusion reached that if the silage changes were attributable to bacteria the frozen corn should have made as good silage as the other. Practically the same amount of acidity was found to have developed in the frozen and the check samples as the result of bacterial growth, but in the frozen samples treated with ether the acidity was very much lower. From these results it is concluded that owing to the immediate destruction of the life of the plant cells the changes which characterize silage formation did not take place.

A number of samples of the same lot of corn were ensiled and opened on different dates to determine the relation of aroma production to death of plant cells. "The production of the characteristic aroma at the early stages noted, before the plant cells had died, is hardly compatible with the view that these changes are explicable on the theory that they are caused by the growth of organisms that must develop on the cells of the ensiled tissues. This observation adds probability to the conclusion already drawn that the internal processes of the living plant cell are the factors that inaugurate the series of changes that result in the production of typical silage."

Influence of close packing of corn in the silo on the unavoidable losses in making silage, F. H. KING (*Wisconsin Sta. Rpt. 1901, pp. 200–209, fig. 1*).—This experiment is the repetition of an investigation made the year before (E. S. R., 13, p. 38). Well matured corn was ensiled in pint and quart bottles in such a way as to have closely duplicate material in each bottle, but with more entangled air and looser packing in the quart than in the pint bottles. Air was prevented from entering the bottles, but the evolved gases were permitted to escape. The weight of the corn put into each bottle, together with the losses, are shown in the following table:

Losses in the weight of material in the silo.

	First pair.		Second pair.	
	1 pint.	1 quart.	1 pint.	1 quart.
	Gms.	*Gms.*	*Gms.*	*Gms.*
Weight of corn	323.7	318.7	299.6	291.7
Loss of silage after 33 days	1.0	7.6	3.8	8.5
Percentage loss after 33 days	.31	2.38	1.27	2.91
Loss of silage after 303 days	2.4	10.4	5.6	12.0
Percentage loss after 303 days	.74	3.26	1.80	4.11

The above figures show an average loss nearly 3 times as large with the loose packing as with the close packing. The closely packed pint bottles came to a constant weight in 8 and 9 days, respectively, while the quart bottles continued to lose for 28 and 30 days. The periodicity in the loss of weight after the rate of change had become small was evident in the data reported last year, and was again observed in these experiments.

The silos entering into the experiments of the previous year were left undisturbed, and analyses of the silage gases obtained from them were made in connection with these experiments, and the results are given in a table. An excess of residual gas over what should be expected if only the residual nitrogen of the air originally in the silo were present was found and its occurrence is discussed. That the air in the silo becomes rarefied was demonstrated by the development of a negative pressure in the bottles which at times produced a suctional effect quite marked. In one experiment silage exposed to the air did not mold, and lost in weight only 0.3 lb. or 0.4 per cent from May 15 to September 18. This silage although appearing normal was less acid than ordinary silage, and had a decidedly abnormal taste. Forcing fresh air through a silo did not injure the appearance of the silage, but gave it a bad odor and made it unpalatable.

From the data obtained the author draws the following conclusions:

"We know that during the early stages of the ensiling process, carbon dioxid is given off in large volumes. Hydrogen is given off from normal clover silage in both the earlier and later stages, and it is probably a constituent of the earlier gases from normal corn silage but produced only in small quantities. Nitrogen, other than that of the residual air, is likely to be proven to be a notable component of the gases from normal silage at all times. Water vapor and other volatile products escape with the gases of normal silage at all times, but their quantitative relations have not been sufficiently investigated to permit any statement as to how large the loss from these sources may be.

"Changes take place in normal silage which can not be measured by either a loss of weight or the escape of gaseous or volatile products, and these must be investigated before the changes in feeding value due to the ensiling process can be estimated and understood. The more loosely silage is packed in the silo and the larger the volume of entangled air the greater will be the unavoidable losses. The more open and porous the silo walls are, the larger will be the volume of air drawn into the silage by suction and forced in by wind pressure and barometric changes. The larger losses near the upper surface of the silage, and especially at the sides, are measurably increased by what may be designated silage breathing. The loss from this source could certainly be reduced and possibly to a notable extent by providing a metal cover under the roof which, when the silo is filled and the doors closed, would leave the silo nearly air tight. Such an arrangement would reduce the breathing and thus lessen the loss."

Growing alfalfa, W. C. Currie (*Farm Students' Rev., 6 (1901), No. 10, pp. 146, 147*).—A note on growing alfalfa in the Platte River Valley in Nebraska.

Studies on Bohemian barley, B. Procházka (*Centbl. Agr. Chem., 30 (1901), No. 10, pp. 695–699*).—This article is a discussion of Bohemian barleys. It recommends that in all breeding experiments the variability in plants and the power of transmission of the derived forms be carefully considered. The different species of barley are described and several varieties compared.

The effects of the growth of berseem on the soil, G. P. Foaden (*Jour. Khediv. Agr. Soc. and School Agr., 3 (1901), No. 3, pp. 134–140, pls. 2*).—This article discusses mainly the value of leguminous crops for soil improvement, and points out especially the adaptation of berseem for this purpose.

Some facts on the maize crop, G. P. Foaden (*Jour. Khediv. Agr. Soc. and School Agr., 3 (1901), No. 3, pp. 130–133*).—This article is a popular discussion on corn culture in Egypt.

History of cotton, G. P. Foaden (*Jour. Khediv. Agr. Soc. and School Agr., 3 (1901), No. 4, pp. 178–185*).—Historical notes on cotton culture.

Flax culture in Argentina, C. D. Girola (*Bol. Agr. y Ganadería, 1 (1901), No. 5, pp. 78–95*).—General directions and statistics.

Johnson grass, C. R. Ball (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 11, pp. 22, fig. 1*).—This bulletin gives a description of Johnson grass, and discusses its introduction, distribution, dissemination, the laws governing its control, the methods of eradicating it, and the uses to which it is adapted. Copies of statutes concerning the control of Johnson grass in Texas are given verbatim, and among the several means of eradication a cultural method of killing the grass patented by a Texas company is described. Chemical analyses of the grass at different stages of growth are quoted from Texas Station Bulletin 20 (E. S. R., 3, p. 890), and the comparative composition of timothy, redtop, Johnson grass, and red clover hays, being the average figures of a number of analyses, are given in tables. The author summarizes the bulletin as follows:

"Johnson grass is a tall, vigorous grass, closely related to the sorghums, with a very strong system of long, jointed, underground stems, popularly known as roots. Each joint of this underground stem is capable of producing a new plant.

"It is a native of the tropics of the Old World, and was first introduced into this country as a hay grass in South Carolina about 60 years ago.

"It has spread rapidly throughout the entire South to the Pacific coast and thence north to British Columbia. It thrives best in rich, moist, alluvial or irrigated soil, where it is also most difficult to eradicate.

"It is commonly spread by means of its seeds. They are widely scattered from hay cut after the seed has matured, and are often planted with seed oats. The seeds are unharmed by passing through the digestive tract of animals, and are thus widely scattered in manure.

"The grass should never be allowed to ripen its seeds in meadows, fields, or along roads, fences, or railways.

"It can be destroyed by hand labor—digging out the underground stems.

"Under field conditions it is best killed by plowing fallow land during hot, dry weather. The stems are thus exposed to the heat of the sun and soon killed. The same result follows the action of severe frosts.

"It can also be killed during the cultivation of a cotton crop by much extra hand labor.

"Various chemical substances have been tried but none has thus far proved successful and economical.

"Johnson grass makes a very good quality of hay when cut while just in flower, and it may be profitably cultivated throughout the South for this purpose. Meadows should be broken up at least every third year to loosen the matted stems. It is not necessary to reseed meadows when thus treated.

"Cowpeas may be sown in the grass when it is broken in the spring. When broken in the fall, oats may be used with it. It affords good pasture during summer when treated in the same way as meadows."

Variations in the fertilizing constituents contained in oats, A. Atterberg (*Jour. Landw., 49 (1901), No. 2, pp. 97-172; K. Landt. Akad. Handl. Tidskr., 40 (1901), No. 1, pp. 14-80*).—The work here reported was performed in the years 1885-1893, and the results have in part been previously noted (E. S. R., 6, p. 407). The investigations consist of 3 different lines of work, namely, (1) a chemical study of well and poorly developed oat plants, taken from different fields, to determine the variations in fertilizing ingredients in the plants under ordinary conditions; (2) a study of the composition of oat plants grown in sand cultures with special plant food solutions, and (3) a consideration of the results with reference to the applicability of plant analyses to practical agriculture.

For the study of plants grown under ordinary conditions 86 samples grown on different kinds of soils were obtained. Of some samples the different parts of the plants were analyzed separately, but in most cases an analysis of the entire portion of the plant above ground was made. No analysis was made of the roots. The variations in the content of nitrogen, phosphoric acid, potash, lime, magnesia, sulphur, and salicylic acid, as shown by the analyses of the samples, are presented in tables. The nitrogen content in the dry matter varied from 0.8 to 1.41 per cent, with an average of 1.02 per cent, the stems containing 0.24 per cent, the kernels 0.78 per cent. Unripe samples showed a high percentage of nitrogen in the stems and a low percentage in the grains. The figures representing the nitrogen content of the hulls and kernels, the stems, and the leaves, bear no definite relation to each other, while the nitrogen content of the kernels and the hulls and kernels, owing to the low nitrogen content of the hulls, varied in about the same ratio. Plants grown in pots in connection with these experiments contained a higher percentage of nitrogen than the field samples, but in the greater number of samples in both cases the nitrogen content in the kernels ranged from 1.30 to 1.69 per cent. A high nitrogen content in the green plants was indicative of a high percentage of nitrogen in the ripe kernels. The average for the ripe kernels was 1.64 per cent and for the green plants 1.20 per cent.

The greater portion of the phosphoric acid was found in the grains. The leaves had a higher percentage of phosphoric acid than the stems, but the absolute amount was smaller. The ripe hulls contained a very small quantity of this element. The average quantity of phosphoric acid in the dry matter was 0.427 per cent, 0.094 per cent being in the stems and 0.333 per cent in the grains. This shows that the variations are relatively much greater than the variations in the nitrogen content. The average content of phosphoric acid of the stems and the grains showed some relation to each other, although in general it was not very definite, while in the stems and leaves the relation was definitely shown. A content of more than 0.30 per cent in the stems was found only in those plants which showed a high content in the grains. All samples with a high content of phosphoric acid had been grown on soils rich in lime and liberally supplied with phosphoric acid. Plants grown in the culture pots showed a higher percentage than the field samples. In the pot-grown samples the phosphoric acid content in the green plants increased regularly with the percentage in the ripe grains, but when the content in the grains had reached 0.90 to 0.95 per cent it remained practically constant.

The greatest variations in the content of potash occurred in the stems. When the plants contained a high percentage of potash the larger portion was found in the stems, and when the quantity was low in the plants the stems and the leaves held about equal amounts. The lowest potash content was found in samples from moor soils and the highest in samples from clay soils and moor soils well fertilized with potash. The potash figures of the grains remained almost constant and bore no relation to the figures representing other parts of the plants. Fluctuations in potash content of the leaves and the grains were small. The average content of potash in the dry matter was 1.05 per cent, the stems showing 0.76 per cent and the grains 0.29 per cent. Plants grown in pots produced grains of a higher potash content than the field-grown plants. This was found to be true only in the case of potash. Green and ripe stems showed equal fluctuations.

The largest variations in the lime content occurred in the leaves, while in the grain only a small variation was noticed. All samples from soils rich in carbonate of lime contained over 0.35 per cent of lime in the stems. The average lime content in the dry matter of the plant was 0.256 per cent, the stems containing 0.198 per cent and the grains 0.058 per cent. The stems and leaves contained equal quantities. The lime content of the stems and leaves of the plants grown in pots was almost 100 per cent greater than in the stems and leaves of the plants grown in the field. Green samples fluctuated as widely as ripe ones, but the average content of the ripe stems and leaves was 0.10 per cent higher. Among the field samples those from limy soils contained 0.60 to 0.75 per cent of lime in the stems and leaves while the samples from moor soils poor in lime contained only from 0.17 to 0.20 per cent. Several samples from sandy soils showed a lime content of from 0.50 to 0.60 per cent.

The largest absolute quantity of magnesia was contained in the grains and the smallest percentage was found in the stems and hulls. The dry matter of the plants contained an average of 0.206 per cent, 0.115 per cent being found in the stems and leaves and 0.091 per cent in the grains. The stems contained two-thirds the quantity of magnesia found in the leaves. The grains of the pot and field-grown samples contained the same amount of magnesia, but the stems and leaves of the pot-grown samples contained a higher percentage than the stems and leaves of the field samples.

The highest absolute quantity of sulphur was found in the grains. The sulphur content was found to increase and decrease simultaneously in all parts of the plant. The stems and leaves showed the greatest variations. The average sulphur content in the dry matter of the plant was 0.15 per cent, of which 0.068 per cent was contained in the kernels.

The content of salicylic acid was highest in the leaves and much lower in the stems and grains. In general the distribution of salicylic acid in the plant was the same as the distribution of lime, but in most parts of the plant the salicylic acid content was about 7 times the lime content, and in the grain it was even 12 times as great. Plants grown on moor, sandy, and sandy loam soils were lowest in salicylic acid, while the plants from clay and chalky loam soils gave the highest figures. The content of salicylic acid in the stems and leaves of the plant seemed to be governed by the quantity of readily soluble salicylic acid combinations in the soil.

In studying the effect of different plant food solutions plants were grown in pots filled with sand according to the sand-culture method of Hellriegel, but in several instances different agricultural soils were used in place of sand. Each series of pots contained one element of plant food in different quantities, while the other elements remained constant. The plants from each pot were dried at 100° C., then weighed and analyzed. The roots were not taken into consideration, the analysis being limited to the grains and the portion of the plant above ground without the grains. These experiments were conducted for a series of years.

Four of the nitrogen series showed an increase in the nitrogen content of the plants as the quantity of nitrogen furnished in the plant food increased. In 2 series the nitrogen figures for the grains and for plants not fully ripe were about constant. According to the author, a definite factor which would indicate the nitrogen content associated with a maximum yield is not to be deduced from the results. In one series the best yields showed 1.81 to 1.94 per cent of nitrogen in the grains; in another series, 1.44 per cent; in a third, 1 per cent. In one instance of plants analyzed before fully ripe the maximum yield was associated with a nitrogen content of 2.03 per cent.

In studying the effects of phosphoric acid it was found that in 8 different series the increase in phosphoric acid in the plant food increased the content of that element in the grains, while in 3 series it remained constant at 0.85 per cent. The striking difference between the results of these 3 series and the others is not explained.

In all the potash series the increase of potash in the plant food increased the potash content in the stems and leaves of ripe and not fully ripe plants. Three series continued for 3 successive years with only an initial application of potash showed a decreasing potash content in the plants from year to year. The potash content was never constant in the stems and leaves when the quantity of potash in the fertilizer varied, but in the grain it remained constant or varied very slightly.

The results of 3 tests with different quantities of lime showed that a decrease in the quantity of lime furnished the plant caused a decrease of that constituent in the stems and leaves of ripe as well as unripe plants. The lime content of the plants in these series varied from 0.10 to 0.18 per cent, which proved too low a figure for their healthy development.

The magnesia content of the stems and leaves increased in these tests with the quantity of magnesia furnished the plant as food. With an insufficient supply the content in the unripe plants and in the mature haulms and grains sank to below 0.15

per cent. The lack of magnesia in the plant food manifested itself in small and many undeveloped grains, but it was noticed that the haulms could develop in spite of an insufficient supply.

The results of the sulphur series show in some cases an increase in sulphur content of the plants associated with an increase of this element given in the fertilizer, but as in the case of nitrogen and phosphoric acid it was also found constant. In this connection the grains showed only slight variations.

The influence of varying quantities of water on the composition of the plants was studied and the results show that in water and sand culture different quantities of water caused great variation in the nitrogen and potash content of the plants, but where the plants were grown on ordinary agricultural soils only the nitrogen figures varied widely, the potash and lime content varied less and the amounts of phosphoric acid, magnesia, and sulphur varied least. The results further indicate that generally an increase in the moisture content of the soil causes a relatively greater increase in the weight of the stems and leaves than in the weight of the grains. It was further noticed that close planting tended to decrease the content of plant food elements, especially in the case of nitrogen. It is stated that the season also is a strong factor affecting the composition of the oat plant, a favorable season usually lowering the figures for nitrogen and phosphoric acid and increasing them for lime. The smallest changes were noticed in the content of phosphoric acid and magnesia.

On the basis of the results of this investigation, the author draws the following conclusions: (1) When, in case of oats, the supply of an element of plant food is increased, this particular element is taken up and assimilated by the plant in increasing quantities, and the percentage content in the plant is also increased, except that nitrogen and phosphoric acid often remain constant under these conditions. (2) When an increase in a certain element of plant food increases the yield, the percentage content of the remaining elements in the plant is necessarily lowered, although in several instances in this work phosphoric acid and sulphur remained constant. (3) In case of a weak and poor development of the plants, a low percentage content is to be expected only of the element which is present in smallest quantity in proportion to the needs of the plant. Other elements, although present in the soil in barely sufficient quantities, may show a more or less high percentage content in the plants produced.

From the results of his work, the author gives the following method for determining the element which is present in the plant in minimum quantity: The percentage content as shown by the analysis is compared with the average and minimum content of oats. In general, the fertilizing ingredient whose percentage is farthest below or least above the average figure and nearest the figure representing the minimum content is present in minimum quantity. The author believes that it is possible to determine by chemical analysis of oats the fertilizing ingredient which was present in minimum quantity in the soil producing them, and the ingredients present in larger quantities, and the results thus obtained will permit of probable deductions as to the relative fertilizer needs of the soil. He explains, however, that the indications are always to be regarded with some doubt. He advises that the green plant be used for analysis. In conclusion the "normal" figures as obtained by the author in his work are summarized.—F. W. WOLL.

Studies on potatoes, A. PETERMANN (*Bul. Inst. Chim. et Bact. Gembloux, 1901, No. 70, pp. 16*).—The results of variety tests are reported and conclusions concerning the relation between the chemical composition of the tubers and their cooking qualities are given. The cultural treatment is described and the different varieties classified according to their starch content and their value for the table.

Variety tests with potatoes, C. FRUWIRTH (*Fühling's Landw. Ztg., 50 (1901), No. 4, pp. 166–168*).—A report on testing 47 varieties in 1899, and 49 in 1900.

The necessary qualities of potatoes for the manufacture of alcohol, with

notes on their culture and storage, W. KELLER (*Württemburg Wchnbl. Landw., 1901, No. 41, pp. 661, 662*).

Observations on rice culture in Argentina (*Bol. Agr. y Ganaderia, 1 (1901), No. 2, pp. 50–54*).—This article discusses the culture of rice in Argentina, mainly from a statistical standpoint.

Rice as a reclamation crop, J. H. PAULL (*Jour. Khediv. Agr. Soc. and School Agr., 3 (1901), No. 3, pp. 141–143, fig. 1*).—This article deals with Sabeini rice, as a means of reclaiming land in Egypt.

Storing root crops (*Deut. Landw. Presse, 28 (1901), No. 80, p. 676*).—A brief note on the subject.

Results of variety tests with rye, BACHMANN (*Landw. Wchnbl. Schleswig-Holstein, 51 (1901), No. 40, pp. 603, 604*).—A table gives the yields and financial returns of 14 varieties.

Experiments in sugar-beet culture during 1900 and 1901, F. W. WOLL and R. H. SHAW (*Wisconsin Sta. Rpt. 1901, pp. 261–276, fig. 1*).—The work with sugar beets for the 2 seasons comprised investigations at the station and analyses of beets grown by Wisconsin farmers.

In 1900, 9 varieties of sugar beets were grown on 3 plats, one of which received an application of common fertilizers. The fertilizer application used consisted of 90 lbs. each of dissolved bone and sulphate of potash and 100 lbs. of nitrate of soda per acre. One-half the quantity of nitrate of soda was applied after the beets were thinned. The average sugar content for the fertilized plat was 15.30 per cent with a purity of 81.7 per cent, and for the unfertilized plats 15.03 per cent with a purity of 82.8 per cent. The use of the fertilizer increased the total yield of beets $2\frac{1}{2}$ tons and the yield of sugar 729 lbs. per acre, but this increase was insufficient to pay for the fertilizer applied. The varieties ranged as follows:

"*As to yield of beets*—Kleinwanzleben Dippe, Austrian Kleinwanzleben, Russian Kleinwanzleben (No. 1), Zehringen, Russian Kleinwanzleben (No. 2), Vilmorin France, Austrian Queen of the North, and Austrian White Improved.

"*As to yield of sugar*—Kleinwanzleben Dippe, Austrian Queen of the North, Austrian Kleinwanzleben, Russian Kleinwanzleben (No. 1), Austrian White Improved, Vilmorin France, Zehringen, and Russian Kleinwanzleben (No. 2).

"*As to the per cent of sugar in the beets*—Austrian Queen of the North, Austrian White Improved, Austrian Kleinwanzleben, Russian Kleinwanzleben (No. 1), Kleinwanzleben Dippe, Vilmorin France, Zehringen, and Russian Kleinwanzleben (No. 2)."

In 1901 the work was carried on under adverse conditions, and the results, as shown by the tables, were low. The beets were planted at a late date and in addition the climatic conditions were unfavorable.

The results of analyses of 34 samples of beets grown by farmers in 1900 and of 249 samples in 1901 are summarized by counties in a table. Sixteen samples of beets grown by members of a beet growers' association showed an average of 19.8 per cent of sugar in the beet with a purity of 85.3 per cent.

Relative composition of different varieties of sugar cane, B. BONÂME (*Bul. Sta. Agron. Mauritius, 1901, pp. 24*).—The analyses of different varieties of sugar cane are tabulated and the quantities of plant food removed from the soil by each are given.

Results of tobacco experiments conducted in various parts of the United States, M. L. FLOYD (*U. S. Dept. Agr., Field Operations of the Division of Soils, Second Report, 1900, pp. 455–473, figs. 2*).—This article discusses in detail the experimental growing of tobacco under shade in Florida, Georgia, and Connecticut, and its subsequent handling, together with tests of packing and fermenting cigar leaf tobacco in Pennsylvania. Experiments in growing tobacco under shade were begun in Gadsden County, Florida, in 1896. The cover consisted of 2-in. laths placed 2 in.

apart. At the present time a cheese-cloth shade is generally used. The author states that to-day there are at least 700 acres under shade for tobacco growing in Gadsden County, Florida, and Decatur County, Georgia. The principal advantages of cloth covering over lath covering are the protection it affords against worms and hail, the maintenance of a more even and higher temperature and the retention of soil moisture. The method of overhead irrigation as practiced in connection with tobacco culture under shade is described and figured. The curing and fermenting of tobacco are considered at some length.

A description is given of the tobacco experiments conducted in Connecticut, and the general results are presented and discussed. The types of tobacco entering into these experiments were Connecticut-Havana seed leaf and Sumatra. "In every case the Connecticut-Havana was pronounced by both packers and manufacturers to be the finest and most useful domestic wrapper leaf they had ever seen. The Sumatra leaf was pronounced to be, however, far superior to the Connecticut-Havana and quite equal in every way to the finest leaf imported from the island of Sumatra." The material required for shading an acre and its cost is given. The results of this work have been previously noted from other sources (E. S. R., 13, p. 133).

The fermentation tests made in Pennsylvania were made in the fall of 1900 with tobacco from the crop of 1898. This tobacco was made soft and pliable by means of warm water and loosely piled into a bulk 6 ft. wide, 12 ft. long, and 6 ft. high in a room kept at a temperature of about 75°. After 3 days when the temperature at the center of the bulk had reached 135° the bulk was repiled putting the tobacco at the surface of the old bulk into the center. This bulk stood for 15 days, when "The tobacco was thoroughly cured, dried out, and ready for packing, without the least sign of black rot." Water applied to a lot of new tobacco caused black rot in the bulk, but when bulked without being moistened, no loss occurred. The present method of packing and fermenting cigar leaf tobacco in the Northern States is briefly described.

The growing of tobacco under shade in Connecticut, E. H. Jenkins (*Connecticut State Sta. Bul. 137, pp. 20*).—This bulletin briefly reviews the experiments on the fertilization, curing, and fermentation of wrapper-leaf tobacco, conducted by the station during the past 9 years, and reports in detail the work of growing an acre of Sumatra tobacco under shade in 1901. The Sumatra seed required a higher heat for germination and a higher temperature in the seed beds than the domestic leaf seed. The extra cost incident to shading the crop and harvesting the leaf by picking, charging the first crop with 20 per cent of the cost of the frame and 40 per cent of the cost of lath for hanging the tobacco, was $326.68 per acre. The initial outlay for this experiment was $582.63 per acre. The entire yield of leaf about 2 months after curing weighed 1,171 lbs. In a comparative test of shade-grown wrapper leaf 2.9 lbs. of Havana seed leaf and a very small fraction over 3 lbs. of the Broadleaf were required to wrap 1,000 cigars. At least 9 lbs. of Broadleaf were required for this same purpose when the plants were grown without shade. The shaded Broadleaf was not as elastic as that grown in the open. Sumatra grown without shade did not give encouraging results. It was noticed this season that topping the plants when in full flower a few weeks before harvest, improved the crop and made it ripen more evenly on the stalk. As compared with the product of the year before the leaf was much more elastic, still, according to the author, a higher degree of elasticity would have been preferable. The color of the leaf was rather dull. It was found that 1¼ lbs. of leaf would wrap 1,000 cigars. Leaf cured on the stalk was lighter in color, but more papery and less elastic than leaf picked or primed before curing. The prices at which a portion of the crop was sold ranged from $1.40 to $2.50 per pound, the average being $1.91.

Report of the wheat experimentalist, W. Farrer and R. W. Peacock (*Agr.*

Gaz. New South Wales, 12 (1901), No. 8, pp. 936–944).—This report discusses the progress of the experimental work with wheat at the different experimental farms in New South Wales during 1900.

The selection of wheat, C. Lemée (*Bol. Ofic. Agr. Ganadera, 1 (1901), Oct., pp. 293–299*).—This article discusses the improvement of wheat by selection, and gives the results of a comparison of light and heavy grains for seed.

Culture experiments with varieties of spring and winter wheat (*Mitt. Deut. Landw. Gesell., 16 (1901), No. 40, pp. 227–229*).—Nine varieties of spring wheat and 8 varieties of winter wheat are briefly described.

The quality of wheat grown in Upper Bavaria in 1899, R. Ulrich (*Vrtljschr. Bayer. Landw. Rath., 6 (1901), No. 2, pp. 321–328*).—Tables are given showing the conditions under which the samples were grown, the weight of the grain, and its germinative power. Deductions from these results are briefly given.

Yields of the best varieties of wheat cultivated in Northern France, R. Lavallée (*Semaine Agr., 21 (1901), Nos. 1061, p. 294; 1062, pp. 302, 303*).—Fifteen varieties of wheat are briefly described and the yields for 1900 and 1901 are given.

The improvement of Egyptian wheats, G. P. Foaden (*Jour. Khediv. Agr. Soc. and School Agr., 3 (1901), No. 4, pp. 162–169*).—This article discusses wheat improvement in general.

The Algerian durum wheats, C. S. Scofield (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 7, pp. 48, pls. 18*).—This bulletin contains a classified list of 31 varieties of Algerian durum wheats and descriptions of the same with key. The object of a descriptive classification of wheat varieties is discussed and the general character of durum wheats with special reference to the soil and climate best suited to their culture is briefly described. The classification and descriptions of the varieties are based on differences in the head and grain. The structure of the head, the characters of the grain, and the relative value of the different characters are briefly noted. In addition to the description a figure of a representative head of each variety is given.

How can Germany dispense with foreign wheats richer in gluten than those of her own production? P. Holdefleiss (*Fühling's Landw. Ztg., 50 (1901), No. 18, pp. 630–634*).—A discussion of the question.

Agriculture and plant breeding in Denmark in 1900, T. C. Westh (*Enkelte træk af landbrugets jorddyrkning og plantekultur i Danmark red aar 1900. Aarhus: L. Bech, 1900, pp. 87*).—This publication consists of a series of articles and reports by different writers and investigators. Types of Danish soils, meadows, and moorlands, and the cost of producing agricultural products in Denmark are discussed, and the results of plant breeding with sugar beets and wheat and of fertilizer experiments are reported.

HORTICULTURE.

Asparagus—its culture for home use and for market, F. M. Hexamer (*New York: Orange Judd Co., 1901, pp. 168, figs. 48*).—This purports to be "a practical treatise on the planting, cultivation, harvesting, marketing, and preserving of asparagus, with notes on its history and botany." Directions for both the field culture and forcing of asparagus are given, methods of canning and drying noted, and the insects and diseases affecting the plants described, suggestions being given regarding their control. The work of the experiment stations has been drawn on to a considerable extent in the preparation of the book, and methods of growers in different sections of the country outlined. The work does not pretend to be original, but summarizes in a popular way the methods of the best asparagus growers at the present time.

A list of American varieties of peppers, W. W. Tracy, Jr. (*U. S. Dept. Agr., Bureau of Plant Industry Bul. 6, pp. 19*).—A list of peppers, including all the varieties catalogued by seedsmen in the United States and Canada for the year 1901, is given, together with synonyms of the different varieties and the seed firms who have offered them to the trade.

The new rhubarb culture, J. E. MORSE and G. B. FISKE (*New York: Orange Judd Co., 1901, pp. 130, figs. 37*).—This work gives in a clear and concise manner specific directions for the winter forcing of rhubarb in cellars, pits, hotbeds, cold frames, and greenhouses. The field culture of rhubarb is also dealt with at length, the methods of many practical rhubarb growers being quoted and summarized, and the work of the experiment stations with varieties and methods of growing rhubarb reviewed. A chapter is devoted to methods of cooking rhubarb and preserving for winter use.

The book of the greenhouse, J. C. TALLACK (*London and New York: John Lane, 1901, pp. 103, figs. 16*).—This is the second of the series of handbooks of practical gardening edited by H. Roberts. It contains short practical chapters on the structure of greenhouses, the culture of hard-wooded plants in the greenhouse, climbers and basket plants, bulbs, plants from seeds, foliage, and miscellaneous greenhouse plants, with a chapter on a small town greenhouse.

The fuel question in greenhouse heating, L. R. TAFT (*Amer. Gard., 22 (1901), Nos. 347, pp. 569, 570; 349, pp. 602, 603; 350, p. 622*).—In this article a discussion is given of the theoretical value of different fuels, the efficiency of different types of boilers, and the coal required for greenhouse ranges of different sizes, etc.

A study of certain conditions affecting the setting of fruits, E. S. GOFF (*Wisconsin Sta. Rpt. 1901, pp. 289–303, figs. 20*).—The work here reported with fruit is mainly from the standpoint of the pollen grain. With the Prunus apple, George Glass cherry, and seedling native plum, the anthers failed to burst in a saturated atmosphere under a bell jar after 56 hours, while in dry air the anthers on duplicate twigs had practically all burst. The experiment indicates that during periods of protracted rain, or so long as the trees are wet with rain or dew, or enveloped in fog, practically no anthers burst, and therefore no pollen is wasted. Even in damp, cloudy weather it is not likely that much pollen will be destroyed. Other experiments with blossoms placed in a refrigerator and kept in the laboratory indicate that pollen is discharged freely only in warm and dry weather.

In order to learn the influence of the weather upon the germination of pollen grains, a number of germination experiments in 3 per cent milk sugar solutions were made. Temperature was the first factor investigated, the germinative power of plum, cherry, apple, pear, raspberry, and strawberry pollen, as affected by temperature varying from 39 to 70° F. being noted. Drawings showing the germination of the pollen grains on microscopic slides are given for each of the different fruits. The Moldavka plum germinated as well apparently at 51° F. as at 65 to 70° F. Wood plum, however, germinated more freely at 65 to 70° F. than at any lower temperature. Dyehouse cherry germinated at 40° F. rather more freely than plums did. Pear pollen failed to germinate at 40° and showed only a feeble germination at 51° F. Prunus apple pollen germinated very slightly at this temperature. Strawberry pollen germinated rather freely at 51° F. but failed to germinate at 40° F. Pollen of King Amarelle cherry and Lombard and Wood plums, exposed to a temperature of 51° F. for 6 days in a saturated atmosphere under a bell jar, germinated rather freely in sugar solutions, while pollen exposed to the temperature of the laboratory for the same period failed to germinate. These facts indicate that the vitality of pollen is not likely to be injured by exposure to a prolonged rainy period if the weather remains cool. If it rises to 65 or 70° F. the vitality of the pollen may be destroyed.

Experiments to determine the effects on pollen of exposure to frosts were not satisfactory. The pollen of plum and cherry germinated slightly after exposure to 28° F. and the pollen of Wallace raspberry freely after exposure to 23° F.

The influence of the vigor of growth of the terminal buds of the cherry as related to the setting of fruit was studied, and some figures are given which show the whole number of the flowers that were produced on spurs which made a terminal growth of 1 in. or less and on spurs which made a terminal growth of more than 1 in. The percentage of flowers that failed to set fruit in each case is also noted. The figures indicate that a vigorous terminal shoot is not detrimental to the setting of fruit. A study of the causes for the failure of the pistil in native American plums tends to the conclusion that this is due to cold after the buds have become excited by warm weather.

The experimental apple orchard, A. DICKENS and G. O. GREENE (*Kansas Sta. Bul. 106, pp. 29–56, pls. 7*).—An account is given of the growth of the station apple orchard planted in 1891 with whole root and piece root grafts and budded trees. The varieties which have been found most desirable are noted and briefly described. An earlier account has been given of the growth of the trees grafted upon whole roots and ordinary piece roots (E. S. R., 9, p. 750). The average height of the trees propagated by the different methods, maximum diameter, and average diameter 18 in. above the ground are shown in the following table:

Growth of apple trees on whole roots, piece roots, and budded apple stock.

Kind of stock.	Number of trees.	Average height.	Maximum diameter 18 in. from ground.	Average diameter 18 in. from ground.
		Feet.	*Inches.*	*Inches.*
Whole root	64	$11\frac{1}{3}$	$7\frac{1}{2}$	4.9
Piece root	102	$12\frac{1}{6}$	9	4.6
Budded	30	$12\frac{1}{4}$	$7\frac{1}{2}$	4.8

These trees were all 1 year old when set in 1891 and have been cared for in exactly the same manner. "The conclusion is inevitable that the manner of propagation seems to count for little after growth commences." As great variation has occurred between trees of the same variety propagated in the same way as between those propagated in different ways. In working the station orchard clean cultivation has been practiced. This has been greatly facilitated by the use of reversible cutaway harrows having extension heads. As cover crops cowpeas and oats have been satisfactorily used. Rye and wheat also made heavy growths, but were somewhat difficult to kill by cultivation in the spring, and are therefore considered of less value than either oats or cowpeas. At the end of a protracted drought the college orchard, which had been cultivated throughout the season, contained 16 per cent of moisture in the upper 15 in. of soil, while with most cultivated field crops there was but 8 to 11 per cent of moisture, and in grass land the amount in the upper 15 in. of soil was but 6 per cent.

The station orchard was planted primarily to test the value of different varieties. The varieties generally regarded in Kansas as standards have succeeded best at the station. Of these the best early varieties are as follows: Early Harvest, Benoni, Late Strawberry, Cooper, and Maiden Blush; fall varieties, Fameuse, Grimes Golden, and Jonathan; winter varieties, Winesap, Missouri Pippin, Gano, and Ben Davis. Fifty-nine varieties of apples grown in the station orchard are described in brief paragraphs.

A study of the growth of apple trees, C. A. KEFFER (*Tennessee Sta. Bul., Vol. XIV, No. 4, pp. 16, figs. 15*).—A study is here reported of the growth of Jonathan and York Imperial apple trees. The purpose of the study was to secure a better understanding of the training of apple trees. The trees were planted in April, 1900, and data as to the buds that grew, growth of terminal branches, effect of pinching certain shoots, etc., are recorded for 1901.

Seventy-five per cent of the shoots on 16 trees made their principal growth in length before July 1. Growth continued thereafter, however, quite generally, and in some shoots as late as the following December, though no increase in length of the shoots took place after November 1. In these observations the terminal shoots or outermost branches made their principal growth in length early in the season, while the shoots lower down the branches and closer to the trunk grew through a longer period. In the case of 2 York Imperial trees, one of which was cut back in the winter from ½ to ⅔ of the new wood and the other left unpruned, 50 per cent of all the shoots on the unpruned tree completed their growth in length by August 30, while on the winter-pruned tree all the shoots continued to grow freely after that date, most of them increasing 10 in. or more. Summer pruning (July 8) in the case of the single Jonathan tree under observation gave somewhat conflicting results as to the growth of the outer and inner branches. As a general law it is stated "that the apple shoot makes its principal growth in length before July 1, and that the outermost shoots finish their growth in length sooner than the lower shoots."

An examination of the growth of buds on the various trees showed that 59 per cent of all the buds found on Jonathan in 1900 above the lowest limb had started into growth by June 30, 1901, and 15 per cent had made shoots ¾ in. long or more. With York Imperial 60 per cent had started into growth and 28 per cent made shoots. It was observed that pinching and other checks to growth also had a considerable influence on the growth of the remaining buds.

Some illustrations, with critical notes, are given of the methods of pruning young apple trees.

Orchard notes, C. F. Austin (*Alabama College Sta. Bul. 117, pp. 292–320*).—Herewith is included a list of the apple trees in the station orchard affected with rust and those free from this disease, the varieties on which the green aphis is troublesome, and miscellaneous notes on the growth of the young trees. Notes are also given on the growth of cherries at the station, Japan walnuts, peaches, and plums, with notes on varieties and the blooming period in some instances.

Orchard cover crops, J. Craig (*New York Cornell Sta. Bul. 198, pp. 97–133, figs. 23*).—In this bulletin the purpose and value of orchard cover crops are discussed. Some data are given on the influence of these crops on the physical qualities of the soil and its fertility. A number of plants used as cover crops, alone and in mixtures, are briefly described, methods of using being noted, and some reports of orchardists conducting cooperative experiments are also included in the bulletin.

Some data obtained from the Iowa Station show that bare cultivated ground contained 31.43 per cent of moisture at a depth of 6 in. in winter; ground covered with a crop of hairy vetch contained 31.87 per cent of moisture at the same depth; soy beans, 28.67 per cent; crimson clover, 21.48 per cent; and with blue grass sod, 21.75 per cent. The bare cultivated ground froze to a depth of 21 in., while under bluegrass sod it froze but 12 in. deep, under hairy vetch 16 in., under crimson clover 15 in., and under soy beans 21 in. deep, the latter crop affording no protection to the soil whatever. At the Cornell Station an examination of the soil at the close of an extended drought showed the following percentages of moisture in the first 6 in. of soil: Bare ground, 6.48 per cent; ground covered with a crop of hairy vetch, 12.15 per cent; ground covered with a crop of cowpeas, 9.30 per cent.

Mention is made of the influence of earthworms in burrowing in the soil, and some illustrations are given showing how roots of cover crops follow these worm holes down deep into the soil.

Some figures have been taken from the Canada Experimental Farms Report (E. S. R., 9, p. 825) which show the amount of nitrogen returned to the soil by 3-month-old leguminous crops to be as follows: Alfalfa (stems, leaves, and roots), 136 lbs.; mammoth red clover, 130 lbs.; crimson clover, 104 lbs.; common red clover, 87 lbs. At the Cornell Station the amount of nitrogen yielded by a crop of vetch, including vines, leaves, and roots, was 256.1 lbs. and with cowpeas 52.6 lbs. These figures show the great fertilizing value of these crops in the orchard in addition to their use as cover crops.

Of the nitrogen-consuming cover crops sometimes used in orchards, rye and buckwheat are considered of most importance. Oats are also spoken of favorably in some parts of the country, but have not been satisfacfory when used in connection with crimson clover at the Michigan Station. A mixture of alfalfa, mammoth clover, and turnips, in the proportion of 6 lbs. mammoth clover seed, 10 lbs. alfalfa seed, and 2½ oz. of turnip seed per acre, is reported as having given satisfaction as an orchard cover crop. In the cooperative experiments the necessity of preparing the soil with great thoroughness before seeding was demonstrated, as well as the fact that good surface tillage conserves moisture and does much to insure a satisfactory catch of seed. Rolling clover seeded ground has proved an excellent aid to germination.

Citrus fruit culture, J. W. Mills (*California Sta. Bul. 138, pp. 1–38, 42–46, pls. 21*).—In this bulletin 12 of the leading varieties of California oranges are described, and a discussion is given of the relative merits of sweet orange, sour orange, and pomelo stocks for oranges, together with general directions for planting out orchards, cultivating, irrigating, top-working over old orchards, pruning, diseases, etc. The scales of points used in judging oranges and lemons are also given.

The Washington Navel, with its subvarieties, constitute the principal oranges of commerce now grown in California. An examination of the root systems of different stocks resulted in showing that the sweet orange produces a shallow root system with an abundance of fibrous surface-feeding rootlets, thus making trees budded on sweet orange stock especially susceptible to drought. Sour orange stock roots, on the other hand, were found penetrating the soil to a depth of 9 ft., and the laterals were generally more sharply descending. Trees on sour stock do not appear to come into full bearing quite as early as on sweet orange or pomelo stock, but in localities where sweet orange stock fails it is thought sour stock will prove especially valuable. In an introductory note by C. H. Shinn it is stated that sour stock is more resistant to alkali than sweet stock, and that the dwarf deciduous orange of Japan (*Citrus trifoliata*) is more resistant to alkali than either. The roots of pomelo stock have been found at a little greater depth than those of sweet orange. It is more fibrous rooted than either stock and is resistant to a certain extent to the root form of gum disease. It has succeeded better at the station than sour stock, and, according to the author, is becoming the favorite stock in southern California.

The Japanese long-fruited "Cumquat," or gooseberry orange, and dwarf Oonshiu have done especially well at the Sierra Foothill Substation on *trifoliata* stock, and are recommended for gardens having an elevation of 2,000 ft.

The Reed system of transplanting is described and illustrated. It consists in thoroughly watering the trees in the nursery before removing and then lifting them with a large ball of earth attached. The most vigorous trees are used and only the longer branches cut back. The trees are set in holes 2 ft. deep and about 2½ ft. wide. Dirt is then filled in around the roots and settled with water, so that the tree stands at the same height as in the nursery. The ground should be soaked for several feet around the newly set tree, after which thorough cultivation should follow. About ¾ lb. of bat guano applied after planting to each tree has been found beneficial. It is mixed with earth and applied in the bottom of trenches on each side of the ball of earth, at right angles to the irrigation furrows and reaching to them. Trees thus transplanted are said to come into bearing one year sooner than by the usual methods.

In working over old trees the use of "cured" buds is especially recommended. "These are buds that have been cut from the tree and kept in damp sand or moss for a few weeks before using. When treated in this way they become tougher, and when inserted into a tree that has freely flowing sap they absorb it more readily. When buds are well cured, and not allowed to become either too wet or too dry, they are not easily injured in handling." The buds should be wrapped with waxed bands, which are allowed to remain from 4 to 6 weeks. By this time the buds will have united with the stock, and the whole top of the tree should be removed and the trunk whitewashed. Spring is considered the best time for budding. In frosty sections it may be necessary to protect the tops during the first winter. Palm leaves nailed to the trunks of the trees and tied about the tops have been successfully used for this purpose.

To prevent the formation of hardpan in orchards, the depth of cultivation should be varied each year. Cultivation 8 in., 12 in., 10 in., 14 in., and then 8 in. again, is recommended. The use of the subsoil plow to assist in breaking up hardpan is also advised. Irrigation water should be allowed to run slowly for a long time in deep, narrow furrows, keeping the greater part of the surface dry, and immediately following the irrigation with thorough cultivation. The spread of water from deep furrows is much greater in sandy loam soil than in clay loam.

Mangoes in India, W. T. Fee (*U. S. Consular Rpts., 67 (1901), No. 253, pp. 197–199*).—Brief notes on the botany and quality of these fruits in India.

Report of the horticultural department, C. A. Keffer (*Tennessee Sta. Rpt. 1901, pp. 7–9*).—A brief outline is given of the work of the year with small fruits. Among 60 varieties of strawberries grown, the best yielding varieties were Pride of Cumberland, Clyde, Tennessee Prolific, Stone 130, Sample, Gibson, W. J. Bryan, Glen Mary, and Greeneville. Excelsior and Michel were the earliest berries. These varieties are perfect flowered and good pollenizers. Berries first in quality were Bennett, Parson Beauty, Brownie, Downing Bride, etc. Of the best late varieties Gandy, Hunn, Michigan, Sampson, McKinley, and Downing Bride are mentioned first. Columbia was one of the best raspberries tested and was considerably superior in yield and size of fruit to Shaffer Colossal. Gregg was the best yielder among the black caps, and Cuthbert among the reds. Snyder was the best yielder out of 10 varieties of blackberries grown, and Houghton the best of 6 kinds of gooseberries tested.

Third report on experiment in pinching raspberry shoots, F. Cranefield (*Wisconsin Sta. Rpt. 1901, pp. 317–320*).—The earlier reports along this line have been previously noted (E. S. R., 13, p. 51). The details for the third year's work have been added to those of preceding years and the whole summarized. The conclusions accord entirely with those of last year in showing that pinching 18 to 20 in. high increased the yield of the Gregg raspberry, but decreased the yield of Cuthbert. Pinching 12 in. high gave decreased yields with both varieties. With the Gregg variety pinching increased the production of shoots and suckers, but decreased it with the Cuthbert variety.

An ever-bearing strawberry for culture under orchard trees and grapes, F. F. Ichon (*Deut. Landw. Presse, 28 (1901), No. 81, p. 683*).—The strawberry described is said to have originated in Greece and is known there as the "ever-bearing Grecian vineyard strawberry." It grows best in the partial shade of fruit trees and vines, and produces fruit from the beginning of May until the end of November. During this time the vines are covered with flowers and green and ripe fruit. The yearly product of one plant is said to be over 10 liters of fruit, which retails for about 20 cts. per liter. The berries are red, about the size of a grape, and are stated to surpass in quality the common cultivated and wild strawberries. The botanical name of this strawberry is not given. The variety does not seem to be particular as regards soil, and is quite resistant against either drought or long continued wet weather. When well fertilized the mother plant makes a growth of 60 cm. in diameter and 40 cm. high. In cultivation the plants are set 50 cm. apart in rows 1 meter distant. The runners should be kept cut off in summer but may be allowed to grow in the autumn. After 3 or 4 years, when the mother plant has begun to fail in fruit production, the plants are renewed by allowing the runners to take root and then hoeing away the mother plants. In starting a new plantation the plants should be set out only in cloudy and damp weather, since the rootlets are very fine and easily destroyed by the direct rays of the sun or drying winds. The fruit is said to be well suited for canning, drying, preserving, dessert, wine making, etc.

The book of the grape, H. W. WARD (*London and New York: John Lane, 1901, pp. 97, figs. 20*).—This is the third of the series of Handbooks of Practical Gardening, edited by H. Roberts, and is devoted to the practical details of growing grapes in houses in England. The final chapter treats of the diseases of the grape. The decorative value of the vine is briefly discussed in the introductory chapter by the editor.

The tendrils of grapes, E. DURAND (*Prog. Agr. et Vit. (Éd. L'Est), 22 (1901), No. 36, pp. 283–295*).—The author shows that grape clusters and tendrils are identical in their origin and anatomical structure, and may pass from one to the other naturally. In the wild state grapes need tendrils to lift the vines up into the light, but under cultivation the production of tendrils is a loss of energy, and it is a frequent custom among French grape growers to remove the larger tendrils of the branches early in the season, lest they make the grape clusters near them "run to tendrils." For the purpose of following the evolution of tendrils into grape clusters and to note clearly the effect of pinching on this transformation, the author made a series of experiments with several varieties of grapes. The results secured with the Chasselas variety are reported in detail. In one lot that portion of the tendrils which bears a little leaf at its base was removed; in a second lot, this same ramification was removed and, in addition, the extreme point of the other branch of the tendril was pinched, removing 1 to 2 mm. or more of the tip; finally, in the third lot, the tendrils were allowed to grow freely. The different operations were performed soon enough in the season to permit the formation of grape clusters. The branches under observation were differently treated. In the first case they were allowed to bear no grape clusters; in the second, 1 cluster; in the third, 2 clusters; and in the fourth, 3 clusters. The essential data obtained in this experiment are shown in the following table:

Conversion of grape tendrils into fruit clusters.

	Total number of tendrils operated upon.	Number of tendrils bearing flowers.	Total number of flower buds obtained.
Lot 1: Branch of tendril removed at node	298	58	500
Lot 2: Branch of tendril removed at node and other branch pinched	294	25	223
Lot 3: Tendrils allowed to develop freely	292	11	230

The table shows that in the absence of all pinching, the tendrils are capable of naturally producing flower buds. Pinching, however, seems to increase the number of flower buds. The greatest number in the present experiment was obtained when that portion of the tendril which bears a small leaf at its base (lot 1) was removed simply. Stated in percentages, the different methods of operating on the tendrils produced flower clusters as follows: Lot 1, 19.4 per cent; lot 2, 8.5 per cent; and lot 3, 3.7 per cent. As shown in the table, lot 1 produced 500 flower buds and lot 3, where the tendrils were allowed to grow freely, 230 buds; therefore, the number of flower buds produced by pinching in this test did not exceed 270.

The author states that on account of insects, diseases, etc., not more than half of these buds set will produce fruit. It is estimated that at harvest time this will reduce the yield so that only from 25 to 30 gm. of grapes additional will be secured per vine. This return is considered too small to pay for the trouble of the operation.

In some varieties under observation a large number of flower clusters were borne naturally on the tendrils. Thus for example with the variety Yapindjack from the Orient, 15 bunches of grapes and 26 fertile tendrils were borne on 8 shoots naturally, against only 16 tendrils which were not fertile. It is thought that with this variety pinching the tendril, as above noted, would produce a very large increase in fruitfulness.

With some other varieties the removal of the ramification of the tendril and the pinching of the point of the principal branch was practiced. The variety *Insolia bianca* had 8 tendrils out of 28 operated upon made fertile. These bore 104 floral buds or enough to make the operation advantageous. With the variety Jurançon 50 per cent of the tendrils pinched were made fertile. On one vine 17 pinched tendrils produced 8 flower clusters bearing 181 buds. Gros Riesling produced 3 flower clusters and 48 flower buds from 12 pinched tendrils. Petit Riesling gave 3 fertile tendrils carrying 21 flower buds out of the 15 operated upon.

Pinching the tendrils of the following varieties was without any effect whatever on the production of flower clusters:

Madeleine Juliette, Mélascone nera, Malvoisie de Liparî, Chardonnay, Fariné ou Gauche, Furmint, Marsanne, Bon noir de Montluçon, Noir Fleurien, Mauzac vert, Mauzac rose, Morillon rose, Morillon hâtif, Aubin blanc, Peloursin, Dureza, Corbel, etc.

Manures and the quality of wines, L. Degrully (*Prog. Agr. et Vit. (Éd. L'Est), 22 (1901), No. 42, pp. 449–452*).—Analyses of several classes of wines are given, with especial reference to the quantities of phosphoric acid and potash contained in them. There seems to be a close relationship existing between quality and phosphoric acid content, the best wines having the highest amount of phosphoric acid and the poorest wines the least.

Pruning trees and shrubs, T. Wirth (*Gardening, 9 (1901), No. 210, pp. 281–283*).—A criticism of usual methods and statement of general principles to be observed.

Storing fruit (*Deut. Landw. Presse, 28 (1901), No. 77, p. 650*).—A number of varieties of apples and pears were wrapped partly in tissue paper and partly in newspaper, and put in layers in a tightly closing box surrounded by peat dust. The layers of apples were also separated from each other by dry peat dust. The apples as thus prepared were put in storage in a cellar about November 1. The box was opened the middle of May following. Eleven out of the 14 varieties of apples thus put in storage averaged over 80 per cent perfect as regards rot. The 2 varieties of pears stored were wholly spoiled. A number of other varieties of both apples and pears, which had been layered in peat dust at the same time, kept well up into July. Not all the data are given in regard to the latter experiment. The experiment as a whole is believed to show that the more carefully the fruit is harvested and the less it is disturbed and shipped the better it will keep. The method of fruit storage here outlined is considered very satisfactory, especially for late-ripening winter apples.

A new method of preserving fruit (*Queensland Agr. Jour., 8 (1901), No. 6, p. 447*).—An apparatus, said to be patented in London for the preservation of fruit by means of sterilized air, is noted, and a report quoted of successfully storing English hothouse grapes and tomatoes for 3 weeks without decomposition or loss of flavor.

The preservation of fruits and vegetables, together with the preparation of marmalades, fruit tablets, jellies, and fruit wines, N. Noble (*Orgaan Ver. Oudleer. Rijks Landbouwschool, 13 (1901), No. 153, pp. 62–74, figs. 22*).—This is a comprehensive paper concerning the methods of drying and canning fruit, with figures and detailed descriptions of the apparatus used, including parers, corers, dryers for both home and commercial use, and special apparatus for cooking and for canning.

Fruit tablets are made by boiling down the pulp mixed with sugar until the desired consistency is reached. The residue is then poured into pans and spread about 1½ cm. thick, after which it is dried slowly, 10 hours being about the time usually required. When finished the mass is cut into circular tablets, which will keep 10 years. When the tablets are to be used they should be soaked in warm water from 1 to 1½ hours before cooking.

Cider making is described at length. Various presses are illustrated and described, and detailed instructions given for the treatment of the product at every stage.—H. M. PIETERS.

Fruit gardening, containing complete practical directions for the selection, propagation, and cultivation of all kinds of fruit, T. BRIDGEMAN (*Philadelphia: Henry T. Coates & Co., rev. ed., pp. 211, figs. 36*).—While this purports to be a revised edition of this work, which first appeared more than a half century ago, it still savors more of European gardening than of present American methods. For example, twice as much space is given to descriptions of European varieties of grapes as of American sorts. The revised list of grapes for this country fails to mention such widely cultivated varieties as Concord, Niagara, and Delaware. Other fruits have been revised in a like manner.

A review of the fruit-growing industry in Cape Colony, C. MAYER (*Agr. Jour. Cape Good Hope, 19 (1901), No. 5, pp. 317–325*).—The number of fruit trees of all sorts in the colony in 1898 was 3,773,507, and the value of the fruit exported in 1901 about $24,000.

The development and needs of the export [fruit] trade in North America, C. FOSTER (*Amer. Gard., 22 (1901), No. 356, pp. 714, 715*).—Paper read before the American Pomological Society at its meeting in Buffalo, September 13, 1901.

The freezing point of vegetable saps and juices, W. F. SUTHERST (*Chem. News, 84 (1901), No. 2190, p. 234*).—Various fruits and vegetables were reduced to a fine pulp by means of a grater, and then filtered through muslin and thick filter paper. The juices thus obtained were placed in narrow test tubes containing a thermometer, and cooled down by a freezing mixture of Glauber salts and concentrated hydrochloric acid. The results secured are shown in the following table:

Freezing point of vegetable saps and juices.

Vegetables and fruits.	Freezing point.	Vegetables and fruits.	Freezing point.
	°C.		°C.
1. Vegetable marrow—(a) Leaf and stalk	−0.75	4. Carrot—(a) Leaf and stalk	−1.2
(b) Fruit	−0.75	(b) Root	−1.0
2. Swede turnip—(a) Leaf and stalk	−1	5. Cabbage—(a) Outside leaf	−1.1
(b) Bulb	−1	(b) Heart	−0.85
3. Celery—(a) Green stalk and leaf	−1.4	6. Apple	−1.4
(b) White portion	−0.75	7. Pear	−1.75

"It will be seen from the above figures that—(1) Those vegetables easily attacked by frost, *e. g.*, vegetable marrow, have the higher freezing points; (2) the sap in the parts exposed to the air has the same freezing point, *e. g.*, fruit and stalk of the turnip and marrow; while (3) those plants which have a portion in the ground, *e. g.*, celery and carrot, or protected, *e. g.*, cabbage heart, the sap in these portions freezes sooner than the exposed. It is very possible that these differences can be accounted for by the fact that the hardy exposed parts contain a more concentrated sap, since more evaporation goes on there; also, pear juice, containing more dissolved uncrystallized matter, freezes lower than apple juice."

Report of the chemical division of the experiment station of the Royal Pomological Institute at Proskau for the year 1900-1901, R. OTTO (*Bot. Centbl., 86 (1901), No. 10, pp. 331–345*).—An outline is given of some of the chemical work of the station in the analysis of wines, ciders, and various fruits and flowers which have been grown in fertilizer experiments. The report of the composition of 1-year wood of orchard fruits grown on the north, south, east, and west sides of apple trees has been noted from another publication (E. S. R., 13, p. 137). Kohl-rabi was successfully grown in pure quartz sand fertilized with chemical manures, and the effect of increasing the amount of phosphoric acid and potash studied, but without satisfactory results. Myrtle, heliotrope, and fuchsias watered with liquid manure made up of a mixture containing 13 per cent phosphoric acid, 13 nitrogen, and 11 per cent potash, and diluted with water in the proportion of 1:1,000, have given very good results. Analyses of the parts of the plants above ground show considerable increase in the percentage of ash content of the plants receiving the fertilizer. Other experiments in fertilizing tobacco, tomatoes, coleus, and begonias with the commercial fertilizer known as "Martellin" are reported, but without striking results. In an examination of apples which had been stored in a cellar for 3 months, it was found that in 6 out of 8 cases there was a considerable decrease in the specific gravity, acid, sugar, and extract content. In the other 2 cases there was an increase in specific gravity, acid, sugar, and extract content. The changes which took place in the composition of different blueberry wines after 3½ years' storage in a cellar are tabulated.

Caoutchouc plants and their culture, O. WARBURG, trans. by J. VILBOUCHEVITCH (*Les plantes à caoutchouc et leur culture. Paris: A. Challamel, 1902, pp. XVI + 307, figs. 26*).—Attention was called to this work when it appeared first in the original German (E. S. R., 12, p. 955). In the present translation into French the text of the German has been closely followed. The translator has included such new facts regarding the value of different species of caoutchouc-producing trees and the methods of handling them as have come to light since the original publication appeared in 1900. The statistics of caoutchouc production and consumption have also been brought up to date. Many other supplementary notes have been added, besides a valuable index. These new features have increased the size of the work to nearly double that of the original volume, and have added greatly to its usefulness.

Vanilla, its culture, and some notes on apiculture as an economic auxiliary agent in its fertilization, E. D. DURÁN (*La vanilla, su cultivo, el beneficio y algunos apuntes sobre apicultura como un agente auxiliar económico para la fecundación. Guatemala: Ministerio de Fomento, 1899, pp. 36*).—A popular treatise.

Experiments in subirrigation of flower beds, F. CRANEFIELD (*Wisconsin Sta. Rpt. 1901, pp. 321–326, figs. 4*).—A comparison was made as to the cost and value of surface and subwatering flower beds. The beds were each 5½ by 8 ft. In the surface watered bed the ground was prepared by simply spading it 1 ft. deep. One subwatered bed was first excavated to a depth of 17 in. The sides were bricked 12 in. high and the bottom covered with a 2-inch layer of cement. Gravel 2 in. deep was then spread on the bottom and a little freshly cut grass spread over it to prevent the soil from working into the gravel. A vertical tile reaching into the gravel was then set up at one end of the bed to serve as an inlet for water. In the case of the other subwatered bed, the ground was excavated to a depth of 15 in., the bottom and sides puddled with clay, and a layer of glazed sewer pipe placed midway in the bed, with lines of common drain tile branching off on either side. After these beds were refilled with earth, all were planted to castor beans, Caladium, cosmos, Pennisetum, coleus, and canna plants. The growth of these plants was most luxuriant in the subirrigated beds and the plants in the cement bottom bed made a stronger growth, were more vigorous, and blossomed more freely than in the tile watered bed. The following table shows the differences in average height of plants in the different beds:

Height growth of plants in surface and subwatered beds.

	Castor beans.	Cosmos.	Coleus.	Pennisetum.
	Feet.	*Feet.*	*Feet.*	*Feet.*
Surface watered	4.8	4.7	1.7	3.7
Subwatered (cement)	8.0	5.0	3.2	4.7
Subwatered (tile)	7.0	4.7	2.5	4.5

The increased cost of construction of the cement bottom bed over the spaded bed was $5.12, and of the tile laid bed $3.42. The cement bottom bed cost the more, but was more satisfactory from the standpoint of a luxuriant growth than the bed in which tile were used.

A southern New Mexico flower garden, F. E. Lester (*New Mexico Sta. Bul. 40, pp. 27, figs. 11*).—This is a popular bulletin on flower growing in southern New Mexico. The chief difficulty in flower growing in that section is the summer heat, combined with the extreme dryness of the air and high spring winds. Owing to these peculiar conditions the best results are usually obtained from using the larger seeds, such as sweet peas, castor beans, morning glory, zinnias, hollyhocks, etc. It has been found that with a number of plants fall seeding gives much better results than the usual spring seeding. The author urges the larger use of native plants in home gardens and gives suggestions regarding the growing of trees, hedges and windbreaks, lawns, vines, shrubs and evergreens, roses, and sweet peas. Lists are also given of the annuals most successfully grown at the station, hardy plants and perennials, winter blooming bulbs, flowering shrubs, and evergreens, with suggestions in each instance regarding the planting of these.

The book of bulbs, S. Arnott (*London: John Lane, 1901, pp. 114, pls. 11*).—This is number 5 of the series of handbooks of practical gardening edited by H. Roberts. It gives a popular account of the appearance and culture of hardy bulbs, with an introductory chapter by the editor on the botanical nature of bulbs.

Old-time gardens newly set forth, Alice M. Earle (*New York: The Macmillan Co., 1901, pp. 489, figs. 166*).—Illustrations and descriptions are given of many old-time colonial gardens, with descriptions of the flowers, shrubs, and trees that grew in them, and an account of the uses, folklore, and something of the poetry connected with each. One chapter is devoted to the apple.

Prize gardening; how to derive profit, pleasure, health from the garden, G. B. Fiske (*New York: Orange Judd Co., 1901, pp. 307, figs. 93*).—This is a compiled account from 500 competitive reports on gardening and gives the actual experience of gardeners using parcels of ground varying all the way from 1,000 sq. ft. to many acres in extent in growing vegetables, flowers, etc., the tools and methods of doing the work, financial results obtained, etc.

Horticulture in Japan, T. Eckhardt (*Florists' Exchange, 13 (1901), No. 42, p. 1074, figs. 2*).—Brief popular account of Japanese horticulture, especially as regards lily growing.

Catalogue of library of the National Horticulture Society of France, G. Gibault (*Catalogue de la bibliothèque de la Société Nationale d'Horticulture de France. Paris: Société Nationale d'Horticulture, 1900, pp. 155*).—Alphabetical lists of books and brochures in the society's library on horticultural subjects, with an authors' index; and in addition a list of French and other foreign periodicals devoted to horticulture in its various branches.

FORESTRY.

The immediate future in forest work, G. Pinchot (*Forestry and Irrig., 8 (1902), No. 1, pp. 18–21*).—The author suggests as desirable the unification of the forest work of the Government and the extension of the forest reserve system. Following the creation of forest reserves, there is a necessity for more intimate knowledge concerning the reserves themselves and the character of their forests. The author mentions the interest that is now being taken in forest investigations throughout the country and calls attention to the work now in progress in tree planting.

Suggestions to prospective forest students, G. Pinchot (*U. S. Dept. Agr., Bureau of Forestry Circ. 23, pp. 5*).—This circular gives information relating to the position of student assistants in this Bureau, and the duties of such individuals. The general preparation for forestry work is outlined and attention called to the opening for trained foresters in various localities.

Forest planting and timber supply, F. E. H. W. Krichauff (*Jour. Agr. and Ind. South Australia, 5 (1902), No. 6, pp. 537–542*).—A brief account is given of the development of tree planting in the United States and Germany, after which the production and exportation of lumber and timber in New Zealand and Australia is shown. With the present rate of cutting, the author believes that before long there will be a dearth of timber throughout New Zealand unless means be immediately taken to restore the cut-over lands.

Forest planting and timber supply, F. E. H. W. Krichauff (*Jour. Agr. and Ind. South Australia, 5 (1902), No. 8, pp. 663–668*).—An account is given of the effect of forests on rainfall and temperature, and species of trees suitable for planting in various parts of Australia are described. Among the summary statements given relating to the effect of rainfall and temperature is an account of 5,000 observations which were made in Bavaria as to the influence of forests on temperature and moisture of the air, also the evaporation of water and rainfall. Observations were made twice a day for a period of 5 years of soil at depths of 6 in., 2 ft., 3 ft., and 4 ft., and at the same time the temperature of the atmosphere was taken. The mean annual temperature of the soil of the forest was found to be 21 per cent lower than that of the open field, and the air temperature 10 per cent lower. In this way the equalizing effect in lowering the extreme summer heat and lessening the winter's cold is shown.

Progress in tree planting, W. L. Hall (*Forestry and Irrig., 8 (1902), No. 1, pp. 40–43, figs. 2*).—A review is given of former attempts at tree planting in the United States and a brief description of the present endeavors in this line, not only in the Western, but also in the Eastern and Southern States. With few exceptions, the large plantations now being established are under the immediate direction of the Bureau of Forestry of this Department.

Investments in Southern forests, C. A. Schenck (*Tradesman, 46 (1902), No. 9 (23. annual), pp. 137–139, figs. 4*).—The increase in large holdings of forest areas in the South is noted and is believed to be the beginning of conservative lumbering. Foresting is not believed to be of immediate financial benefit to the small holder on account of the difficulties of marketing the produce, fire protection, time required to produce the crop, etc.

The boundary line between the desert and the forest, S. J. Holsinger (*Forestry and Irrig., 8 (1902), No. 1, pp. 21–27, figs. 5*).—The author considers the forest conditions of Arizona, calling attention to the effect of the destruction of brush lands, and suggests that greater attention be paid to their protection. By protecting the lesser growth it would be possible to secure the development of forests as generally understood.

Notes on some forest trees of Ohio, W. R. Lazenby (*Proc. Columbus Hort. Soc., 16 (1901), pp. 115–118, figs. 2*).—Descriptive notes are given of the American linden or basswood, sycamore, black walnut, and white oak, together with notes on their characteristics as forest trees and the value of their timber and other products.

Forestry in the Philippines (*Queensland Agr. Jour., 10 (1902), No. 2, p. 126*).—A brief review is given of the forest conditions in the Philippine Islands, and the organization of the forestry bureau is commented upon.

English coppices and copse woods, J. Nisbet (*Jour. Bd. Agr. [London], 8 (1901), No. 3, pp. 293–305*).—An historical statement of the beginnings of arboriculture in England.

Forestry in Sweden (*Queensland Agr. Jour., 9 (1901), No. 6, p. 570*).—The public forests of Sweden are said to embrace 18,000,000 acres, of which 12,500,000 are under scientific management. There is in Sweden a central forestry bureau, and a forestry corps for work in the field, comprising 9 inspectors and 88 chiefs of range, besides foresters and watchmen. The State forests are divided into ranges, which average 166,250 acres; and for forest management, administration, and instruction in the State college of forestry and 6 schools of forestry the annual expenditures are $480,000. In 1899 the total income to the Government from the State forests amounted to more than $2,000,000.

Forest tree planting on the estate of Nikolsko-Sergievskoye, N. SUKHODSKI (*Selsk. Khoz. i Lyesov., 200 (1901), Feb., pp. 335–344*).—Experiments in planting oak, ash, maple, birch, elm, linden, pine, larch, locust, and willow in a locality where there are no natural forests. The experiments have been continued since 1893, and extend now over an area of about 150 acres. The results are satisfactory.—P. FIREMAN.

The spruce forests of Canada (*Queensland Agr. Jour., 10 (1902), No. 2, p. 127*).—In quoting from the report of the superintendent of forest ranges of Quebec, it is stated that the world's demand for pulp wood, on the basis of its present supply of 1,500,000 tons annually, can be met by the Canadian spruce forests for 840 years. The extent of the spruce forests in the 4 provinces is given as follows: Ontario, 52,818,420 acres; Quebec, 144,363,454 acres; New Brunswick, 11,224,540 acres; and Nova Scotia, 10,853,544 acres.

Hybrid conifers, M. T. MASTERS (*Jour. Roy. Hort. Soc. [London], 26 (1901), No. 1, pp. 97–110, figs. 9*).—A number of what are believed to be natural hybrids between different species of conifers are mentioned, and a description given of a hybrid produced by the late Henry de Vilmorin, who succeeded in 1867 in producing a hybrid between *Abies pinsapo and A. cephalonica.*

Notes on the supposed hybridization among eucalypts, H. DEANE and J. H. MAIDEN (*Proc. Linn. Soc. New South Wales, 26 (1901), pt. 2, pp. 339–343*).—Hybridization among eucalypts has been a subject of considerable discussion, and attention is called to a supposed case of hybridism between known species. While not denying the existence of the hybridity of the species, the authors hold their opinion in suspense and for the time being describe an interesting new form.

DISEASES OF PLANTS.

Report of the botanical section of the experiment station of the Pomological Institute, Proskau, III, R. ADERHOLD (*Centbl. Bakt. u. Par., 2. Abt., 7 (1901), No. 17–18, pp. 654–662*).—Notes are given upon a number of diseases which were more or less under investigation during the period covered by the report. The shot-hole and other leaf-spot diseases of stone fruits were investigated and it was found that 11 genera and 26 species of fungi were the causes of these diseases. Further notes are given upon *Mycosphærella cerasella*, the perethecial form of *Cercospora cerasella*, a preliminary account of which was noted in E. S. R., 12, p. 768. Infection experiments with *Cladosporium cerasi* seemed to point to the identity of a number of so-called species of that genus of parasites. The perethecial form of the species under investigation is said to be *Venturia cerasi*. A Monilia-like disease of cherries was investigated and found to be due to *Fusarium gemmiperda*, n. sp. The fungus was quite conspicuous upon the dead buds of cherry trees in the spring of the year. The occurrence of the brown slime flux upon young apple trees is noted. It appeared in May, 1900, upon a number of 3-year-old trees. The cause of its occurrence is believed to have been a severe frost that occurred late in April of the same year. A study was made of the morphology of the plum rust (*Puccinia pruni*), and it is claimed that 2 distinct types of the fungus were found, differing mainly in the character of their teleutospores. The typical form occurred upon *Prunus spinosa*, *P. domestica*, *P. institia*, and *P. americana;* while the other form, which by some authors is considered a distinct species, occurs normally on *Persica vulgaris*, *Amygdalus communis*, and *Armeniaca vulgaris*, and rarely upon some of the other species of allied plants. Investigations of the chrysanthemum rust (*Puccinia chrysanthemi*) showed that it was a specialized form confined to *Chrysanthemum indicum*. Inoculation experiments were conducted with the rust of cultivated and wild violets from which it was learned that *Puccinia violæ* is autœcious, the different phases in its life cycle being spent upon a single species of host plant. Experiments were conducted in preventing the rust of pinks (*Uromyces caryophyllinus*). Bordeaux mixture seems to be of little value in combating this fungus. Its spores were subjected to several fungicides, such as solutions of copper sulphate and liver of sulphur; copper acetate; sulphuric acid; zinc sulphate and borax; and copper sulphate and borax. The spores failed to grow in very dilute solutions of the first and last two, and it is believed that these fungicides could be successfully employed in combating the disease. The effect of adding sugar to Bordeaux mixture upon bees visiting trees sprayed with the mixture was studied, and it is claimed that bees failed to visit or eat any of the solutions prepared and placed accessible to them.

The effect of winter and summer spraying of apple trees for the prevention of Fusicladium was investigated. Winter sprayings, summer sprayings, and winter and summer treatments of apple trees were compared. But little disease appeared upon any of the trees and but slight difference could be seen as the effect of the treatments until the end of the season. There was little difference even then, except in those trees which had received summer applications only after the leaves had become large and well developed. These were more affected than any others. When summer applications were made while the leaves were young the effect was as good as where both winter and summer sprayings were given the trees. The author reports occasional injury to apple and pear trees when sprayed with copper sulphate solutions as dilute as 0.5 per cent. It is claimed that a 1 per cent Bordeaux mixture can be substituted for stronger ones for summer use. Adding sugar to Bordeaux mixture increased its adhesive property, and experiments showed that soda-Bordeaux mixture was less efficient than ordinary Bordeaux mixture, and that the substitution of iron salts for copper is not advisable.

Report of the government mycologist, J. B. CARRUTHERS (*Trop. Agr.*, *20* (*1900–1901*), *pp. 707–710*).—The first report of the government mycologist of Ceylon, who assumed the duties of his position during the summer of 1900, is given. The report covers investigations made during 6 or 7 months, which were principally devoted to a study of the diseases to which tea is subject. The principal study was made of the fungus causing gray blight (*Pestalozzia guepini*). Investigations have been begun in order that the life history of the fungus may be ascertained, and a series of experiments planned to ascertain the distribution of the blight. The effect of screens interposed between the tea bushes and the prevailing winds is to be investigated, as well as the effect of pruning upon the distribution and extent of the disease. The effect of removing diseased leaves was examined into and found to greatly diminish the occurrence and spread of the fungus. Where the spotted leaves were picked from the bushes soon after pruning the percentage of diseased leaves was greatly reduced, and this treatment, it is believed, will prove the most economical and effectual method for combating the disease. The leaf fungus (*Cladosporium herbarum*) was observed on leaves, but without producing a great amount of injury. The parasitic lichen *Cephaleurus mycoidea* was found occurring on the leaves of tea in a number of districts. It produces characteristic reddish or white and gray spots upon the leaf, but does little harm and spreads very slowly. A root disease of the tea, caused by the fungus *Rosellinia radiciperda*, was investigated and was found to occur most frequently in clearings where the stumps of the forest trees remained. The fungus occurring upon these stumps spread by its mycelium and spores to the tea plants, causing considerable damage. The means suggested for combating this disease is the removal of all stumps and application of lime about the place where they were formerly grown.

The author reports the occurrence of *Hemileia vastatrix* upon coffee, and reports inquiries relative to the cacao canker (*Nectria* sp.). These diseases and others are to be the subjects of future investigations.

Report of the vegetable pathological experiment station for the year 1900-1901, G. LÜSTNER (*Ber. K. Lehranst. Wein, Obst u. Gartenbau, Geisenheim, 1900-1901, pp. 127-134, pl. 1, figs. 3*).—The organization of the laboratory connected with the station and some of the lines of investigation are described. The principal investigations during the year have been on diseases of orchard trees and on grapes. Descriptions are given of the mildew of pears caused by *Sphærotheca mali*, the occurrence and distribution of the Monilia disease of stone and other fruits, and of the winter form of the grape mildew (*Oidium tuckeri*). These diseases are described at some length and suggestions given for their prevention.

Report of the station for plant protection and plant diseases at Weihenstephan, 1898-1900, J. E. WEISS (*Vrtljschr. Bayer. Landw. Rath., 6 (1901), No. 2, pp. 338-372, 496-514*).—A review is given of the various lines of investigation and instruction carried on by the station for the years 1898, 1899, and 1900. The principal part of the report was taken up with notes on fungus, insect, and other pests; their occurrence noted, injury described, and means suggested for their prevention or eradication. The various diseases and injuries are grouped under the respective headings of cereals; root, fodder, and garden crops; orchard and small fruits, etc.

Contributions to the knowledge of some undescribed or imperfectly known fungi, C. A. J. A. OUDEMANS (*Proc. Sec. Sci. Koninkl. Akad. Wetensch. Amsterdam, 3 (1901), pp. 140-156, 230-244, 332-347, 386-400, pls. 4, figs. 12*).—Descriptions are given of 108 new species of fungi and critical notes given upon a number of others. Many of the fungi enumerated are of considerable economic importance since they are found parasitically upon many economic plants.

Oat smut in Wisconsin, R. A. MOORE (*Wisconsin Sta. Bul. 91, pp. 15, figs. 2*).—The smut of grains has become a source of great annoyance to the farmers of Wisconsin, reducing the yields of their crops to a considerable extent. In order to ascertain the natural increase of smut a sample of oats which was infected to the extent of 10 per cent was sown without treatment, and by careful counting of the crop produced it was found that 20 per cent was affected. Seed was saved from this crop and the resultant crop was affected to the extent of 31 per cent. An attempt was made to determine the distribution of the smut throughout the State. Directions were sent out, giving methods for determining the amount of smutted oats in a given field, and the replies received indicate an average from all the counties reporting of 20 per cent infection. Data obtained in a somewhat similar manner from former students throughout the State showed an average percentage of smut in 124 fields examined of 15 per cent. The number of experiments which were carried out during 1901 to test the efficiency of formaldehyde as a preventive of smut are briefly reviewed, and letters are published from a number of farmers who have successfully used this treatment.

Treatment of seed oats to prevent smut, R. A. MOORE (*Wisconsin Sta. Rpt. 1901, pp. 255-260, figs. 2*).—Formaldehyde in various strengths was used as a treatment of the seed, which should be given several days in advance of sowing to enable the seed to dry sufficiently for drilling. According to the author, the treated oats seem to germinate more quickly, differences from 2 to 4 days being reported in favor of oats treated. No detrimental effect on the germination of the seed was apparent, and of 30 varieties treated not a single affected head could be found during the growing season. In order to determine the most efficient strength and time that the oats should be submerged in the solution, experiments were carried on with solutions of 1 lb. of formaldehyde to 50, 100, and 200 gals. of water, respectively, the seed being soaked from 10 to 60 minutes. The best results were obtained where the seed oats were submerged in the solution for 20 minutes in a 1-lb. to 50-gal. solution.

Investigations concerning the cereal fungus Rhynchosporium graminicola, E. Heinsen (*Bot. Mus., Abt. Pflanzenschutz, Hamburg, 3 (1900–1901), pp. 13, pls. 4*).—For a number of years a disease of cereals due to *Rhynchosporium graminicola* has been under observation. It was first noticed as occurring upon rye and later upon barley. The disease seems rather widely distributed throughout Germany, and it produces an effect upon the host plant quite similar to that caused by the mildew *Erysiphe graminis*. Inoculation experiments show the disease could be rather easily produced upon rye and barley, less easily upon wheat, and oats seem to be entirely immune from attacks of the fungus. Frost injuries and the use of certain fertilizers, such as those containing potassium perchlorate, seem to favor the spread of the disease. The different stages of the fungus are described at considerable length and its possible affinities are pointed out.

A California beet disease, Linhart (*Oesterr. Ungar. Ztschr. Zuckerind. u. Landw., 1901, p. 26; abs. in Bot. Centbl., 87 (1901), No. 10, pp. 356, 357*).—In 1899 there is said to have appeared a sugar-beet disease in California that in some localities destroyed from 10 to 100 per cent of the beets. The cause of the disease was attributed to bacteria and it was thought probable it was the same disease as that known to occur in Germany. Diseased beets preserved in alcohol were examined by the author and the symptoms of disease are described. The beets begin growth in the usual way and the first symptom of disease is shown when they have put out 6 or 8 leaves. The root puts out numerous fine roots, often the body and main root having a felted appearance. The leaves are undeveloped and die, while the crown of the beet changes color from yellow to brown, and finally becomes black and rotten. The flesh of the beet becomes discolored and with a short exposure to the air turns black. Sometimes the roots are uncolored; at other times they are discolored to the tap root. Many specimens appearing normal are found upon examination to be woody internally. The fundamental tissues are poorly developed, the cells being much smaller than in normal beets. Numerous bacteria 1.5 to 2μ in length with about half that diameter were found that resembled those occurring in diseased beets in Europe, but as all available material had been in alcohol for some time no cultures could be made. The author believes the bacteria are saprophytic in the soil and find their way to beets whose growth had been interfered with by unfavorable conditions. Attention should be given to the proper irrigation and fertilizing of the crop and as an additional precaution seed should be soaked for 20 hours in a 22 per cent solution of copper sulphate before planting.

A bacterial disease of beans, G. Delacroix (*Ann. Inst. Nat. Agron., 24 (1897–1900), No. 16, pp. 151–160, figs. 3*).—An account is given of a bacterial disease of beans which has been noted in the environs of Paris, a preliminary notice of which has already been given elsewhere (E. S. R., 11, p. 948).

Orange and lemon rot, C. W. Woodworth (*California Sta. Bul. 139, pp. 3–11, figs. 5*).—During the past year considerable loss has been reported in early shipments of oranges and lemons. The cause of the rot is said to be due to the presence of a mold, *Penicillium digitatum*. The characteristics and growth of the fungus are described at some length and the method of attack is shown. The rot of these citrus fruits is not usually an orchard disease. In lemons the infection occurs almost entirely in the curing houses, and in oranges after they are packed and usually in transit to the market. Navel oranges, however, often come to the packing house badly infected by the disease. The trouble begins at the navel end and may be scarcely visible from without, though commonly a slight split or perhaps a little exudation of gum will indicate the point of entrance of the fungus. In this case the trouble clearly began in the orchard and sometimes infection has taken place before the fruit is ripe. The conditions for the entrance of the fungus are described. A number of preventive measures are suggested, among them the use of refrigerator cars, and ventilated cars or ventilated curing houses. The practice of wrapping the fruits in tissue paper also decreases the danger from rot. As a preventive means of distribution the decayed fruit should be burned or deeply buried to destroy the spores. Packing houses should be thoroughly disinfected and where possible sulphuring should be resorted to.

Notes on diseases of the orange, J. W. MILLS (*California Sta. Bul. 138, pp. 39-42, figs. 2*).—The important diseases of the orange in California are said to be gummosis, a scaly bark gum disease, and die-back. The gummosis attacks the roots and trunks just below the surface of the ground and makes its appearance where the ground has been allowed to remain wet for long periods. It is also stated that the disease may be produced by heavy applications of nitrogenous manures, followed by irrigation close to the trees during hot weather. The scaly bark gum disease is prevalent in southern California. It attacks the trunk of the tree as well as some of the larger branches and if not checked destroys the tree. The new bark is unhealthy and the disease penetrates to the center of the limb or trunk of the tree. Thus far this form of the disease has not been observed in California on sour-orange stocks, nor upon the pomelo stock. The sour stock has not proved entirely satisfactory in southern California, and it is recommended that pomelo stock should be used in its stead. The sweet-orange stock is much more susceptible to the disease. The third disease, die-back, is quite prevalent in some parts of the State. The affected trees make an apparently healthy growth in the spring and summer, but the young shoots soon turn yellow, the leaves drop off, and the twigs die back to the older wood, from which a brown granular exudation takes place. In a season or two the older wood also dies. Experiments with fungicides in combating this disease have been attempted, but so far without appreciable results. It is claimed in most cases that die-back is due to some fault in the subsoil, such as hardpan, marl, or overirrigation. The correction of these evils will, it is believed, tend to prevent the disease. Closely related to the die-back and probably due to the same causes is a disease designated as mottled leaf. It is believed to be a partial chlorosis of the leaves. This disease has been noticed most commonly upon trees grown in soils where the tap roots reach sand or dry gravel, and it is probable that other unfavorable conditions, such as alkali or hardpan, may produce the same effect.

The fungus diseases of cacao in the West Indies, A. HOWARD (*West Indian Bul., 2 (1901), No. 3, pp. 190-211*).—This paper gives an account of work already done by the author in studying the cacao diseases of the West Indies, and also brings together the results obtained by some other investigators. The diseases of cacao are grouped under the headings pod diseases, stem diseases, and root disease. At the present time 3 distinct pod diseases have been noted in the West Indies; one is widely distributed and is believed also to occur in South America, while the other 2 appear almost entirely confined to Trinidad.

The brown rot (*Diplodia cacaoicola*) is a widely spread disease of the pods, and although investigation as to its nature appears to have been undertaken only quite recently the disease is believed to have existed for a long time. Pods attacked by this disease exhibit circular brown spots which gradually extend all over the pod, causing the complete destruction of the rind and its contents. The spread of the disease varies somewhat according to ripeness, but usually the whole pod is affected within 6 to 10 days from the time that the disease first makes its appearance. The microscopical characters of the fungus are described at some length and its parasitic nature was established by means of infection experiments. The fungus has been found living not only on the old husks but also on living pods, dead cacao trees, old prunings, and on diseased sugar cane where cane cultivation was carried on among the cacao trees. As remedial measures for the prevention of injury by this fungus the author suggests the gathering of the pods before they become too ripe, as ripe pods seem to be especially liable to attack. All hulls and husks should be buried or burned and diseased pods removed from the trees. All dead trees, prunings, and branches should be collected and burned, as the fungus can live saprophytically upon them. The pod diseases described as occurring in Trinidad are due to the fungi *Phytophthora omnivora* and *Nectria bainii.* For the prevention of injury by the Phytophthora the reduction of shade, destruction of diseased pods, and spraying the unattacked pods with Bordeaux mixture are recommended. The second fungus so far has not proved of great economic importance.

Of the stem diseases described the canker, due to *Calonectria flavida*, is one of the most important. A symptom of the presence of this fungus is the occurrence of a reddish gummy liquid oozing from the bark of the stem which gives a rusty appearance to the bark when dry. Infection experiments have readily produced the disease, and the diseased area spreading often completely rings the tree, and when this is complete the tree dies suddenly. Wounds made by pruning should be coated with tar to prevent the entrance of the fungus, and all trees which have been destroyed by the canker should be cut to the ground and burned. It appears probable that the fungus causing the rot of the pods described above occasions considerable damage to the cacao trees by causing their dying back at the extremity of the branches. Fertilizing and cultivation are recommended, together with the suggestions given for the prevention of the pod rot, for the prevention of this trouble.

A disease known as the witch-broom disease of Surinam, due to *Exoascus theobromæ*, is described as frequently causing considerable injury. By careful attention to trees and pruning out the diseased branches this can be kept in check.

The root disease described is from an unknown cause. The trees seem to die suddenly without any indication of disease in stems or branches, but the roots are usually surrounded by a matted sheet of fungus filaments. The fruiting stage of the fungus has never been recognized and its affinities can only be surmised. It seems to have some of the characteristics pertaining to the Basidiomycetes and is believed to be similar if not identical with the fungus which attacks the nutmeg trees of Grenada and many fruit trees in the West Indies. Where this disease appears it is recommended that trenches should be dug about the affected trees to isolate them from the rest of the plantation. A brief summary is given of the general means to be adopted for combating these diseases; and a bibliography, together with directions for the preparation and use of Bordeaux mixture, completes the bulletin.

Fungus diseases of cacao, D. MORRIS (*Bul. Bot. Dept. Jamaica, n. ser., 8 (1901), No. 8, pp. 113–124*).—An article by A. Howard on the diseases of cacao in Grenada is quoted. The diseases described are a brown rot of the cacao pod caused by *Diplodia cacaoicola*, canker diseases due to *Nectria theobromæ* and *Calonectria flavida*, and a root fungus which is believed to be a species of Polyporus. These diseases are described at some length and suggestions given for their repression.

Leaf curl of mulberry trees, M. MIYOSHI (*Bot. Centbl., 86 (1901), No. 11, pp. 375–378*).—According to the investigation of the author, this disease appears to be caused by faulty assimilation and nutrition, brought about by improper methods of culture, unfavorable climatic conditions, and varying resistance and hardiness of varieties.

Notes on Nematospora coryli, V. PEGLION (*Centbl. Bakt. u. Par., 2. Abt., 7 (1901), No. 21, pp. 754–761, pl. 1*).—In 1897 the author described a disease of filberts that had become of considerable importance in parts of Italy. Continued observations have been made upon the disease, and its cause has been determined as due to the fungus *Nematospora coryli*, one of the Saccharomycetes. The fungus is a parasite, and the affected nuts are bitter, misshapen, and often more or less decayed. The characteristics of the fungus, effect upon the host, and means of dissemination are discussed at some length. The affinities of the new genus Nematospora with the other genera of Saccharomycetes are shown by a key of the genera.

A bacterial disease of strawberries, P. VOGLINO (*Ann. R. Accad. Agr. Torino, 42 (1900), pp. 11, pl. 1; abs. in Bot. Centbl., 86 (1901), No. 12, pp. 410, 411*).—In the experimental garden attached to the agricultural academy at Turin there appeared in July a hitherto unknown disease of strawberries. It spread rapidly, and by October had attacked nearly every plant and destroyed many of them. The leaves of diseased plants wilt, dry up, become white or spotted, although sometimes they are but little changed. The roots are badly affected. A section across one of the main roots shows the outer part more or less disorganized and the woody axis entirely laid bare. No fungus could be found associated with this disease, but numerous colonies of bacteria were present. The organism was isolated, cultivated, and infection experiments conducted that seem to show that the disease is due to bacteria. The morphology and physiology of the organism are described at some length. It grows readily upon a number of media and is from 0.9 to 1.5μ in length, although young specimens often occur 2 or 3 times that size.

Investigations upon the action and condition of the sulphur used in combating grape mildew, K. WINDISCH (*Landw. Jahrb., 30 (1901), No. 3, pp. 447–495*).—Various theories have been suggested as to the action of sulphur in preventing the growth of the powdery mildew (*Oidium tuckeri*) upon the grape. The efficiency of this fungicide has been attributed to mechanical, physical, and chemical action. All of these theories are stated and reviewed at some length, the author seeming to adhere to the theory of chemical action, although his experiments were not satisfactory and are to be repeated. Investigations were carried on upon various kinds of sulphur in which the questions of fineness and purity were examined and the different methods of determining these factors are described. The different kinds of sulphur found upon the market were studied, and comparisons are drawn between the efficiency of ground, sublimed, and precipitated sulphur. The author claims that nearly all investigators agree that ground sulphur is more efficient than the flowers of sulphur in preventing grape mildew. Analyses are reported of a number of trade preparations that are recommended for use as substitutes for sulphur. In nearly all of them sulphur was found to be the most abundant constituent, lime, gypsum, etc., often being added to make bulk.

A disease of carnations at Antibes, G. DELACROIX (*Ann. Inst. Nat. Agron., 24 (1897–1900), No. 16, pp. 161–201, figs. 11*).—This article gives detailed report of investigations conducted upon a disease of carnations caused by *Fusarium dianthi*. A preliminary account of this disease has been noted elsewhere (E. S. R., 13, p. 153).

ENTOMOLOGY.

The entomologist's experiment orchard, J. B. SMITH (*New Jersey Stas. Bul. 155, pp. 71*).—The author gives in detail the history of each tree in the orchard, which was planted for experimental purposes. The orchard contains 48 trees of different species and varieties. Notes are given on the method of application and effectiveness of arsenate of lead, cement and milk, kerosene, crude oil, whale-oil soap, and lime-sulphur-and-salt wash. No harm was done to any trees by spraying with arsenate of lead. Experiments covering a number of years, with the cement and milk treatment, indicate that this is an effective method for preventing the attacks of peach borers. Fuel oil with a specific gravity of 35° injured peach trees to some extent, but was safely used on plum, pear, and hawthorn. It was fatal to early Richmond cherry trees. Four kinds of whale-oil soap were used, with varying results. In some cases it seemed ineffective, in others all scale insects were destroyed. On peach trees the buds were badly injured in some cases. Detailed notes are given on experiments with mechanical mixtures of kerosene and crude petroleum with water, and with these substances undiluted. The results varied according to the time of year when the application was made and the hardiness of the trees. In general crude petroleum was found a safe and effective application on dormant trees. Biological and economic notes are given on codling moth, sinuate pear borer, pear midge, San José scale, apple-plant lice, and plum curculio.

Report of committee on entomology and report of chief inspector of nurseries and orchards, F. M. WEBSTER (*Reprint from Ohio Hort. Soc. Rpt. 1901, pp. 37, pl. 1, figs. 10*).—Notes are given on the damage caused to willows and poplars by *Cryptorhynchus lapathi*, and by the strawberry weevil (*Anthonomus signatus*). A warning notice is given concerning the brood of periodical cicada which will appear in western Ohio during the coming season. Experiments were made to determine the extent of infestation of orchard trees from apples and other fruits infested with San José scale. It was found that scales rarely left infested apples to settle upon the trees, even when the apples were placed near or in contact with the trunk of uninfested trees. During the operations of the State inspector and his assistants large quantities of fish-oil caustic-potash soap were used for spraying orchards and ornamental trees. The soap was used in the proportion of 2 lbs. to 1 gal. of water, and was found to be effective. In some cases the scale was apparently exterminated by one application. In experiments with crude petroleum it was found that a 10 per cent mixture was ineffective, and that some damage was frequently caused by the use of a mixture containing more than 35 per cent of oil. When the fish-oil soap was applied under favorable conditions 98 per cent of the scales were killed by one application. Details are given of a number of spraying experiments with this substance. It is concluded that fish-oil soap is the safest effective mixture for use against San José scale. It is, however, too expensive for general application. Crude petroleum is considered safe if applied cautiously, and has the advantage of being much cheaper. Notes are given on the location of nurseries and other premises throughout the State which were inspected or found to be infested. Brief notes are also presented on the extent of peach yellows and black knot in Ohio.

Report of the entomologist, J. M. SOUTHWICK (*Rhode Island State Bd. Agr. Rpt. 1900, pp. 20–49, figs. 17*).—Brief notes on the habits, life history, and means of combating carpet beetles, fleas, cockroaches, bollworms, white-marked tussock moth, May beetle, goldsmith beetle, San José scale, scurfy scale, oyster-shell bark-louse, and oak pruner.

Report of the entomologist, H. TRYON (*Queensland Dept. Agr. Rpt. 1900–1901, pp. 24–28*).—The author gives brief notes on a large number of injurious insects. Experiments were conducted in fumigating fruit trees with hydrocyanic-acid gas. It was found that excessive use of sulphuric acid in producing gas was not attended with any injury to the trees. Brief notes are given on certain insectivorous birds, on field work of the entomologist, and the collection of insects.

A report of the State entomologist for the year 1900, S. LAMPA (*Ent. Tidskr., 22 (1901), No. 1, pp. 1–56, figs. 4*).—The most important noxious insect during the year was *Lymantria monacha*. An outbreak occurred in the southern and eastern portions of Sweden, and after considerable damage had been caused, the insects suddenly disappeared. It is reported that the gypsy moth occurs from time to time in injurious numbers in certain localities. It is considered possible, however, to prevent any great injuries from the spread of this species. Notes are given on the distribution and injuries caused by the Hessian fly. An account is given of the various parts of the country visited by the entomologist in the investigation of injurious insects. This report contains notes on *Melolontha hippocastani*, *M. vulgaris*, *Tortrix viridana*, *Nematus ribesii*, gypsy moth, and *Hemerobious nervosus*. The last-named species is said to be one of the most important predaceous insects in Sweden. Notes are given on experiments in spraying with Paris green and kerosene emulsions. These operations are becoming more widely spread from year to year and are attended with better success. An account is given of certain household insects, including

Tinea pellionella, and *Tineola bisselliella*. Biological and economic notes are given on *Agrotis segetum*, *Hadena secalis*, *H. basilinea*, pea weevil, cabbage-root maggot, *Cassida nebulosa*, codling moth, *Cecidomyia pyricola*, *C. tritici*, and other species of less importance.

Report on injurious insects in Finland for the year 1900, E. REUTER (*Landbr. Styr. Meddel. [Helsingfors], 1901, No. 35, pp. 41*).—In this report especial attention is given to a discussion of the habits and life history of *Charæas graminis*. This insect proved especially injurious during 1900 and a circular letter of inquiry was sent to various parts of Finland for the purpose of obtaining a better idea of its distribution and the extent of its injuries. Notes are also given on a number of insects which caused the so-called silver top condition of grasses. A brief report is also made on *Sitones lineatus*, *Meligethes æneus*, cabbage weevil, cabbage butterfly, cabbage-root maggot, codling moth, *Argyresthia conjugella*, gypsy moth, and other miscellaneous insects.

Report of the committee on diseases of cane, A. KOEBELE (*Hawaiian Planters' Mo., 21 (1902), No. 1, pp. 20–24*).—Notes on the habits and life history of a species of leaf hopper and *Sphenophorus obscurus* as injurious to sugar cane.

The Hessian fly, H. GARMAN (*Kentucky Sta. Bul. 96, pp. 193–198*).—Experimental plats of wheat were planted at the station for the purpose of determining the length of time during which the female fly lays eggs. It was found that ordinarily the insect lives but a short time after depositing its eggs, but when the weather was not unusually severe some belated flies escaped the effects of early frosts and appeared later during warm days. The author's observations indicate that in order to secure complete protection against injury from this insect it is not safe to plant wheat earlier than October 3, and in the southern part of the State wheat should not be planted before the middle of October or perhaps the first of November. Brief descriptions are given of the insect in its various stages.

Two Noctuidæ injurious to cereals, S. LAMPA (*Ent. Tidskr., 22 (1901), No. 2–3, pp. 129–136, pl. 1*).—The author gives notes on the habits, life history, and means of combating *Hadena tritici* and *H. secalis*. Notes are given on the food plants of these species and extensive bibliographical references are made.

Colorado potato beetle in Europe, S. LAMPA (*Ent. Tidskr., 22 (1901), No. 2–3, pp. 170–174*).—Brief notes are given on the recent importation of the Colorado potato beetle into England, and attention is again called to the possibility of the spread of this insect in other parts of Europe. A number of weeds are found in all parts of continental Europe upon which the insect might feed.

Some orchard pests, J. M. STEDMAN (*Missouri State Bd. Agr. Mo. Bul., 1 (1902), No. 11, pp. 22–24*).—Brief notes on the habits, life history, and means of combating the plum curculio and cankerworm.

A monograph of the Coccidæ of the British Isles, R. NEWSTEAD (*London: Ray Society, 1901, vol. 1, pp. 220, pls. 39, figs. 20*).—In this volume the author gives a general account of the life history and habits, migration, distribution, acclimatization, and natural enemies of the Coccidæ. According to observations in England, the blue titmouse (*Parus cæruleus*) feeds extensively upon a number of species of scale insects. Other birds are also reported as more or less effective enemies of the Coccidæ. Notes are given on the parasitic and fungus enemies of Coccidæ, on methods of collecting and preserving these insects, and on the approved artificial remedial and preventive measures. The greater portion of the volume is occupied with a description of the various species of the subfamily Diaspinæ. The plates illustrating the volume are for the most part original and of excellent character.

San José scale investigations, III, V. H. LOWE and P. J. PARROTT (*New York State Sta. Bul. 202, pp. 167–214, pls. 2, fig. 1*).—*Spraying experiments with crude petroleum and other insecticides* (pp. 171–188).—The crude petroleum used in these experiments had a specific gravity of 44°; the emulsion was perfect and did not separate completely after being allowed to stand for more than 2 days. A winter treatment was given to plums, pears, and cherries. The trees were sprayed December 22–24, during an average temperature of 39° and accompanied with cloudy weather. The weather during the following week was also cloudy. In the same orchard a spring application was given April 18, at a temperature of 52°, with cloudy weather during the following week. Some of the trees were given both the winter and spring treatment, on December 24 and April 18. The winter treatment injured none of the plum trees when the 25 per cent emulsion was used, but all the trees were injured or killed by 40 per cent mixture. Old trees were more seriously affected than younger trees. Pears and cherries were uninjured. Plums were even more seriously injured by the spring treatment, but the pears and cherries were unaffected, even by the 60 per cent mixture. A combination of winter and spring treatment caused more damage to the trees than either single application. The spring treatment proved to be less injurious than the winter treatment, while both treatments together proved fatal with all mixtures above 25 per cent.

In experiments to determine the effect of crude petroleum upon hibernating scales a number of pear trees were sprayed October 23, with a temperature of 64°; the week following the application was clear. Other pear trees were treated in winter and spring. The trees were rather badly infested with the scale. In these experiments it was found that a 25 per cent emulsion could not be depended upon to kill dormant scales, while a 40 per cent mixture gave satisfactory results. No injury was observed on any of the trees which were sprayed once, although some were much weakened by the scale. Trees which were sprayed twice with a 60 per cent solution or with undiluted petroleum were killed or seriously damaged in every case.

Experiments were undertaken in spraying large apple trees to determine the efficiency of crude petroleum applications upon large trees. Applications were made on some of the trees in winter, and on others in the spring. The 25 per cent mixture had no effect on the scales and some live scales were found on trees sprayed with a 40 per cent mixture. This was probably due to the practical impossibility of completely covering large trees. Experiments on peach, pear, and apple trees which were given a winter treatment showed that the scale was not killed by 25 per cent mixture, while the 40 per cent mixture was effectual. Peach trees were somewhat injured by a 25 per cent mixture. From these experiments it is concluded that peach and plum trees are more sensitive to crude petroleum than apple, cherry, or pear trees, and that a 25 per cent mixture of crude petroleum can not be depended upon to kill hibernating scales.

A plum orchard was treated in the spring, partly with a resin wash and partly with so-called government whitewash. The trees were sprayed April 12, with an atmospheric temperature of 47°. Neither treatment had any effect on the scale.

Fumigation experiments with hydrocyanic-acid gas (pp. 188–210).—Experiments were conducted to determine the effect of the gas on healthy buds and the strength of gas required to destroy hibernating scales. Buds were fumigated in box fumigators and the amount of cyanid used varied from 0.18 to 0.3 gm. per cubic foot of space. Apple buds were not appreciably affected by the treatment. Cherry and pear buds suffered a slight injury from the gas. Peach buds were considerably injured when 0.3 gm. of cyanid per cubic foot was used. Plum buds were practically unaffected. In experiments to determine the effect of gas upon the scale, pear, peach, and plum trees were fumigated. In these experiments it was found that fumigation with gas at a strength less than 0.3 gm. of cyanid per cubic foot of space had no effect on scales when applied in the winter. In the spring the gas was much more effective, killing the scales when 0.18 gm. of cyanid per cubic foot of space was used. In the authors' opinion the principal advantage of fumigation over other treatment is in thoroughness, but that it is expensive if used upon large trees.

Notes are given on other insecticides, including whale-oil soap and crude petroleum combined; lime-sulphur-and-salt wash; and kerosene-lime emulsion. A simpler method for fastening the door of the tree fumigator, devised at the station, is described. Its chief advantage lies in the ease and quickness with which the door may be put in place. By this method the buttons previously used are replaced by stout straps which extend across the door to the margin of the fumigator.

Spraying and fumigating for San José scale, F. H. Hall, V. H. Lowe, and P. J. Parrott (*New York State Sta. Bul. 202, popular ed., pp. 6, figs. 2*).—A popular summary of the above bulletin.

Preliminary experiments in spraying to kill the San José scale insect in 1901, W. E. Britton (*Connecticut State Sta. Bul. 136, pp. 12, pl. 1*).—In experiments by the author twigs were examined before insecticides were applied for the purpose of determining the percentage of living scales. Another examination was made 6 weeks after spraying. The insecticides used in these experiments included common laundry soap, Babbitt's lye, kerosene, and crude oil. Applications were made on April 12, the kerosene being applied in a mechanical mixture containing from 15 to 20 per cent of the oil, and Babbitt's lye in the proportion of 1 lb. to 4 gal. of water. A pear tree drenched with crude oil showed less than 1 per cent of living scale insects after the application. The use of a 15 per cent mixture of kerosene was also fatal to most scales. Babbitt's lye was less effective than either the crude oil or kerosene. Various mixtures of crude oil with water caused such injuries to the foliage and fruit of peach trees as to prohibit its use on these trees when in leaf. Soap and water also injured the foliage nearly as badly as crude oil. The kerosene mixture did not injure the foliage. The crude oil was most effective of all in killing scales. In another experiment kerosene and crude oil in mixtures with water containing 10 to 15 per cent of the oils were used. Young scales were found crawling about on the trees the day after the application. A plum tree was sprayed with a 15 per cent mixture of kerosene until the insecticide dripped from the branches. The tree shed a few leaves but was not seriously damaged; only 3 of 308 scale insects remained alive. Currants sprayed on March 12 with a soap emulsion of kerosene containing 25 per cent kerosene were not injured and less than 1 per cent of the scale insects remained alive. The author concludes that it is safe to apply kerosene in a 15 per cent mixture with water to fruit trees and foliage and that the scale may be held in check to some extent by such treatment. It was found that crude oil and a 20 per cent mixture of kerosene destroyed the scales when applied to dormant trees late in the spring. The scale insects were not so effectively destroyed by the same treatment in June.

The principal scale insects of grapes, V. Mayet (*Prog. Agr. et Vit. (Éd. L'Est), 22 (1901), No. 52, pp. 757–760, pl. 1*).—Descriptive biological and economic notes are given on *Dactylopius vitis* and *Lecanium cymbiforme*. According to the author's observations, the grapevines most frequently become infested with scale insects when they are in a weakened or unthrifty condition. Winter treatment is preferred to summer treatment. The main trunk of grapevines and branches may be painted with crude petroleum containing 5 per cent of naphthaline and 10 per cent of powdered lime. Another remedy recommended by the author is prepared in the following proportions: 1,000 gm. water, 300 gm. black soap dissolved while warm, 5 gm. heavy oil, 5 gm. naphthaline.

British vegetable galls, E. T. Connold (*London: Hutchinson & Co., 1901, pp. 312, pls. 130, figs. 27*).—In this volume the author describes and illustrates about two-thirds of the vegetable galls known in England and gives a list of the remainder, with a brief description of each. In the preliminary chapters the nature of vegetable galls is described, with notes on their sizes, shapes, colors, and on methods of collecting, mounting, and preserving them. One chapter is devoted to the mode of growth and various systems of classification of galls, and another to the collection and preservation of animal organisms which cause galls. The agents concerned in the production of galls are mites, nematodes, beetles, flies, plant lice, moths, wasps, and fungi. Galls may be formed on the roots, stem, branches, leaves, flowers, seed pods, and other organs of the plants. The discussion and description of each kind of gall are exhaustive and the original illustrations accompanying the text are of excellent character.

Spraying for second brood of codling moth, J. W. Lloyd (*Trans. Illinois Hort. Soc., n. ser., 35 (1901), pp. 451–459*).—It was observed that the second brood of the larva of the codling moth was entering late apples in the orchards of the experiment station to a considerable extent. On August 3, 5 trees were sprayed with Paris green at the rate of ¼ lb. to 50 gals. of water, and on August 10 a second application was made. Examinations of the fallen apples from unsprayed trees showed that 22.75 per cent of the larvæ had entered close to the stem, 33.48 per cent at the calyx, and 43.76 per cent at other points on the surface of the apple. Experiments in the field and in the laboratory indicated that young larvæ may be destroyed by spraying with Paris green, even after they have punctured the skin of the apple. An examination of the larvæ of codling moth in sprayed and unsprayed apples showed conclusively that the larvæ in unsprayed apples were in a more healthful and vigorous condition than those in sprayed apples.

Investigations concerning Lymantria monacha and its injuries in Södermanland during 1900, S. Bengtsson (*Ent. Tidskr., 22 (1901), No. 2–3, pp. 145–157*).—The author made a study of the habits of this species. Notes are given on the relative abundance of the 2 sexes. A large number of parasites were bred and are briefly described in the article.

Plum sawfly (Hoplocampa fulvicornis), J. Andersson (*Ent. Tidskr., 22 (1901), No. 1, pp. 57–60*).—Great damage is reported from the attacks of this insect. In some cases 90 per cent of the plums were injured. Various remedies are suggested, including picking off all injured fruit.

Imported willow and poplar curculio (Cryptorhynchus lapathi), F. M. Webster (*Extract from Jour. Columbus Hort. Soc., 16 (1901), No. 4, pp. 12, figs. 6*).—Brief notes are given on the distribution of this insect in the United States and on the injury caused by it in various States where it has become most numerous. A review of the European literature on this insect is given by A. H. Kirkland.

Notes on Australian Hemiptera, W. W. Froggatt (*Agr. Gaz. New South Wales, 12 (1901), No. 12, pp. 1592–1601, pl. 1*).—Brief biological and economic notes on a number of species of bugs which are injurious to cultivated crops in Australia.

Dangerous mosquitoes in Kentucky, H. Garman (*Kentucky Sta. Bul. 96, pp. 199–215, pl. 1*).—The author presents a general review of the results obtained by different authors in the study of the biology of mosquitoes. Among the species found in Kentucky, mention is made of *Anopholes punctipennis*, *A. maculipennis*, *Culex pungens*, *C. impiger*, *Psorophora ciliata*, and *Stegomyia fasciata*. The last-named species is the one which is commonly supposed to be connected with the transmission of yellow fever, and is stated by the author to be the most common species of mosquito in Kentucky. It was found to be breeding in barrels, buckets, and other utensils in which water was allowed to stand during the summer. With regard to the destruction of mosquitoes the author recommends the draining of ponds or covering them with a film of kerosene oil, and for protection against the bites of mosquitoes it is recommended that the exposed parts of the body be rubbed with naphthaline, oil of pennyroyal, or kerosene.

Carbon bisulphid as an insecticide, W. E. Hinds (*U. S. Dept. Agr., Farmers' Bul. 145, pp. 28*).—A general account is given of the nature, application, and effectiveness of carbon bisulphid for insecticide purposes. The discussion includes the following subjects: Liquid properties, vapor properties of carbon bisulphid, effects of inhalation of the vapor, diffusion of the vapor, insecticidal power, commercial uses. It is used in the treatment of phylloxera, root maggots, ants, white grubs, mole crickets, borers in trunks of trees, sucking insects on small plants, insects injurious to stored products, seed insects, clothes moths, other household insects, museum pests, and gophers. A brief account is also given of the effect of the vapor of carbon bisulphid on plants, on the growth of crops, on the germination of seed, on food stuffs and on fruits. An appendix to the bulletin, prepared by E. E. Ewell, discusses the amount of carbon bisulphid in a saturated atmosphere, the inflammability and explosiveness of carbon bisulphid vapor with air, and the ignition temperature of the vapor.

Experience with dust spray, A. A. HINKLEY (*Trans. Illinois Hort. Soc., n. ser., 35* (*1901*), *pp. 219, 220*).—The author has experimented for a number of years with insecticides in a dry form in the place of sprays. While the results are not always satisfactory it is believed that dry application may be, under certain circumstances, cheaper and more effective than liquid spray.

Insecticides and fungicides, J. K. HAYWOOD (*U. S. Dept. Agr., Farmers' Bul. 146, pp. 15*).—A report is made on the chemical composition and effectiveness of Paris green, London purple, Green Arsenoid, Pink Arsenoid, White Arsenoid, Paragrene, lead arsenate, Bug Death, Slug Shot, Black Death, Smith's Vermin Exterminator, P. D. Q., Instant Louse Killer, Lambert's Death to Lice, roach destroyers, Bordeaux mixture, Grape Dust, Veltha, and Fibro Ferro Feeder.

Report of the inspector of fumigation appliances, W. LOCKHEAD (*Toronto: L. K. Cameron, 1902, pp. 16, figs. 5*).—This is the third annual report by the author on fumigation, and is occupied with a discussion of the Canadian regulations for fumigation of nursery stock, methods of applying fumigation, necessary equipment for this work, and the results of observations made in different parts of Canada. Notes are given on fumigation in orchards, nurseries, greenhouses, flour mills, and granaries. With regard to the possible injury of nursery stock from fumigation with hydrocyanic-acid gas, the author believes that the most of such injury is due to exposure of the roots of young trees for too long a time. With careful attention to this point it is believed that the number of trees which fail to grow will be decidedly reduced.

Fumigation of imported plants, A. W. L. HEMMING (*Bul. Bot. Dept. Jamaica, n. ser., 8* (*1901*), *No. 11–12, pp. 184, 185*).—A copy is given of a proclamation announcing that hereafter plants, cuttings, buds, grafts, and packages or boxes in which such material is shipped shall be subject to a thorough process of fumigation with hydrocyanic-acid gas before being admitted into Jamaica.

FOODS—NUTRITION.

Experiments on the metabolism of matter and energy in the human body, 1898–1900, W. O. ATWATER and F. G. BENEDICT (*U. S. Dept. Agr., Office of Experiment Stations Bul. 109, pp. 147*).—The details of 13 experiments with man are reported, in which the balance of income and outgo of nitrogen, carbon, and energy was determined. These were made with the aid of the respiration calorimeter. Experiments designed to test the accuracy of the apparatus were also made, in which heat was generated in the respiration chamber electrically or by the combustion of ethyl alcohol. In a number of experiments the subjects performed more or less severe muscular work, in others there was as little muscular activity as practicable. From these and earlier experiments (E. S. R., 11, p. 770) a number of general deductions were drawn which have to do with such topics as the food materials supplied and consumed, and the difference in demand of men at work and rest, the elimination of water, carbon dioxid, and energy under different conditions of work and rest. Especial interest attaches to the results which have to do with the measurements of energy. The following table shows the average percentages of energy given off from the body in the rest and work experiments:

Percentages of total energy given off from the body in different ways.

Heat.	In rest experiments.	In work experiments.
	Per cent.	*Per cent.*
From skin by radiation and conduction (and in exhaled air)	74.2	62.3
In urine and feces	1.4	.5
In water vaporized from lungs and skin	24.4	30.8
Heat equivalent of external muscular work done	....	6.4
Total	100.0	100.0

The following table compares the amounts of potential energy in the food materials actually oxidized in the body with the amounts of kinetic energy given off from the body, either as heat alone in the rest experiments, or as heat and external muscular work in the work experiments:

Comparison of income and outgo of energy in 19 experiments covering 65 experimental days—Amounts per day.

Subjects and kinds of experiments.	Number of experimental days.	Net income (potential energy of material oxidized in body).	Net outgo (kinetic energy given off from body.)	Difference (in terms of net income).	
REST EXPERIMENTS.					
Experiments with E. O.:					
Experiment in which the net outgo falls farthest below the net income (No. 5); average for the whole experiment	4	*Calories.* 2,482	*Calories.* 2,379	*Calories.* −103	*Per cent.* −4.1
Experiment in which the net outgo is farthest above the net income (No. 14); average for the whole experiment	4	2,131	2,193	+ 62	+2.9
Average for 9 experiments	33	2,288	2,278	− 10	− .4
Experiments with A. W. S.: Average for 1 experiment	3	2,304	2,279	− 25	−1.1
Experiments with J. F. S.: Average for 3 experiments	9	2,118	2,136	+ 18	+ .8
Experiments with E. O., A. W. S., and J. F. S.: Average for 13 experiments	45	2,255	2,250	− 5	− .2
WORK EXPERIMENTS.					
Experiments with E. O.: Average for 2 experiments	8	3,865	3,829	− 36	− .9
Experiments with J. F. S.: Average for 4 experiments	12	3,539	3,540	+ 1	0
Experiments with E. O. and J. F. S.: Average for 6 experiments	20	3,669	3,656	− 13	− .4
Rest and work experiments: Average for 19 experiments	65	2,690	2,682	− 8	− .3

The authors note that the experiments reported practically afford a demonstration of the action of the law of the conservation of energy in the living organism.

Results of experiments on the metabolism of matter and energy in the human body, W. O. Atwater, F. G. Benedict, et al (*Connecticut Storrs Sta. Rpt. 1900, pp. 96–129*).—Noted above from another publication.

Contribution to the subject of metabolism of matter and energy in man, A. Loewy and F. Müller (*Arch. Anat. u. Physiol., Physiol. Abt., 1901, pp. 299–322; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 6, p. 262*).—Experiments are reported of which one of the authors was the subject. During 4 days only ordinary laboratory work was performed. During the 6 remaining days of the experimental period the subject walked 20 to 22 kilogrammeters per day. The diet contained only a small quantity of protein, the amount being just sufficient for the days in which no work was performed. On the other days the amount of nitrogen-free material was increased. During the work period the nutrients were much more thoroughly assimilated than during the days in which the subject did not work. When no work was performed there was a loss of nitrogen. On the other days there was a gain in nitrogen and a loss of fat.

Principles of nutrition and nutritive value of food, W. O. ATWATER (*U. S. Dept. Agr., Farmer's Bul. 142, pp. 48, dgms. 2*).—The chemical composition and uses of food are discussed, as well as digestion, assimilation, excretion, dietary studies and standards, cooking of food, errors in food economy, and related topics. This bulletin is designed as a summary of available information on these topics with special reference to the results obtained in the Department of Agriculture investigations and the closely related work of the agricultural experiment stations.

Nutrition investigations among fruitarians and Chinese at the California Agricultural Experiment Station, 1899–1901, M. E. JAFFA (*U. S. Dept. Agr., Office of Experiment Stations Bul. 107, pp. 43, pl. 1*).—Dietary studies are reported with a family of so-called fruitarians who lived almost exclusively upon raw fruits and nuts, as well as similar studies of Chinese performing different amounts of muscular work. The digestibility of the fruitarian diet was also studied, as well as the income and outgo of nitrogen with one of the subjects. The following table shows the amounts of nutrients consumed per day by the fruitarians and the Chinese, as well as the cost of the diet:

Dietary studies of fruitarians and Chinese—Amounts consumed per person per day.

	Cost.	Protein.	Fat.	Carbohydrates.	Fuel value.
Fruitarians:	*Cents.*	*Grams.*	*Grams.*	*Grams.*	*Calories.*
Woman, 33 years old	23.7	33	59	150	1,300
Woman, 30 years old	17.2	25	57	99	1,040
Girl, 13 years old	19.0	26	52	157	1,235
Boy, 9 years old	19.9	27	56	152	1,255
Girl, 6 years old	17.0	24	58	134	1,190
Girl, 7 years old	27.5	40	72	134	1,385
Chinese:					
Dentist's family	16.4	115	113	289	2,705
Laundry association	21.0	135	76	566	3,580
Truck-farm laborers	19.7	144	95	640	4,100

In the case of the Chinese, the proportion of rice in the diet was especially studied, and the amount of this cereal eaten was compared with the amounts of wheat flour and other carbohydrate foods in ordinary dietaries. Concerning the Chinese dietaries, the following statements were made: "The Chinese studied, who are believed to be fairly representative of Chinese residents in California in similar employment, did not, as is often supposed, live almost entirely upon a vegetable diet. Indeed, they approached no nearer to such a diet than does the average American, who has no thought of doing without animal food. The diet was varied and the dietaries were well balanced, approaching quite closely to the commonly accepted dietary standards. Many of the foods eaten were unfamiliar to most Americans, but nevertheless can not be regarded as other than wholesome and nutritious.

"The Chinese dietary is commonly believed to be very inexpensive and limited in amount. As shown by these studies, it was quite cheap, but was neither scanty nor inferior.

"Rice on an average constituted between one-half and one-third of the total food consumed, and held much the same relation to the total food of the Chinese as do bread and other cereals, starches, etc., to the total food of the ordinary American family."

A diet with a small amount of protein, W. Caspari (*Arch. Anat. u. Physiol., Physiol. Abt., 1901, pp. 323–337; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 6, p. 264*).—In a 10-day metabolism experiment, of which he was himself the subject, the author endeavored to learn the protein minimum. When the daily diet furnished 13.26 gm. nitrogen it was possible to attain nitrogen equilibrium. This was not the case when the daily diet furnished 10.11 gm. nitrogen. From a comparison of his results with those obtained by other investigators, the author concludes that the minimum amount of protein required varies with different individuals, and may also vary with the same individual within rather wide limits.

The diet of prisoners, F. Hirschfeld (*Ztschr. Diätet. u. Phys. Ther., 4 (1901), pp. 37–53; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 6, p. 262*).—An investigation of the diet of a Berlin prison is reported.

Dietaries [at the New York State Reformatory], Z. R. Brockway (*New York State Reformatory, Elmira, Yearbook 1899, pp. 18–22*).—Brief statements are made concerning experimental diets furnished to some of the inmates of the New York State Reformatory. The total protein and energy supplied are recorded.

The therapeutic use of a vegetarian diet, T. Rumpf (*Ztschr. Diätet. u. Phys. Ther., 4 (1901), pp. 25–37; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 6, p. 265*).—The author found that a man long accustomed to an absolute vegetarian diet consumed daily 73 gm. protein, 28.6 gm. fat, and 698 gm. carbohydrates. The therapeutic uses of a vegetarian diet are spoken of. The author believes, however, that for persons in health a mixed diet is to be preferred.

Some new food products made from skim milk, J. König (*Fühling's Landw. Ztg., 51 (1902), No. 1, pp. 5–8*).—Several soluble and insoluble casein products which are made from skim milk are described, their composition given, and their manufacture and food value discussed.

Slimy bread, H. Svoboda (*Oesterr. Chem. Ztg., 4 (1901), No. 18, pp. 418, 419*).—A bacteriological study of slimy bread of local manufacture is reported.

Concerning the examination and valuation of egg pastes, M. Mansfeld (*Oesterr. Chem. Ztg., 4 (1901), No. 19, pp. 442, 443*).—Analytical data are reported.

Nutritive value and chemical composition of vegetables, A. Larbalétrier (*Jardin, 1901, May 5, p. 137; abs. in Jour. Soc. Nat. Hort. France, 4. ser., 2 (1901), May, pp. 458–460; Rev. Agr. Reunion, 7 (1901), No. 12, pp. 502–505*).—Analytical data are reported and discussed.

The bacteriology of vegetables grown on an infected soil, Wurz and Bourges (*Arch. Med. Exper. et Anat. Path., Paris, 1. ser., 13 (1901), p. 575; abs. in Public Health, 14 (1901), No. 4, pp. 250, 251*).—Experiments showed that vegetables grown in infected soils or watered with infected solutions transmitted pathogenic bacteria under the experimental conditions.

Concerning the amylolitic effect of saliva, P. Bielfeld (*Ztschr. Biol., 41 (1901), No. 3, pp. 360–367*).—Experiments are reported in detail which lead to the conclusion that within the experimental limits (1 to 10 cc. saliva or ptyalin solution) the quantity of ptyalin present is without effect upon the sugar produced. Further, the percentage amount of starch was without influence, provided the absolute quantity of starch remained the same in a given experiment. The larger the absolute quantity of starch in a given test, the greater the amount of sugar produced.

A contribution to the subject of the quantitative effect of pepsin, F. Krüger (*Ztschr. Biol., 41 (1901), No. 3, pp. 378–392*).—The author's experiments led to the following conclusions: The amount of cleavage products increases with the quantity of ferment present, though not proportionally. Provided the albumen present remains the same, the quantitative action of pepsin increases with diminished protein concentration, but not proportionally. The larger the absolute amount of albumen, the greater the amount of cleavage products which are produced. These deductions are compared with those noted above in experiments with ptyalin.

Further observations on the quantitative digestive power of pepsin, F. KRÜGER (*Ztschr. Biol., 41 (1901), No. 4, pp. 467–483*).—In the experiments reported, the effect of the amount of free hydrochloric acid present during the proteolytic action of pepsin was studied. According to the author, pepsin acts most powerfully when the digestive mixture contains from 0.18 to 0.4 free hydrochloric acid. The author's experiments are discussed in relation to the work of other observers.

On the preserving of fresh meat and on preserved meat from a hygienic and sanitary standpoint, W. ROHARDT (*Vrtljschr. Gerichtl. Med. u. Oeffentl. Sanitätsw., 3. ser., 21 (1901), pp. 321–355; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 6, p. 269*).—A general discussion of the subject.

A list of licenses granted by the dairy and food commissioner from January 1, 1901, to July 1, 1901, G. G. HUTCHISON (*Pennsylvania Dept. Agr. Bul. 86, pp. 421*).—In addition to a list of the licenses granted during the first 6 months of 1901 by the State dairy and food commissioner, the bulletin enumerates the food samples analyzed and the suits and legal proceedings instituted from January 1, 1900, to July 1, 1901.

"Of the 507 samples analyzed under the pure-food act 233 proved to be pure and 274 adulterated. Of the 18 samples of cheese 10 were full cream and 8 below standard. Of the 94 samples of milk 61 were pure and 33 adulterated. Of the 27 samples of condensed milk 19 were pure and 7 adulterated. Of the 66 samples of vinegar analyzed 41 were pure and 25 adulterated."

ANIMAL PRODUCTION.

Analyses of fodders and feeding stuffs, A. P. BRYANT (*Connecticut Storrs Sta. Rpt. 1900, pp. 82–95*).—In studying the effects of nitrogenous fertilizers upon the composition of feeding stuffs, analyses were made of a number of samples of cowpea fodder, corn stover, soy-bean seed, and white flint corn. A number of miscellaneous fodders and feeding stuffs were also analyzed, including corn fodder for silage, corn stover, oat straw, hay from mixed grasses, rowen, Hungarian grass hay, oat-and-pea hay, corn silage, Buffalo gluten feed, gluten meals, corn-and-cob meal, cotton-seed meal, wheat bran, wheat middlings, ground wheat, grain mixtures, and several proprietary and mixed feeds. In studying the effect of nitrogenous fertilizers, the total nitrogen and nitric-acid nitrogen were determined to learn whether the increase in protein, which has been observed to follow the use of nitrogenous fertilizers, was due to an increase of albuminoids or to nitrates taken up by the plants. The proportion of nitric nitrogen to total nitrogen in orchard grass in pot experiments ranged from 0.029 per cent to 0.041 per cent; in Hungarian grass (pot experiments), from 0.035 per cent to 0.048 per cent; in corn silage (plat experiments), from 0.010 to 0.018 per cent; in cowpea fodder (plat experiments), from 0.005 to 0.009 per cent; and in corn stover (plat experiments), from 0.009 to 0.01 per cent.

According to the author, "There was a larger proportion of nitrates present in the samples from the pot experiments than in those from the plat experiments; the comparison, however, is between different crops. It may be possible that there was less leeching of nitrogen from the soil in the pot experiments, but on this point these investigations furnish no evidence. While the first cutting of orchard grass in the pot experiments contained appreciable amounts of nitrates, the rowen from the same pots contained none. The corn seeds, as was to be expected, gave no tests for nitrates. No nitrates were found in the corn stover grown on the plats supplied with the mineral fertilizers without nitrogen."

Concentrated feed stuffs, J. B. LINDSEY (*Massachusetts Sta. Bul. 78, pp. 40, figs. 4*).—The more common commercial by-products used as concentrated feeds are described, and analyses made in accordance with the State feeding-stuff law are reported of cotton-seed meal, linseed meal, gluten meal, gluten feed, germ-oil meal, wheat middlings, mixed feeds, wheat bran, distillers' grains, malt sprouts, oil meal, bean meal, green-pea meal, cereal breakfast-food by-products, corn meal, hominy meal, oat feed, cob meal, Graham flour, rye meal, rye middlings, wheat-hay feed, a by-product obtained in the manufacture of baby food, Kafir corn, clover meal, poultry feeds made from grains, meat and bone meals, and meat scrap.

Average composition of feeding stuffs, W. FREAR (*Pennsylvania Dept. Agr. Bul. 87, pp. 41*).—Data showing the composition and digestible nutrients in feeding stuffs are reprinted from various sources. A method for computing the composition of mixed feeds is given.

Concentrated feeding stuffs and fertilizers licensed for sale in Wisconsin, 1902, F. W. WOLL (*Wisconsin Sta. Bul. 90, pp. 8*).—A list of 23 brands of feeding stuffs and 6 of fertilizers licensed for sale in Wisconsin during 1902, with the text of the Wisconsin feeding-stuff law and the fertilizer law.

Analyses of grasses and fodder plants, J. C. BRÜNNICH (*Queensland Agr. Jour., 9 (1901), No. 6, pp. 572–575*).—Proximate analyses are reported of hay and grass from alfalfa (*Medicago sativa*), prairie grass (*Bromus unioloides*), cocksfoot grass (*Dactylis glomerata*), and *Paspalum dilatatum*. The author also reports ash analyses of different sorts of hay.

Dried brewers' grains, T. DIETRICH (*Landw. Vers. Stat., 56 (1901), No. 2–3, pp. 207–256, figs. 6*).—A summary of the available information on the production and feeding value of brewers' grains. A number of forms of apparatus for drying this material are described.

Dried distillery refuse, T. DIETRICH (*Landw. Vers. Stat., 56 (1901), No. 2–3, pp. 257–262*).—The composition and feeding value of distillery refuse is discussed, a number of investigations on the subject being summarized.

Tang, P. R. SOLLIED (*Tidsskr. Norske Landbr., 1901, pp. 13–30; abs. in Centbl. Agr. Chem., 30 (1901), No. 6, pp. 375–377*).—The composition of a number of sorts of seaweeds used as feeding stuffs is given, together with results of artificial digestion experiments. According to the author, the fact should not be overlooked that seaweeds contain a considerable amount of pentosans, and on this account may be satisfactorily combined with materials rich in protein. The iodin which the plants contain is also regarded as of importance.

Silkworm excrement as a feeding stuff, G. E. RASETTI (*Staz. Sper. Agr. Ital., 34 (1901), No. 9, pp. 865–880, fig. 1*).—Analytical data are reported, showing that the material studied consisted largely of carbohydrates.

On the preservation of feeding cakes, R. W. TUINZING (*Landw. Vers. Stat., 56 (1901), No. 2–3, pp. 153, 154*).—Experiments which are briefly reported led to the conclusion that the increase in water content observed when linseed cake is stored is due to the growth of mold.

Experiments on the utilization of the protein of gluten, O. KELLNER (*Landw. Vers. Stat., 56 (1901), No. 2–3, pp. 149–152*).—Experiment showed that considerable more ether extract could be obtained from gluten by digesting with pepsin and hydrochloric acid before extracting with ether than was the case by the ordinary method. On the basis of such experimental work the author calculates that the physiological nutritive value of 1 gm. of gluten protein is equal to 4.697 calories. The work is discussed in relation to the author's earlier investigations (E. S. R., 10, p. 669), the opinion being expressed that the new values do not modify the conclusions previously reached.

Methods of analyzing blood and the value of such data for studying proteid metabolism, G. ASCOLI (*Arch. Physiol. [Pflüger], 87 (1901), No. 1–2, pp. 103–115*).—Experiments are described and discussed.

Experiments on artificially lowering the protein metabolism of a sheep having fever, S. WEBER (*Arch. Exper. Path. u. Pharmakol., 47 (1901), pp. 19–47;*

abs. in Chem. Centbl., 1902, I, No. 3, p. 219).—Experimental data are reported and discussed.

The digestibility of glucose and its influence upon the utilization of protein, L. DUCLERT and R. SÉNÉQUIER (*Ann. Agron., 27 (1901), p. 209; abs. in Centbl. Agr. Chem., 31 (1902), No. 1, pp. 15, 16*).—Experiments in which rabbits were fed glucose in addition to meadow hay, showed that glucose was readily digested, provided the amount eaten did not exceed some 25 gm. per kilogram body weight. A test in which glucose was fed with alfalfa led to the conclusion that it did not effect the digestibility of protein. The rabbits fed alfalfa digested only 67 per cent of the total protein, those fed alfalfa and glucose digested 66 per cent.

The formation of sugar from fat, O. LOEWI (*Arch. Exper. Path. u. Pharmakol., 47 (1901), pp. 68–76; abs. in Chem. Centbl., 1902, I, No. 3, pp. 220, 221*).—Experiments with dogs fed phlorizine led the author to the conclusion that the protection of protein by fat was not brought about by preserving the entire protein molecule, but by the retention of the nitrogen radical of the protein, while the carbohydrate radical was used in other ways.

The behavior of xylan in the animal body, B. SLOWTZOFF (*Ztschr. Physiol. Chem., 34 (1901), No. 2, pp. 181–193*).—Experiments on the digestion of xylan were made with rabbits. It was found that from 33.17 to 82.91 per cent was digested. Of the resorbed xylan only a small portion (1.49 to 4.63 per cent of the total amount eaten) was recovered in the urine. The remainder was apparently utilized by the animal. It is uncertain, according to the author, whether zylan is a nutrient.

Steer feeding, D. O. NOURSE (*Virginia Sta. Bul. 121, pp. 15–19*).—A 15-week trial with 6 lots of 2 steers each, to test hay alone and with silage in comparison with corn stover, and to compare whole corn with corn meal, alone and with cotton-seed meal and bran, is summarized by the author as follows:

"A combination of foods, both grain and roughage, is best from every standpoint. Ground corn is better than whole corn after it has become hard. A mixture of corn meal and bran gave greatest gain and with least expense per pound. Cotton-seed meal was not, in these experiments, used with success, due at least in part, to the fact that in former years the steers had not become accustomed to it. Silage was a very economical addition to the roughage. Stover gave a bad showing when used without other roughage."

Conformation of beef and dairy cattle, A. M. SOULE (*U. S. Dept. Agr., Farmers' Bul. 143, pp. 44, figs. 44*).—With the object of pointing out the differences between good and inferior beef and dairy cattle, and the extent to which certain desirable qualities effect their value for beef and dairy purposes, the author discusses the conformation of cattle and stock judging, giving detailed information regarding the conformation of different parts of the body. Typical animals of various grades are described and the possibility of grading up common stock by crossing is discussed and explained.

The comparative value and the effect upon lamb crop of feeding various rations to ewes in winter, W. L. CARLYLE (*Wisconsin Sta. Rpt. 1901, pp. 16–24*).—Continuing earlier work (E. S. R., 13, p. 77), the comparative merits of different sorts of coarse fodder in combination with grain was tested with 4 lots of 12 ewes each. The grain ration of all the lots consisted of 0.5 lb. bran and oats 1:1 per head daily. Lot 1 was also fed corn fodder and corn stover, lot 2 corn silage and corn stover, lot 3 corn silage and blue-grass hay, and lot 4 sugar beets and blue-grass hay. The corn fodder contained 43 per cent ear corn. All the ewes weighed about 140 lbs. each at the beginning of the test. In 12 weeks the lots gained 140, 33, 156, and 175 lbs., respectively, the corresponding cost of food per head being 0.71, 0.7, 1.07, and 1.56 cts. The lots dropped respectively 18, 16, 19, and 21 lambs, the average weight at birth being 7.05, 8.82, 7.98, and 7.5 lbs.

According to the author, the corn fodder, corn stover, and corn silage rations were the cheapest and the ration containing roots and hay the most expensive, the cost of the ration in the latter case being approximately double that of the ration containing silage and fodder or stover and fodder. From this and a former test the conclusion is drawn that corn silage is one of the cheapest and most satisfactory feeds for breeding ewes in winter, and that a ration supplying coarse fodder entirely in the form of corn fodder is not entirely satisfactory for this purpose.

The food requirements of the pig for maintenance and gain, F. D. TAYLOR, reported by W. A. HENRY (*Wisconsin Sta. Rpt. 1901, pp. 67–72*).—The amount of feed required for maintenance and for gain was tested with 4 pigs, 2 being high-grade Berkshires and 2 razorback-Berkshire crosses, the investigation being similar to work previously reported (E. S. R., 12, p. 77). The rations selected consisted of a mixture of wheat bran, corn meal, and oil meal in varying proportions. These materials were analyzed. At the beginning of the trial the pigs weighed about 50 lbs. each. A grain mixture was fed sufficient for maintenance at this weight. The ration was then increased in such a way as to induce rapid gains until the pigs weighed 100 lbs. each. A period on a maintenance ration was then followed by a second period of gain, the pigs weighing at the close 150 lbs. It was found that on an average the pigs at 50 lbs. required 0.48 lb. shorts, 0.24 lb. corn meal, and 0.08 lb. oil meal daily for maintenance. At 100 lbs. they required 1.14 lbs. shorts, 0.57 lb. corn meal, and 0.19 lb. oil meal; and at 150 lbs. they required 1.2 lbs. shorts, 0.6 lb. corn meal, and 0.2 lb. oil meal. On an average the ration per hundred pounds live weight furnished 0.258 lb. protein, 0.069 lb. ether extract, 0.069 lb. nitrogen-free extract, 0.898 lb. crude fiber, and 0.052 lb. ash.

The author notes that per hundred pounds live weight the 150-lb. pig consumed least and the 100-lb. pig most. On an average the pigs required for maintenance corn meal, shorts, and oil meal, furnishing an amount of dry matter equivalent to 1.41 per cent of the live weight, or an amount of middlings furnishing dry matter equivalent to 1.37 per cent of the live weight. No differences were observed in the several periods between the razorbacks and grade Berkshires.

The food requirements during the periods of gain were also recorded, the results being expressed for average weights of 75 lbs., 125 lbs., and 175 lbs. At these weights the pigs required on an average 62.5 days, 58.8 days, and 54.5 days, respectively, to gain 50 lbs. The dry matter consumed per pound of gain was 3.19, 4.22, and 5.41 lbs. The dry matter consumed per hundred pounds of live weight daily at the 3 weights was 3.4, 2.9, and 3.06 lbs. The estimated dry matter in that portion of the daily food required for maintenance was 1.22 lbs., 1.76 lbs., and 1.80 lbs., respectively. It was calculated that the portion of the food required for maintenance at the different weights constituted 1.62, 1.4, and 1.08 per cent, respectively, of the live weight. The author notes that the food eaten for a given gain in weight increases materially with increased weight. The daily requirement for maintenance also increases, which would "tend to show that the 75-lb. pig would be the most profitably fed." But it also appeared that as the pigs increased in weight a smaller amount of food in proportion to body weight was required for maintenance, while the daily gain was larger. This, according to the author, would indicate that "the 175-lb. pig is fed at a greater profit than either the 75 or the 125 lb. pig."

The digestibility of the full ration was tested when the pigs weighed 125 lbs. and that of the maintenance ration when they weighed 150 lbs. each. On full feed the average coefficients of digestibility were dry matter 78.4, protein 73.9, fat 78.4, and nitrogen-free extract 89.2 per cent. On a maintenance ration the average coefficients were dry matter 54.6, protein 75.8, fat 82.5, and nitrogen-free extract 78.8 per cent.

Experiments in pig feeding, W. L. CARLYLE and T. F. MCCONNELL (*Wisconsin Sta. Rpt. 1901, pp. 25–58, figs. 17*).—Two tests similar in purpose to those previously carried on at the station are reported (E. S. R., 13, p. 78).

Effect of feeding various grain rations to growing and fattening hogs, W. L. Carlyle and T. F. McConnell (pp. 25–44, figs. 13).—Using 2 lots each made up of 3 pure-bred pigs and 2 razorback-Poland-China grades, the authors compared the relative merits of corn and rye 1 : 1 and peas and wheat shorts 1 : 2, all the grains being finely ground. The nutritive ratio of the first ration was 1 : 8.2 and of the second 1 : 4.1. The test covered 12 weeks. The average weight of the pigs at the beginning was 1.32 lbs. The average gain per pig per day in the 2 lots was 0.96 and 0.62 lb., respectively, the feed eaten per pound of gain being 5.52 and 7.62 lbs. The pigs were slaughtered and the results of a block test recorded, which included determinations of the strength of the bones and tendons in addition to the usual data. As pointed out by the authors, lot 1 ate more and gained more than lot 2. In other words, the ration with the wide nutritive ratio was the more profitable.

The results of a feeding trial to determine the comparative effect of feeding pigs rations of corn meal and of ground peas, *W. L. Carlyle* (pp. 44–58, figs. 4).—To further test the comparative value of ground peas and corn meal, these grains were each fed alone, using 2 lots each made up of 2 razorback pigs, 1 Yorkshire, and 2 razorback grades, weighing on an average some 48 lbs. each at the beginning of the trial. In 30 weeks the average daily gain per pig in lot 1 (fed peas) was 0.75 lb. In lot 2 (fed corn meal) it was 0.63 lb. The feed eaten per pound of gain was 4.52 and 4.91 lbs., respectively, the corresponding cost of a pound of gain being 6.78 and 4.34 cts. At the close of the test the pigs were slaughtered and a block test made. The nutritive ratio of the pea ration was 1 : 3.18 and of the corn ration 1 : 9.75. According to the author, the pigs fed peas, *i. e.*, the narrower ration, gave much better results than the lot fed corn. "The razorback-Poland-China cross-bred pigs ate the most grain, made the greatest average gain, had much the larger quantity of internal fat, and the greatest thickness of surface fat on outside of body."

From the 2 tests a number of general deductions were drawn which are in effect as follows: Feeding stuffs exercise a marked influence on the proportion of fat and lean meat in the carcass of growing pigs and may also materially affect the development of the various internal organs and the breaking strength of the bones and tendons. A ration of peas and shorts give a larger proportion of lean meat, firmer flesh, stronger bone and more blood than a ration of corn and rye. A ration of peas, when compared with a ration of corn, gave more marked results in these respects than did the ration of peas and shorts when compared with corn and rye. Rations of corn and corn and rye when fed to growing pigs tended to retard the development of their internal organs and to increase the proportion of fat meat. The thigh bones of pigs fed upon peas were on the average 26.9 per cent stronger than the thigh bones of pigs of the same age and breeding fed upon corn. "At the prevailing market prices for the grains in the rations fed, corn has proved to be a much cheaper feed for hogs than peas. Owing to the observed tendency to a lessened development of the internal organs and a reduction in the comparative strength of bones in corn-fed hogs, it is still an open question if, in the case of breeding stock, it would not be advisable to feed a much more expensive ration than corn and build up thereby a stronger vitality in the animal."

Whole corn compared with corn meal for fattening swine, W. A. HENRY (*Wisconsin Sta. Rpt. 1901, pp. 10–15*).—Continuing previous work (E. S. R., 13, p. 79), the comparative merits of whole and ground corn were tested with 2 lots, each containing 12 pure-bred and grade pigs, some of the latter showing razorback blood. Lot 1 was fed whole corn and wheat middlings 2 : 1; lot 2 corn meal and wheat middlings 2 : 1, mixed with water to a slop. At the beginning of the trial the average weight of the pigs of the 2 lots was 145 and 148 lbs. each. In the 12 weeks covered by the test the average gain per head was 74.4 and 86.5 lbs. respectively, the feed consumed per pound of gain being 5.88 and 5.53 lbs. The author notes that the pigs fed corn meal made larger gains and ate more than those fed whole corn. Taking into account the present trial and those made in former years, a saving has been effected by grinding the corn in 7 cases and in 2 cases there has been a loss. The greatest saving was 17.6 and the least 6 per cent. The greatest loss was 9 per cent and the least 2 per cent. According to the author, these figures do not take into account the cost of grinding, but are based entirely upon gains or losses in weight.

The feeding value of rape for swine, W. L. CARLYLE (*Wisconsin Sta. Rpt. 1901, pp. 59–67*).—Using 2 lots of 17 pigs each, the feeding value of rape was studied. Lot 1 was fed corn meal and shorts only *ad libitum*, while lot 2 was hurdled on rape and fed the same grain in addition. At the beginning of the trial all the pigs weighed on an average about 59 lbs. each. The average daily gain per pig without rape was 0.85 lb. and with rape 1.06 lbs. The grain eaten per pound of gain was 4.37 and 4.20 lbs., respectively. The corresponding cost of feed per pound of gain was 3.78 and 3.36 cts. From this and earlier tests at the station (E. S. R., 13, p. 80), a number of general conclusions are drawn, of which the more important follow: When properly grown, an acre of rape combined with corn and shorts has a feeding value for pigs 4 to 10 months old equivalent to 2,436 lbs. of the mixed grain and is worth $19.49 per acre. As a feed for growing pigs rape is superior to clover pasturage. Pigs are more thrifty, have better appetites, and make correspondingly greater gains when pastured on rape in conjunction with a grain ration than when fed on grain alone. "Rape is the most satisfactory and cheapest green feed for swine that we have fed. . . . Hogs should not be turned upon a rape pasture until the plants are at least 12 to 14 in. high and . . . they should be prevented from rooting while in the rape field. Rape is not a satisfactory feed when fed alone, when it is desired to have any live-weight gain made in hogs, though it has been found that they will just about maintain themselves without loss of weight on this feed alone.

Our saddle horses, A. BRUCE (*Agr. Gaz. New South Wales, 12 (1901), No. 12, pp. 1563–1588, pls. 2*).—The local horse-breeding industry is discussed and suggestions for improvement given.

Poultry experiments in 1900–1901, G. M. GOWELL (*Maine Sta. Bul. 79, pp. 9–40*).—A number of questions connected with poultry feeding were investigated.

Coops vs. house and yard (pp. 9–17).—Continuing previous work (E. S. R., 12, p. 585), 4 tests are reported on the comparative merits of feeding chickens in yards and in small coops, as has been recommended by French and English, and later by Canadian poultrymen. In the first test 20 Plymouth Rock chickens 95 days old were fed in small coops a porridge of corn meal and wheat middlings and meat meal (5:5:2) mixed with water for 28 days, gaining on an average a total of 1.34 lbs. A pound of gain required 8.92 lbs. of feed. Sixty-eight chickens of the same age, kept in a small house with a small yard and fed the same ration, made an average gain of 1.43 lbs., requiring 5.26 lbs. of feed per pound of gain. In the second test the experimental conditions were the same, except that the ration was mixed with skim milk instead of water, the amount of meat meal being correspondingly diminished. The chickens in coops gained on an average 1.68 lbs., requiring on an average 6.85 lbs. of feed per pound of gain. Similar values for chickens fed in coops were 1.713 and 4.03. These tests were repeated with chickens 160 days old at the beginning of the trial. On the ration mixed with water, the chickens fed in coops gained an average of 0.78 lb. each, requiring 9.74 lbs. per pound of gain, while those fed in yards gained on an average 0.45 lb., each requiring 16.87 lbs. of feed per pound of gain. On the same ration mixed with skim milk the average gain of the chickens fed in coops was 0.875 lb., the feed required per pound being 8.22. Similar values for the chickens fed in yards were 0.932 lb. and 7.63 lbs. According to the author, these results and those previously obtained show that close cooping is not necessary in order to secure the greatest gain in chicken fattening, and that the chickens made greater gains when given a little liberty than when kept in close confinement. The labor involved in caring for birds in small numbers in coops is greater than in caring for an equal number in a house and yard. The results are so pronounced that the author regards them as conclusive.

The fact is also pointed out that larger gains were made on the ration containing skim milk, and also that gains were more economically made by the young than the older chickens.

Experiments in incubation (pp. 18–25).—The effect of storing eggs in closed cases and in the open air, storing at different temperatures, and allowing them to remain for a time undisturbed, *i. e.*, "resting" the eggs before incubation, was tested, as well as the time required after mating to insure fertility, the duration of fertility, and the relative fertility of eggs of different shapes. The following table summarizes some of the results obtained:

Effect of storing eggs in different ways.

	Number of eggs incubated.	Number of chicks hatched.	Number of eggs infertile.	Number of eggs in which development stopped by the 12th day of incubation.	Number of eggs in which development stopped between 12th and 20th days of incubation.
Eggs stored in closed cases	81	30	11	36	5
Eggs stored in open air	79	19	9	41	9
Eggs stored at 70° F	66	23	4	20	19
Eggs stored at 50° F	62	18	4	18	22
Eggs rested before incubating	65	15	17	20	13
Eggs not rested before incubating	63	22	18	17	20

A test made with year-old Plymouth Rocks showed that eggs became fertile very soon after mating commenced. The cockerel was put in the pen with the hens in the evening and it is not probable that he mated with any hen until daylight the next morning, yet the eggs laid by 2 of the hens not more than 40 hours after mating yielded vigorous chicks.

To learn how long the fertility of eggs continues after mating has been discontinued the cockerel was removed from a pen of year-old Plymouth Rocks. The eggs laid by the 20 hens during the next 13 days were incubated. Eight eggs laid on the last day of the test yielded 3 good chicks. Of the 27 eggs laid during the first 3 days after the removal of the male, 10 yielded chicks. The 30 eggs laid on the last 3 days of the test yielded 7 chicks.

The results show diminished fertility, but it is evident that longer test periods are needed to determine the limits of its duration after mating. The work is to be continued.

Of 25 eggs of normal shape, 8 hatched and 9 were infertile. From the same number of very long eggs 9 chickens were hatched, 12 of the eggs proving infertile. From 25 short, roundish eggs 7 chickens were hatched, 8 eggs proving infertile. In the first case, 3 chickens died in the shell when well grown and 5 by the tenth day of incubation. Similar values for the long eggs were 2 and 2, and for the short, roundish 7 and 3.

Breeding for egg production (pp. 26–40).—The tests begun at the station several years ago on the possibility of breeding hens of superior egg-producing qualities (E. S. R., 12, p. 586) were continued. The results, which are reported in detail, led to the following conclusions:

"During the 3 years in which we have been selecting breeding stock by use of the trap nests we have found 30 hens that laid between 200 and 251 eggs each in a year. Twenty-six of them are now in our breeding pens and constitute—until other additions are made to them—the 'foundation stock' upon which our breeding operations are based. Males for our use have been raised from them during the last 2 years. The number of the foundation stock, now secured, makes practicable the avoidance of inbreeding, and this is to be strictly guarded against, as it is doubtful if the inbred hen has sufficient constitution to enable her to stand the demands of heavy egg production."

As the author notes, the tests have not continued long enough for final deductions.

Poultry raising on the farm, D. E. SALMON (*U. S. Dept. Agr., Farmers' Bul. 141, pp. 16, figs. 31*).—Breeds of poultry and poultry raising are discussed, especial attention being paid to poultry houses, coops, feeding troughs, drinking fountains, and related topics.

Experiments on feeding chickens when bacteria are excluded and on the value of the intestinal bacteria, SCHOTTELIUS (*Ztschr. Untersuch. Nahr. u. Genussmtl., 4 (1901), No. 24, pp. 1165, 1166*).—In a paper presented at the seventy-third meeting of German Naturalists and Physicians at Hamburg, September, 1901, the author reported experiments with chickens hatched and fed in such a way that bacteria were excluded. The chickens ate readily and apparently digested their food normally, yet they did not gain in weight and died after about 20 days. Tests showed that the feces were free from bacteria. At the end of the same period, chickens fed normally weighed about 3 times as much as at the beginning. When the chickens fed under sterile conditions were inoculated with intestinal bacteria from normal chickens, they became strong and gained in weight.

DAIRY FARMING—DAIRYING.

A study of rations fed to milch cows in Connecticut, C. S. PHELPS (*Connecticut Storrs Sta. Rpt. 1900, pp. 130–157*).—This study began in 1892 and has been continued to the present time. The results for 1892 to 1897 were presented at length in a previous report of the station (E. S. R., 10, p. 681) and are here briefly summarized. Preliminary experiments undertaken during the winters of 1897–98 and 1898–99 to study the value of rations based upon milk yields have not been reported. In the experiments during the winter of 1899–1900, of which a detailed account is given, the effect of feeding according to the yield of butter fat was studied with 4 private herds of 8 to 18 cows each.

"Two tests were made with each herd, covering periods of 11 or 12 days. In the first test the entire herd was fed a ration which was essentially the same for each cow; while in the second test the ration was varied according to the yields of butter fat. Two grain mixtures were used in the second test. The first, together with the coarse fodder used, was called a basal ration, which was planned to contain not far from 2 lbs. of digestible protein daily. The actual amounts of digestible protein in the basal ration varied from 1.80 to 2.30 lbs. The second grain mixture was called a protein mixture. It was usually composed of the feeding stuffs which the farmer was using, combined in such proportions as to furnish approximately 0.3 of a pound of digestible protein for each pound of the mixture.

"The plan of feeding in the second test was to use the basal ration for all the cows in the test, and to add to this varying quantities of the protein mixture according to the yields of butter fat, as shown by the results of the first test. Those cows producing from 0.50 to 0.65 lb. of butter fat in the first test received the basal ration only; those producing from 0.66 to 0.80 lb. of butter fat received 1 lb. of the protein mixture in addition to the basal ration; those producing from 0.81 to 0.95 lb. of butter fat received 2 lbs. of the protein mixture in addition to the basal ration; while those producing 0.96 to 1.10 lbs. of butter fat received 3 lbs. of the protein mixture in addition to the basal ration."

The following table summarizes the results of each test:

Original and suggested rations fed to dairy cows.

	Average weight of cows.	Digestible protein.	Fuel value.	Nutritive ratio.	Total cost of ration.	Cost, less value of manure.	Daily yield of milk.	Daily yield of butter.	Total cost of 100 lbs. milk.	Total cost of 1 lb. butter.
Herd P:	*Lbs.*	*Lbs.*	*Calories.*		*Cents.*	*Cents.*	*Lbs.*	*Lbs.*		*Cents.*
First test.....	800	2.71	31,990	1:5.3	22.4	13.9	16.6	1.01	$1.35	22
Second test ..	800	2.92	30,950	1:4.7	20.4	11.1	16.2	1.03	1.26	20
Herd Q:										
First test.....	750	2.23	28,800	1:6.0	19.5	12.0	13.9	.88	1.40	22
Second test ..	750	2.37	27,250	1:5.2	19.4	11.3	16.3	.98	1.19	20
Herd R:										
First test.....	750	1.49	27,270	1:8.8	16.8	11.2	15.9	.84	1.06	20
Second test ..	750	2.36	27,400	1:5.2	18.4	10.6	16.8	.96	1.09	19
Herd S:										
First test.....	725	1.45	27,290	1:9.1	18.6	12.8	13.5	.78	1.38	24
Second test ..	725	1.98	26,460	1:6.2	17.2	11.2	16.7	1.03	1.03	17

"In 3 of the experiments the average cost of the ration used in the second test was less than that of the one used in the first test. The cost of producing 100 lbs. of milk was also less in the second test of the same 3 experiments, while the cost of producing 1 lb. of butter was less in all cases.

"The economy of feeding according to the yield of milk or of butter fat will depend much upon what yields are taken as a basis in feeding. In these experiments there was used about 2 lbs. of digestible protein for 0.50 to 0.65 lb. of butter fat, and the protein was increased by 0.3 lb. for an increase of 0.15 lb. in the yield of fat. In the cases of 3 herds this plan of feeding proved more profitable than the one of feeding a nearly uniform ration to all the cows.

"The experiments, as a whole, help to verify the earlier work of this station, and point out the economy of feeding a larger proportion of protein than most farmers are in the habit of feeding. Rations supplying from 1.80 to 2.60 lbs. of digestible protein per day, according to the yields of milk or of butter fat, have generally proven more profitable than those furnishing less protein."

Forage for dairy cows, T. L. Haecker (*Farm Students' Rev., 7 (1902), No. 5, pp. 74, 75*).—The improvement of cows by feeding is briefly discussed, and notes are given on several forage crops.

Oil cakes in the feeding of dairy cows, J. B. Martin (*Jour. Agricole [Paris], 13 (1902), No. 143, pp. 34–38*).—The relative value of different oil cakes for dairy cows is discussed, average analyses of several oil cakes are given, and 4 rations for dairy cows are suggested.

Records of station cows; feeding dairy cows, J. S. Moore (*Mississippi Sta. Bul. 70, pp. 19*).—Summarized records are given of the station herd of Jersey cows for the calendar years 1897–1901. The average yield of milk per cow for the 4 years varied from 4,043 to 5,149 lbs., and the average yield of butter fat from 210.4 to 278.6 lbs.

Experiments in comparing cotton-seed meal with wheat bran and cowpea hay with Johnson grass hay, and on the relative feeding value of different grains, have already been noted (E. S. R., 13, p. 586).

A test was made of the effect of feeding grain to cows on good pasture. Three cows were fed cotton-seed meal and wheat bran for 6 weeks, and 6 cows were fed the same amount during the same period and a reduced quantity during the 6 weeks following. The difference in yield was not sufficient to justify the feeding of grain.

Several rations for dairy cows are suggested and notes are given on the care of cows, rearing calves, and the influence of feed on the quality of milk and butter. The station herd was fed for periods of 2 weeks each rations containing, respectively, cotton-seed meal, cotton seed, and corn-and-cob meal. There was very little difference in the score of the butter from the 3 rations.

On the average composition of milk of pure-bred cows of different breeds, F. W. WOLL (*Wisconsin Sta. Rpt. 1901, pp. 85–97*).—Original analyses of 97 composite samples of milk of 82 pure-bred cows are reported. The average results by breeds are given in the following table:

Average composition of milk of pure-bred cows.

Breed.	Number of cows.	Number of analyses.	Solids.	Fat.	Casein and albumen.	Milk sugar.	Ash.	Solids-not-fat.	Fat in solids.
			Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Holstein	70	75	11.78	3.33	3.18	4.52*	0.75	8.45	28.3
Guernsey	2	12	14.46	5.39	3.45	4.83	.79	9.07	37.3
Shorthorn	2	2	12.60	3.52	3.53	4.63	.92	9.08	27.9
Red Polled	8	8	12.57	3.74	3.34	4.75	.74	8.83	29.7

The author has also compiled data from American and foreign sources on the composition of the milk of the principal American dairy breeds. The following table gives a summary of American data as regards fat content, and also the average daily yield of milk and fat:

Average fat content and daily yield of milk and fat of pure-bred cows.

Breed.	Fat content of milk.		Daily yield of milk and fat.		
	Number of cows.	Fat.	Number of cows.	Milk.	Fat.
		Per cent.		*Pounds.*	*Pounds.*
Jersey	164	5.13	153	24.5	1.26
Guernsey	67	4.87	53	28.9	1.41
Holstein-Friesian	502	3.30	493	48.9	1.61
Shorthorn	43	3.58	39	31.9	1.14
Ayrshire	33	3.85	18	27.7	1.07
Red Polled	15	3.84	15	26.6	1.02
Brown Swiss	14	3.77	14	37.3	1.41
Dutch Belted	5	3.40	5	27.2	.92
Devon	28	4.64	25	11.8	.55
Polled Jersey	5	4.66	5	22.9	1.07
French Canadian	5	3.99	5	27.0	1.08

Annual milk and butter production of cows owned by patrons of the university creamery, E. H. FARRINGTON (*Wisconsin Sta. Rpt. 1901, pp. 98–128, figs. 14*).—Data obtained in farm tests of 6 dairy herds supplying milk to the university creamery, and reported in Bulletin 75 of the station (E. S. R., 11, p. 673), are reprinted with the results of additional work along this line.

The milk supply of the university creamery from April, 1894, to October, 1901, is shown in tabular form. During the 6 years from 1895 to 1900, inclusive, the average number of patrons varied from 50 to 67, and the annual amount of milk received from 1,890,400 to 2,437,840 lbs. The fat content of the milk from year to year varied between 4.08 and 4.20 per cent. It was highest in October and November, with no marked changes during other months. During the summer of 1901 milk was received from 95 herds, comprising in all 872 cows.

It was found difficult to secure the cooperation of patrons in the systematic and extended testing of the milk of individual cows, even where the station furnished all the necessary material for sampling and paid the patrons for the extra time involved. From August, 1897, to April, 1901, 217 cows on 13 farms were tested, the tests representing 135 complete and 98 partial lactation periods. Only 2 or 3 of the herds were tested for this entire period. Some of the data not previously published, showing extreme variations in the butter value of the cows on different farms, are given in the following table:

Range in value of annual products.

Patron.	Number of cows in herd.	Creamery value of cows.		
		Best.	Poorest.	Average.
Farm A, 1900	11	$82.23	$20.18	$39.20
Farm A, 1901	11	64.93	23.51	38.92
Farm D, 1900	6	51.28	28.40	44.42
Farm E, 1900	5	68.16	43.47	61.20
Farm E, 1901	4	70.72	59.47	62.11
Farm F, 1900	7	58.70	31.90	44.00
Farm G, 1900	14	72.21	39.32	56.57
Farm H, 1900	8	66.08	17.23	50.00
Farm H, 1901	8	62.71	46.65	56.00
Farm I, 1901	24	67.85	14.56	39.00
Farm J, 1901	7	51.14	37.58	46.00
Farm K, 1900	8	54.61	22.35	39.00
Farm K, 1901	8	46.81	36.69	42.00

Official tests of dairy cows, 1900–1901, F. W. WOLL and R. H. SHAW (*Wisconsin Sta. Rpt. 1901, pp 73–84*).—Detailed data are given of official 7-day tests of 120 Holstein and 4 Guernsey cows. In addition 1-day tests of 6 Guernsey cows are reported. Many of the cows were tested more than once. The results are not discussed, except briefly as regards variations in the fat content of the milk of the Holstein cows. Marked variations were found in the percentages of fat in milk from individual cows. "In most cows these differences can not be explained, as their causes are not yet understood."

Comparative skimming qualities of Holstein and Jersey milk, W. D. SAUNDERS (*Virginia Sta. Bul. 122, pp. 21–29*).—A comparison was made of mixed milk from a number of Holstein cows and from the same number of Jersey cows as regards skimming qualities. In a preliminary experiment 200 lbs. of milk from each breed was separated in each of 7 trials under like conditions. The average fat content of the Holstein milk was 3.77 per cent and of the skim milk 0.077 per cent. The average fat content of the Jersey milk was 5.65 per cent and of the skim milk 0.0385 per cent. In a second experiment extending over 4 months the cows of each breed were in corresponding stages of lactation and different separators were used. In each of 29 trials 100 lbs. of milk of each breed was separated. The average fat content of the Holstein milk was 3.45 per cent and of the skim milk 0.188 per cent. The average fat content of the Jersey milk was 5.71 per cent and of the skim milk 0.095 per cent.

The Trowbridge method of calibrating Babcock test bottles, E. H. FARRINGTON (*Wisconsin Sta. Rpt. 1901, pp. 129–131, fig. 1*).—A practical method of testing the graduation of milk test bottles proposed by O. A. Trowbridge, of Columbus, Wis., is described. The test bottle is filled with water to the zero mark and a piece of metal, standardized to displace 2 cc. of liquid is carefully lowered into the bottle by means of a fine wire to below the 10 per cent mark, to which the water should rise if the graduation is correct. Precautions in making the test, such as having the bottle clean and avoiding air bubbles, are mentioned.

The use and abuse of the Babcock test, C. H. ECKLES (*Dairy and Creamery, 4 (1902), No. 2, pp. 2, 3*).

The problem of a pure milk supply, H. D. CHAPIN (*Forum, 33 (1902), No. 3, pp. 293–296*).—A brief general discussion on this subject.

On the increased resistance of bacteria in milk pasteurized in contact with the air, H. L. RUSSELL and E. G. HASTINGS (*Wisconsin Sta. Rpt. 1901, pp. 185–194, figs. 2*).—In the report of the station for 1900 (E. S. R., 13, p. 83) it was shown, in confirmation of the work of Theobald Smith, that the tubercle bacillus is more resistant in milk when heated in an open than in a closed vessel. In the present report an account is given of experiments made with a micrococcus originally isolated from pasteurized milk, to determine if similar results could be obtained with other bacteria and to ascertain why the destruction of bacteria in milk is subject to such variation.

The thermal death point of the micrococcus with a 12-minute exposure in a sealed tube was found to be about 76° C. The results were practically uniform when bouillon, skim milk, whey, and milk were used as media. In milk heated in an open vessel the micrococcus resisted a temperature of 80°. Milk drawn from beneath the surface by a siphon was sterile, while numerous colonies developed on plate cultures made from the surface membrane. The surface membrane on milk heated at 80° was removed at the end of 10 minutes and showed the presence of bacteria. A second membrane formed, which was removed at the end of another period of 10 minutes and found to be sterile. The organism was not destroyed in the film when the milk was heated for 20 minutes at the same temperature.

The experiments show an increased resistance of the organism in the surface membrane. Two possible explanations of this phenomenon were advanced, (1) a diminished temperature of the surface membrane as compared with the remainder of the milk, and (2) protection afforded the bacteria by the membrane itself. The first was disproved by removing the membrane and immersing it in water at the same temperature. The second hypothesis is therefore considered the most probable explanation.

The ripening of cream, H. W. Conn and W. M. Esten (*Connecticut Storrs Sta. Rpt. 1900, pp. 13–33*).—This article has already been noted from another source (E. S. R., 13, p. 688).

Investigations on the sources of the acid organisms concerned in the souring of milk, R. H. Burr (*Connecticut Storrs Sta. Rpt. 1900, pp. 66–81*).—The bacteria mainly concerned in the souring of milk and cream in Connecticut are *Bacillus acidi lactici*, *B. acidi lactici II*, and *B. lactis aerogenes*, of which the first is by far the most important, comprising commonly 90 per cent of the organisms present in ripened cream. Three series of experiments were conducted by the author at the Connecticut Hospital for the Insane to determine the source of these organisms, especially that of *B. acidi lactici*.

In the first and second series of experiments made in 1900 and 1901, bacteriological studies were made of the milk as drawn directly from 70 cows kept under excellent dairy conditions. The results on the whole show that lactic acid bacteria are not present in freshly drawn milk, but are a secondary contamination from some external source. The acid organisms multiply rapidly, and soon check the growth of the liquefying and other bacteria present in fresh milk. All 3 species of lactic acid bacteria were found in the air and in the dust and dirt falling from the cows during milking. The *B. acidi lactici* was present in the air in the smallest numbers.

In the third series of experiments 2 cows reacting to tuberculin were slaughtered and a bacteriological study was made of their udders. In both cases the udders were apparently normal. None of the 3 species of bacteria was found. An organism producing an acid reaction in milk without curdling was found in both udders and is described. It is considered identical with the *Micrococcus acidi lactici* of Conn and the micrococcus described by Ward (E. S. R., 12, p. 184). This organism is not considered of any significance in the souring of milk.

Starters, G. L. McKay (*Iowa Agriculturist, 1 (1902), No. 3, pp. 5–7*).—A brief popular account of the use of pure cultures in the ripening of cream.

Water in butter—an important feature, G. S. Thomson (*Jour. Agr. and Ind. South Australia, 5 (1902), Nos. 6, pp. 544–549; 8, pp. 678, 679*).—The average water content of over 50 samples of South Australian butter analyzed by the author was 11.7 per cent. The butter trier was found unreliable as a practical guide for judging the amount of water in butter. A difference of 1.4 per cent in the water content of butter followed a difference of 4° F. in the temperature of the cream when churned.

Butter salted at the rate of 5 and of $2\frac{1}{2}$ lbs. of salt to 100 lbs. of butter contained, respectively, 10.5 and 12.7 per cent of water, and butter salted in brine at the rate of 3 and $5\frac{1}{2}$ lbs. of salt to 5 gals. of water contained, respectively, 13.4 and 14.6 per cent of water. Butter salted at the rate of 5, 7, and 10 per cent contained, respectively, 15.4, 17.9, and 18.8 per cent of water. Butter worked with 19 revolutions of worker per minute contained less water than butter worked with 45 revolutions per minute. The water content was not materially affected by the size of granules. There was an improvement in the flavor of butter kept in the refrigerator for 6 weeks.

Mottles in butter, J. Findelow (*Abs. in Dairy World, 10 (1902), No. 118, p. 192*).—It is stated that the author has shown by experiments that the following are some of the causes of mottles in butter: "Ripening the cream at too high a temperature, no matter how well it may be cooled afterwards; uneven distribution of salt; use of excessive cold water; insufficient washing; insufficient working; and uneven temperature throughout the mass of butter."

The microscopic examination of butter under polarized light, H. D. Richmond (*British Food Jour., 3 (1901), No. 36, p. 374*).—According to the author, margarin mixed with butter can in many cases be detected by examination under polarized light. Ordinary pure butter gives no bright appearance under polarized light, but under several conditions it may give the appearance of butter adulterated with small percentages of margarin.

The chemical changes in the ripening of cheese, W. F. Sutherst (*Sci. Amer. Sup., 53 (1902), No. 1373, p. 22007*).—The author discusses the rôle of bacteria, enzyms, and molds in the ripening of cheese, and gives analyses to show changes in composition. The total nitrogen in the fresh curd July 10 and in the cheese August 23 and October 16 was, respectively, 4.824, 4.916, and 5.021 per cent. The amount of casein and albumin decreased from 2.203 per cent August 23 to 1.850 per cent October 16, and the albumoses and peptones from 1.586 to 1.288. During the same time the amids increased from 1.120 to 1.848 per cent, and the ammonia from 0.007 to 0.025 per cent. The methods of analysis employed were those suggested by Stutzer (E. S. R., 8, p. 667).

Influence of cold-curing on the quality of cheese, S. M. Babcock, H. L. Russell, A. Vivian, and U. S. Baer (*Wisconsin Sta. Rpt. 1901, pp. 136–161, figs. 8*).—Four series of experiments made during a period of 4 years to study the effect of curing Cheddar cheese at lower temperatures than usual are reported. In the first series 2 cheeses were kept at a temperature below freezing (25 to 30° F.) for 14 and 17 months, respectively, and then analyzed. In the second series of experiments cheeses were made with 3, 6, and 9 oz. of rennet per 1,000 lbs. of milk and cured at temperatures of 15, 33, 40, 50, and 60° F. Analyses and scorings were made at frequent intervals. In the third series cheeses were made with 3 oz. of rennet per 1,000 lbs. of milk and cured at temperatures of 15, 40, and 60° F. Analyses and scorings at frequent intervals for 7 months are given. This series and the following are not yet completed. In the fourth series of experiments milk was obtained from different regions and a larger number of cheeses were made. The curing temperatures were 15, 40, 50, and 60° F. The results are discussed at some length and general conclusions are drawn.

The authors believe that lower temperatures than usual may be employed with perfect safety in the curing of cheese. "Not only have we found in our experiments that no bitter or other undesirable flavors have been produced, but that the quality of cheese cured under these conditions was on the whole better than that of those ripened at the more usual temperatures employed (60° F. and above). Good results have been obtained at all temperatures from 33 to 50° F., although more uniform results were obtained from 40 to 50° F. This indicates that the ordinary temperatures secured in cold-storage rooms are suitable for this purpose. The experiments made at temperatures below freezing show that the course of ripening is not normal and these can not be recommended for general practice, although the casein of cheese breaks down even under these low-temperature conditions."

The flavor of the cold-cured cheese was always mild. "In no case was there any of the sharp flavors that characterize old cheese ripened at the usual temperatures. This fact is very significant in indicating that the physical breaking down of the casein and the production of the peculiar flavors that characterize ripe Cheddar cheese are quite independent of each other, although under normal temperature conditions the 2 processes progress simultaneously."

The texture of cheese cured below freezing was often soggy and crumbly. The texture of cheese cured above freezing was almost without exception improved over that of cheese cured at the higher temperatures. The body of cold-cured cheese remained quite firm and the color even. "In all the cheese cured below 40° F. small, opaque, whitish specks were produced which were scarcely noticeable when the plug was cold but became apparent upon warming. An examination of cold-storage goods in various places revealed the fact that this was a common occurrence, and in the judgment of buyers was neglected as a factor in determining values, as these specks were generally inconspicuous and apparently had no effect on the flavor of the product. The nature of these bodies is yet under investigation."

Curing at lower temperatures than usual enhanced the keeping quality of the cheese and lessened the losses from shrinkage and mold.

"The system of cold-curing here proposed differs from simple cold storage of ripened cheese in that these low temperatures are employed from the beginning of the ripening period. In our experience the quality of such cheese, as measured by the standards of flavor, texture, and body, are materially improved, with the result that the value of the cheese per pound is somewhat increased, and particularly so when the lengthening of the commercial period of the cheese is taken into consideration. Not only is the value per pound improved, but the losses due to mold and shrinkage are diminished. . . .

"It should be kept in mind that the expense of this system of curing is somewhat greater than the old method, but the returns will undoubtedly more than balance the debit side."

The desirability of curing cheese by this method in central stations is briefly discussed.

Influence of sugar on the nature of the fermentations occurring in milk and cheese, S. M. Babcock, H. L. Russell, A. Vivian, and E. G. Hastings (*Wisconsin Sta. Rpt. 1901, pp. 162–176, figs. 2*).—The influence of environment on the production of flavor in cheese is discussed and several series of experiments are reported.

In milk from which the milk sugar had been removed by dialysis a putrefactive fermentation replaced the usual acid fermentation. Indol was invariably produced. In dialyzed milk to which glucose and sucrose were subsequently added no disagreeable odor developed. These experiments having shown that sugar prevents the putrefaction of proteid compounds in milk, the authors were led to study the effect of the removal of milk sugar upon the flavor of cheese.

Cheese was made from curds which had been thoroughly washed in order to remove the sugar, and cured along with cheese made from the same milk according to the usual Cheddar process. Analyses and scorings were made at frequent intervals. Cheese made from washed curds developed a putrid flavor, which became very marked. The cheese was also inferior in texture and body. During the first 2 months the total soluble nitrogen was greater in the Cheddar cheese as compared with the cheese from washed curds, but later this relation was reversed. Liquefying bacteria developed more rapidly than nonliquefying forms in cheese from washed curds.

"The more rapid peptonization of the casein in Cheddar cheese, as shown by the increased amounts of soluble proteids present, is undoubtedly attributable to the fact that this type of cheese contained a larger amount of digestive enzyms (galactase and pepsin), as the washing of the curd would to a considerable extent remove these ferments. But as the condition in the washed cheese permits the development of the digestive or liquefying bacteria, the soluble by-products formed as a result of the action of the enzyms which they secrete accumulate in the cheese and so increase the rate of digestion."

The effect of adding sugar to washed and also to normal curds was studied. Cheese from washed curds without the addition of sugar was adjudged worthless in a few months, while cheese from washed curds to which 2 to 3 lbs. of sugar per 1,000 lbs. of milk had been added developed no putrid flavor. The sugar series, however, did not equal the Cheddar controls. The conclusion is drawn that the addition of sugar to washed curds restored in part at least the conditions that prevailed in normal curds.

"When this conclusion is taken in connection with the results obtained when normal Cheddar and washed cheese were compared, it seems to indicate that the types of bacteria that may develop in a cheese are closely related to the presence and amount of sugar which the cheese contains; that the liquefying, digesting organisms are able to thrive better when the sugar is removed, and that under these conditions putrid flavors are produced that are entirely different from those normally occurring in typical Cheddar cheese. It is possible that the development of these liquefying forms and the appearance of the undesirable flavors noted are nothing more than mere coincidences, but when these two conditions are brought about through the removal of the sugar, and the normal conditions in large measure restored through the addition of sugar, it seems highly probable that the two phenomena are causally related.

"The whole series of experiments, not only with cheese but those made with dialyzed milk, seem to harmonize perfectly and indicate that the type of bacteria that develops in milk and cheese is largely controlled by the sugar content."

A pinhole organism in cheese curd, G. S. Thomson (*Jour. Agr. and Ind. South Australia, 5 (1902), No. 8, p. 682, pls. 3*).—An organism causing numerous small holes and a bitter flavor in cheese was isolated and studied. The appearance of milk inoculated with pure cultures of the organism and of curd and cheese from inoculated milk is shown.

Print cheese, E. H. Farrington (*Wisconsin Sta. Rpt. 1901, pp. 132–135, fig. 1*).—A method of making print cheese employed at the university is described. The usual method employed in making Cheddar cheese is followed except as regards pressing. The bottom of the rectangular mold used is a carved board which stamps a design and marks the cheese into prints. Cheeses made for cutting into 15 one-pound prints, each measuring $2\frac{1}{2}$ by $2\frac{1}{2}$ by $4\frac{1}{4}$ in., are illustrated. No difficulty was experienced in curing in the regular Cheddar cheese curing room.

Roquefort cheese, F. de Barrau (*Jour. Agr. Prat., n. ser., 3 (1902), Nos. 7, pp. 215–217; 9, pp. 294–296*).—An account of the Roquefort cheese industry.

Testing rennet, A. Rolet (*Laiterie, 12 (1902), No. 3, pp. 17–19*).—Directions are given for determining the quantity of rennet preparation to be added to milk in cheese making.

Statistics of oleomargarine, oleo oil, and filled cheese, 1900 and 1901, R. A. Pearson (*U. S. Senate, 57th Cong., 1st session, Doc. 168, pp. 22*).—Statistics relating to the production and distribution of oleomargarine, oleo oil, and filled cheese for the fiscal years 1900 and 1901. Statistics for previous years were published in the report of the Bureau of Animal Industry for 1899 (E. S. R., 13, p. 180).

Oleomargarine, J. H. Garber (*Twelfth Census United States, Census Bul. 138, pp. 16*).—Statistics of the manufacture of oleomargarine for the year ended May 31, 1900.

VETERINARY SCIENCE AND PRACTICE.

The relation of animal diseases to public health, D. D. Grout (*Sanitarian, 47 (1901), No. 383, pp. 310–324*).—The author discusses in a general way the danger from transmission of various animal diseases to man. Among the more important of such diseases mention may be made of glanders, rabies, anthrax, tuberculosis, milk sickness, smallpox, diphtheria, scarlet fever, and plague. Especial attention is devoted to a discussion of the problem of tuberculosis and the value of the tuberculin test in detecting the presence of incipient cases of this disease.

Insects as a living medium for cultivating infectious diseases of man and animals, C. von Holub (*Centbl. Bakt. u. Par., 1. Abt., 30 (1901), No. 7, pp. 284–287*).—The author conducted experiments in cultivating the organisms of ulcus molle and syphilis in a large variety of living insects, including nearly all the orders of insects. It was found that the organisms grew rapidly and luxuriantly in the body cavity and various organs of all insects with which experiments were made. A rapid growth and development of the organisms took place, whether the insects were inoculated with the hypodermic needle or by being allowed to feed upon the organisms. It was found that by infecting an insect and then placing it in a cage with other insects of the same or different species, all the other insects ultimately became infected with the pathogenic organisms. The author calls attention to the great importance of these facts for the future development of the bacteriology of infectious diseases.

Influence of the body cavity on the hæmolytic power of serum from other animals, S. J. Meltzer (*Centbl. Bakt. u. Par., 1. Abt., 30 (1901), No. 7, pp. 278–281*).—Numerous experiments in connection with this problem were carried out by the author. It was found that the serum of cattle operated vigorously in disintegrating the red blood corpuscles of rabbits. When the serum was previously kept for from 10 to 14 days at a temperature of living rooms, it was found that its hæmolytic property was entirely lost. Fresh normal serum of cattle maintained for 3 hours in the body cavity of a rabbit loses almost entirely its power of dissolving the red blood corpuscles of rabbits. During the experiment it was found that the serum of cattle when placed in the body cavity of a dead animal soon lost its hæmolytic property. It is concluded from these experiments that immune as well as normal sera lose their hæmolytic power by remaining for different lengths of time in the body cavity of another animal. It is believed that the disappearance of this property of the serum may be due to alexins.

Involution forms of bacteria on salt-agar, which resemble the plague bacillus, A. Rosenfeld (*Centbl. Bakt. u. Par., 1. Abt., 30 (1901), No. 17, pp. 641–653*).—The author investigated these forms in a number of bacteria, including the bacillus of mouse typhus, of hog cholera, swine plague, ferret plague, chicken cholera, pseudo-tuberculosis, and the bacillus of Danysz. The various bacteria were cultivated for a considerable time on artificial nutrient media, at a temperature of 37° C. The usual formula was adopted for making a slightly alkaline agar medium, but instead of adding only 5 gm. of sodium chlorid to the liter of bouillon, from 20 to 50 gm. were used. The growth of different bacilli under these conditions showed great differences. In general there was a noticeable check to the development of bacteria in the presence of a large percentage of salt. The organisms of swine plague, pseudo-tuberculosis, and chicken cholera produced only a weak growth, even in the presence of slight quantities of salt, while the organisms of hog cholera, mouse typhus, and ferret typhus showed quite vigorous development in the medium containing 5 per cent of salt. In connection with the decrease in growth a modification of the form of individual elements was noted. In the organisms of hog cholera, ferret plague, and mouse typhus this phenomenon was first observed in media with a high salt content, and consisted simply in an enlargement of the rods and the formation of threads with considerable branching. In cultures of the bacillus of Danysz in media containing 5 per cent of salt, many swollen forms were observed, club-shaped, spindle-shaped, or even spherical. The various modifications of form which occurred under the influence of different percentages of salt in the nutrient media are described in detail. The author maintains, however, that these involution forms produced under the influence of salt should not be mistaken for the plague bacillus.

Injurious effects of sorghum on stock, T. E. COULSON (*Queensland Agr. Jour., 9 (1901), No. 1, p. 133*).—The author gives various instances of poisoning from eating sorghum in various stages. In one case 17 animals in one herd died from eating sorghum; in other instances cattle were allowed to feed upon sorghum in all its stages without suffering any harm. In most cases death resulted very quickly, even more quickly than from strychnin poisoning. An urgent request is made for a further investigation of this subject.

Report of the division of veterinary science, J. A. GILRUTH and C. J. REAKES (*New Zealand Dept. Agr. Rpt. 1901, pp. 186–268, pls. 9*).—Two outbreaks of anthrax occurred, and both were traceable to the use of "green bone" fertilizer. For some time shipments of this material have been accompanied by declarations that the bones were thoroughly sterilized, but these statements seemed to be of little value. Details are given of circumstances surrounding the 2 outbreaks of the disease.

Hog cholera occurred in 4 districts in outbreaks of greater or less severity. The majority of the outbreaks took place between July and December. Repeated outbreaks of the disease occurred on a certain farm, and after one appearance of the disease the hogs were all killed off, the buildings and food material burned, fences destroyed, and the land plowed. It is believed that by keeping hogs off this land for a period of 2 years the disease may be eradicated. The agglutination test in cases of hog cholera proved to be very reliable, according to the observations of the authors.

A case of verminous pleurisy combined with pneumonia was observed in a pig, but no further cases of the disease could be discovered. The worm which was apparently the cause of the disease was not identified, but is described as resembling trichinæ but being considerably smaller.

A considerable portion of the time of the veterinary staff was occupied with work in connection with tuberculosis. A large amount of inspection work was done, and the tuberculin test was applied on request from cattle owners. Detailed reports on the prevalence of tuberculosis and on the results of tuberculin tests are made by a number of the veterinary staff. The members of the staff are unanimous in their opinion as to the great value and reliable character of tuberculin when carefully and properly used. A large amount of tuberculous infection was observed in pigs which were fed on by-products of the dairy.

A number of cases of actinomycosis among cattle were observed, 2 cases being found in the udder of dairy cows.

Considerable attention was given to the study of cirrhosis of the liver, also known in horses as "Winton disease." Experiments showed that the disease could be successfully treated in horses by repeated doses of strychnin internally. The same disease was observed among a number of cattle. The authors were unsuccessful in attempts to isolate any pathogenic organism. It is believed that the primary seat of infection is not in the liver, and further search will be made for the specific organism in the alimentary tract or in some other organ.

Brief notes are given on epithelioma, especially as affecting the external eye membranes, œsophagus, and liver. An unusual number of cases are reported of hypertrophy of the thyroid glands in calves, lambs, and colts. This produced an appearance similar to that of goitre in human beings. Many calves were born with enlarged thyroids, and 150 lambs from a herd of 450 ewes were lost on account of this disease. The trouble appears to be associated with malnutrition and a condition of anemia in the parent animals. No outbreaks of the disease occurred among sheep which required especial investigation during the year. The number of deaths from malignant œdema after shearing or docking was much less, and this improvement is believed to be the result of better sanitary measures.

Notes are given on the various pathological material which was received for investigation at the laboratory of the veterinary division. A detailed report is given on the inspection of horses for unsoundness in selecting animals for military use, on inspection of dairies, veterinary inspection, and cruelty to animals.

An account is given of an investigation of a plague among rats occurring in Auckland. The appearance of the bacillus and the behavior on different media are described. A number of inoculation experiments were made in order to determine the virulence of the plague bacillus for rats and other experimental animals. These experiments indicate that little is to be feared from infection of rats and guinea pigs with the plague bacillus. In several instances artificially-infected rats were killed and eaten by other rats and the infection was not transmitted.

Brief notes are also given on a trip to Europe for the purpose of securing Shorthorn dairy cattle free from tuberculosis and improved stallions for service in the Colony.

Summary of results of experiments with tuberculous cows, C. S. Phelps (*Connecticut Storrs Sta. Rpt. 1900, pp. 175–187*).—The author summarizes results of experiments with 4 cows upon which several preliminary reports have already been made (E. S. R., 11, pp. 890, 891; 12, pp. 1086, 1087). At the tenth application of the tuberculin test, March 19 and 20, 1900, none of the cows reacted. Another test made on September 28 of the same year gave a reaction in 1 cow. Detailed notes are given on the progress of the disease in the different cows. In the early part of the fourth year 3 of the cows began to show signs of decline, but the fourth continued to give a good flow of milk and appeared to be in a vigorous state of health when killed in November, 1900. All of the cows were slaughtered and post-mortem examinations were made by Dr. N. S. Mayo. The disease was found to be generalized in 2 of the cows and somewhat restricted in the other 2.

In May, 1900, 3 calves from healthy cows were selected for further experiments on the infectiousness of milk of the tuberculous cows. The calves were placed in a small pasture and all possible precautions were taken to prevent transmission of the disease in any way except by the milk. The calves did not react to the tuberculin test on May 24 or on September 28, after having been fed over 4½ months on tuberculous milk. After the second test the calves were fed no more milk. One calf died on November 29 and was found on post-mortem examination to be tuberculous. The other calves were kept by themselves during the winter, and after having been tested with tuberculin in February, 1901, without reaction, were sent to pasture in May of that year.

As in previous reports on this subject, the author concludes that the danger of the spread of tuberculosis through the milk of infected animals is not so great as generally supposed. This is especially true during the earlier stages of the disease; after the tuberculosis has become generalized the danger is greater and all reasonable precautions are necessary to prevent the spread of the disease from such long-standing cases. It is recommended that all cows be tested with tuberculin and that those which react should be separated from the rest, and that the nonaffected animals should be subsequently tested at least once per year.

The extent to which tuberculin investigations among cattle in Sweden have been useful, L. G. L. Regner (*K. Landt. Akad. Handl. Tidskr., 40 (1901), No. 2, pp. 134–145*).—Since 1897 the Swedish Government has expended from $6,760 to $21,000 annually for the investigation and eradication of tuberculosis among cattle. The early investigations showed that about 30 per cent of the animals which were examined were tuberculous. Large herds showed a greater percentage of reacting animals. In 1897–98 the percentage of reacting animals in herds of from 2 to 15 was 25.5 per cent; in herds of from 16 to 30, 28.4 per cent; in herds of 31 to 60, 37 per cent; in herds of 61 to 100, 47.8 per cent; and in larger herds, 54.4 per cent. Of all the animals examined about 37 per cent were found free from tuberculosis. The isolation of nonreacting animals and feeding calves on pasteurized and boiled milk have given favorable results. During 1900 about 20,000 cattle were placed under special protection against the contagion of tuberculosis. The author ascribes great importance to annual disinfection of dairy barns and stables.—F. W. WOLL.

Congenital tuberculosis, V. VOIRIN (*Deut. Tierärztl. Wchnschr.*, *9* (*1901*), *Nos. 30, pp. 305–308; 31, pp. 315, 316*).—This paper was read before the general meeting of the Association of Veterinarians at Wiesbaden. The author gives a critical review of the literature relating to this subject and discusses the various possibilities of transmission of the disease to the fœtus before birth. It is considered that such transmission is possible in animals and man. Statistics, however, indicate that the percentage of congenital tuberculosis is exceedingly small. Of 370,000 calves slaughtered in Prussia only 73 were tuberculous.

Biochemical studies on the Bacillus tuberculosis, P. A. LEVENE (*Jour. Med. Research*, *6* (*1901*), *No. 1, pp. 135–144*).—The author investigated the chemical composition of *Bacillus tuberculosis* for the purpose of determining, so far as possible, the relationship between its composition and virulence. The pathogenic power of the bacillus in animal organisms appears to be due, according to the author, to its resistance toward destructive influences of the animal cells, rather than to any toxin which it secretes. Detailed notes are given on complete chemical analyses of samples of tubercle bacilli from different culture media. The different samples of tuberculinic acid which were obtained differ considerably in their composition, and it appears from these experiments that this acid is less stable than other nucleic acids.

On the value of tuberculin, C. J. POUND (*Queensland Agr. Jour.*, *8* (*1901*), *No. 6, pp. 476, 477*).—It is urged that the tuberculin test should be applied every 6 months, whether the animals appear to be healthy or not. Instances are cited in which a considerable portion of the herd has been found to be tuberculous within 3 months after the herd had successfully passed the tuberculin test. A thorough and repeated use of the tuberculin test is considered the most effective means for exterminating tuberculosis.

Anthrax, J. C. ROBERT (*Mississippi Sta. Bul. 72, pp. 12, fig. 1*).—The author gives a brief historical account of outbreaks of anthrax in Mississippi. The nature of the disease is discussed and notes given on the various domestic mammals and birds which are susceptible to infection by anthrax. It is believed that the rapid spread of anthrax in the recent outbreak in the State was due to inoculation of healthy animals by the bites of insects. An examination of the stomach contents of a fly which had sucked blood from infected animals demonstrated the presence of numerous anthrax bacilli. The symptoms of anthrax are briefly described. In controlling this disease little encouragement is received from any line of medical treatment. The main reliance must be placed on preventive measures. These should include a rigid quarantine, the destruction of carcasses of all animals which die of anthrax, the vaccination of animals which may have been exposed to the disease, and the thorough disinfection of premises where outbreaks have occurred. Animals may also be protected against such flies which may carry infection by smearing with offensive oily preparations.

Means of immunizing cattle against cattle plague, A. DUDUKANOV (*Arch. Vet. Nauk, St. Petersburg*, *31* (*1901*), *No. 10, pp. 897–900*).—In this paper a brief summary is given of the results obtained by the author in extended experiments with this disease. It was found that after vaccination the animal at once acquired a great resisting power against cattle plague. From artificially immunized animals blood may be drawn in large quantities, and frequently without greatly injuring the health of the animal or weakening the protective power of the serum obtained from such blood.

Blackleg, F. SIVORI (*Bol. Agr. y Ganadería*, *1* (*1901*), *No. 13, pp. 3–13, pl. 1*).—In various herds of cattle in Argentina outbreaks of blackleg occurred and the mortality in such herds varied from 2.5 to 6 per cent. The author made elaborate investigations for the purpose of definitely identifying the disease. An examination was made of the blood and various organs of affected animals and inoculation experiments were conducted on rabbits and guinea pigs, with the result that all tests proved conclusively that the disease was blackleg.

Texas fever, J. C. ROBERT (*Mississippi Sta. Bul. 69, pp. 15, figs. 4*).—During the past 2 years 65 northern cattle were vaccinated against Texas fever at the station; 18 of these were purchased by the station for experimental purposes, and of this number 16 passed through the period of inoculation fever and are at present carrying ticks and in good health. Of the other 47, 20 were vaccinated only once and 27 twice. Of the whole 47, 22 were kept free from ticks until after recovery from the inoculation fever, and none of these died; 25 were subjected to tick infestation before recovery from the fever, and 3 of these died. The nature of Texas fever is briefly described. A record is given of the various symptoms which appear in the inoculated animals. In one case the temperature reached 108° F. Notes are also given on the appearance of various organs as noted in post-mortem examinations. From the author's observations it is concluded that immunity to Texas fever is not transmitted to offspring, that nonimmune cattle of all ages are subject to the disease, and that southern cattle if prevented from becoming infested with ticks are equally as susceptible as northern. Blood inoculation is considered the most practical method of conferring immunity. Inoculated cattle should be kept entirely free from ticks until after recovery from inoculation fever. It is recommended that cattle ticks should not be entirely exterminated on farms south of the quarantine line for Texas fever. It is urged that a few ticks are necessary for the purpose of producing mild forms of the disease and thus immunizing southern cattle. Brief notes are given on the rations which should be fed during periods of fever, and on methods of vaccination.

Actinomycosis, F. SIVORI (*Bol. Agr. y Ganadería, 1 (1901), No. 1, pp. 21–25*).—The author gives a general account of this disease, including statistics on its prevalence in various countries. In parts of Argentina the disease prevailed in an epizootic form. Of 9,540 cattle which were examined 8 per cent were found infected with the disease. The different forms of actinomycosis are described according to their characteristic symptoms, and treatment with iodid of potash is recommended.

Operation for neomorphs of actinomycotic nature, C. DORN (*Berlin. Thierärztl. Wchnschr., 1901, No. 32, pp. 492–494*).—The author gives in detail the symptoms and operative procedure adopted in the surgical treatment of actinomycosis in various parts of the body. These operations were made on actinomycotic tumors in the cheek, reproductive organs, nasal passages, eyelids, and bones.

Pleuro-pneumonia (*Agr. Jour. Cape Good Hope, 19 (1901), No. 3, pp. 195, 196*).—This disease having become prevalent among cattle in the Transvaal and the Orange River Colony, a proclamation was issued by the government to prevent the importation of cattle from these countries into noninfected regions.

Milk fever, P. BRIDGE (*Farm and Home, 20 (1901), No. 1000, p. 100*).—The term milk fever is considered inappropriate for this disease, on account of the fact that the temperature of affected cows is usually normal, or even subnormal. Preference is given to the term postpartum paralysis. While it is generally recognized that cows which have once had milk fever are very susceptible to the disease at all future times of calving, yet it is argued that such animals may be legally declared sound.

Milk fever, J. C. ROBERT (*Mississippi Sta. Bul. 71, pp. 6, fig. 1*).—A brief account of the cause, symptoms, and treatment of this disease. The author recommends the use of Schmidt's treatment.

Parturient paresis: Schmidt's treatment, W. R. FRENCH (*Amer. Vet. Rev., 25 (1901), No. 5, pp. 356–358*).—Notes are given on the symptoms, treatment, and results, in 6 cases of this disease, 5 of which recovered under treatment with iodid of potash. In all these cases antiseptic precautions were observed and hourly massage of the udder was rigidly enforced.

The eradication of sheep scab, MATTHEISEN (*Deut. Tierärztl. Wchnschr., 9 (1901),* *No. 34, pp. 345, 346*).—Statistics are presented showing the prevalence of sheep scab in different districts and in different herds. The following regulations have been adopted for the control of this disease in 1902: All sheep are to be inspected between January 1 and April 1 in order to determine whether or not they are infected; the inspection must be made without previous announcement; scabby sheep are to be treated as soon as possible after shearing, according to the method of Fröhner. Sheep are first to be treated for a period of 3 or 4 days on the scabby spots with a mixture of 1 part English creolin, 1 part alcohol, and 8 parts green soap. They are then to be washed, and then dipped for 2 minutes in the 2½ per cent aqueous solution of creolin, after which the scabby spots are to be brushed for about 3 minutes and the sheep to be again dipped in the solution. The treatment is to be repeated in 1 week.

Treatment of sheep scab, FRÖHNER (*Deut. Tierärztl. Wchnschr., 9 (1901), No. 38, pp. 385–387*).—The results obtained by treatment of this disease according to Fröhner's method are discussed in a critical manner. It is believed that the failures from the use of this method are due to the creolin. Of 3,866 sheep treated for scab by this method in 1900, 3,500 were later slaughtered on account of the development of scab which appeared to be unchecked by the treatment. It is believed that the treatment would be much more effective if applied before shearing, since the solution would be thus held longer by the wool and the scab mite would be subjected to a longer exposure to the insecticide.

Heartwater in sheep and goats (*Agr. Jour. Cape Good Hope, 19 (1901), No. 5, pp. 302–314, figs. 2*).—Experiments made by the Colonial Veterinary Department indicated that the disease known as heartwater was not communicated by ordinary sources of infection. It was suspected that some species of tick was concerned in the transmission of the disease from animal to animal. The entomological department made experiments along this line and demonstrated conclusively that the bont tick (*Amblyomma hebræum*) was an agent in the transmission of the disease.

Further experiments were made in the artificial communication of the disease by means of ticks. It was shown that even a limited infestation by young bont ticks which fed during their larval stages on the diseased animals will produce the disease in a severe form in susceptible animals. An excessive infestation by other ticks which have been allowed to feed on diseased animals does not produce the disease in susceptible animals.

Inoculation against swine erysipelas, KÜHNAU (*Milch Ztg., 30 (1901), No. 24, pp. 372–375*).—The nature and cause of this disease are discussed in a general way. The author describes the usual symptoms of swine erysipelas and gives an account of experiments which have thus far been conducted in perfecting a protective serum for inoculation and in devising a convenient and practical method for making the inoculation.

Lymphangitis saccharomycotica equorum, A. DEDYULIN (*Arch. Vet. Nauk, St. Petersburg, 31 (1901), No. 9, pp. 814–822*).—This disease is known under a number of names, including African glanders, trembling lymphangitis, epizootic lymphangitis, and curable farcy. The symptoms and pathological changes produced by this disease are described in detail. In experiments with remedies for treatment of the disease the author obtained different results, according to the susceptibility of the affected horses and according to the virulence of the infection. In some cases all forms of treatment were unsatisfactory, while in others fairly satisfactory results were obtained by a combination of internal and external remedies. The colloidal silver preparations were given in intravenous injections in doses varying according to the nature of the diet. For external application upon ulcerated areas, caustic potash, iodin with glycerin, corrosive sublimate, naphthaline, and iodoform gave fairly good results.

Observations on skin diseases which have appeared in cavalry horses in the region of the loins and under the saddle since the introduction of the new army saddle, KALKOFF (*Ztschr. Veterinärk., 13 (1901), No. 4, pp. 149–172,* *figs. 5*).—Detailed notes are given on the structure of the saddle recently introduced in army service and on the parts of the horse with which the saddle comes in contact during movement. A number of skin diseases have been produced in a considerable proportion of horses by rubbing of the saddle and the evidence for considering the saddle as the cause of these diseases is critically discussed. One of the more important forms of skin diseases which is produced in this manner is eczema. It is believed that the most effective means for preventing the development of these diseases lies in further improvement of the form of saddle so as to reduce so far as possible friction during the movement of the horse.

The most common irregularities of the teeth of the horse, I, C. McCulloch (*Virginia Sta. Bul. 119, pp. 157–169, figs. 13*).—Brief notes on the irregularities in the number of the teeth, form and union of the incisors, form of the central enamel, in the length and width of the jaws, and from the effects of cribbing and excessive or insufficient wear. A brief account is also given of fraudulent modification of the appearance of the teeth.

The most common irregularities of the teeth of the horse, II, C. McCulloch (*Virginia Sta. Bul. 120, pp. 11, figs. 10*).—Descriptive notes on irregularities of the molar teeth of the horse which are due to excess or lack of wear, or to the employment of fraudulent means in changing their appearance.

Canine rabies: Its distribution and eradication, J. Ehrhardt (*Die Hundswut: Ihre Verbreitung und Bekämpfung. Aarau: Emil Wirz, 1900, pp. 87, charts 7*).—The author gives a statistical account of the presence of rabies in Germany, Hungary, Austria, Belgium, France, England, Italy, Roumania, Bulgaria, Servia, and Switzerland. Especial attention is given to the unusually extensive outbreak of the disease in Switzerland, and to the various means which were adopted for checking the progress of rabies in that country.

Clinical pathology of rabies in dogs, W. Lellmann (*Berlin. Thierärztl. Wchnschr., 1901, No. 31, pp. 465, 466*).—In 3 dogs the circumstances surrounding their infection were well known. The point of infection was in the neighborhood of the central nervous system. Paralysis of the lower jaw was manifested early in the progress of the disease, and the symptoms of so-called dumb rabies were pronounced. The development of the dumb or rabid form of the disease, in the author's opinion, does not depend so much on the place at which infection occurred, but upon the virulence and quantity of the infectious material, upon the susceptibility of the nervous system to rabies, the nearness of the point of infection to the medulla oblongata, and upon the temperament of the animals which are infected.

A new method for rabies inoculations and for removing the spinal cord, T. Oshida (*Centbl. Bakt. u. Par., 1. Abt., 29 (1901), No. 25, pp. 988–991*).—The author describes in detail his method of inoculating rabbits with rabies virus through the optical foramen. When carefully carried out this operation is considered safer than any other which has yet been devised. Injury to the optic nerve does not usually occur and the operation has the great advantage of being simple and convenient. If the virus is injected into the eyeball or orbital cavity the animal does not develop rabies, and if the virus is injected too deeply into the brain the animal dies from cerebral hemorrhage. These dangers may be avoided by careful manipulation so that the rabies virus is deposited just under the dura mater.

In removing the spinal column of rabbits the author disinfects the surrounding tissue, makes two sections of the spinal column in the cervical and lumbar regions, and then introduces a rod with sterilized absorbent cotton on the end. By pressing upon this rod the spinal cord is easily forced out from the other end of the canal.

Transmission of malignant jaundice of the dog by a species of tick, C. P. Lounsbury (*Agr. Jour. Cape Good Hope, 19 (1901), No. 11, pp. 714–724*).—In cooperation with the colonial veterinary surgeon, Doctor Hutcheon, the author undertook a number of experiments for the purpose of determining the possible connection of ticks with the disease of dogs commonly known as malignant jaundice, and sometimes less properly called distemper and dog plague. At first experiments were made with the ticks in the younger stages, and no infection took place. Later experiments with adult ticks showed that the blood parasites which cause the disease are readily transmitted by adult ticks. The common dog tick of the Cape region, and the one with which experiments were made, is *Hæmaphysalis leachi.* It appears that infection can pass from the mother ticks into the eggs, and that the blood parasite requires some time for reaching a stage in which infection of the dog can take place. It appears, therefore, that the ticks are not merely transmitting agents but true secondary hosts for the blood parasites.

A previously undescribed chicken epizootic, A. Krausz (*Centbl. Bakt. u. Par., 1. Abt., 29 (1901), No. 25, pp. 980–982*).—An epizootic outbreak occurred in a large hennery where fowls have recently been imported from Italy. The disease attacked chiefly the young fowls, and affected birds quickly lost their appetite, remaining standing in one place, and appeared sleepy. Underneath the lids an œdematous swelling appeared, and in many cases the eyelids were stuck together. Death occurred in a majority of cases 10 to 15 minutes after the chief symptoms appeared. Post-mortem examinations showed that the veins were filled with blood and all vital organs were congested. The liver was somewhat enlarged. Bacteriological investigations showed the presence of an organism which was identified as *Staphylococcus pyogenes albus.* Inoculation and feeding experiments with this organism gave negative results, but no young chickens were to be had for such experiments. Isolation of diseased birds and disinfection of their quarters were completely effective in checking the progress of the disease.

Note on the veterinary service for the year 1900 (*Jour. Khediv. Agr. Soc. and School Agr., 3 (1901), No. 3, pp. 149–152*).—Statistics are given on the distribution and prevalence of glanders, rabies, sheep pox, foot-and-mouth disease, anthrax, pleuro-pneumonia, tuberculosis, and cattle plague. A brief account is also given of a number of animals slaughtered in the abattoirs, the number of cattle and sheep imported, and the activity of the vaccine institute for the year.

Veterinary pharmacy and toxicology, A. F. Delaud and O. Stourbe (*Pharmacie et toxocologie vétérinaires. Paris: J. B. Baillière & Sons, 1900, pp. 496*).—In this volume the authors present a discussion of veterinary medicines; the preparation and administration of drugs; weights, measurements, and doses of drugs; determination of the density of liquids; the principal forms of medicines; and the classification of drugs used in veterinary practice. In the second part of the volume the subject of toxicology as applied to domesticated animals is treated.

The stock-owner's adviser, C. K. Rhodes (*Richmond, Va.: B. F. Johnson Publishing Co., 1901, pp. 574, figs. 140*).—In this volume the author discusses the history, habits, breeding, hygiene, dietetics, anatomy, and treatment for various diseases of horses, cattle, sheep, swine, and dogs. The diseases of the horse receive the most extended treatment. These diseases are discussed under the following chapters: Inflammation, fractures of bones, diseases of bones, diseases of joints, lameness, sprains and strains, diseases of the feet, wounds, injuries to the mouth, tumors, eye diseases, hernia, diseases of the head and neck, of the skin, of the veins and arteries, lymphatics, diseases of the reproductive organs, diet during disease, symptoms of diseases, contagious diseases, diseases of the respiratory organs, of the alimentary canal, of the nervous system, liver, spleen and pancreas, kidneys, heart, diaphragm, parasitic diseases. The purpose of the volume is to furnish the ordinary stockman in simple language a description of symptoms and treatment for the diseases which are ordinarily met with in domesticated animals.

Insurance of slaughterhouse animals, Siedamgrotzky (*Deut. Thierärztl. Wchnschr., 9 (1901), No. 16, pp. 157–160*).—The author outlines the proposed plan by which animals about to be slaughtered are insured. The chief features are concerned with the matter of indemnity paid by the government for animals suffering from contagious diseases.

AGRICULTURAL ENGINEERING.

Drainage of southern Indiana, J. F. NEWSOM (*Jour. Geol., 10 (1902), No. 2, pp. 166–181, pl. 1*).—This article discusses the drainage of that portion of southern Indiana which "lies south of a line running from Indianapolis east to the Ohio State line, and from Indianapolis southwestward along the course of the West White River to the mouth of that stream." The drainage of this area is dependent upon geological structure, and is not controlled primarily by glacial drift. The drainage, except in the eastern part of the area, is toward the southwest, following the dip of the strata.

Report on irrigation investigations for 1900, E. MEAD (*U. S. Dept. Agr., Office of Experiment Stations Bul. 104, pp. 334, pls. 25, figs. 29*).—This is an account of investigations on the methods of conserving, distributing, and using water in irrigation made in 1900 under the supervision of the expert in charge of irrigation investigations of this Office. It includes a review of the principal results of the investigations, by E. Mead; a discussion of methods and results, by C. T. Johnston; and reports by special agents and observers as follows: Irrigation along Pecos River and its tributaries, by W. M. Reed; Irrigation in the Salt River Valley, by W. H. Code; Irrigation at the Arizona Experiment Station farm, by A. J. McClatchie; Duty of water under Gage Canal, Riverside, Cal., 1900, by W. Irving; Irrigation investigations in Nevada, by J. M. Wilson; Water administration in Utah, and Duty of water on Big Cottonwood Creek, 1900, by R. C. Gemmell; Irrigation under canals from Logan River, by G. L. Swendsen; Irrigation under the Great Eastern Canal, Platte County, Nebr., by O. V. P. Stout; The use of water for irrigation at Wheatland, Wyo., by C. T. Johnston; Duty of water on the Laramie Plains, 1899, by W. H. Fairfield; Duty of water in Idaho, by D. W. Ross; Use of water in irrigation in the Yakima Valley, by O. L. Waller; Irrigation investigations in Montana, 1900, by S. Fortier; Progress report on silt measurements, by J. C. Nagle. The investigations made during 1900 followed the same general lines as those of the preceding year (E. S. R., 12, p. 895), although better equipment and increased skill and experience of those in charge have permitted their extension in several important directions. Special attention has been given to a study of the duty of water and the conditions which influence it, since information on this point is necessary as a basis for planning irrigation works and to assist in framing contracts for supplying water, which will be in accord with the necessities of users and enable those charged with the division of streams to properly perform their duties.

"An examination of the reports of the different experts and special agents shows close agreements between the average rainfall and average duty of water in 1899 and 1900. These averages are based on measurements made in 10 States and Territories, at stations which are scattered over a region which embraces about one-third of the United States.

	Feet.
In 1899 the average rainfall for the irrigation period was	0.44
In 1900 the average rainfall for the same period was	.45
The average depth of water applied to crops in 1899 was	4.35
The average depth of water applied in 1900 was	4.13"

One of the more important new lines of investigation reported on is the determination of the volume and fertilizing qualities of the silt carried by the rivers of the West and Southwest. This has an important bearing on the question of the duration of storage works, and the results reported show that the construction of reservoirs should always be preceded by a careful investigation of this subject. Examinations of samples of water from the principal rivers of Texas and the results of studies of the silting up of the Austin and Pecos reservoirs are reported with suggestions as to methods of dealing with the silt problem.

Irrigation in the United States, E. MEAD (*U. S. Dept. Agr., Office of Experiment Stations Bul. 105, pp. 47, pls. 12, fig. 1*).—The testimony of the expert in charge of irrigation investigations of this Department before the United States Industrial Commission June 11 and 12, 1901. This testimony "presents a review of the irrigation situation in the United States, including not only the arid region of the West, but also the humid sections of the South and East. The testimony also deals briefly, but in some detail, with the practical aspects of extending public aid to irrigation, either through the State or national governments."

Irrigation practice among fruit growers on the Pacific Coast, E. J. WICKSON (*U. S. Dept. Agr., Office of Experiment Stations Bul. 108, pp. 54, pls. 10, figs. 7*).—This bulletin, prepared under the direction of Prof. Elwood Mead, expert in charge of irrigation investigations of this Office, presents the results of a special investigation into the conditions, extent, and methods of irrigation as practiced among fruit growers on the Pacific Coast.

Irrigation possibilities of the Lower Colorado River, J. B. LIPPINCOTT (*Forestry and Irrig., 8 (1902), No. 4, pp. 153–159, figs. 4*).

A complete irrigation system, A. P. DAVIS (*Twentieth Century Farmer, 1902, No. 69, pp. 1, 2*).—An argument in favor of irrigation development under national control.

Earthen reservoirs, A. P. DAVIS (*Forestry and Irrig., 8 (1902), No. 3, pp. 121–123*).—Brief directions for the construction of such reservoirs.

Hydrography (*Twenty-first Ann. Rpt. U. S. Geol. Survey, 1899–1900, pt. 4, pp. 768+XI, pls. 156, figs. 329*).—This includes a report by F. H. Newell of progress of stream measurements for the calendar year 1899 similar to those of previous years (E. S. R., 12, p. 797), a preliminary description of the geology and water resources of the southern half of the Black Hills and adjoining regions in South Dakota and Wyoming, by N. H. Darton; and a paper on The High Plains and their utilization, by W. D. Johnson. "The first paper discusses the results of measurements of the flow of various streams in different parts of the United States, the data being presented in diagrammatic form as well as by statistical tables. The arrangement adopted for this progress report is a geographic one, beginning in the extreme northeastern part of the United States and ending in the extreme southwestern." The second paper deals more particularly with the artesian water supply of the region studied and "the results obtained have interest and value not only to the citizens in the vicinity of the Black Hills, but to a still larger class who, in all parts of the country, are seeking an underground supply of water." The article also treats of the topography, geology, soils, mineral resources, climate, and timber of the region. The third paper gives "the result of field work begun in 1896 in western Kansas and extending over portions of Nebraska, Colorado, Oklahoma, and Texas." The article discusses the general characteristics, origin, and structure of the High Plains, the deficiencies of climate, the necessity for irrigation, and the impossibility of general irrigation on account of the insufficiency of the water supply.

Relative velocity in streams, D. T. SMITH (*Nature [London], 65 (1901), No. 1678, p. 174*).—The author claims "that friction against the bed increasing progressively from the middle to the margin divides every stream longitudinally into two halves, which roll spirally toward each other. This spiral being determined by the friction, its helix rises with the speed, or the increased friction depending on the speed, which in turn depends on the slope of the channel. It follows that beyond a certain speed the stream loses all the momentum gained by its fall in beating with the two outward moving undercurrents against the channel walls. In this way the stream attains its kinetic equilibrium."

Public water supplies (*Ohio State Bd. Health Rpt. 1899, pp. 88–206, 451–732, charts 57*).—Reports on the water supplies for various towns in Ohio and on the measurement of the flow of the rivers of Ohio and their value as sources of public water supply.

The evolution of reaping machines, M. F. MILLER (*U. S. Dept. Agr., Office of Experiment Stations Bul. 103, pp. 43, pls. 9, fig. 1*).—This article summarizes the history of the various stages in the development of reaping machines. It has not been attempted to refer to all inventions in connection with reaping machines, but as a rule only those are considered which have marked some important advance in the development of the perfected modern machine. A partial bibliography of the subject is given.

The test station and information bureau for agricultural machines of the Bavarian Academy of Weihenstephan, 1896–1901, H. PUCHNER (*Vrtljschr. Bayer. Landw. Rath., 7 (1902), No. 1, pp. 44–55*).—A brief account is given of the work done by this institution during the period named.

Eighth annual report of the commissioner of public roads for the year ending October 31, 1901 (*New Jersey State Com. Pub. Roads Rpt. 1901, pp. 197, pls. 34, map 1*).

Roads and national welfare, J. P. O'REILLY (*Nature [London], 65 (1902), No. 1680, p. 222*).—A brief discussion of this topic.

Roads; their construction and maintenance, A. GREENWELL and J. V. ELSDEN (*London: Whittaker & Co., 1901, pp. VII+280*).

Refrigerating machines; their construction and use, R. STETEFELD (*Die Eis- und Kälteerzeugungs-Maschinen. Ihr Bau und ihre Verwendung in der Praxis. Stuttgart: Max Waag, 1901, pp. 488, pls. 35, figs. 313*).

MISCELLANEOUS.

Fourteenth Annual Report of Alabama Station, 1901 (*Alabama College Sta. Rpt. 1901, pp. 321–344*).—This includes the organization list of the station, a financial statement for the fiscal year ended June 30, 1901, a report of the director on the work and publications of the station during the year, and brief departmental reports.

Thirteenth Annual Report of Connecticut Storrs Station, 1900 (*Connecticut Storrs Sta. Rpt. 1900, pp. 194; sup., pp. 12*).—This includes the organization list of the station, a financial statement for the fiscal year ended June 30, 1900, a report of the director on the different lines of station work during the year, and miscellaneous articles noted elsewhere. A supplement to the report contains a list of the publications of the station since its organization.

Nineteenth Annual Report of New York State Station, 1900 (*New York State Sta. Rpt. 1900, pp. 494*).—This contains the organization list of the station, a financial statement for the year ended September 30, 1900, a list of periodicals received by the station, a meteorological record noted elsewhere, and reprints of Bulletins 174–195 of the station on the following subjects: Fumigation of nursery stock (E. S. R., 12, p. 273); a parasite of carnation rust (E. S. R., 12, p. 358); inspection of concentrated commercial feeding stuffs during 1900 (E. S. R., 12, p. 877); report of analyses of commercial fertilizers for the spring and fall of 1900 (E. S. R., 12, p. 1026); inspection of Babcock milk-test bottles (E. S. R., 12, p. 1083); an anthracnose and a stem rot of the cultivated snapdragon (E. S. R., 12, p. 1055); miscellaneous notes on injurious insects (E. S. R., 13, p. 65); a fumigator for small orchard trees (E. S. R., 13, p. 71); experiments on the sulphur-lime treatment for onion smut (E. S. R., 13, p. 58); notes on some dairy troubles (E. S. R., 13, p. 85); the influence of the temperature of curing upon the commercial quality of cheese (E. S. R., 13, p. 86); the New York apple-tree canker (E. S. R., 13, p. 59); the sterile fungus Rhizoctonia as a cause of plant diseases in America (E. S. R., 13, p. 55); commercial fertilizers for potatoes (E. S. R., 13, p. 41); spraying for asparagus rust (E. S. R., 13, p. 147); a little-known asparagus pest (*Agromyza simplex*) (E. S. R., 13, p. 159); report of analyses of Paris green and other insecticides in 1900 (E. S. R., 13, p. 108); a fruit disease survey of western New York in 1900 (E. S. R., 13, p. 148);

the substitution of soda for potash in plant growth (E. S. R., 13, p. 121); San José scale investigations, I (E. S. R., 13, p. 369); San José scale investigations, II (E. S. R., 13, p. 370); and director's report for 1900 (E. S. R., 13, 396).

Annual Report of South Carolina Station, 1901 (*South Carolina Sta. Rpt. 1901, pp. 21*).—This includes the organization list of the station; reports of the agriculturist, assistant agriculturist, State chemist, botanist, veterinarian, and horticulturist; and a financial statement for the fiscal year ended June 30, 1901. The report of the State chemist contains a summary of fertilizer analyses made during the year.

Fourteenth Annual Report of Tennessee Station, 1901 (*Tennessee Sta. Rpt. 1901, pp. 16*).—This includes the organization list of the station, a brief report of the president of the University of Tennessee relating to the work of the station, departmental reports reviewing the different lines of work and stating briefly some of the results obtained during the year, a list of available station publications, and a financial statement for the fiscal year ended June 30, 1901. Some results of soil analysis and of cooperative fertilizer experiments are given in the report of the chemist. The report of the horticulturist is noted elsewhere.

Annual Report of Virginia Station, 1901 (*Virginia Sta. Rpt. 1901, pp. 14*).—This contains the organization list of the station, a financial statement for the fiscal year ended June 30, 1901, and brief reports of the director and heads of departments.

Eighteenth Annual Report of Wisconsin Station, 1901 (*Wisconsin Sta. Rpt. 1901, pp. 352*).—This contains the organization list, a report of the director on the work and publications of the station, miscellaneous articles abstracted elsewhere, lists of exchanges and acknowledgments, analyses of fertilizers reprinted from Bulletin 86 of the Station (E. S. R., 13, p. 236), text of the Wisconsin fertilizer law and the feeding-stuffs law, and a financial statement for the fiscal year ended June 30, 1901.

Eleventh Annual Report of Wyoming Station, 1901 (*Wyoming Sta. Rpt. 1901, pp. 30*).—This includes the organization list of the station; a report of the director containing notes on the work and equipment of the station and abstracts of Bulletins 46–94 of the station issued during the year; a financial statement for the fiscal year ended June 30, 1901; and departmental reports outlining work in progress during the year.

Finances—meteorology—index (*Maine Sta. Bul. 78, pp. 177–200+8*).—This contains a list of acknowledgements, meteorological observations noted elsewhere, a financial statement for the fiscal year ended June 30, 1901, an index to the annual report for 1901 (Bulletins 70–78), the organization list of the station, brief notes on the aim and work of the station by the director, and reprints of newspaper bulletins published in 1901, as follows; The Colorado potato beetle, feeding-stuffs inspection law, and the chinch bug.

Bulletins of Alabama Station (*Index to Vol. IX, Buls. 113–117, and Ann. Rpt. 1901, pp. 447–464*).

Experiment Station Work, XIX (*U. S. Dept. Agr., Farmers' Bul. 144, pp. 32, figs. 9*).—This number contains articles on the following subjects: Maintenance of soil fertility, Thomas slag, rotation of crops, gardening under glass, winter irrigation of deciduous orchards, improvement of American grapes, condimental and medicinal cattle and poultry foods, feeding rice meal to pigs, dressing and packing poultry for shipment, the curing of cheese, and an improved cow stall.

Crop Reporter (*U. S. Dept. Agr., Division of Statistics Crop Reporter, 3 (1902), Nos. 10–12, pp. 8 each*).—Crop conditions on April 1, 1902, are given and various articles of a statistical nature are included in these numbers, among which are the following: The cotton trade and industry of Japan, the production of cork, principal crops of Russia, the United States coffee trade with South America, crops and live stock in Manitoba, principal crops of Ireland and changes in crop areas since 1855, proposed efforts to extend maize culture in Russia, the banana trade, imports of beef into the United Kingdom, hop crop of Germany, the Department's cotton statistics, the world's flax crop, the horse trade of the United States with foreign countries, the world's corn crop, production of honey and wax in 1899, production and exports of Argentina, and the horse trade of Canada with foreign countries.

Domestic animals in the United States (*Twelfth Census United States, Census Bul. 156, pp. 22*).—This bulletin gives the statistics of domestic animals on farms and ranges, by States and Territories, on June 1, 1900. Statistics of the domestic animals not located on farms or ranges were published in Census Bulletin 17. The aggregate number of domestic animals in the United States is given as follows: Neat cattle 69,438,758, horses 21,216,888, mules 3,445,029, asses and burros 111,450, sheep 61,837,112, swine 64,694,222, goats 1,949,605.

Report of the enological station of Haro, Spain (*Mem. An. Estac. Enol. Haro, 1901, July, pp. 24*).

The Babcock medal presentation, W. A. Henry (*Wisconsin Sta. Rpt. 1901, pp. 6–9*).—A brief account is given of the presentation to Dr. S. M. Babcock of the medal voted by the Wisconsin legislature in 1899 (E. S. R., 12, p. 999). Brief extracts are given from the addresses of Governor Robert M. La Follette, Ogden H. Fethers, and Ex-Governor W. D. Hoard.

NOTES.

Alabama College.—C. C. Thach, M. A., for about 15 years professor of English in the college, has been elected to the presidency, made vacant by the death of William LeRoy Broun.

California University and Station.—Leroy Anderson, in charge of dairy husbandry, has been elected principal of the new California Polytechnic School which has been located at San Luis Obispo. The last legislature appropriated $50,000 for the establishment of such a school, and a tract of about 280 acres of land for a farm and campus has been bought. One or more buildings will be erected during the coming summer. For the present attention will be confined to agricultural instruction on a practical scale, but later it is expected to broaden the scope of the school to include various trades.

Delaware Station.—The governing board at a recent meeting adopted a resolution calling for the appointment of a committee to investigate the method of managing the station by the council, with a view to a possible change. The station council is at present an administrative body, composed of the staff of the station and the committee on agriculture from the board of trustees.

Purdue University and Station.—C. S. Plumb, professor of animal husbandry and dairying in the university and directer of the station, has resigned to accept the chair of animal husbandry in the Ohio State University.

Kentucky Station.—C. W. Mathews, horticulturist, has withdrawn from the station and will hereafter devote his time exclusively to college work.

Louisiana University.—Congress, by a recent act, has ceded to the university the tract of land embracing approximately 150 acres, together with the buildings, which it has occupied subject to the needs of the United States for military purposes. The tract was originally a military fort, and some years ago was turned over to the State for the use of the university until such time as it might be needed for purposes of defense. Mr. John Hill, a prominent sugar planter near Baton Rouge, has given $32,000 to the university for the erection of a fireproof library building as a memorial to his son. The State legislature at its recent session appropriated $47,000 for the erection of a dormitory and a building for the mechanic arts department, and $8,500 for furnishing the library building mentioned above. The usual appropriation of $15,000 for the experiment stations was made, and the appropriation for the State geological survey, which is under the charge of the director of the stations, was increased to $2,500 a year for 2 years.

Massachusetts College and Station.—S. T. Maynard has resigned his position as professor of horticulture in the college and horticulturist of the station.

Michigan College and Station.—At a recent meeting of the board, C. D. Smith was relieved from the superintendency of the farmers' institutes and made agriculturist of the station, in addition to his duties as director. L. R. Taft was made superintendent of institutes and also State inspector of orchards and nurseries in place of D. W. Trine, resigned. Professor Taft is succeeded as head of the horticultural department in the college by U. P. Hedrick, who also becomes superintendent of the grounds. Philip W. Ayres, of New Hampshire, was elected professor of forestry. The board also adopted plans for the new mechanical building, which will contain rooms for the departments of electrical engineering and physics and for civil engineering, and appropriated $5,000 for the equipment of the new bacteriological laboratory.

Montana Station.—R. W. Fisher has been appointed assistant horticulturist of the station.

Oklahoma Station.—A. G. Ford, B. S., who was assistant in chemistry in this station from 1898 to 1900, has been appointed associate chemist. A. B. McReynolds, assistant in chemistry, has severed his connection with the station. An assistant in soils and crops has been provided for, but the position has not yet been filled.

Pennsylvania College and Station.—John A. Woodward and Chas. W. Stone have been reelected members of the board of trustees, and Chas. M. Schwab and M. E. Conard have been elected trustees *vice* Amos H. Mylin and Samuel R. Downing Chas. A. Browne, jr., has been promoted to the rank of first assistant chemist of the station and instructor in agricultural chemistry in the college, and T. I. Mairs, assistant superintendent of the correspondence courses, has also been appointed instructor in animal industry in the college. At the recent commencement gifts to the college were announced as follows: By Andrew Carnegie, $100,000 for a library building; by Mr. and Mrs. Chas. M. Schwab, $60,000 for an assembly hall, and by Jas. Gilbert White, class of '82, $10,000 for a graduate fellowship and $10,000 additional for three undergraduate scholarships. Thorne M. Carpenter, assistant chemist, and W. T. Carter, fellow in agricultural chemistry, are no longer connected with the station.

Texas College and Station.—J. H. Connell, director and agriculturist, has resigned to accept the position of assistant manager of *The Texas Farm and Ranch*, and will enter upon his new duties during the latter part of July. This, with the previous resignations, will make an entire change in the agricultural and horticultural departments in the college and station, except in the case of the assistant agriculturist in the station. F. W. Mally, State entomologist, failed of reelection at the June meeting of the governing board.

Utah College and Station.—James A. Wright, horticulturist, has resigned to accept a position as agricultural editor in connection with *The Salt Lake Tribune*.

West Virginia University and Station.—A. D. Hopkins, entomologist, has resigned to accept the position of forest entomologist in this Department. K. C. Davis, horticulturist, has resigned to accept the position of principal of the Dunn County Agricultural School, in Wisconsin.

Association of American Agricultural Colleges and Experiment Stations.—The announcement has been issued of the sixteenth annual convention of the association, to be held at Atlanta, Ga., October 7, 1902. "Atlanta and Athens have been selected on invitation of the city, the chamber of commerce, the citizens, and the State University. Arrangements have been made for holding one session at Athens and a meeting of station workers at Experiment. After adjournment, excursions will be offered at liberal rates to Lookout Mountain, Tenn., and Asheville, N. C., the latter at the invitation of Mr. George Vanderbilt. Concessions, it is expected, will be obtained from the railroads and the hotels. Full details of all necessary matters will be sent out by the secretary well in advance of the date of the meeting. The general programme and programmes for the sections will be duly issued, together with circulars of information respecting hotel rates and places of meeting."

Briarcliff School.—The School of Practical Agriculture at Briarcliff Manor, N. Y., has outgrown its present quarters on the farm of Mr. W. W. Law, and it has been decided by the trustees to seek a new location, where there will be greater opportunity for growth. A tract of 415 acres near Poughkeepsie, N. Y., has been secured for a permanent site, and the erection of the necessary buildings will proceed as rapidly as funds are available. It is hoped to transfer the school from Briarcliff Manor some time next spring. For the immediate needs of the school a fund of $200,000 is being raised by subscription. Additional subscriptions have been asked for, and it is hoped eventually to swell the fund to $1,000,000. Speaking of the school, Director George T. Powell says: "At Poughkeepsie, to an extent greater than has been possible at Briarcliff, the students will handle farm machinery and tools, prepare the soil, apply fertilizers, sow the seed, plant orchards, make gardens and greenhouses, propagate flowers, control insects, treat the diseases of plants and animals, and perform every practical detail necessary to be understood on a big or a little farm. It should be said that our aim is chiefly to make the school a practical institution in every respect. Our students have come from different sections of the country, and mostly from the cities, and our experience has been that the actual physical labor of farming incident to our course of instruction in field work does not in any way detract from the attractiveness of study, even in the cases of young women students, of whom we have not a few."

School of Aviculture in France.—A short account of the poultry farm school at Gambais, near Houdan, France, is given in a current number of the *Journal of the Board of Agriculture* of Great Britain. This school was founded by decree of the Minister of Agriculture in 1888, on a farm where the present directors had successfully carried on artificial incubation for some years previously. It is in the midst of a district where poultry farming is extensively followed. The practical appliances used at the school are more or less the invention of the original founders, who have introduced many improvements in existing machinery. The course, which is very practical, covers 3 months, and three courses are given from February to October. Pupils of either sex over 15 years of age are received alternately. A certain amount of elementary education is presupposed. The fees for the three months' course, including tuition, board, and lodging, are about $70. On leaving the school, pupils who have shown capacity to act as instructors in aviculture receive a certificate of competency, which, it is said, enables them without difficulty to obtain employment in this line of industry. Some 500 pupils have passed through the school since its foundation in 1888.

Personal Mention.—We note from *Science* that Douglas A. Gilchrist, professor of agriculture and director of the agricultural department at Reading College, has been appointed professor of agriculture at the Durham College of Science, Newcastle, in succession to Prof. T. H. Middleton, who was recently elected to the chair of agriculture in the University of Cambridge.

According to *Gardeners' Chronicle*, A. Millardet, professor of botany in the University of Bordeaux, France, has retired from active duty. Mr. Millardet's name is associated with the discovery of Bordeaux mixture, one of the widest known and most satisfactory of fungicides.

Dr. E. Zacharias, formerly director of the Botanic Gardens at Hamburg, has become director of the Hamburg Botanical Institute. This includes the Botanic Gardens, Economic Botanical Museum and Laboratory, and the Section of Seed Control and Plant Pathology.

Prof. Dr. Augusto Napoleone Berlese has been elected professor of phytopathology in the Royal High School for Agriculture in Milan, Italy.

Dr. J. B. de Toni, lately at Camerino, has become professor of botany and director of the Botanic Gardens at the University of Sassari, Italy.

Dr. Alessandro Trotter, late assistant in the Botanical Institute of the University of Padua, has been chosen professor of natural history and phytopathology in the School for Grape Culture and Enology at Avellino, Italy.

Dr. A. Fischer, professor of botany in Leipzig, has been called to the position of professor of botany and director of the Botanic Gardens at the University of Basel, Switzerland.

Dr. Treub, director of the Botanical Institute and Gardens at Buitenzorg, Java, is away on leave until March, 1903.

Miscellaneous.—A bill authorizing the transfer of supervision of national forest reserves, now under the jurisdiction of the General Land Office of the Interior

Department, to the Department of Agriculture, was defeated in the House of Representatives June 10, considerable objection developing on the score of additional expense and divided authority in administration.

In the consideration by the House of Representatives of the bill for the irrigation of arid lands, the agricultural colleges were brought forward quite prominently and in a way to show that they have many champions. The bill, as is known, dedicates to the construction of irrigation works the funds arising from the sale of public lands in the arid States, which is the principal source from which the Morrill fund is derived. A clause in the bill provides that in case the receipts from the sale of public lands not embraced by the irrigation bill are insufficient for the purposes of the second Morrill act, the deficiency shall be made up from any moneys in the Treasury not otherwise appropriated. An amendment to this clause, offered by Mr. Grosvenor, was to the effect that no part of the proceeds from the sales of public lands required to carry into full effect the provisions of the act of August 30, 1890 (the second Morrill act), should be set apart or diverted to the irrigation fund; in other words, that the colleges should be first provided for. The advocates of this amendment claimed that the second Morrill act practically mortgaged a portion of the proceeds from public lands; that the wisdom of this action was agreed to at the time the act was passed, and that the clause in the irrigation bill as it stood would place the colleges, in case of a deficiency, which was almost certain, at the mercy of Congress. The amendment was discussed at much length, and the point was made that the bill would take away the main support of the colleges, and would thus make them a direct burden upon the other resources of the Treasury. The position of the experiment stations in this regard was also pointed out, as well as the effect which the passage of the bill might have upon the pending bill to provide schools of mines in connection with the land-grant colleges. The opponents to the amendment claimed that as the bill stood it made the necessary provision for meeting the emergency, and that special legislation would not be necessary in order to provide the funds. It was quite evident that the friends of the irrigation bill realized how seriously Mr. Grosvenor's amendment would affect its operation, by withholding so large an amount from its working fund. The amendment was defeated and the irrigation bill, which has now become a law, carries the provision mentioned above for maintaining the appropriation under the second Morrill act.

The Board of Agriculture of Great Britain has given notice that the Colorado potato beetle has again made its appearance at Tilbury. It requests farmers and gardeners to examine their potato plants and to send to the board any insects suspected to be the potato beetle for investigation. The board has issued a leaflet with colored illustrations of the beetle, which it is sending out free of charge upon application.

The Department of Agriculture of Victoria has recently begun the publication of a journal similar to the monthly publications of a number of the Australian colonies. In it will be reported the results of the investigations and studies carried on by the officials of the Department of Agriculture, together with other matters of interest to those engaged in agricultural pursuits. The first number contains over 100 pages on subjects relating to horticulture and fruit growing, cereals, tobacco industry, economic entomology, live stock, dairying, and veterinary science. The articles are popular in character, and the initial number presents an attractive appearance. It should prove not only a useful source of information to the farmers of Victoria, but a means of following up what is being done in experimental and educational branches in that country.

The following note regarding an international agreement for the protection of birds useful to agriculture, concluded at Paris on March 19, is taken from *Science:* The parties to the agreement are Belgium, France, Greece, Lichtenstein, Luxemburg, Monaco, Austria-Hungary, Portugal, Sweden, Switzerland, and Spain. The agreement contains 16 clauses, of which the first states that birds useful to agriculture, especially insect eaters and birds enumerated in the lists attached to the agreement, are to enjoy an unconditional protection, and that the destruction of these birds, their nests, eggs, and broods is to be forbidden. Certain nocturnal birds of prey, as well as woodpeckers, bee-eaters, swallows, and several birds of the sparrow species, appear as useful birds, while ravens, magpies, jays, and others are branded as mischievous. Some exceptions protect sporting and other rights. Italy, a country in which the capture of northward-bound birds is a regular trade, does not appear amongst the signatories. According to statistics recently given in the Reichstag, no less than seven hundredweight of migratory birds were put on the Verona market at one time. The agreement will shortly be submitted to the Reichstag.

At the last session of the South Australian House of Assembly a resolution was adopted affirming the desirability of making experiments with cereals, manures, etc., under the auspices of the Department of Agriculture. In view of the present condition of the finances, the Minister of Agriculture has decided that for this season the work will be confined to experiments with fertilizers and with rust-resistant wheats. The experiments with fertilizers will be cooperative, and will be carried on at nine different places, there being, as a rule, 10 plats of 2½ to 3 acres each at the different places. About 20 rust-resistant wheats have been selected for trial in different localities. These experiments are likewise cooperative, the farmers all being members of the agricultural bureau and entering into an agreement to sell one-half of the crop of each variety to the department at 6d. above the local market price, "the object being to afford the neighboring farmers an opportunity of securing seeds of desirable wheats at a reasonable price." The Minister of Agriculture anticipates, another season, undertaking experiments in the fertilizing of vineyards, orchards, and pastures, as there is believed to be good opportunity for useful work in each of these directions.

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EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, PH. D., *Assistant Director.*

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With the cooperation of the scientific divisions of the Department and the Abstract Committee of the Association of Official Agricultural Chemists.

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EXPERIMENT STATION RECORD.

Vol. XIII. No. 11.

The biological activities of the soil, and their relations to soil fertility and to the availability of soil constituents, have not yet received the attention which their importance warrants. The study of maintenance of fertility and crop production has been confined too generally to supplying the necessary commercial fertilizers to meet the temporary demands. This field has been experimented upon quite thoroughly, and the limitations of fertilizer experiments are quite keenly felt by some who have followed that line for a series of years.

Little progress has as yet been made in studying availability or the conditions which influence or control it. It is now recognized as being associated with the biological activities taking place within the soil, and these in turn as influenced by a variety of conditions such as temperature, moisture, the atmosphere of the soil, etc. The process of nitrification, for example, may be changed to denitrification by unfavorable conditions of temperature and moisture, resulting in the dissipation of the nitrogen which has been made available by the first process. But the effect which different methods of tillage and soil management have upon the available plant food in the soil is only known to a very limited degree; for we have only slight knowledge of the character of the changes which are taking place and of the influences which favor or retard the desirable processes.

A plea for investigation along this line, in addition to fertilizer experiments, was made in a recent paper by W. Farrer before the Australasian Association for the Advancement of Science.[1] In this paper Mr. Farrer points out that the transformation of potential plant foods into available and assimilable forms is accomplished by the chemical, physical, and biological activities which are constantly occurring in the soil, and expresses the opinion that available materials may be produced in increased quantitities by increasing and stimulating these activities. He advocates making "such improvements in

[1] The absolute dependence of agricultural progress upon experiments, and suggestions in regard to some directions in which experimental work should be done for the agriculture of Australia. Reprinted in Agr. Gaz. New South Wales, 13 (1902), pp. 206–214.

our methods of tilling and managing the soil as will enable us to increase, and, if possible, give direction to the activities of the chemical and biological (bacterial) forces which are incessantly at work in it, and cause them to change potential plant foods into available forms in greater abundance than they do by means of our present methods." He reasons that "as the soil is known to be in general well supplied with potential plant foods—sometimes within 8 inches of the surface with enough for some hundreds of crops—it would be a far more philosophical course to make it our aim to learn how to make the greatest possible use of these potential plant foods than to devote our energies almost exclusively, as until lately we have been doing in our field experiments, to the study of hand feeding our crops with manures." He does not contend that we shall be able to dispense altogether with manures and fertilizers, but believes that "the potential plant foods which are already in the soil can be made to contribute far more largely, and that they should be made to contribute as much as possible to the nourishment of our crops; and that eventually, under ordinary conditions and for ordinary (as distinguished from intensive) farming, it will only be found necessary to hand feed crops with such plant foods as the soil is naturally or may become by cropping insufficiently provided with, or particular crops require in special abundance."

This proposition is not a novel one, but comparatively little experimental work has yet proceeded from it as a basis. The importance of the biological agencies at work in the soil has probably only been hinted at. The desirability of a better knowledge of them as a means of progress was forcibly pointed out by Professor Conn in his recent book on Agricultural Bacteriology. Professor Conn says:

"The whole problem of the soil fertility is inextricably woven with bacterial fermentation. From the origin of the soil, through its use by plants and the subsequent destruction to their original condition of the products formed, we find nearly every step accompanied by bacterial action. The continued fertility of the soil is thus associated with bacterial life. In the future the problem of the proper treatment of soil for the use of agriculture will be, in a very large degree, a problem of the proper control of bacteria. Agriculturists must learn to stimulate the bacterial actions which are advantageous and check those which are disadvantageous, if they would insure the continuance of soil fertility."

Referring to the possibility of influencing chemical changes in the soil, Mr. Farrer ventures the suggestion that "it may be we shall learn how, either by particular methods of treatment, or by the addition of certain substances, to give direction to, as well as increase, the chemical activity amongst the constituents of the soil. If we could learn, for instance, how to make soluble some of the insoluble silica in the soil, we might promote the formation of zeolitic substances, which are valuable for reasons of the same character as are the double humates." A number of American investigators, notably Hilgard and Snyder, are working in this direction, and have shown the important relation which the zeolitic substances and humates bear to soil fertility.

As Mr. Farrer remarks, the great need is for methods of investigation. "We must make the best use we can of our knowledge of principles for planning our experiments, and, when they fail, for finding out the causes of our failures, which we must go on eliminating until we have succeeded." The difficulties of the work should inspire rather than deter the investigator, and the possibilities for the exercise of originality and for securing results of the highest importance should attract a considerable number of investigators to take up the work systematically.

To a certain extent we are in a transition stage as regards soil and fertilizer investigations. We long since abandoned the theory of returning to the soil all of the fertilizing ingredients which the crop takes from it. We are relying upon the soil to furnish a certain amount of these substances in available form year by year, and are searching for a means of determining approximately how much of these available substances may be expected from a given soil, as a basis for the intelligent application of fertilizers. We know that the soil is of most complicated constitution; that its composition is constantly changing, mainly in the vegetable matter, as are also its physical conditions, particularly temperature and moisture, and that in consequence chemical changes of a complicated and obscure character are continually taking place in the fertile soil, through which small quantities of assimilable plant food are released from unavailable forms.

Considering these facts in connection with what is already known of the life of the soil, it would seem that studies of these biological and chemical agencies, and the conditions of culture and soil management favorable to their action or control, should at least form a prominent part in the study of problems of soil fertility.

The successful opening of the Graduate School of Agriculture at Columbus, Ohio, on July 7 is encouraging and inspiring to those who have been instrumental in arranging for it, and to the instructors who take part in it as well. The national character of the school was shown by the presence at the inaugural exercises of the Secretary of Agriculture, the president of the Association of American Agricultural Colleges and Experiment Stations, and a member of the executive committee of that association who has long been associated with agricultural education, as well as by the attendance of students from 25 different States, representing every section of the country.

There has been comparatively little effort in our agricultural colleges in the direction of providing courses of post-graduate instruction in the different branches of agriculture. The need for such advanced study for men who are to become instructors in the agricultural colleges, investigators in the experiment stations, and leaders in other fields of agricultural endeavor is being felt. This is a healthful sign, for it indicates that we are making progress. The establishment of a graduate school of agriculture, even though it covers only one month, is a significant step, for it marks a distinct epoch in the development of agricultural education.

The school is unique, for, so far as known, no such summer school of agriculture, embracing in its corps of instructors so many of the leading agricultural teachers and investigators, has ever been held by any country before. The opportunity to meet these specialists and gain something of their points of view is in itself an unusual one, which should prove of great advantage to the students; and the number and character of the latter will insure the instructors an inspiring audience.

An important result of the school will be to show some of the lines along which agriculture may profitably be specialized, and to open up to the younger college graduates the opportunities which are afforded for advanced study. It will serve also to bring out the strength of the workers in their respective lines, and to enforce the desirability of making provision for university instruction in agriculture. As the dean of the school said in his opening address: "In an unusual measure we believe this school will furnish inspiration and up-to-date knowledge to workers in our agricultural institutions gathered out of many States and Territories; but beyond this we believe that in its ultimate results the school will greatly aid in the formation of public opinion in favor of the more thorough and rational organization of agricultural education and research."

The early literature of agriculture, except for the writings of a comparatively few authors, is very little known, even in the most general way. With a view to encouraging greater familiarity with the earlier writers and preparing the way for a study of their works, Dr. Max Güntz has issued a Handbook of Agricultural Literature, in three parts. The first part appeared in 1897 and the third or final part has just been issued. In his preface Dr. Güntz expresses the belief that this early agricultural literature is a relatively neglected subject, even among specialists, but that it is of value in tracing the history of agriculture and the development of our theories, and might well form a part of the training of men who are taking advanced study in that branch.

The work represents a vast amount of search through the literature of different periods as found in a number of large libraries, and, so far as known, is the first attempt to bring these writings together in a systematic manner. The arrangement is by periods. Beginning with the Greek and Roman writers, the author follows the development of the literature which was epoch making or especially noteworthy for the times, down through the centuries, frequently noting briefly the conditions of agriculture which were prevalent at the different periods.

The work does not consist merely of bibliographical lists, but is more descriptive in character. In most cases some account is given of the books cited and the ground covered by them, and there are frequently brief biographic notes on the writers. Portraits of some 38 of these writers are given. Particular phases of the subject are discussed in several general articles. The evolution of different classes of books, as the "husbandman literature," agricultural handbooks, agricultural calendars, etc., is traced, and later the development of periodical literature.

For the recent literature the book is far more complete for Germany than for any other country; and the list of periodicals for the United States displays a lack of familiarity with our literature and sources of publication which is lamentable in a book of this character.

Such a work should possess considerable value as a basis for historical study, and in itself it makes it possible for the reader to get a general survey of the early writers on agriculture and their works.

1302—No. 11—02——2

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

Report of the professor of chemistry, R. Harcourt (*Ontario Agr. Col. and Expt. Farm Rpt. 1901, pp. 35–42*).—Analyses are here reported of soap, sorghum silage, several grains used as poultry foods, and of drippings from washed and unwashed curds made to determine the loss of casein due to washing. The loss before salting was greater in the case of washed curd, but after salting was greater in the case of curd which had not been washed. The total loss of casein was increased by washing. Work with sugar beets is noted elsewhere.

Miscellaneous chemical analyses, A. D. Selby and J. W. Ames (*Ohio Sta. Bul. 127, pp. 175–218*).—Analyses of various materials made by the chemical department during the years 1892–1901 are reported. These include corn and corn products, clover and timothy hay, wheat and wheat products, strawberries, blackberries, raspberries, currants, gooseberries, cherries, grapes, lead arsenate, Paris green, crude petroleum, dried blood, nitrate of soda, sulphate of ammonia, boneblack, phosphatic slag, acid phosphate, phosphate rock, muriate of potash, tankage, mixed fertilizers, corncob ashes, wood and coal ashes, jadoo fiber, liquid manure, limestones, and mineral waters. Some of the analyses have previously been reported (E. S. R., 11, pp. 142, 1046). Data concerning the average composition of many of the materials are collated from publications of other stations.

Treatise on agricultural chemistry (*Ann. Agron., 27 (1901), No. 12, pp. 594, 595; Rev. Sci., 4. ser., 17 (1902), No. 2, pp. 51–53*).—Notes on the second edition of Dehérain's well-known *Traite de Chimie Agricole*, which was presented to the French Academy December 9, 1901.

A plan for cooperating in the study of available plant food, C. C. Moore (*U. S. Dept. Agr., Bureau of Chemistry Circ. 9, pp. 8, figs. 3*).—A plan for the cooperative study of the soil of four fiftieth-acre plats bearing, respectively, oats, spring barley, spring rye, and spring wheat. The methods of sampling and analysis are described in detail. The proposed method of determining available phosphoric acid and potash given in this circular has already been noted (E. S. R., 13, p. 927).

On the determination of citrate-insoluble phosphoric acid, C. D. Harris (*Jour. Amer. Chem. Soc., 24 (1902), No. 1, pp. 25–27*).—An improved method of filtering the citrate solution is described as follows: Place in the bottom of a carbon filter "a tightly fitting perforated porcelain disk, to which is attached a small wire that extends down beyond the small end of the carbon filter. A rubber stopper is then fitted tightly in a pressure bottle and the carbon filter passed through it. A layer of asbestos is placed on the disk in the carbon filter and by the aid of pressure this gave entire satisfaction. By this method it took only from 30 to 40 minutes to filter and wash the residue." To save time in precipitation the author recommends the following procedure: "Just before adding the molybdic solution, to precipitate the phosphoric acid, neutralize the excess of acid with ammonia, and then add 10 or

12 gm. of ammonium nitrate; then the molybdic solution can be added immediately, for the ammonium nitrate cools the solution down to where it is safe to precipitate and no waiting to cool is necessary as is the case if ammonium nitrate is added before the excess of acid is neutralized."

The determination of calcium, strontium, and barium as oxalate, C. A. Peters (*Ztschr. Anorgan. Chem., 29 (1901), No. 1, pp. 145–155*).—Methods in which these substances are determined by titration of the oxalates with permanganate solution are described in detail and a number of determinations are reported. From these the conclusion is drawn that calcium may be accurately determined by titration of the oxalate with permanganate solution if hydrochloric acid (with the addition of a manganous salt) is used as a solvent. Practically complete precipitation of strontium by ammonium oxalate may be obtained in solutions containing one-fifth by volume of 85 per cent alcohol. Almost complete precipitation may be obtained in water solutions if the dilution does not exceed 250 cc. The strontium oxalate may be accurately titrated with permanganate solution either when sulphuric acid or hydrochloric acid (with the addition of manganese oxalate) is used as the solvent. Barium may be practically completely precipitated by means of ammonium oxalate in solutions containing one-third by volume of 85 per cent alcohol. The oxalate may be accurately titrated with permanganate solution when dissolved in hydrochloric acid with the addition of manganous salt. The strontium and barium oxalates may be converted into carbonate by ignition and weighed as such.

On the determination of sulphur in soils, T. Pfeiffer and R. Riecke (*Mitt. Landw. Inst. Univ. Breslau, 1 (1901), No. 5, pp. 47–51*).—The presence of large amounts of iron was found to interfere with the accurate determination of sulphuric acid by the ordinary method of removing iron with ammonia and precipitating sulphuric acid with barium chlorid in acid solution. The tests of different methods reported indicate that accurate results can be obtained only by fusion of the soil with potassium hydroxid and oxidizing substances.

Determination of nitrogen, F. Jean (*Ann. Chim. Analyt., 6 (1901), p. 441; abs. in Chem. Centbl., 1902, I, No. 5, p. 333*).—A distilling apparatus, especially a device for preventing solutions from being carried over into the condenser, is described. For decomposition of the mercury compounds the author uses sodium hypophosphite instead of sodium sulphid.

Analysis of water, H. Potell (*Bol. Agr. São Paulo, 2. ser., 1901, No. 10, pp. 635–649*).—This article discusses methods of analysis.

The evolution of the oxygen absorption test in water analysis, J. B. Weems (*pp. 8*).—This is a paper read before the Iowa Engineering Society at its thirteenth annual meeting at Davenport, January 16–19, 1901. A brief review of the history of this test is given, with a list of references to literature.

A delicate method for the detection of formaldehyde, C. Arnold and C. Mentzel (*Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 8, pp. 353–356*).—To 5 cc. of an alcoholic extract of the material under examination are added 0.03 gm. of phenylhydrazin chlorid and 4 drops of a solution of ferric chlorid. Upon the addition of 10 to 12 drops of concentrated sulphuric acid, with cooling of the solution, a red color appears.

The quantitative estimation of formaldehyde, L. Vanino and E. Seitter (*Ztschr. Analyt. Chem., 40 (1901), No. 9, pp. 587–589*).—The estimation of formaldehyde by the proposed method is made by the use of potassium permanganate, as often previously employed, and the use of strong sulphuric acid and hydrogen peroxid.

In carrying out the method 35 cc. of two-tenths normal potassium permanganate solution is placed in a glass stoppered flask of about 250 cc. capacity. There is added a previously mixed and cooled solution of 30 gm. of concentrated sulphuric acid and 50 gm. of water. There is then added slowly, with constant shaking, 5 cc. of about

1 per cent formalin solution, which is made by diluting 10 cc. of commercial formalin with 400 cc. of water. The flask is then stoppered and set aside for 10 minutes, with occasional shaking. The excess of potassium permanganate is then eliminated by the addition of one-tenth normal hydrogen peroxid solution.

With the author's work, 1 cc. of potassium permanganate solution determined iodometrically contained 0.0072601 gm. $KMnO_4$=0.001723 gm. H.COH; 21.175 cc. hydrogen peroxid equal 10 cc. potassium permanganate solution.

Progress in the analysis of butter, margarin, cooking fats, and oils, A. Hasterlik (*Oesterr. Chem. Ztg., 5 (1902), No. 7, pp. 148–152*).—A review of recent literature.

Note on the Reichert value of butter and other fats, E. Reychler (*Bul. Soc. Chim. Paris, 3. ser., 25 (1901), pp. 142–144; abs. in Analyst, 26 (1901), No. 300, pp. 71, 72*).—The author suggests an extension of the Reichert-Meissl method so as to obtain the amount of volatile insoluble acids. Instead of filtering, he adds 50 cc. alcohol, and, if necessary, a little ether to the distillate, and titrates the solution in the usual way. The ratio thus obtained between the total volatile acids and the soluble volatile acids varies with different fats, the difference being especially marked between butter and cocoanut oil. A table of results is shown.

Determination of cocoanut oil in butter, F. Ranwez (*Rev. Internat. Falsif., 14 (1901), No. 4, pp. 89–94; abs. in Chem. Centbl., 1901, II, No. 14, pp. 835, 836*).—A compilation and test of methods. That of Vandam is recommended. In this the amount of fatty acid soluble in alcohol of 60° strength is determined and the results expressed in cubic centimeters of deci-normal alkali.

The anatomy of the fruit of the cocoanut, A. L. Winton (*Connecticut State Sta. Rpt. 1901, pt. 2, pp. 208–225, figs. 11*).—The morphology and macroscopic structure of the cocoanut are described, and the histological characters of its different parts figured and discussed. Means are suggested for the detection of powdered cocoanut shells in ground spices. Of 147 samples of black pepper examined 21 contained ground cocoanut shells; of 37 samples of cloves 7 were similarly adulterated, and of 24 samples of allspice 6 contained cocoanut-shell powder. Radical differences in the composition between cocoanut shells and the spices to which they are added are shown by the analyses of the different materials.

Detection and approximate estimation of minute quantities of arsenic in beer, brewing materials, food stuffs, and fuels (*Jour. Soc. Chem. Ind., 21 (1902), No. 2, pp. 94–96, fig. 1*).—This is a report of the joint committee of the Society of Chemical Industry and of the Society of Public Analysts recommending and describing the Marsh-Berzelius method.

Methods for the analysis of insecticides and fungicides, J. K. Haywood (*U. S. Dept. Agr., Bureau of Chemistry Circ. 10, pp. 8*).—Methods are given for the analysis of Paris green, London purple, copper carbonate, potassium cyanid, soap, soda lye, tobacco and tobacco extracts, and formalin.

Experiments on the separation by means of metallic salts of the albuminoids produced by digestion, Z. Černy (*Arch. Physiol. [Pflüger], 87 (1901), No. 10–12, pp. 614–633*).—Laboratory work is described in detail.

The analysis of some new tanning materials, F. A. Blockey (*Jour. Soc. Chem. Ind., 21 (1902), No. 3, pp. 158–162*).

A method of gas analysis, A. Samojiloff and A. Iudin (*Physiologiste Russe, 2 (1901), No. 31–35, pp. 171–184, fig. 1*).—The method described is especially recommended for determining carbon dioxid and oxygen in respired air.

The sampling and preparation of shoddy, wool dust, and similar materials for analysis, L. Meggitt (*Jour. Soc. Chem. Ind., 21 (1902), No. 2, pp. 105, 106*).—Directions are given for the preparation of samples for the determination of nitrogen.

The pentosans, G. Bertrand (*Bul. Assoc. Chim. Sucr. et Distill., 18 (1901), No. 12, pp. 1019–1025*).—A historical and descriptive article on the pentosans.

The action of ammonium chlorid on various silicates, F. W. Clark and G. Steiger (*Ztschr. Anorgan. Chem., 29 (1902), No. 3, pp. 338–352*).

A new viscometer, L. Meggitt (*Jour. Soc. Chem. Ind., 21 (1902), No. 2, p. 106, fig. 1*).

BOTANY.

A university text-book of botany, D. H. Campbell (*New York: The Macmillan Co., 1902, pp. XV+579, pls. 15, figs. 493*).—This recent contribution to American botanical literature is, as its name suggests, a text-book for use in colleges and universities and is in no way intended as a laboratory guide, nor to supplant any of the numerous botanies for secondary schools. The author has presented in a very compact form an outline of the essentials of botany, and the work is intended more as a reference text-book than otherwise. As far as possible the illustrative material has been drawn from our native flora, and this feature will doubtless commend itself to American students. After a general introduction the author considers the plant body, describing its parts, structure, and function. A similar chapter is devoted to the plant cell, after which the classification of plants is treated in several chapters. In this the several orders are described, beginning with the lowest and ending with the highest, the sequence of orders following in the main that of Engler and Prantl in their Die natürlichen Pflanzenfamilien. The physiology of the plant is discussed at considerable length, the method of treatment being based largely on that of Pfeffer's recent work, but the results obtained by other recent investigators have been quite extensively incorporated. Chapters are devoted to the relation of plants to their environment and to their geological and geographical distribution. Short lists of works that are believed to be of most value for the student are appended to the various sections, and the illustrations are for the most part new, many having been drawn expressly for this work.

The movements of plants, F. Darwin (*Nature [London], 65 (1901), No. 1672, pp. 40–44, figs. 6*).—This article is a lecture delivered by the author before the British Association for the Advancement of Science, in which an attempt is made to explain the different movements in plants and their physiological causes. The author appears to consider that gravity in some of its modifications is the principal stimulus to plant movement.

Injuries to plants by London fog and engine smoke, G. Henslow (*Jour. Roy. Hort. Soc. [London], 26 (1901), Nos. 2–3, pp. 310–313*).—This is a lecture delivered to the students at the gardens of the Royal Horticultural Society, in which the injurious effects of fog and smoke are shown. A similar paper by the author has been noted (E. S. R., 12, p. 826), in which the percentage of sulphurous acid occurring in the atmosphere was given. These figures are erroneous, according to the present paper. The average amount of sulphurous acid in dull weather should have been 6 mg. per 100 cu. ft. of air. The amount in a light fog was 8.16 mg., while in a thick yellow fog it amounted to 20.4 mg., instead of percents as given in the previous article.

Influence of mineral salts on the production of tubercles on pea roots, E. Marchal (*Compt. Rend. Acad. Sci. Paris, 133 (1901), No. 24, pp. 1032, 1033*).—By means of peas grown in water cultures, the author has investigated the effect of different salts of potassium, sodium, calcium, ammonium, and magnesium upon root tubercle development. The different salts were used in strengths ranging from 0.5 to 5 gm. per liter of its culture medium. The results showed that the alkaline nitrates in the proportion of 1:10,000 checked the production of root tubercles on peas grown in water cultures. The ammonium salts exercised a similar action when used in strengths of 1:2,000. Potassium salts tended to retard symbiosis when used in strengths of 1:200, and sodium salts, 1:300, acted similarly. On the other hand, calcium and magnesium salts greatly favored the production of root tubercles. Phosphoric acid, although quite variable, depending on the base used, in the main exercised a stimulating effect. The action of the nitrates seems to be the production of an osmotic state which is prejudicial to the entrance of the organism causing root tubercles.

The formation of bacteroids in artificial media, A. Stutzer (*Centbl. Bakt. u. Par., 2. Abt., 7 (1901), No. 25, pp. 897–912*).—Studies are reported on the bacteroids of peas, alsike clover, red clover, crimson clover, horse beans, vetches, garden beans, lupines, serradella, and soy beans. The organisms as influenced by growth in a number of artificial media are described.

The assimilation of free elementary nitrogen, E. Jacobitz (*Centbl. Bakt. u. Par., 2. Abt., 7 (1901), Nos. 22, pp. 784–794; 23, pp. 833–844; 24, pp. 876–890*).—A critical review is given of some of the more important literature relating to the assimilation of atmospheric nitrogen, and a bibliography of 113 publications is included.

The nitrogenous constituents of green leaves, E. Winterstein (*Ber. Deut. Bot. Gesell., 19 (1901), No. 5, pp. 326–330*).

Investigations on the fixation of carbon by leaves and the diffusion of carbon dioxid, H. T. Brown (*Ann. Agron., 27 (1901), No. 9, pp. 428–439*).—This is a translation by E. Demoussy of a presidential address delivered before the British Association for the Advancement of Science (E. S. R., 11, p. 1015).

The presence of a glucosid formed during the germination of beech seed, P. Tailleur (*Compt. Rend. Acad. Sci. Paris, 132 (1901), No. 20, pp. 1235–1237*).—During the process of germination of beech seed a glucosid is formed which is said to disappear with the first season's growth. It is localized in the hypocotyl and is present to a slight extent in the upper part of the root, but is not found in the cotyledons nor does it occur in the stems or leaves. This glucosid acted upon by the diastase of the seed in the presence of water gives rise to methyl-salicylic ether and glucose, which is assimilated by the plant. This ether is identical with that produced by wintergreen and which has also been found produced under the same conditions as described above in the roots of Polygola and Spiræa, in the petioles and leaves of certain species of Azalea, in the bark of black birch, and other plants.

A physiological balance, A. Petermann (*Bul. Inst. Chim. et Bact. Gembloux, 1901, No. 70, pp. 22, 23, pl. 1*).—A form of balance is described which was devised by Gregaire and Hendrick, by the use of which a constant state of humidity may be secured throughout the growing period of a plant.

The genera of Gastromycetes, C. G. Lloyd (*Cincinnati: Author, 1902, pp. 24, pls. 10*).—The author presents a general classification of the genera of Gastromycetes. An introduction is given in which the various parts of the fungi are described and the life history is traced. A brief historical sketch is given of the group, followed by the classification in which about 22 genera are recognized.

Monilia sitophila, an economic fungus of Java, F. A. F. C. Went (*Centbl. Bakt. u. Par., 2. Abt., 7 (1901), Nos. 15, pp. 544–550; 16, pp. 591–598, pl. 1; Proc. Sec. Sci. Koninkl. Akad. Wetensch. Amsterdam, 3 (1901), pp. 489–502*).—A description is given of "ontjom," a small cake said to be quite common in West Java. It is made from peanuts and is of an orange color, due to the conidia of the fungus *M. sitophila*. The fungus seems to exert a very active influence through enzyms secreted by it upon the material of which the cake is made. The morphology of the fungus is described at length and the various changes induced by it are traced. A study was made on the influence of nutrition on the secretion of enzyms by this fungus. The fungus thrives well on such media as peanuts, bread, carrots, milk, broth, potatoes, etc. The growth on the various media shows that albuminous substances and peptone can serve as sources of carbon and nitrogen. For the production of the enzym which characterizes the fungus the author found that certain substances favored its development. The enzym, to which the name maltoglucase is given, is exclusively secreted when the fungus has access to certain carbohydrates. The best for this purpose is raffinose, followed by dextrin, maltose, galactose, glycogen, cane sugar, etc., in the order named.

Monilia sitophila and its appearance as the first vegetation on the ash fields left by volcanic eruptions, A. G. VORDERMAN (*Teysmannia, 12 (1901), No. 6, pp. 274–279*).—The author notes the occurrence of this fungus abundantly on the branches and trunks of trees in a district where everything had been killed by a rain of hot ashes after a volcanic eruption.—H. M. PIETERS.

The useful plants of French Guiana, M. GRESHOFF (*Bul. Kolonial Mus. Haarlem, 1901, No. 25, pp. 23–45*).—Brief economic notes are given upon a collection of nearly 200 useful plants of French Guiana which were prepared for the Paris Exposition of 1900.

FERMENTATION—BACTERIOLOGY.

A contribution to the knowledge of bacterial diseases of plants, C. J. J. VAN HALL (*Inaug. Diss., Univ. Amsterdam, 1902, pp. 198*).—In the first part of this work the author summarizes our knowledge relative to plant diseases that are known to be caused by bacterial attacks, and briefly considers a large number of others which are considered as probably of bacterial origin, but of which the evidence is not wholly conclusive. Among the diseases which have been demonstrated as of bacterial origin are the brown rot of crucifers, brown rot of potatoes, cucurbit wilt, Wakker's hyacinth disease, sweet-corn wilt, pear blight, lilac blight, olive tuberculosis, bean bacterial blight, carrot rot, ruta-baga and turnip rot, a new disease of iris, and the rot of hyacinths due to *Bacillus hyacinthi septicus*. Among those which are suspected as being due to attacks of bacteria are a rotting of potatoes, mulberry-tree blight, corn blight, timothy blight, a sugar-beet disease, celery bacteriosis, cotton-boll blight, fruit rot of tomatoes, sorghum blight, onion slime rot, grape gummosis, grape bacteriosis, "maladie d'Oleron" of grapes, a form of potato scab, bacteriosis of lupines, sugar-cane gummosis, canker of ash trees, etc. The evidence of the bacterial origin of the carnation bacteriosis, the mosaic disease of tobacco, and the "sereh" disease of sugar cane is not considered as sufficient to permit of their being classed as bacterial diseases.

In the second part of the dissertation an account is given of the author's investigations on some new diseases. These included studies of *Bacillus subtilis* and *B. vulgatus* as parasites which cause the rotting of parts of many plants; descriptions of a new disease of the German and Florentine iris, due to attacks of *Pseudomonas iridis*, n. sp.; a rotting of potato stems by *Bacillus atrosepticus;* and a disease of lilacs caused by *Pseudomonas syringæ*, n. sp. The symptoms of these different diseases are fully described, and the results of isolation, culture, and inoculation experiments are given. The new species of bacteria are described in detail, and their behavior toward a large number of media is indicated.

On different forms of hereditary variation of microbes, M. W. BEIJERINCK (*Proc. Sec. Sci. Koninkl. Akad. Wetensch. Amsterdam, 3 (1901), pp. 352–365*).—An account is given of observations made upon many bacteria when grown in various cultures. In comparing the results obtained with bacteria and similar organisms the rules found applicable to higher organisms do not apply. In the first place, there is a want of sexuality, the variations being comparable with bud variations of the higher plants; and in the second place, the organisms are unicellular, which, in the author's opinion, tends to render more apparent the phenomena of variation. A discussion is given of different forms of variation and the conclusion drawn that hereditary variability is a function of growth, in particular of slackened or weakened growth, and that variability attacks only one characteristic at a time. The forms of hereditary variability are grouped in 3 classes: In those in which variation is caused by degeneration all the individuals gradually losing their vegetative power, so that species may cease to exist. By transformation, individuals may lose a specific characteristic and acquire another. By hereditary variability or variation, the normal form throws off some individuals which possess characteristics strongly differing from those of the normal form, while the normal form continues to propagate quite unchanged. The author believes that many of the so-called new species are only variants of others and are not new species. Especially is this true among bacteria where the want of crossing strongly favors the continuation of variants once produced. If these variants become isolated the discoverer is liable to recognize them as new species, but their affinities can be determined only after prolonged investigation.

Symbiosis and symbiotic fermentation, J. R. GREEN (*Proc. Roy. Inst. Great Britain, 16 (1900), II, No. 94, pp. 261-273*).—In a paper read before the Royal Institution, the author discusses symbiosis at considerable length, describing many of the best known forms. Among those mentioned are the symbiosis between phanerogams, the symbiosis of lichens, the symbiosis existing between the Leguminosæ and the bacteria of the root tubercles, and the symbiosis in kephir, ginger beer, and that reported from Madagascar in which sugar cane is attacked by organisms which consist of yeast and bacteria associated in the same way as are the organisms of the ginger-beer plant.

The disinfectant properties of washing powders, C. F. DOANE (*Maryland Sta. Bul. 79, pp. 51-64*).—A report is given of the value of a number of washing powders, sal soda, baking soda, and caustic soda as disinfectant agents for the cleansing and purifying of culinary and dairy implements and vessels. The washing powders were found to have a decided value for destroying bacteria, as also did the sal soda. Baking soda had little or no effect on the germs present in the cultures tested. Dilute caustic soda was also without effect. A test was made to determine whether the free alkali in the washing powders is entirely responsible for their antiseptic properties, the results indicating that such is not the case.

The effect of physical agents on bacterial life, A. MACFADYEN (*Proc. Roy. Inst. Great Britain, 16 (1900), II, No. 94, pp. 448-457*).—An abstract is presented of a paper in which the effect of various physical agents on bacterial life is described. Among those mentioned are gases, electricity, mechanical agitation, etc.

Studies of the efficiency of water filters in removing different species of bacteria, S. DE M. GAGE (*Massachusetts State Bd. Health Rpt. 1900, pp 527-535*).—A report is made on the relative efficiency of continuous and intermittent filters for the removal of bacteria from river water. The filters were constructed, and the waters tested were supplied with a number of species of organisms, and the filtrate examined. The intermittent filter showed somewhat greater distribution of species and a slightly poorer efficiency than the continuous filter. The efficiency of the continuous filter in removing bacteria in every instance but one was about 99 per cent. Both kinds of filters were most efficient in the removal of the more common and widely distributed species of bacteria.

Notes are also given on the significance of *Bacillus coli* in filtered water. This organism is found in the effluents of filters more commonly than *B. typhi*, the waters being examined for that organism at the same time. The experiments indicate that *B. coli* is more hardy than the other species, and *B. typhi* could not serve as a test organism as well as the previous species.

Studies of media for the quantitative estimation of bacteria in water and sewage, S. DE M. GAGE and E. B. PHELPS (*Reprint from Proc. Amer. Pub. Health Assoc. 1901, pp. 8*).—A report is given of the comparative value of a number of different media for the estimation of bacteria in waters and sewage. The tendency at present is toward a medium which will permit of the shortening of the period of incubation necessary to give an opinion on the purity of water. Of the dozen or more media tested, that known as Nahrstoff-agar has advantages over all the other media for quantitative work. In all the tests with this medium, the counts of bacteria more nearly approximate the actual bacterial content of the water than is the case with any other medium known to the authors. This medium is said to be a pure albumose made from egg albumen, and, although somewhat complex in composition, is less liable to vary than the usual materials used. This is considered a distinct advantage, as it enables bacteriologists to prepare a medium of uniform composition, making the results obtained at different laboratories comparable.

Bacteria and sewage, F. Clowes (*Proc. Roy. Inst. Great Britain, 16 (1900), II, No. 94, pp. 317–324, figs. 9*).—A discussion is given of the relation between sewage and bacteria, and the purification of sewage by the action of numerous organisms.

Bacteria and the disintegration of cement, R. G. Smith (*Proc. Linn. Soc. New South Wales, 26 (1901), pt. 1, pp. 107–117*).—A number of authors having reported the disintegration of cement linings of waterworks and reservoirs by the action of bacteria led the author to investigate the subject in connection with the Sydney water supply. The cement above water line was hard, while below the water it was soft and easily broken away. An examination of the sediment showed the presence of a considerable number of bacteria; among them were specimens of *Vibrio denitrificans* and *Micrococcus radiatus*. Cultures were made of these organisms and they were grown upon cement blocks without any disintegration being observed. As a result of these observations the author believes there is considerable room for doubting the action of micro-organisms on cement, but thinks that the action is purely chemical, brought about by the decomposing and solvent action of the water.

On the nature of certain oxidizing ferments, J. H. Kastle and A. S. Loevenhart (*Amer. Chem. Jour., 26 (1901), No. 6, pp. 539–566*).—A report is given of extended studies on the oxidizing ferment found in the common potato. As a result of their investigations the authors claim that oxygen is absolutely essential to the production of the guaiacum-bluing ferment of the potato. This so-called oxidizing ferment, they believe, is an organic peroxid and not a true soluble ferment. It is believed that the oxidizable substances are oxidized to the peroxid condition by molecular oxygen, and that the peroxids thus formed give up part of their oxygen to other less oxidizable substances present in the cell; in other words, that the process of rendering oxygen active by the living cell is probably brought about in essentially the same way as that accomplished by phosphorus, benzaldehyde, and other oxygen carriers—that is, as one phase of autooxidation.

Oxidizing enzyms, C. R. Newton (*Indian Gard. and Plant., 9 (1901), No. 22; abs. in Jour. Soc. Chem. Ind., 21 (1902), No. 3, p. 182*).

Note on the production of casease by a streptothrix parasite, E. Bodin and C. Lenormand (*Ann. Inst. Pasteur, 15 (1901), No. 4, pp. 279–288*).—The authors describe a fungus of the form Oospore of Microsporum that when grown in a milk culture produces an enzym that is able to coagulate the casein like rennet and another enzym that possesses the power to dissolve the coagulated casein like the casease of Duclaux.

ZOOLOGY.

Destroying gophers and prairie dogs, D. E. Lantz (*Kansas State Bd. Agr. Quart. Rpt. 1902, Mar. 31, pp. 325–330, pl. 1, fig. 1*).—*Geomys bursarius* is generally distributed in the eastern part of Kansas, while *G. lutescens* is found chiefly in the western parts of the State. The adoption of the bounty system in destroying these pests is considered ineffective. The use of carbon bisulphid and traps in the burrows, and scattering poisoned baits are recommended for destroying these animals. The prairie dog is especially common in the western part of the State, where it is estimated that

2,000,000 acres of land are infested. Fumigation with carbon bisulphid and the use of baits poisoned with strychnin are recommended.

A coli bacillus affecting the hamster, B. GALLI-VALERIO (*Centbl. Bakt. u. Par., 1. Abt., 30 (1901), No. 7, pp. 273-276, figs. 2*).—An infectious disease was observed among hamsters which had been imported from Alsace in 1900. The disease caused the death of a large proportion of infected animals within a few days. Animals which died of the disease showed an enlargement of the liver, which was affected by a complete fatty degeneration. Microscopic examination of the liver, spleen, and blood revealed the presence of large numbers of bacilli which belonged to the coli group. Detailed notes are given on the culture experiments conducted with these organisms. Inoculation experiments with rabbits, guinea pigs, and chickens gave negative results. Positive results, however, were obtained from experiments on mice.

Studies on the bacillus pathogenic for rats, B. ISSATSCHENKO (*Centbl. Bakt. u. Par., 1. Abt., 31 (1902), No. 1, pp. 26-28*).—The author made numerous experiments on the bacillus, which was found to cause fatal infection in mice and rats but which did not affect domesticated animals; cats, dogs, chickens, and pigeons were not infected by eating food containing pure cultures of the bacillus. Feoktistoff carried out similar experiments on horses, cattle, hogs, sheep, dogs, cats, and domestic poultry, with similar results. None of the animals became infected or showed any evidence of disease. In feeding experiments with the bacillus it was found that rats and mice almost without exception became infected with a fatal disease. The death rate was greatest 15 days after infection. Only 2.7 per cent of the rats and mice upon which experiments were made resisted infection.

The value of the bacillus of Danysz in destroying rats, G. MARKL (*Centbl. Bakt. u. Par., 1. Abt., 31 (1902), No. 5, Orig., pp. 202-204*).—Numerous experiments were made for the purpose of comparing the effect of this bacillus with that of the bacillus of mouse typhus. It was found that the serum of a rabbit which had been inoculated subcutaneously with a sterilized culture of the Danysz bacillus agglutinated the culture of this organism when added in the proportion of 1 to 50, or 1 to 100 parts, while it had no such effect on the culture of the bacillus of mouse typhus. It is believed that the use of the Danysz bacillus in destroying rats offers only slight advantages over chemical poisons.

Comparative studies on the bacillus of Danysz, and a new organism pathogenic to rats, M. GRIMM (*Centbl. Bakt. u. Par., 1. Abt., 31 (1902), No. 7, Orig., pp. 286-293*).—The behavior of these 2 organisms on various nutrient media, and their pathogenic properties and resisting power to different chemical and physical agents, are compared. The new organism described by the author proved to be very pathogenic for rats, but experiments indicated that it was also pathogenic to some extent for the larger domesticated animals. Its use, therefore, in combating rats on farms or in the neighborhood of cities must be somewhat limited.

The biology of the trypanosoma of rats, JÜRGENS (*Arch. Hyg., 42 (1902), No. 3, pp. 265-288*).—The material with which the author made his experiments was obtained from 2 wild gray rats which were thoroughly infested with trypanosoma. It was found possible to transmit the parasites to white rats, in all of the 47 tests which were made. A small quantity of blood was taken from the caudal vessels of the infected rats, mixed with an equal quantity of normal salt solution, and injected into the peritoneal cavity of the experimental animals. The demonstration of the parasites in the blood of the inoculated animals was possible after 3 or 4 days. The incubation period, during which it was not possible to find the parasites, varied somewhat according to the amount of material which was used for inoculation purposes. The incubation period is also much affected by the developmental stage of the parasites. If the blood which is used for inoculation contains larval parasites, the period of incubation is only 1 or 2 days.

Annotated list of the birds of Oregon, A. R. WOODCOCK (*Oregon Sta. Bul. 68,* *pp. 118, pl. 1*).—In this bulletin the author has prepared a list of all birds known to nest or to be found as migrants in the State of Oregon. The number of species thus slited is about 325. Brief notes are also given on the nesting and feeding habits of various species. A copy of the bird laws of Oregon is appended to the bulletin.

The birds of Ontario in relation to agriculture, C. W. NASH (*Toronto: L. K. Cameron, 1901, pp. 79, figs. 32*).—In this pamphlet notes are given on the feeding habits of hawks, owls, shrikes, crows, blackbirds, orioles, meadow larks, woodpeckers, nuthatches, titmice, thrushes, robins, catbirds, wrens, warblers, flycatchers, swallows, sparrows, and a few game birds. In general it is argued that birds, by their extensive destruction of insects, render a service to agriculture which far more than counterbalances the damage caused by eating fruits and grains.

The relation of birds to horticulture, W. R. LAZENBY (*Proc. Columbus Hort. Soc., 16* (*1901*), *No. 1, pp. 62–64*).—It is believed by the author that the unusual prevalence of certain species of injurious insects may be partly due to the reckless destruction of birds.

Bird notes, M. W. DOHERTY (*Ontario Agr. Col. and Expt. Farm Rpt. 1901, pp. 31–34*).—Brief notes are given on the prevalence and feeding habits of orioles and sparrows, as well as upon the migratory movements of birds as observed for the season of 1901.

The feeding habits of Corvus cornix, G. STAES (*Tijdschr. Plantenziekten, 7* (*1901*), *No. 1, pp. 1–9*).—In this article the results are given of a series of investigations on the feeding habits of this species of crow. Of the 150 stomachs which were examined, 39 were empty, 85 contained plant substances almost exclusively, 5 were filled with the remains of animal food, and 8 contained mixed food. A considerable variety of insects were found which had been eaten by the crow, some of the species being injurious and some beneficial. The crow had also fed upon corn, cereal grains, potatoes, and other farm crops.

The value of Fringilla cœlebs for agriculture and horticulture and general remarks on the protection of birds, J. RITZEMA BOS (*Tijdschr. Plantenziekten, 7* (*1901*), *No. 5–6, pp. 165–176*).—This species of bird, while feeding largely upon seeds, is also known to eat a considerable variety of insects in various stages, and is therefore considered distinctly beneficial to agriculture. Notes are also given on the desirability of protecting all common birds which are known to have beneficial feeding habits.

Legislation for the protection of birds other than game birds, T. S. PALMER (*U. S. Dept. Agr., Division of Biological Survey Bul. 12, rev. ed., pp. 143, pls. 4, figs. 7*).—A revised and enlarged form of this bulletin, including copies of legislation enacted since the publication of the first edition of the bulletin (E. S. R., 12, pp. 616, 617).

Directory of State officials and organizations concerned with the protection of birds and game, 1902, T. S. PALMER (*U. S. Dept. Agr., Division of Biological Survey Circ. 35, pp. 10*).—A list of State officials concerned with the protection of birds and game, as well as officials connected with national organizations, State organizations, and Audubon societies, for this purpose.

METEOROLOGY.

Storms accompanied by snow at different stations in Italy (*Nature* [*London*], *65* (*1902*), *No. 1686, p. 372*).—"In connection with the campaign against hailstorms, Prof. V. Monti publishes in the *Bulletin of the Italian Meteorological Office* some statistics of the number of storms accompanied by snow at different stations, as recorded for the period 1881–1887, inclusive. The phenomenon of snow during thunderstorms is shown to be very rare in Italy, and in about one-fourth of the storms in which snow fell it was also accompanied by hail. When account is taken of the time of year, as well as of the altitude of the station, it is found that in the majority of cases snowy thunderstorms occurred when snowy weather was the normal condition of affairs. There are but few records of snow falling out of season as a result of the sudden cold produced by thunderstorms. These statistics, so far as they go, are interesting as affecting the theory that by bombarding a thunderstorm the hail is transformed into snow. If snow frequently falls after a storm-cloud has been bombarded, and rarely under other circumstances, the theory in question obtains support. But, as Professor Monti points out, we have not at present sufficiently complete statistics to enable any very definite conclusions to be drawn."

Meteorological summary for 1900, C. A. Patton (*Ohio Sta. Bul. 128, pp. 219–231*).—This summary includes notes on the weather 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 previous years and for other parts of the State. The following is a summary of results:

Summary of meteorological observations in Ohio.

	For the experiment station.		For the State.	
	1900.	Average for 13 years.	1900.	Average for 18 years.
Temperature (°F.):				
Mean	50.7	49.2	52.2	50.8
Highest	(July 4) 95	(Aug. 8, 1891) 99	(July 4, Aug. 6, and Aug. 10) 103	(July 4, 1897) 113
Lowest	(Feb. 27) 10	(Feb. 10, 1899) 21	(Jan. 29, Feb. 27) −20	(Feb. 10, 1899) −39
Mean daily range	20.6	20.6	....	....
Greatest daily range	(May 6) 43	(Oct. 6, 1895) 55	(Feb. 9) 57	(Sept. 28, 1897) 67
Clear days	149	123	....	....
Cloudy days	118	119	....	....
Days rain fell	132	126	107	127
Rainfall (in.):				
Greatest monthly	(Aug.) 5.97	(July, 1896) 8.05	....	....
Least monthly	(Dec.) .99	(Sept., 1897) .29	....	....
Mean yearly	....	....	32.87	37.78
Prevailing direction of wind	SW	S.-SW	SW	SW.

Meteorological observations, H. H. Hume and A. W. Blair (*Florida Sta. Rpt. 1901, pp. 96, 97*).—A tabular summary of daily observations on maximum and minimum temperature, atmospheric pressure, and rainfall for the 6 months ended June 30, 1901.

Meteorological summary for the year 1901, D. Valet (*Chron. Agr. Canton Vaud, 15 (1902), No. 9, pp. 267–271*).—A summary of observations at Lausanne and other places in Switzerland on temperature of the air and soil, precipitation, sunshine, etc.

The moon and thunderstorms, A. B. MacDowall (*Nature [London], 65 (1902), No. 1686, p. 367, fig. 1*).—Diagrams are given which show the distribution of thunderstorms about the different quarters of the moon as shown by data recorded at Greenwich. The results are compared with those reported by Hann. "All agree in showing a larger percentage [of thunderstorms] about new moon than about full moon and in the two earlier phases than in the two later."

The mode of action of cannon used for protection against hail, G. Gastine and V. Vermorel (*Grêle, 2 (1901), Nos. 3, pp. 12–18; 4, pp. 13–16*).

Hailstorms and cannonading, F. Houdaille (*Les orages à grêle et le tir des canons. Paris: Félix Alcan, 1901, vol. 1, pp. ——, figs. 63; rev. in Ann. École Nat. Agr. Montpellier, n. ser., 1 (1901), No. 1, p. 98*).

Climatological atlas of the Russian Empire, RYKATCHEW (*Atlas climatologique de l'Empire de Russie. St. Petersburg, 1900; rev. in Nature* [*London*], *65* (*1902*), *No. 1694, pp. 554, 555*).

Destruction by lightning in Ontario, 1901, J. B. REYNOLDS (*Ontario Agr. Col. and Expt. Farm Rpt. 1901, pp. 2–6*).—A summary of statistics collected by the agricultural college relating to loss of life and destruction of buildings and stock during the year, with a brief discussion of means of protection of barns from lightning.

SOILS.

Lands of the Colorado Delta in the Salton Basin, California, F. J. SNOW, E. W. HILGARD, and G. W. SHAW (*California Sta. Bul. 140, pp. 51, pl. 1, figs. 5*).—This is an account of a study of the soils and agricultural conditions and possibilities of that portion of the delta of the Colorado River which slopes toward the north into the Salton Basin or Sink. The area "is to a considerable extent covered with alluvial deposits originally derived from the Colorado River; as is clearly indicated by their nature, as well as by the fact that at times of exceptional high water (such as occurred in 1890) the river overflows into the basin through 2 channels, named respectively the Salton and New rivers. The alluvial deposits of the river finally cut off the upper end of the Gulf [of California] so that now a large area of alluvial country, or delta, extends between the Salton Basin and the present head of the Gulf. As to the thickness of these delta deposits, the only evidence as yet available is from a boring at Imperial made to determine the feasibility of obtaining artesian water in this region. This boring was carried to the depth of 685 (?) ft. without penetrating anything different from the various materials found at or near the surface, and without finding water. It is thus apparent that the Gulf was originally of very considerable depth." Within this area occur two extreme typical classes of soil, namely, a very hard compact clay and a silt or loam soil. The latter occupies about one-fourth of the entire area studied. Between these two extremes occur many transition grades. "The silt soil contains about 60 per cent of silt of medium to coarse grade, which imparts the distinctive character to the soil. It also carries from 10 to 15 per cent of very fine silt, which in some respects might act similarly to clay in respect to capillary power. The soil characterized as clay carries about 30 per cent of clay proper, and over 60 per cent of very fine silt; making over 90 per cent of extremely fine matter, which, when compacted (as much of it is), makes a material almost impervious to water."

Experiments made in long glass tubes showed that "the silt soil became wet to the depth of 3 ft. within 18 hours, while in the case of the clay soil it required 165 days for the water to reach the same depth; a rate entirely prohibitive of successfully handling this soil under its highly saline conditions."

In tests of the capillary rise of water in the soils it was found that in the case of the silt soils the water rose 2 in. in 7 minutes, 4 in. in 18 minutes, 7 in. in 1 hour, and 10 in. in 1 hour and 43 minutes, "while it took the clay 11 hours and 17 minutes to draw the water to a like height, or approximately 10 times as long. This rate, however, diminishes somewhat more rapidly in the silt as the water column ascends, than it does in the clay. The water-holding power is greater by 30 per cent in the case of the clay than in the silt, which might be expected on account of the difference in the nature of the 2 soils."

The chemical analyses of the soils reported show that as a rule their intrinsic fertility is high. The percentage of potash is large, "there being nearly four times as much as the average for soils of humid regions," and the supply of phosphoric acid and humus is good. The percentage of lime is high and it is present largely in the form of carbonate. The proportion of soluble matter is much larger in the clay soil than in the silt or loam soil. The percentage of alkali in the soils is very variable, but generally high. This alkali is of the "white" type, that is, that in which the relatively innocuous sulphates predominate. "Carbonate of soda is quite subordinate, because of the presence of gypsum throughout the materials. Common salt is rather abundant near the surface, but only in small supply below the first 3 ft., until a depth of 20 ft. is reached. Nitrates appear to be present throughout, to an extent varying from 1,000 to 1,800 lbs. per acre (0.025 to 0.044 per cent) in 4 ft. depth; increasing from the surface downward, contrary to the usual rule." While it appears that the clay soils are more heavily impregnated with alkali than the silt or loam soils it would seem that the clayey, plastic, and impervious character of the former is a more serious obstacle to their utilization for agricultural purposes than the alkali salts.

Analyses of water of the Colorado River, Blue and Cameron lakes, and of a well at Cameron Lake, with reference to their use in irrigation, are reported. The results show that the composition of the Colorado River water is quite variable at different periods of the same season and in different seasons and that while it "could be used with impunity upon the silts, it would but increase the extremely undesirable saline conditions of the clay soils of the region." Methods of irrigating alkali lands so that evaporation from the surface is reduced to a minimum are discussed and the need of a thorough system of drainage is explained. The climatic conditions and the plant growth of the region are described and a list of crops adapted to alkali soils with their limits of tolerance for alkali is given.

Willis and Huntsville tobacco soils, H. H. Harrington and P. S. Tilson (*Texas Sta. Bul. 61, pp. 14, pls. 2*).—Chemical and mechanical analyses of 18 samples of soil from Willis and 6 from Huntsville are reported, with analyses of 6 samples of Connecticut Valley tobacco soils and a discussion of the adaptability of the Texas soils to the growth of filler and wrapper tobacco. Recommendations are given regarding the fertilizers required, based upon analyses of the ash of 4 samples each of the tobacco leaf grown in the 2 localities. Determinations of nicotin showed that the percentage in the Willis and Huntsville tobaccos varied from 1.75 in the wrapper to 2.5 in the filler. The conclusion was reached that the soils of Willis are admirably adapted to the growth of high-grade filler or wrapper, the growth of filler perhaps being more likely to be profitable under present conditions than the growth of wrapper tobacco. "Yet with greater outlay of capital, and especially with the introduction of shade growth, and with the application of irrigation, a most satisfactory wrapper can be grown."

The soil and the agricultural conditions of Prussia, A. Meitzen and F. Grossmann (*Der Boden und die landwirthschaftlichen Verhältnisse des Preussichen Staates. Berlin: Paul Parey, 1901, vol. 6, pp. XVIII+656+526*).—The sixth annual report on the comprehensive survey of the soil and agricultural conditions of Prussia, published under the auspices of the Minister of Agriculture, Domains, and Forests. It deals with the history of the people and the economic phases of their agriculture.

Chemical exploration of Belgium soils, A. Petermann (*Bul. Inst. Chim. et Bact. Gembloux, 1901, No. 71, pp. 36*).—Mechanical and chemical analyses of 15 samples by the author's well-known methods, are reported.

Analyses of soils, Paarl and Worcester Divisions, C. F. Juritz (*Agr. Jour. Cape Good Hope, 20 (1902), No 6, pp. 351–363*).—This is a report on work in continuation of the soil survey of the province (E. S. R., 13, p. 119), and includes results of analyses of 44 samples of soils. The average amounts of fertilizing constituents in these soils were, for the Paarl Division, lime 0.03 per cent, potash 0.041, phosphoric acid 0.044, nitrogen 0.1; for the Worcester Division, lime 0.136 per cent, potash 0.022, nitrogen 0.124. These results show that the Paarl soils are "rather poor in lime, potash, and phosphoric acid, while the average amount of nitrogen they contain is about normal." The Worcester soils, on the other hand, contain "as a rule a fair amount of lime, potash, and phosphoric acid, and also a good quantity of nitrogen."

The subsoil, L. DUMAS (*L'Ing. Agr. Gembloux, 12 (1902), No. 6, pp. 255–261*).—This article attempts to show that in spite of the predominating influence attributed to it by scientific and practical men, the surface soil is probably of less importance in plant growth than the subsoil for the following reasons: (1) The roots of plants descend as rapidly as possible into the subsoil, in many cases to a considerable depth, the surface soil (0.1 to 0.35 meter) serving the requirements of the plant only during germination and the early stages of growth; (2) the plant draws its water supply largely from that layer of the soil, which has a higher retentive power for water than the surface soil and so holds a reserve for times of need; and (3) the plant only partially uses the food supply of the surface soil and draws its nourishment during the greater part of its period of growth from the supply of plant food in the subsoil. To this latter fact may be ascribed in part the capricious action of commercial fertilizers. Under ordinary systems of farming the tendency is to enrich the surface soil at the expense of the subsoil. Nature seeks to restore the equilibrium by promoting in various ways the descent of the fertilizing constituents into the subsoil. Improvement of the subsoil by thorough drainage, the occasional growth of deep rooting plants such as the legumes, etc., is advised. The practice of a system which returns a liberal amount of organic manure to the soil, as opposed to the exclusive use of commercial fertilizers, is also recommended.

Humus, F. SESTINI (*Studi e Ricerche Ist. Lab. Chim. Agr. Univ. Pisa, 1900–1901, No. 17, pp. 11*).—A discussion of the formation, properties, and functions of humus.

Humus as a preservative against frost, W. R. FISHER (*Nature [London], 65 (1901), No. 1677, p. 152*).—Illustrations of the fact stated by Wollny that spring and autumn frosts are dangerous on peaty soils only when the surface of the latter is dry are reported.

Experiments on black pocosin soils and methods of treating them (*Bul. North Carolina State Bd. Agr., 23 (1902), No 1, pp. 37, 38*).—These soils, which occur in considerable areas in the eastern part of North Carolina, contain large amounts of organic matter and are quite productive when first cleared, but after a few years' cultivation become absolutely unproductive. The use of lime, potash salts, and acid phosphate has been found beneficial.

The improvement of peaty soils and marsh lands, R. ROGER (*Jour. Agr. Prat., n. ser., 3 (1902), No. 7, pp. 217–220*).

The decomposition of organic matter in cultivated soils, H. LAGATU (*Ann. École Nat. Agr. Montpellier, n. ser., 1 (1901), No. 1, pp. 65–94*).—This is a critical review of the literature of this subject, dealing especially with investigations relating to the combustion of organic carbon and nitrogen in the soil.

Studies in nitrification, J. G. LIPMAN (*Jour. Amer. Chem. Soc., 24 (1902), No. 2, pp. 171–186*).—Observations on the progress of nitrification in 3-lb. lots of soil in 6-in. flower pots and 100-gm. samples in 750-cc. Erlenmeyer flasks, are reported. The soils used were (1) a calcareous sand, (2) a loam soil, and (3) an artificial greenhouse soil rich in organic matter. "For the determination of organic and of total nitrogen, the Kjeldahl and the Kjeldahl modified methods were used. The Ulsch and the phenolsulphonic acid methods were used for the determination of nitrates. Of the different methods proposed for the determination of nitrites in the presence of nitrates, the method first proposed by Griess and known as the sulphanilic acid and naphthylamin method was selected because of its convenience and delicacy. Ammonia was determined by distillation with soda or magnesia, and titration against standard acid or by nesslerizing. For qualitative tests there were also used metaphenylenediamin for nitrites, and brucin and diphenylamin for nitrates."

The Griess method for nitrites and the phenolsulphonic acid method for nitrates as used in these experiments are discussed. The precautions found to be necessary to insure accuracy with the latter are stated.

The pots were placed in porcelain saucers and the water content of the soil was maintained at about 25 per cent of the water capacity of the soils by addition from below. At the end of the period the nitrites and nitrates in the soil were obtained for determination as follows: "One hundred grams of soil were shaken in a 2-liter bottle, provided with a stopper, with 1 liter of distilled water. After shaking for 5 minutes the liquid holding the nitrites and nitrates in solution was filtered, about a gram of freshly precipitated and washed aluminum cream added to the filtrate and the latter shaken. It was then filtered again, 100 cc., representing one-tenth of the nitrates held in solution, carefully measured off for the determination of nitrates, and 100 cc. for the determination of nitrites." The influence of varying amounts of common salt and of sulphur, and of stirring the soil, on the nitrification of ammonium sulphate was studied in the pot experiments. In the experiments in flasks the influence of varying amounts of water and of sodium chlorid, ferrous sulphate, calcium carbonate and sulphate, and large quantities of organic matter was studied. The results obtained with the pots were inconclusive. In the experiments in flasks it was found that with amounts of water varying from 8 to 12 cc. per 100 gm. soil there was little difference in the rate of nitrification. "There was a distinct diminution in the amount of nitrates produced as the amount of salt was increased, still the differences were not very great, and from this experiment we must conclude that quantities of salt up to 0.1 per cent, or 3,500 lbs. to the acre, while they retard nitrification, do not stop it entirely."

Ferrous sulphate in amounts varying from 10 to 100 mg. per 100 gm. of soil apparently had little effect. "Where equivalent amounts of gypsum were used the nitrification was, on the whole, fairly uniform, and slighter than in the flasks where calcium carbonate was used. . . . It appears that more nitrate was formed where 1 per cent of organic matter was present than where only 0.5 per cent was present."

The life of the soil, C. Bauverd (*Jour. Soc. Agr. Suisse Romande, 43 (1902), No. 1, pp. 17–20*).—A brief review of an article by Chuard on this subject.

On the emission and absorbtion of heat and their importance in relation to the temperature of the earth's surface, N. Ekholm (*Meteor. Ztschr. [Vienna], 19 (1902), No. 1, pp. 1–26, fig. 1*).

The adaptation of seeds to soil, S. Castex (*Bul. Agr. Algérie et Tunisie, 8 (1902), No. 5, pp. 121–124*).—A brief discussion of the influence of the chemical properties of the soil on the seed and its offspring.

FERTILIZERS.

Contribution on the treatment of barnyard manure with absorbents to prevent the loss of nitrogen in form of ammonia compounds, H. D. Haskins (*Massachusetts Sta. Bul. 81, pp. 17, 18*).—Experiments to determine the relative absorbtive power for ammonia of magnesium sulphate (kieserite), potassium-magnesium sulphate, kainit, potassium sulphate, and calcium sulphate are referred to. Although the results, "in all probability, do not represent the actual nitrogen absorption power of the chemicals as used in ordinary farm practice," they show that calcium sulphate (gypsum) possesses the lowest absorptive capacity for ammonia of any of the materials tested, the results with magnesium sulphate being highest in this respect.

Permanence of manure, T. Jamieson (*Proc. Agr. Research Assoc. [Aberdeenshire], 1901, pp. 26–42, dgms. 5*).—A summary of 17 years' experiments undertaken for the purpose of securing "precise and reliable information upon the relative permanence of different forms of manure" to be used in determining the compensation for unexhausted manure under the "Agricultural Holdings Act." The fertilizers used were various forms of bone, superphosphate, coprolite, and sodium and potassium nitrates. The results showed that by the fifth year the fertilizers had become practically exhausted, that the complete fertilizers gave the highest results throughout, that the effect of the phosphates depended very largely upon their fineness and was greatly increased by the addition of nitrogen and potash. The most lasting effect was observed in case of coarse and slowly decomposing bone, followed by steamed bone meal with nitrate of potash and dissolved bone. "Generally the results show that the manures that stood somewhat low in the first turnip crop (in consequence of rough division) stand relatively higher in the grass—bones now standing above all the other manures; coprolite standing above superphosphate; and nitrates, which stood lowest in the turnips, now exerting their effect in the fourth year, the grass crop being one that is responsive to nitrogen."

Deep culture and the turning under of green manures and barnyard manure, WODARG (*Deut. Landw. Presse, 29 (1902), No. 15, p. 122*).—A plea for a thorough study of this subject.

Deep culture and turning under green crops and barnyard manure (*Deut. Landw. Presse, 29 (1902), No. 22, pp. 185, 186*).—A general discussion of this subject.

Green manuring with lupines and the use of nitrogenous fertilizers, C. SCHREIBER (*Rev. Gén. Agron. [Louvain], 10 (1901), No. 11, pp. 481–488, fig. 1*).—The author concludes from the results of experiments that the nitrification of lupines as green manure proceeds too slowly to dispense with the addition of an active nitrogenous fertilizer. In this connection nitrate of soda was found preferable to sulphate of ammonia. The renovation of the soil by means of green manuring with lupines and a supplementary application of commercial fertilizers is considered economical.

Bokhara clover as a nitrogen collector, BANNERT (*Deut. Landw. Presse, 29 (1902), No. 22, p. 184*).—A brief note.

Compost formulas (*Bul. North Carolina State Bd. Agr., 23 (1902), No. 3, pp. 31–34*).—Formulas and instructions are given for the preparation of composts of barnyard manure, cotton seed, and cotton-seed meal with acid phosphate and kainit. The injurious action of lime in composts is briefly referred to.

Fertilizers and the fertilization of the soil, A. LARBALÉTRIER (*Les engrais et la fertilisation du sol. Paris: J. B. Baillière & Son, 1901, pp. 332, figs. 74*).

Contribution to the study of the feeding of plants with phosphorus, T. SCHLOESING (*Compt. Rend. Acad. Sci. Paris, 134 (1902), No. 1, pp. 53–55, figs. 2*).—Previous investigations along this line are referred to and determinations of phosphoric acid soluble in distilled and recently boiled water in 2 soils, one very rich in soluble phosphoric acid, the other very poor, are reported. Small lots of soil (40 to 100 gm.) were repeatedly (10 to 11 times) shaken up with relatively large amounts of water (1,750 to 1,850 cc.), the solutions clarified with a small amount of calcium nitrate (100 mg. per liter), and phosphoric acid determined by the molybdic method. Parallel tests were made on each soil, cultivated and uncultivated, and kept uniformly moist. The phosphoric acid in each water extract is shown in tables and diagrams. The total soluble phosphoric acid was 150.2 mg. per kilogram in the uncultivated soil rich in this constituent and 122.1 mg. in the same soil after growth of a crop (corn), a difference of 28.1 mg.; 14.33 mg. in the uncultivated soil poor in soluble phosphoric acid and 8.8 mg. in the cropped soil, a difference of 5.53 mg. For the 36 kg. of soil used for each experiment with corn the difference was in the first case 1,012 mg., in the second 199 mg. Analyses of the corn plants showed that they took up in the first case 1,115 mg. of phosphoric acid, in the second 451 mg.

The utility of alkaline phosphatic manures, J. HUGHES (*Sci. Amer. Sup., 53 (1902), No. 1375, pp. 22034–22036*).—Noted from another source (E. S. R., 13, p. 234).

Increasing the calcium phosphate content of phosphorite, K. J. LISSENKO (*Zap. Imp. Russ. Techn. Obschtsch., 35 (1901), p. 825; abs. in Chem. Ztg., 26 (1902), No. 18, Repert., p. 62*).—By a process of grinding and sifting a large proportion of the sand in phosphorites may be removed and the content of pure calcium phosphate correspondingly increased. The product thus obtained is better adapted to the manufacture of superphosphates than the crude material.

Some observations on ammonium-magnesium phosphate, E. SELLIER (*Rev. Gén. Chim. Appl.*, *5* (*1902*), *p. 77; abs. in Chem. Ztg.*, *26* (*1902*), *No. 22*, *Repert.*, *p. 73*).—The author found in the course of experiments that ammonium-magnesium phosphate is not completely decomposed by magnesia at boiling temperature.

On the use of sulphate of ammonia, W. HASSELMAN (*Meded. Proefstat. Suikerriet West Java*, *1902*, *No. 55*, *pp. 7*).—A brief discussion of the absorptive power of the soil for ammonium sulphate, and its effect on capillary rise of water, nitrification, and the calcium carbonate of the soil.

The action of potash on plant life, H. WILFARTH and G. WIMMER (*Arb. Deut. Landw. Gesell.*, *1902*, *No. 68*, *pp. 106*, *figs. 14*).—This is a detailed account of pot experiments with potatoes, tobacco, buckwheat, mustard, chicory, oats, and sugar beets. The method used was essentially that of Hellriegel, modified to secure better aeration and to prevent loss of fertilizing matter in drainage. The soil used was a sand-peat mixture very poor in potash. The results obtained show that potash is absolutely essential to plants, and is needed throughout the period of growth. The yields increased in proportion to the amount of potash applied until the maximum, determined by the size of the pot or the water supply, was reached. Beyond this point the effect of an increased application of potash was shown, not in an increase of yield, but in an increase of potash content of the plant. The greater the amount of potash available in the soil, the greater the amount taken up by the plant, especially by the leaves and straw, the potash content of the seeds, roots, and tubers remaining remarkably constant with variations in the supply of potash, and increasing only when a large excess of potash was applied. It was shown that the potash was very completely taken up by the plant, whether needed for growth or not. Even when potash was applied in excess far beyond the point of increasing the yield it was largely (90 to 95 per cent) taken up by the plant. Potash appeared to be especially necessary for such plants as potatoes, sugar beets, etc., which produce organs which store up reserves of starch, sugar, and fat. Small potatoes poor in starch and small sugar beets poor in sugar were produced when there was a deficiency of potash. A deficiency of potash also retarded the development of grain in case of cereals and buckwheat. In the case of such crops many of the seeds were imperfectly developed or abortive. Plants suffering from potash hunger have a generally sickly appearance as distinguished from their appearance when suffering from lack of phosphoric acid or nitrogen. In the latter cases the plants are small but normal in all parts. Plants insufficiently supplied with potash, especially potatoes and beets, appeared to be very susceptible to rot. Potash deficiency has a characteristic effect on the leaves of plants, especially as regards coloring. The spaces between the leaf veins show first characteristic brownish stripes, followed later by white spots, causing a peculiar crinkling, and finally the leaves dry up, with a more or less brown color. No such appearance was noted in case of deficiency of phosphoric acid or nitrogen.

The experiments on the possibility of substituting soda for potash were not entirely conclusive and are being continued, but they indicated that while soda is taken up to a considerable extent by plants, and exerts some influence, it can not perform the functions of potash in plant growth.

The results of experiments with kainit and 40 per cent potash salt, BACHMANN (*Fühling's Landw. Ztg.*, *51* (*1902*), *No. 4*, *pp. 147–155*).—With rye the results as a rule favored the 40 per cent salt, both on limed and unlimed soil; with oats and barley they were not conclusive.

Potash fertilizers on soils rich in potash, L. GRANDEAU (*Jour. Agr. Prat.*, *n. ser.*, *3* (*1902*), *No. 10*, *pp. 309–311*).—Experiments by Maercker are briefly reviewed, which afford a striking illustration of the fact that the need of the application of potassic fertilizers is determined by the assimilable and not by the total potash present. In the author's opinion complete information as to the soil potash can be obtained only by 4 distinct determinations, (1) the total potash, including that combined as silicates, (2) potash soluble in weak mineral acids, (3) potash soluble in citric acid (1 gm. per liter), and (4) potash soluble in water.

Why and when may one dispense with potash fertilizing? A. Felber (*Deut. Landw. Presse, 29 (1902), No. 20, pp. 164, 165, figs. 4*).—Experiments with oats to test this point are reported. Stable manure was applied alone and in combination with potash salts and nitrogenous and phosphatic fertilizers. The results show that the potash salts in some cases gave profitable returns on soils well supplied with potash and receiving liberal applications of manure. This is attributed to the fact that the potash compounds of the soil and of manure are not readily assimilable by plants. In the author's opinion the need of soils for potash can be determined only by carefully planned and conducted experiments. It is also claimed that potash salts may be safely used in combination with any kind of fertilizer or manure.

Potash salts as a top-dressing, A. Felber (*Deut. Landw. Presse, 29 (1902), No. 28, pp. 237, 238, fig. 1*).

The use of potash as a protection against injury from frost, Vibrans (*Deut. Landw. Presse, 29 (1902), No. 18, p. 148*).—Referring to Baumann's observations that plants fertilized with potash salts were injured to a less extent by frost than those not so treated, the author suggests that this may be a result entirely of physical action in the soil influencing the temperature, and not due to concentration of the carbohydrates in the plant, as suggested by Baumann. He cites in support of this view the old practice of applying kainit to the soil, in anticipation of frost, to protect beets.

Potash as a protection against frost, Baumann (*Deut. Landw. Presse, 29 (1902), No. 23, p. 197*).—In reply to above suggestion of Vibrans the author points out that the beneficial action of potash salts in protecting from frost was observed after these salts had been taken up by the plants from the soil.

The value of liming for marsh soils, E. Möller (*Deut. Landw. Presse, 29 (1902), No. 30, p. 254*).

Fertilizer inspection, C. D. Woods and J. M. Bartlett (*Maine Sta. Bul. 81, pp. 65–80*).—This bulletin contains analyses of 150 brands of fertilizers (manufacturers' samples) licensed before March 1, 1902, with a summary of the chief provisions of the State fertilizer law.

Analysis of commercial fertilizers sold in Maryland, H. B. McDonnell et al. (*Maryland Agr. Col. Quart., 1902, No. 15, pp. 51*).—A report of the results of inspection of fertilizers, September, 1901, to January, 1902, inclusive.

Fertilizer inspection in Massachusetts, C. A. Goessmann (*Massachusetts Sta. Bul. 81, pp. 20*).—This bulletin includes analyses of fertilizers sent to the station for examination, of licensed fertilizers collected by the agent of the station during 1901, and of Paris green; instructions regarding sampling of fertilizers and to manufacturers, etc.; a discussion of trade values of fertilizing ingredients; and a brief account of experiments with manure preservatives (see p. 1028). The fertilizing materials examined included wood ashes, limekiln ashes, cotton-seed meal, bone, fish, tankage, Thomas slag, jadoo fiber, dried and pulverized rockweed, mill waste, sheep fertilizer, milk casein, besides mixed fertilizers and soils.

Fertilizer inspection in North Carolina, B. W. Kilgore (*Bul. North Carolina Bd. Agr., 23 (1902), No. 3, pp. 3–26*).—The names and guaranteed composition of fertilizers registered for 1902, and analyses and valuations of 78 samples of fertilizers examined during the spring of 1902, with the usual explanations regarding freight rates, valuation, etc.

Analyses of commercial fertilizers, J. Hamilton and W. Frear (*Pennsylvania Dept. Agr. Bul. 89, pp. 195*).—This bulletin contains the text of the fertilizer law of Pennsylvania, notes on valuation, a discussion of the composition of raw materials and the cost of fertilizer constituents, and tabulated analyses and valuations of 761 samples of fertilizing materials examined during 1901. The average composition of the fertilizers examined during 1901 is given and their selling price and valuation are compared with similar data for fertilizers examined during previous years.

On the rational use of sulphite solutions from fiber factories in the preparation of fertilizers, T. Knösel (*Chem. Ztg., 26 (1902), No. 21, p. 229*).—This is a brief account of a patented process in which sulphite solution evaporated to 25° Baumé is mixed with an equal amount of Thomas slag, thereby largely increasing the percentage of citrate-soluble phosphoric acid in this material.

Formation of oceanic salt deposits, particularly of the Stassfurt beds. XXIV. Gypsum and anhydrite. 3. Natural anhydrite and its formation at 25°, J. H. van't Hoff and F. Weigert (*Sitzber. Kgl. Preuss. Akad. Wiss. Berlin, 1901, XLVIII, pp. 1140–1148; abs. in Jour. Chem. Soc. [London], 82 (1902), No. 472, II, p. 137*).

FIELD CROPS.

Report of the experimentalist, C. A. Zavitz (*Ontario Agr. Col. and Expt. Farm Rpt. 1901, pp. 82–111*).—The work here reported consists largely of variety and culture tests and is in continuation of experiments conducted for some years (E. S. R., 13, p. 338). Brief comments on other work by the experimentalist are also given.

Seed grain selections with oats, barley, peas, and spring and winter wheat have been in progress from 5 to 8 years, and the average yields of straw and grain and the weight of grain per measured bushel in each case are in favor of large, plump seed as compared with medium-sized or small seed. Shrunken seed of barley and spring and winter wheat and broken seed of barley produced small yields. Split seed of peas and winter wheat yielded only 10 and 8 bu. of grain per acre, respectively.

Of 228 varieties of oats tested during the past 14 years, White Siberian, Oderbrucker, Vick American Banner, and Bavarian were among the very best general-purpose varieties. Joanette Black is reported as a large yielder, with exceedingly short straw. It stools abundantly and for this reason very thin sowing is recommended on rich soils. Daubeney and Alaska have proved to be very early varieties. Seed oats obtained from varieties sent from the college to the Missouri station 4 years ago were compared with seed from the same varieties grown continuously at the college. The Missouri seed produced the largest yield of grain per acre and the Ontario seed the heaviest grain per measured bushel. Continuous seed selection of Joanette oats for 9 years resulted in 1901 in a yield of 44.4 bu. for large, plump seed, 28.5 bu. for light-weighing and light-colored seed, and 37 bu. per acre for hulled seed. The grain from large, plump seed weighed 5 lbs. more per measured bushel than that produced from light seed.

Among the 6-rowed varieties of barley grown for a number of years, Mansbury gave decidedly the best results. The average results for the past 13 years show that this variety yielded about 9 bu. per acre more than the common 6-rowed barley of Ontario. Oderbrucker, Scotch Improved, and Imperial Six-Rowed are also classed among the best. The best 2-rowed barley yielded an average of about 13 or 14 bu. of grain less per acre than the best 6-rowed variety. New Zealand Chevalier and French Chevalier were among the very best 2-rowed varieties. The hulless barleys gave much smaller yields of grain than Mansbury. Of the varieties tested for several years Guy Mayle, Purple, and Black Hulless produced the most grain.

A mixture of barley and oats in 9 different proportions was tested for 2 successive years. The mixture of 1 bu. of oats and 1½ bu. of barley per acre gave the best yield of grain in 1900 and the second best in 1901, but the average yield for the year was in favor of this proportion. It was found that in the yield of straw 1½ bu. of oats and 1 bu. of barley made the best record.

In several years' experiments with spring wheat, excluding the macaroni varieties, Red Fife, Herison Bearded, Wellman Fife, and Red Fern gave the best average results. Wild Goose, a macaroni wheat, gave decidedly the largest yield of grain of all the varieties grown. Medeah, Bart Tremenia, Sorentina, and Algiers, the other macaroni wheats grown in these experiments, also gave better yields than any of the finer varieties of spring wheat.

The winter-wheat varieties grown for 6 years were Dawson Golden Chaff, Imperial Amber, Egyptian Amber, Early Genesee Giant, Michigan Amber, Turkey Red, and Treadwell, the average yields being 54.1, 51.5, 50.1, 49.7, 49.3, 40.6, and 39.1 bu. per acre, respectively. Buda Pesth, which has been grown for only 4 years, has an average yield of 49.6 bu. It was noticed that among 100 varieties of winter wheat Imperial Amber, Egyptian Amber, Early Genesee Giant, and Michigan Amber were almost free from injury by the Hessian fly. Turkey Red, grown in Ontario for 8 years, was little affected by the fly, but the same variety obtained from Kansas in 1900 was considerably injured. Bisseli, Geneva, Turkey Red, Emporium, Amherst Isle, Imperial Amber, Reliable, Arnold Hybrid, Red May, and McPherson were most rust resistant, and American Bronze, Helena, Silver Star, Early Genesee Giant, Early Red Clawson, and Red Velvet Chaff, the least rust resistant. The best average yields for several years from seeding on different dates were obtained from the grain sown on or before September 9. Drilling and broadcasting have given practically equal results for 7 years. This season an experiment was begun with drilling one-half of the seed one way and drilling the other half crosswise. The cross drilling gave slightly better results than the common method. The results for 6 years show that cutting wheat after it has become very ripe gives the highest weight per measured bushel and the largest yield of grain and straw.

In the average results for several years Mammoth winter rye gave the largest yield of grain per acre, surpassing the common rye by 5 bu. in 1898, 1½ bu. in 1900, and 14 bu. in 1901. The 4 varieties of spring rye, Dakota Mammoth, Prolific Spring, Common, and Colorado Giant, yielded 38.3, 33.3, 32.6, and 15.6 bu., respectively, in 1901, and 41.8, 37.6, 35, and 25 bu. per acre, respectively, on an average for 4 years.

The average results of 3 varieties of buckwheat grown for 6 years show that Japanese yielded 20.3, Silver Hull 16, and Common Grey 13.8 bu. of grain per acre. In the production of straw these varieties stood in the same order.

The largest average yields per acre of peas grown for 7 years were obtained from White Wonder, New Zealand Field, Early Britain, Egyptian Mummy, New Zealand Brown, and Tall White Marrowfat. No varieties proof against the pea weevil have as yet been found. Grass peas, for a period of 7 years, have given an average yield of 25.7 bu. of grain and 2.2 tons of straw per acre. The average results for 7 years with the Egyptian or Chick pea (*Cicer arietinum*) show that 35.6 bu. of grain and 1 ton of straw were obtained per acre. The growing season in Ontario has been found too short for maturing cowpeas.

Of 29 varieties of field beans grown for 5 successive years, Day Improved Leafless, White Wonder, Medium or Navy, Burlingame Medium, Pearce Improved Tree, Schofield, Snowflake, and Boston Pea bean produced the largest average yields, which ranged from 22.3 bu. for Day Improved Leafless to 20.8 bu. for Boston Pea bean. Among 5 varieties of soy beans Early Yellow has given much the best results during a period of about 10 years, and in 1901 produced 25.3 bu. of grain per acre.

Common and hairy vetches were grown for seed in 1900 and 1901, but the results were not satisfactory from spring sowing. All fall sowing of hairy vetch produced over 8 bu. of seed per acre, which is considered a profitable yield, since the seed costs from $5 to $7 per bushel. For the production of green fodder the vetches have given promising yields.

Experiments have been in progress for 5 years with Manitoba, Common, and Russian flax, and the results have been fairly uniform for all varieties.

In testing the seed-producing capacity of different millets, it was found that the average yield for 4 years of California millet was 40.4 bu. and of Hungarian 36.4 bu.

of seed per acre. Japanese Panicle and Common millet produced smaller yields of seed.

In 1900 and 1901 the ears of the earlier varieties of dent, flint, and sweet corn were shelled to ascertain the yields of grain. Of 28 varieties treated in this way the following produced an average of over 60 bu. of shelled corn per acre: Hathaway Yellow Dent, Great Western, North Star Yellow Dent, King Phillip, Genesee Valley, Keil Early Dent, Pride of Canada, Salzer South Dakota, and Angel of Midnight.

In an experiment conducted for 2 successive years to determine the seed production of different varieties of sugar cane the Fodder cane produced the largest yield of seed, 20.8 bu. in 1900 and 24.2 bu. in 1901, followed by Early Minnesota Sugar Cane with a yield of 19.9 bu. in 1900 and 15.7 bu. in 1901. Among the varieties of broom corn Early Japanese produced the largest yield of seed, 30.8 bu., Improved Evergreen being second, with 29.5 bu. per acre. The Dwarf variety of broom corn averaged only 5.3 bu. Brown Durra produced the largest yield of seed among a number of other sorghums. The yields of 16 different sorghums grown for green fodder are given in a table.

The average production of sunflower seed for 4 years was 64.8 bu. by the Mammoth Russian sunflower, 62.7 by the White Beauty, and 55 bu. per acre by Black Giant.

In 1901, 103 varieties of potatoes were under test. They were planted May 23, in rows 26.4 in. apart, the sets placed 1 ft. apart in the row, and only one piece planted in a place. The seed was planted 4 in. deep, and level cultivation was given. The largest yields this season were produced by the Sunlit Star, American Wonder, Daisy, Pearl of Savoy, and Rural Blush. From the average results for a series or years it is concluded that Empire State, Pearl of Savoy, American Wonder, Dempsey Seedling, and Rural New Yorker No. 2 are among the best general-purpose varieties. For very early use, Stray Beauty, Howe Premium, and Early Ohio are recommended. The work in the selection of seed potatoes has shown in its results that large potatoes or large pieces produced greater yields than small potatoes or small pieces. Large potatoes cut into pieces of about 2 oz. in weight gave very satisfactory results. Planting one set in a place was found most profitable. The results of other tests indicated that potatoes should be planted immediately after the tubers are cut into sets. Remedies for the potato beetle are given.

Of several hundred varieties of roots tested for at least 5 years in succession, the following have given the best yields: *Long Red mangels*—Evans Improved Mammoth Sawlog, Simmers Improved Mammoth Long Red, and Steele-Briggs Long Red Selected, *Intermediate mangels*—Carter Champion Yellow; *Globe mangels*—Carter Warden Yellow; *swedes*—Hartley Bronze Top, Kangaroo, and Sutton Magnum Bonum; *fall turnips*—Cow Horn, and Jersey Navet; *carrots*—Mammoth Intermediate Smooth, Improved Short White, and Improved Half Long White. Large, plump seed of these different root crops, according to results for several years, has given best yields as compared with medium-sized and small seed. It was found that the seed of root crops should be sown quite close to the surface, and especially in the case of mangels and sugar beets. Taking the average of all the tests with the different roots, sowing on the level produced from 4 to 5 bu. per acre more than sowing on ridge land. On an average, early thinning gave $1\frac{3}{4}$ tons of roots per acre more than later thinning. Twenty-five varieties of sugar beets for feeding purposes were tested this season, and the yields are shown in a table. The results of the chemical analyses have been noted elsewhere.

Of fodder corn 138 varieties, including flint, dent, and sweet corn, were grown. Mammoth Cuban and Mastodon Dent have given promising results in southern Ontario, and Wisconsin Earliest White Dent has produced the largest yield of ears per acre among 67 varieties grown for 5 years in succession. Salzer North Dakota, Compton Early, and King Philip, 3 flint varieties, and North Star Yellow Dent have also given good results. Planting corn 2 in. deep gave the best average yields of total crop per acre for 3 years.

Among the different mixtures of peas and oats grown for green fodder, 2 bu. of Siberian oats and 1 bu. of Prussian Blue peas gave very satisfactory results. The average results for 5 years for the different mixtures under test were as follows: *Early varieties*—Daubeney oats and Chancellor peas, 5.9 tons; *medium early varieties*—Siberian oats and Prussian Blue peas, 6.9 tons; and *late varieties*—Mammoth Cluster oats and Prince Albert peas, 6.1 tons of green crop per acre. On an average the early varieties were cut 70 days, the medium early varieties 77 days, and the late varieties 84 days after seeding took place.

Early White Vienna kohl-rabi gave the largest yield per acre in 1901, and also in the average of 5 years.

The results for 7 years show that Dwarf Essex rape produced an average of 22.4 tons and Victoria 20.6 tons of green forage per acre. From the results of experiments carried on for 5 years, it was found that large rape seed yielded 70.4, medium-sized seed 15, and small seed 12.4 tons of green fodder per acre. The average results of sowing rape on level and ridge land are somewhat in favor of ridging. Subsoiling immediately before sowing produced no advantage. The results from planting rape seed at different depths have varied in different years, but in general were in favor of shallow planting.

The results with a number of leguminous crops and grasses grown for green fodders, hay, and pasture are reported.

Field crops, G. E. Day (*Ontario Agr. Col. and Expt. Farm Rpt. 1901, pp 63, 64*).—The culture of different field crops at the college in 1901 is briefly noted.

Plant food trials, H. E. Stockbridge (*Florida Sta. Rpt. 1901, pp. 22–35, fig. 1*).—Fertilizer tests with sweet potatoes, sugar cane, Irish potatoes, corn, cotton, and cassava are reported. Each crop received a series of fertilizer applications, including a standard application and multiples and fractional parts of the same. The check plats received no fertilizers.

Sweet potatoes.—The experiment with sweet potatoes demonstrated that the normal application consisting of 200 lbs. acid phosphate, 204 lbs. cotton-seed meal, 66 lbs. nitrate of soda, and 80 lbs. sulphate of potash per acre was the most profitable formula.

Sugar cane.—The standard formula for sugar cane consisted of 50 lbs. each of acid phosphate and muriate of potash and 400 lbs. of cotton-seed meal per acre. Increasing this application had no material effect on the crop. Diminishing the proportion of phosphoric acid and of nitrogen reduced the nitrogen content of the cane and diminishing the proportion of potash reduced the yield.

Potatoes.—In connection with the tests on Irish potatoes, a study was made of cotton-seed meal, castor pomace, and nitrate of soda as sources of nitrogen. Cotton-seed meal and castor pomace gave practically the same result, but the nitrate increased the yield over these 2 forms by 30 per cent. The standard application for potatoes consisted of 500 lbs. acid phosphate, 250 lbs. cotton-seed meal, 125 lbs. nitrate of soda, and 200 lbs. sulphate of potash per acre. This application proved very effective on soil exhausted by tobacco culture and this result is considered a demonstration of the value of crop rotation. Cowpeas preceding the potatoes increased the yield 40 per cent. Where only one-half of the normal application of phosphoric acid was applied a larger yield of potatoes was obtained than where the full normal application was used. A reduction of the normal application of potash to one-half diminished the yield 40 per cent, representing a financial loss of $5.50 per acre.

Corn.—In the tests with corn an application of 200 lbs. acid phosphate, 125 lbs. cotton-seed meal, 75 lbs. nitrate of soda, and 100 lbs. muriate of potash was used as the standard. This application increased by one-half gave an increase in yield of 18 bu. per acre, but the result was the same when the application was diminished by one-half. This increase was the largest in the series of tests and the use of one-half the normal application was the most profitable.

Cotton.—The normal application in the experiments with cotton consisted of 187.5 lbs. acid phosphate, 137.5 lbs. cotton-seed meal, and 25 lbs. muriate of potash per acre. An application in which the phosphoric acid had been reduced one-half from the normal gave the most profitable results in the series. Diminishing the proportion of nitrogen and potash was found unprofitable.

Cassava.—The results here showed that a reduction of the normal application consisting of 125 lbs. acid phosphate, 150 lbs. cotton-seed meal, and 75 lbs. muriate of potash per acre decreased the yield considerably as compared with the normal application and the same increased by one-half or doubled. In this test the check plat receiving no fertilizers produced a larger yield than any of the plats which had received a smaller quantity of fertilizer than the normal application. The normal formula gave a yield of 539 lbs. of roots per acre, $1\frac{1}{2}$ times the normal, 742 lbs., and double the normal, 785 lbs.

Report of the agricultural work for 1900, J. R. BOVELL and J. P. D'ALBUQUERQUE (*Imp. Dept. Agr. West Indies Rpt. 1900, pp. 178*).—The work reported consisted of experiments with sugar cane and several leguminous crops. Cooperative fertilizer experiments with sugar cane were conducted on a number of plantations and in reporting the results the mechanical and chemical analysis of the soil and the rainfall for the particular locality are given. Experiments with seedling and other varieties of canes are described, and a list of selected varieties is given, together with their general characters, yield, and composition. The experiments with leguminous plants consisted mainly of variety tests of cowpeas. All results are tabulated in detail. In addition to the analyses of the different varieties of cowpeas, the analyses of Bengal bean, velvet bean, horse bean, woolly pyrol, monkey pea, *Dolichos formosus*, *D. cultratus*, *Phaseolus semierectus*, *P. helvolus*, and *Cyanopsis* sp. are reported.

Field experiments, F. B. GUTHRIE (*Agr. Gaz. New South Wales, 12 (1901), No. 8, pp. 894–902*).—This report presents the results of experiments with different fertilizers applied in different combinations and quantities. The experiments were conducted with wheat at the Wagga and Bathurst experimental farms in 1900.

Experiments at Bathurst Experimental Farm, A. A. DUNNICLIFF (*Agr. Gaz. New South Wales, 12 (1901), No. 8, pp. 1005–1009*).—Brief notes on experimental work with cereal and forage crops in 1900.

Cereals, legumes, grasses, and saltbushes at Coolabah Farm in 1900, R. W. PEACOCK (*Agr. Gaz. New South Wales, 12 (1901), No. 8, pp. 1028–1031*).

Report on the experimental plats at the Hawkesbury Agricultural College, G. L. SUTTON (*Agr. Gaz. New South Wales, 12 (1901), No. 8, pp. 964–973*).—This report enumerates the varieties of cereals, legumes, sorghums, millets, and other forage plants grown experimentally during the season of 1900. The results with numerous species of grasses growing on permanent plats are briefly noted.

General experiments at Wagga Experimental Farm, G. M. McKEOWN (*Agr. Gaz. New South Wales, 12 (1901), No. 8, pp. 994–1002*).—Brief notes on culture, fertilizer, and variety tests with cereal and forage crops in 1900.

Field crops at Wollongbar Experimental Farm in 1900 (*Agr. Gaz. New South Wales, 12 (1901), No. 8, pp. 1012–1017*).—Short notes on culture and variety tests with cereal, hay, and root crops.

Guide to experiments at Manor Farm, Garforth, 1901 (*Yorkshire Col., Leeds, and East and West Ridings Joint Agr. Council, Pamphlet 15, 1901, pp. 17, pls. 2, map 1*).—This bulletin is a brief tabular statement of experiments with fertilizers and barnyard manure on grass, oats, potatoes, and swedes. The varieties of the different crops under test are enumerated.

Investigations on the cereal crops of Roumania, V. CARNU-MUNTEAUNU and C. ROMAN (*Recherches sur les céréales Roumaines. Bucharest, 1900, pp. 227*).—This publication, issued by the experiment station at Bucharest, discusses wheat, corn, and barley culture in Roumania, and reports in tabular form the chemical analyses of the various crops for different sections of the country.

An experiment on the improvement of cereals, E. Gavillet (*Chron. Agr. Canton Vaud, 14 (1901), No. 20, pp. 498–502*).—This article reports the results of variety tests with oats, and calls attention to the very promising results obtained with a number of foreign varieties, including American Banner and Improved American.

The seeding of grain, J. Speir (*Jour. Bd. Agr. [London], 8 (1901), No. 4, pp. 438–446*).—This article discusses tillering, size of seeds, quantity, germination, and change of seed, quality of the land, date of sowing, broadcasting, and drilling, and the losses which occur in seeding.

Manures for a four-year rotation, D. A. Gilchrist (*Jour. Bd. Agr. [London], 8 (1901), No. 3, pp. 324–327*).—An account is given of a four-year rotation and the use of fertilizers in connection with it. The fertilizers were applied at the beginning of the rotation. The best financial results for the entire rotation were obtained from an application of 2 cwt. of nitrate of soda, and 6 cwt. of basic slag per acre.

Experiments with potash fertilizers, Clausen (*Landw. Wchnbl. Schleswig-Holstein, 51 (1901), No. 48, pp. 736–739, fig. 1*).—In these experiments oats, beets, and horse beans were grown in pots containing a heavy marsh soil. Potash was supplied to each crop in the form of kainit, 40 per cent potash salt, and sulphate of potash. The use of kainit gave the largest increase in the yield of oats, and the application of potash in general increased the production of grain as compared with that of straw. The different forms of potash increased the yield of beets from 12 to 22 per cent. Beets were found to be the most sensitive to impurities contained in the potash fertilizers. The results with horse beans were vitiated to some extent.

Catch and cover crops, J. Gould (*Rural New Yorker, 60 (1901), No. 2699, p. 691*).—An article discussing the culture of oats and Canada peas and of rape as catch and cover crops.

Fertilizer experiments on irrigated meadows, B. Tacke (*Mitt. Deut. Landw. Gesell., 16 (1901), No. 46, pp. 263, 264*).—A description of the work and the results obtained are given, and a grass-seed mixture for this class ot meadows recommended. It is the intention to continue the experiments for a series of years before drawing definite conclusions.

Manuring of meadow hay, R. S. Seton (*Yorkshire Col., Leeds, and East and West Ridings Joint Agr. Council, Pamphlet 14, 1900, pp. 12*).—The results of the cooperative fertilizer tests on meadows conducted in 1900 showed that the most profitable proportions of commercial fertilizers were 1½ cwt. ot nitrate of soda, 2 cwt. superphosphate, and 3 cwt. of kainit per acre. The annual or biennial use of barnyard manure for this purpose was also found profitable.

Rotation of crops as a means of destroying weeds on meadows, Ulrich (*Sächs. Landw. Ztschr., 49 (1901), No. 45, pp. 1072, 1073*).—A brief account is given of the ways in which a rotation may be arranged with a view to destroying weeds on meadows.

Cultivation by the use of deep-rooting plants, R. H. Elliot (*Jour. Bd. Agr. [London], 8 (1901), No. 3, pp. 313–323*).—This article discusses the value derived from the culture of deep-rooting plants, and dwells upon the necessity of conserving humus and restoring it to the soil.

Seed corn and some varieties for Illinois, A. D. Shamel (*Breeders' Gaz., 40 (1901), No. 21, pp. 882–884, figs. 7*).—This article discusses the growing of seed corn and enumerates the varieties of corn bred in Illinois. The occurrence of barren stalks is also briefly considered.

Corn crop tables of Standard Cattle Co., Ames, Nebr. (*Ames, Nebr.: Standard Cattle Co., 1900, pp. 16*).—These tables show the yields of corn, the estimated amounts of stover, and the cost of producing the crop on the lands of the company for the years 1893–1899, inclusive.

Cotton culture, R. J. REDDING (*Georgia Sta. Bul. 56, pp. 121–154*).—These experiments are continued from previous years (E. S. R., 13, p. 40). In 1901, 26 varieties were tested. Peterkin, Wise, Schley, Pullnot, Culpepper, and Jones, given in the order of their value of total products, headed the list in profitable returns. Omitting Culpepper and Jones, they ranked in the same order in the production of lint cotton per acre. Mascot, the earliest variety, produced a total crop valued at $42.11 per acre and ranked thirteenth as to profitableness. The highest value of total crop in these experiments was $44.13 per acre. Sims Long Staple, the only variety of upland long staple type grown in these tests, ranked twenty-fifth in the value of lint and seed produced. This season, unlike the results of the 7 previous years, the best half of the number of varieties had the smallest bolls and also the smallest seeds, still "it seems fair to conclude from the 8 years' record that large bolls, large seed, and a high percentage yield of lint are closely related with the greatest value of total product of lint and seed, and that these are all desirable qualities."

Varietal notes and directions for selecting a variety and selecting seeds in the field are given.

This season's results of the composite seed test were equally significant with those obtained in previous years.

Taking into consideration the results of distance experiments for this and the 2 previous seasons, the author concludes that on soils varying in productive capacity of from 1 to $1\frac{1}{2}$ bales per acre the best results will be obtained when the plants are placed 12 in. apart in rows 4 ft. wide.

As in 1900, the results of the comparison between thorough and ordinary preparation of the soil were inconclusive. The yield of plats which had received a preparatory plowing, subsoiling, and harrowing was a little smaller than the yield of the plats not given this extra preparation.

A potash test on a certain soil showed that with 362 lbs. of 14 per cent acid phosphate, 139 lbs. of cotton-seed meal, and 38 lbs. of nitrate of soda per acre, at least 31.20 lbs. of muriate of potash would be required to produce a maximum yield of seed cotton. A nitrogen test with cotton-seed meal and nitrate of soda indicated that on the soil on which the test was made no nitrogen, or at most a very little, is required when 355 lbs. of 15 per cent acid phosphate and 28 lbs. of 50 per cent muriate of potash are applied per acre. The author believes that the soils of middle Georgia can be brought into such condition by a regular rotation of corn and cowpeas, small grain and cowpeas, and cotton that they will not require nitrogenous fertilizers.

The weather conditions for a series of seasons are shown in the bulletin, and brief notes on cotton culture, together with fertilizer formulas for the crop, are given in an appendix.

Experiment on cotton at the society's experimental farms at Mit-el-Diba and Ghizeh, G. P. FOADEN (*Jour. Khedir. Agr. Soc. and School Agr., 3 (1901), No. 6, pp. 248–261, figs. 2*).—Fertilizer and rotation experiments with cotton are reported. The results indicated that suitable applications of commercial fertilizers give profitable results. Superphosphate increased the yield satisfactorily and hastened maturity, while nitrate of soda also increased the yield, but greatly delayed ripening, and produced a crop somewhat inferior in quality. A mixture of superphosphate and nitrogen gave the best results. The author recommends the use of 3 or 4 cwt. of superphosphate and from $1\frac{1}{4}$ to $1\frac{1}{2}$ cwt. of either nitrate of soda or sulphate of ammonia per acre. Potash alone did not give profitable returns. In rich soil where cotton was grown immediately after berseem the application of manures had very little effect. Cotton grown after crops requiring irrigation during the summer did not give very good yields. The use of suitable mixtures of manures was found to hasten the maturity of the cotton crop.

Cotton cultivation in India, G. P. FOADEN (*Jour. Khedir. Agr. Soc. and School Agr., 3 (1901), No. 5, pp. 220, 221*).—Statistics on the crop of 1900–1901.

The cost of cotton cultivation, G. P. FOADEN (*Jour. Khediv. Agr. Soc. and School Agr., 3 (1901), No. 5, pp. 217–219*).—A brief consideration of the outlay involved in growing cotton in Egypt, Queensland, and America.

The exhaustive effects of the cotton crop, G. P. FOADEN (*Jour. Khediv. Agr. Soc. and School Agr., 3 (1901), No. 5, pp. 205–209*).—This article gives the quantities of plant food withdrawn from the soil by the cotton plant and compares them with amounts removed by the most common field crops.

Cowpea culture, J. F. DUGGAR (*Alabama College Sta. Bul. 118, pp. 40, figs. 2*).—Various experiments with cowpeas conducted at the station during the last 6 years are described and the results reported and discussed. Directions for the culture of the cowpea for seed and for hay are given.

Cowpeas were planted in April, June, and July, and from the results obtained it is concluded that usually nothing is gained by planting before May. For the production of seed, planting in June was most satisfactory. New Era cowpeas planted April 26 matured 2 crops before frost.

Tests in subsoiling and liming did not show an increase in yield.

In one test broadcast sowing gave a larger yield of hay than drilling and cultivating, but the author does not consider broadcasting as certain a method in unfavorable seasons.

Among the large number of varieties tested New Era and Black and Red Ripper produced the most seed. Wonderful and Clay produced the largest average yield of hay for 3 years. The number of seeds per bushel varied from 94,634 with Taylor to over 236,000 with New Era and Small Black. The number of pounds of dry unhulled peas required to shell a bushel ranged from 78 lbs. with the Brown-eye Crowder to 90 lbs. with Wonderful.

On the station soil fertilizer produced very slight gains. For poor sandy or loamy soils the use of acid phosphate with or without potash is recommended. The results of 3 tests showed a superiority of acid phosphate over crude phosphate.

Analyses were made of the different parts of the cowpea plant, and the results are given in tabular form. With some varieties from 51 to 75 per cent of the whole plant by weight was obtained in the hay, and of this quantity the leaves averaged 30 per cent. The leaves were found to be at least twice as rich in protein as the other parts of the plant. It is stated that cowpea hay resembles wheat bran in composition, and that the seeds are much richer in nitrogen than either wheat bran or corn.

As compared with velvet beans, cowpeas have an advantage in curing and in palatability, but a disadvantage in being subject to attacks of nematode worms and several fungus diseases. At the station, cowpeas have also given a higher average yield than velvet beans, soy beans, and beggarweed. By sowing sorghum with cowpeas the yield of hay was increased, but it did not facilitate curing.

"Cows pastured on cornstalks and drilled cowpeas between the corn rows afforded butter and increased live weight worth, in 1900, \$4.47 per acre grazed over. The next year the returns in butter alone from cowpeas drilled between the corn rows was \$5.28 per acre."

Winter forage crops for the South, C. R. BALL (*U. S. Dept. Agr., Farmers' Bul. 147, pp. 36, figs. 24*).—This bulletin discusses the past and present winter forage conditions of the South, and briefly reviews the forage resources of the region for the winter months. A list of forage crops, including grasses, leguminous plants, and rape, is recommended as furnishing forage during the winter. Each species is described and directions for its culture are given.

Grasses (*New Zealand Dept. Agr. Rpt. 1901, pp. 159–163*).—The kinds of grasses on trial at the Momohaki Experiment Station, New Zealand, with brief notes on their value, are given in a table.

Grass seeding (*Rural New Yorker, 60 (1901), No. 2688, p. 530*).—A report on an experimental seeding of grass by the Clark method.

Grass seeded without grain (*Rural New Yorker, 60 (1901), Nos. 2688, p. 531; 2689, pp. 545, 546*).—A description of the Clark system of grass culture.

Manila hemp culture in Manila, H. AUSTIN (*New Zealand Dept. Agr. Rpt. 1901, pp. 294–300*).—This is a report presenting information on the hemp industry in the Philippine Islands. The culture and preparation of the plant is discussed and statistics on the industry from 1890 to 1900, inclusive, are presented.

New Zealand hemp (Phormium tenax) (*New Zealand Dept. Agr. Rpt. 1901, pp. 289–294*).—Report of the commissioner appointed to examine the machines and processes submitted in competition for the bonuses offered for the encouragement of the New Zealand hemp industry.

Investigations upon the growth of hops, 1895–1901, A. D. HALL (*Jour. Bd. Agr.* [*London*], *8 (1901), No. 4, pp. 459–469*).—Growing hops upon string and wire gave better results than the use of poles, and cutting away the vine at picking time produced a weakening effect which was noticeable for 2 seasons. The Butcher, umbrella, and Worcester systems of stringing are described. The results of a 5-year test of the different systems did not show a definite advantage in favor of any one system. Stripping the plant of the lower leaves to facilitate spraying caused no loss in the years of vigorous growth, but in the seasons when the development of the plants was slow they did not recover from the check which they had received from the removal of these leaves. In a cultivation test the discontinuance of all cultivation beyond the destruction of weeds for 7 successive years resulted in no particular reduction of the crop, though perhaps in a slight inferiority in the quality. Deep cultivation at the time the hops began to form induced earlier ripening.

Several chapters on the lupine, O. SCHELLENBERGER (*Fühling's Landw. Ztg., 50 (1901), Nos. 12, pp. 423–431; 13, pp. 463–471; 14, pp. 489–494*).—This article discusses the culture of lupines, their use for soil improvement, and their value for feeding purposes. In considering the culture the author speaks of the different varieties, the sensitiveness of the plant to the lime content of the soil, the kind of seed to be used, the effects of inoculation of the soil, and the diseases to which lupines are subject. The discussion of lupines for soil improvement consists of concise presentations of the observations made by prominent agriculturists and investigators. The consideration of lupines as fodder is devoted mainly to the subject of the harmful alkaloids of the plant and the methods of removing them. Of the different kinds the blue lupine is considered of greatest economical value. This species has the best developed root system, and a low alkaloid content, in addition to being one of the best nitrogen gatherers and seed producers. It is also least sensitive to lime and frost.

A new variety of lupine, A. SEMPOLOVSKI (*Deut. Landw. Presse, 28 (1901), No. 99, p. 821*).—A brief note describing the development of a red lupine from a sport of the blue lupine. The new variety has been fixed, and has certain advantages over the mother variety. The results of chemical analyses of the 2 varieties are given.

Salt for mangels (*Agr. Jour. Cape Good Hope, 19 (1901), No. 9, pp. 590–691*).—A brief article on fertilizing the soil for mangels and the use of salt in that connection.

Culture of oats in 1900, P. P. DEHÉRAIN and C. DUPONT (*Ann. Agron., 27 (1901), No. 11, pp. 551, 552*).—Of 3 varieties grown at Grignon, Ligowo gave the best yield of grain. This is a yellow variety, and for this reason it is not a favorable sort for the Paris market.

A new Paspalum (*Queensland Agr. Jour., 9 (1901), No. 5, p. 463*).—Under this title a brief note on *P. virgatum* is given. The species is compared with *P. dilatatum.*

Paspalum dilatatum (*Agr. Ledger, 1901, No. 1 (Agr. ser., No. 33), pp. 9*).—A description of results obtained in India.

Paspalum dilatatum (*Queensland Agr. Jour., 9 (1901), No. 6, pp. 532–534*).—Notes on the value of this grass for Australia.

Early potatoes by the "boxing" system (*Farmers' Gaz., 60 (1901), No. 42,* *p. 761*).—A description of growing early potatoes by means of starting the sprouts by a special method.

Desirable extra-early potato, C. W. FORD (*Amer. Agr., 61 (1901), No. 12, p. 52*).—History and description of the Irish Cobbler potato.

The potato, L. ROUBAL (*L'Ing. Agr. Gembloux, 12 (1901), No. 5, pp. 190–210*).—This article discusses a wide range of subjects related to the culture of potatoes and their uses.

Fertilizer and variety tests with potatoes (*New Zealand Dept. Agr. Rpt. 1901, pp. 164–166*).—The tabulated results show that superphosphate, steamed bone dust, and Thomas slag invariably gave the best results, while kainit diminished the yield. The different varieties tested are briefly described.

The influence of manuring on the chemical composition of potatoes, W. F. SUTHERST (*Chem. News, 84 (1901), No. 2192, pp. 258, 259*).—The chemical composition of potatoes grown on unmanured soil is compared with the composition of tubers grown on soil which received 20 tons of barnyard manure or an application of 5 cwt. of superphosphate, 2 cwt. of muriate of potash, and 2 cwt. of sulphate of ammonia per acre. On account of insufficient data no definite conclusions are drawn.

Rice culture in Japan, F. MAIN (*Jour. Agr. Prat., n. ser., 2 (1901), No. 50, pp. 761–763*).—A general article on the rice industry of Japan.

Culture experiments with Petkus rye in Sweden, S. RHODIN (*Deut. Landw. Presse, 28 (1901), Nos. 101, pp. 836, 837; 102, pp. 851, 852*).—These experiments were carried on for 6 years. The results show that this variety of rye is very resistant to unfavorable winter weather. The average weight of the rye for the entire period was 71 kg. per hectoliter, and the average proportion of grain to straw was as 55:100. Cooperative tests showed that it was the best variety for many sections, but that in some localities the requirements of soil and climate for its successful culture could not be fulfilled.

The use of commercial fertilizers for rye in East Germany, GERLACH (*Deut. Landw. Presse, 28 (1901), Nos. 74, pp. 623, 624; 75, pp. 629, 630; 76, pp. 641, 642*).—This article presents observations and results of experiments on growing rye with commercial fertilizers in the eastern provinces of Germany.

A cross between spelt and wheat, P. H. STOLL (*Deut. Landw. Presse, 28 (1901), No. 101, p. 840, fig. 1*).—A brief statement on the method of producing this cross, with a description of its characters and qualities.

Sugar beets, R. HARCOURT (*Ontario Agr. Col. and Expt. Farm Rpt. 1901, pp. 38–42*).—Cooperative culture tests with sugar beets were made, and the results are here recorded by districts. Brief directions for the culture of sugar beets are also given. Tests were made by 25 farmers in each of 15 different districts, and the results for this entire series show an average sugar content of 15.61 per cent and a purity of 87.49 per cent. The average yield of beets per acre was 17 tons and 495 lbs.

Sugar beets for feeding purposes, R. HARCOURT (*Ontario Agr. Col. and Expt. Farm Rpt. 1901, p. 37*).—Twenty-five varieties of sugar beets for feeding purposes were grown and the average weight of the beets, with the percentage of sugar they contained and the coefficient of purity for each sample, is reported in a table without further comment.

The sugar beet, L. MALPEAUX (*La betterave à sucre. Paris: Masson & Co., pp. 206, figs. 26*).—A general and popular treatise on the culture of the sugar beet. A list of 32 reference works is given.

Sugar-beet culture in Egypt (*Deut. Zuckerind., 26 (1901), No. 28, pp. 1322–1325*).—This article discusses the possibility of sugar-beet culture in Egypt, and reports briefly the results of several cultural tests.

Beet crop tables of the Standard Cattle Co., Ames, Nebr. (*Standard Beet Sugar Co., pp. 16*).—General instructions for sugar-beet culture are given and the results of growing sugar beets on the fields of the company, including the cost for the years 1893–1898, inclusive, are tabulated.

Influence of manure upon sugar beets, W. H. JORDAN and G. W. CHURCHILL (*New York State Sta. Bul. 205, pp. 251–264*).—Experiments were conducted for the purpose of comparing the composition of sugar beets grown with commercial fertilizers and those grown with stable manure applied in the spring before planting. From 20 to 40 tons of stable manure and in most cases 1,000 lbs. of commercial fertilizers were applied per acre. No manure whatever was used on the check plats. These experiments were conducted for 4 consecutive years, and during that time at least 6 varieties of seed were grown. The results for the different years are given in tables and discussed. The beets obtained were all of high quality, the average being somewhat better with the stable manure than with no manure or with commercial fertilizers. Stable manure did not induce an excessive growth of leaves as compared with commercial fertilizers.

Sugar cane, G. J. B. BLEKKINK (*Orgaan Ver. Oudleer. Rijks Landbouwschool, 13 (1901), No. 160, pp. 226, 227*).—A discussion of methods practiced in sugar-cane culture in Java.

Sugar cane as a halophilous plant (*Jour. Agr. Trop., 1 (1901), No. 5, pp. 145, 146*).—This article points out the fact that sugar cane can thrive on soils impregnated with salt.

The sugar industry of Roumania (*Mitt. Deut. Landw. Gesell., 16 (1901), No. 49, Sup. 39, pp. 189, 190*).—Statistics.

The culture of sulla in Southern Spain, DE SAN-BERNARDO (*Jour. Agr. Prat., n. ser., 2 (1901), No. 50, pp. 752–754*).—The culture of sulla is discussed and results of experiments are reported. A plat inoculated with soil from a field on which sulla had matured produced 45 times as much green fodder per hectare as a plat uninoculated.

Results of experiments on swede growing, R. S. SETON (*Yorkshire Col., Leeds, and East and West Ridings Joint Agr. Council, Pamphlet 16, 1900, pp. 16*).—A report on the results of cooperative fertilizer and variety tests with swedes in 1900.

Tobacco business in France, J. C. COVERT (*U. S. Consular Rpts., 67 (1901), No. 255, pp. 502–505*).—This article embodies statistics on the amount of tobacco sold annually and gives a description of the organization and management of the State tobacco factory at Lyons.

Fertilizer and variety tests with turnips and mangels (*New Zealand Dept. Agr. Rpt. 1901, pp. 166–171*).—The results of these tests are given in tables.

Velvet bean, H. K. MILLER (*Florida Sta. Bul. 60, pp. 448–468, pls. 4*).—This bulletin contains a report on investigations with the velvet bean and a popular description of its culture, together with its uses as a soil renovator, fertilizer, cover crop, and ornamental. It was shown by analysis that the dried root of the plant contained 1.41 per cent of nitrogen, and by calculating the weight of the dried root to the basis of an acre, it was found that 690 lbs. of dried root would be produced. These figures show an increase of 9.7 lbs. of nitrogen per acre obtained from the root alone. The quantity of nitrogen removed in the hay from an acre is estimated at 131.5 lbs., so that if the hay were plowed under, 141.2 lbs. of nitrogen per acre would be added to the soil.

Analyses of the vines at different stages of maturity are recorded in tables. From the time the bloom appears until before the seeds begin to form is considered the proper time for cutting the velvet bean for hay. From further analyses it was found that a ton of beans in the pod contains 54.8 lbs. of nitrogen, 31.8 lbs. of potash, and 13.8 lbs. of phosphoric acid, representing a fertilizing value of over $10. Feeding experiments are noted elsewhere.

Field experiments with wheat, J. F. HICKMAN (*Ohio Sta. Bul. 129, pp. 27*).—The work reported in this bulletin consisted of variety tests and of cultural investigations. The average results for the 9 years indicate that Mealy and Early Ripe wheats are 2 of the best yielders on upland soils of average fertility. Red Russian, Poole, and Gypsy were close competitors for first place. Valley is recommended as the best variety for rich, strong, or low lands such as creek or river bottoms. Nigger, Egyptian, Currell Prolific, Mediterranean, New Monarch, and Improved Poole proved to be high yielding varieties, while Jones Square Head, Jones, Winter Fife, Royal Australian (Clawson), Early White Leader, New Longberry, and Martin Amber were some of the less promising sorts in these tests. The Mealy wheat, grown at the Station for 11 years in succession, gave relatively the highest average yield in the comparative tests. Observations seem to indicate that this variety has a tendency to shrivel when grown on low or otherwise rich land, but the results of the last year show that under like conditions it does not shrivel worse than the other varieties. The results of the year show that a larger proportion of white wheats than of red wheats were shrivelled.

Under normal conditions seeding at the rate of 8 to 10 pecks per acre gave a superior quality with higher yields as compared with thinner seeding. Eight or nine pecks of seed per acre are recommended for the thinner and less fertile soils of the State and 5 or 6 pecks for the rich, alluvial, or very strong upland soils. Comparatively late seeding gave the best results, but the author warns against deferring seeding too long in order not to interfere with a good, strong, fall growth. From the results of using different grades of seed it is concluded that either the quality of the seed does not influence the crop materially or that the variation in the quality of the seed was not sufficiently marked.

The California wheat industry, N. A. COBB (*Agr. Gaz. New South Wales, 12 (1901), No. 11, pp. 1317–1348, figs. 43; Dept. Agr. New South Wales, Misc. Pub. 519, pp. 32, figs. 43*).—This article presents personal observations in the wheat-growing regions of California. The author describes the most important varieties grown, pointing out their adaptation to the conditions of soil and climate, and discusses at some length the methods of harvesting grain and the machines employed for that purpose.

Wheat culture on the experiment field at Grignon in 1900 and 1901, P. P. DEHÉRAIN and C. DUPONT (*Ann. Agron., 27 (1901), No. 11, pp. 534–551*).—This report compares the results of 3 varieties of wheat, Japhet, Bordeaux, and Noe, spring sown in 1900, and 2 varieties, Japhet and Scholley, fall sown in 1901. Of these varieties, Japhet gave the best yields. The weather conditions which prevailed during the season, and the treatment of the soil with reference to rotation and fertilization, are shown in tables. Sowing wheat the latter part of October gave better results than sowing about 2 weeks later. In these tests wheat grown after potatoes gave larger yields than wheat grown after beets. It was found that vetch was not a favorable crop to precede wheat.

Variety tests of wheat (*New Zealand Dept. Agr. Rpt. 1901, pp. 158, 159*).—The results with 10 varieties of wheat are tabulated. Marshall Chaff produced the best yield.

Australian methods of testing and improving wheat (*Agr. Ledger, 1901, No. 2 (Agr. ser., No. 34), pp. 11–31*).—These methods are discussed and their applicability to India with special reference to the prevention of rust is considered.

The harvest of wheat, rye, and mixed grain (*Semaine Agr., 21 (1901), No. 1063, pp. 305, 306*).—Estimates on the production of wheat, rye, and mixed grain in France for 1901, and a discussion of the commercial relation between the millers and bakers of the country.

The cost of producing wheat, rye, and potatoes (*Sächs. Landw. Ztschr., 49 (1901), No. 49, p. 1154*).—A brief note on the cost of producing these crops in Germany.

The cost of producing our most important field crops, W. H. HOWARD (*Die Produktionskosten unserer wichtigsten Feldfrüchte. Berlin: Paul Parey, 1901*).

Colonial plants, H. JUMELLE (*Les cultures coloniales. Paris: J. B. Baillière & Son, 1901, vols. 1, pp. 360, figs. 101; 2, pp. 430, figs. 103*).—The author has brought together for the use of French colonists the divers methods employed in the culture of tropical and subtropical plants. Volume I treats of food plants and Volume II of industrial and medicinal plants.

HORTICULTURE.

Report of the professor of horticulture, H. L. Hutt (*Ontario Agr. Col. and Expt. Farm Rpt. 1901, pp. 67–73*).—This is a brief outline of the course of agricultural instruction observed in the college, with an account of some experimental work in testing strawberries, raspberries, blackberries, currants, gooseberries, and tomatoes. Of the strawberries grown, Stone Early has been one of the most uniform in productiveness from season to season. Among the leading early varieties are Sadie, Wesley, Anna Kennedy, and Van Deman; and among the best mid-season varieties Clyde, Irene, Warfield, Tennessee Prolific, and Williams. Of the raspberries grown, Columbian and Shaffer, of the purple varieties, head the list for productiveness, while Marlboro, Cuthbert, and Loudon rank among the best red varieties. Of the black raspberries, Older, Eureka, Gault, and Smith Giant are considered best. In a test with gooseberries the least productive of the American varieties gave nearly double the yield of the most productive English variety. Pearl was the best American variety grown. In tests of tomatoes for from 1 to 4 years, Atlantic Prize, Earliest of All, Mayflower, Express, Plentiful, and Dominion Day are given as a few of the most valuable varieties.

Report of the horticulturist, H. H. Hume (*Florida Sta. Rpt. 1901, pp. 76–86, pls. 2*).—This is a brief outline of the work of the horticulturist during the year, including descriptive notes on 30 varieties of pecans, in addition to those noted in Bulletin 54 of the station (E. S. R., 12, p. 751). Forty-five varieties of strawberries have been grown at the station. The best of these are stated as follows: McKinley, Lady Thompson, Murray Extra Early, Brandywine, Cloud, Michel Early, Johnson Early, and Improved Newman. Lady Thompson was practicatly free from disease and Michel Early was also comparatively free.

American horticultural manual, I, J. L. Budd and N. E. Hansen (*New York: John Wiley & Sons, 1902, pp. 417, figs. 106*).—This manual is intended to meet the needs of students, amateurs, and beginners in horticulture. It discusses the leading principles and practices connected with the propagation, culture, and improvement of fruits, nuts, ornamental trees, shrubs, and some of the more common garden plants in the United States and Canada. The plan of the work provides that Part II, which is not yet published, shall treat of systematic pomology. In the discussion of orchard fruits, subtropical fruits like the orange, lemon, pomelo, olive, fig, date palm, pineapple, etc., are included. A chapter is devoted to the history, development, and culture of American grapes. Chapters are also devoted to raspberries and blackberries; strawberries; currants and gooseberries; promising wild fruits; nut trees; ornamental shade, lawn, and park trees; ornamental shrubs and vines; perennials and bulbs; vegetable and small fruit garden; and irrigation. The large number of subjects included has necessitated a rather brief treatment of each.

Problems of heredity as a subject for horticultural investigation, W. Bateson (*Jour. Roy. Hort. Soc.* [*London*], *25* (*1900*), *No. 1–2, pp. 54–61*).—Largely a review of the work of Mendel and de Vries.

The mechanism of hybridization and the production of races, A. Gautier (*Rev. Vit., 16* (*1901*), *Nos. 413, pp. 529–534; 414, pp. 557–564; 415, pp. 585–590*).—A general review of this subject with particular reference to vines.

The rôle of artificial pollination in horticulture, Foussat (*Jour. Soc. Nat. Hort. France, 4. ser., 2* (*1901*), *July, pp. 703–715*).—The improvements in plants in form, color, size, hardiness, etc., brought about by artificial cross pollination, are discussed.

The book of the greenhouse, J. C. Tallack (*London and New York: John Lane, 1901, pp. 103, pls. 10, figs, 6*).

Greenhouse construction, B. C. Ravenscroft (*London: L. Upcott Gill*).

Fuel material and boilers for greenhouse heating, O. Peschke (*Möller's Deut Gart. Ztg., 16 (1901), No. 47, pp. 562–565*).—Some data on the fuel value of coke, stone coal, and peat are given, together with a discussion of boilers for heating greenhouses.

The manuring of market-garden crops, B. Dyer (*London: Vinton & Co., Ltd' 1898, pp. 64*).—The author has brought together the results of a large number of experiments in fertilizing all the more usual garden crops, including cabbage, onions, lettuce, Brussels sprouts, cauliflowers, broccoli, asparagus, rhubarb, Jerusalem artichokes, strawberries, Globe artichokes, carrots, parsnips, spinach, beets, celery, and potatoes. The experiments, on the whole, bring out the fact that market gardeners frequently pay too large prices and use too large amounts of barnyard manure in their gardening operations. For some crops it was found that commercial fertilizers used alone were most economical, but that on the whole the best method of manuring was to combine the use of a moderate quantity of barnyard manure with the liberal use of commercial fertilizers.

The artichoke, J. Mathiaud (*Rev. Hort. et Vit., 33 (1901), No. 11, pp. 210–216*).—A paper on varieties, methods of culture, including care over winter, and the diseases and insects affecting.

Forcing beans, R. Priebe (*Möller's Deut. Gart. Ztg., 16 (1901), No. 47, pp. 567–570*).—Directions are given for forcing beans in the greenhouse. Seed 3 years old is preferred in this work.

Cauliflower, H. H. Hume (*Florida Sta. Bul. 59, pp. 425–439, pls. 2, fig. 1*).—Full directions are given for the culture, fertilizing, and marketing of cauliflower in Florida, with an account of the chief insects affecting and methods for their control. Work at the station has shown that the cauliflower can be profitably grown in Florida. Varieties of the forcing type, like Extra Dwarf Erfurt, Early Snowball, and Dry Weather, are considered most desirable. The seed used should be the best. Seeding the first week in August was found the earliest date at which a good stand of plants could be secured. About 6 months are required between the time the seed is sown to the maturity of the crop. At transplanting time the leaves should be cut back from one-half to one-third. In the station work, sufficient well-rotted stable manure is used to cover the ground 1 to 1½ in. deep. This is supplemented by a fertilizer mixture made up of 250 lbs. nitrate of soda, 400 lbs. cotton-seed meal, 600 lbs. acid phosphate, and 400 lbs. high grade sulphate of potash. The stable manure and half the commercial fertilizers are applied broadcast 2 to 3 weeks before planting and thoroughly worked into the soil. The remainder of the fertilizers are applied 1½ to 2 months after the plants are set by scattering it around them and lightly raking in. If the soil is sufficiently rich in vegetable matter the barnyard manure is omitted and more commercial fertilizers added.

Celery culture, W. R. Beattie (*U. S. Dept. Agr., Farmers' Bul. 148, pp. 32, figs. 7*).—Popular discussion of the growing of celery, including notes on diseases and insects affecting, profits in the business, varieties, and marketing.

Celery growing in Orange County, C. F. Heil (*Pacific Rural Press, 62 (1901), No. 16, pp. 244, 245*).—A paper on this subject dealing with cultural methods and cost of growing. The cost of growing an acre of celery in Orange County, California, placing the rent of land at $30 per acre, is given as $75. From an acre 1,000 to 1,500 dozen bunches are obtained, for which buyers pay from 10 to 18 cts. per dozen.

Whitloof chicory and the formation of second-growth leaves, E. Carpiaux (*Bul. Agr. [Brussels], 17 (1901), No. 5, pp. 564–568*).—The author has studied the chemical transformation that takes place in plants which produce a secondary growth at the expense of the reserve material of the root. Chicory was the subject chosen, and analyses are given of chicory roots before and after having produced a second growth of leaves. The results are stated as follows: The inulin, which is the principal reserve material of chicory roots, decreases notably in the production of second-growth leaves. The nitrogenous material, both albuminoid and nonalbuminoid, undergoes no appreciable modification during the growth of the secondary leaves. These are transported from the mother root to the growing product, but there is no transformation of amid bodies into albuminoids. In the production of the foliage only a small portion of the phosphoric-acid content in the mother root is used, but a considerable portion of the potash.

Pollination of cucumbers, O. Schmeiss (*Möller's Deut. Gart. Ztg., 16 (1901), No. 20, p. 242*).—Contrary to the author's usual practice, the hand pollination of cucumber blossoms in the forcing house was not found necessary, good fruits being secured without it.

A guide to the cultivation, harvesting, and marketing of the ginseng plant (*New York: Crowell & Kirkpatrick Co., 1902, pp. 52, figs. 9*).—This is largely a compilation of different works on ginseng cultivation. Besides the cultivation, harvesting, and marketing of ginseng, it contains some notes on the history, botany, and uses of the plant. A list of buyers and growers of ginseng is appended.

Stable manure and nitrogenous chemical fertilizers for forcing lettuce, S. A. Beach and H. Hasselbring (*New York State Sta. Bul. 208, pp. 307–342, pls. 10*).—The results of earlier work by the station in forcing lettuce with different combinations of fertilizers and on different soils have been previously noted (E. S. R., 10, p. 957). In the present account the results of work in forcing lettuce from 1898 to 1901 are recorded. The experiments were carried out in the forcing house, using boxes 15 by 15 by 8 in. inside. Four lettuce plants were grown in each box. Both a medium clay loam and a rather light sandy loam were used, and the experiments with the different fertilizers were made in duplicate with these 2 soils. An excess of phosphoric acid and potash over the requirements of the plants was used in the soil of each box. The problems studied were the comparative values for lettuce forcing of the nitrogenous fertilizers—dried blood, nitrate of soda, dried blood and nitrate of soda combined, and sulphate of ammonia. These fertilizers were used alone in the different boxes and combined with well-rotted horse manure. The first year the stable manure in the different boxes constituted 5, 10, 15, and 20 per cent by weight of the soil used, and the following years these same percentages in bulk were used. In other boxes without commercial fertilizers, stable manure constituted 33⅓ per cent of the soil. Grand Rapids and Rawson Hothouse varieties of lettuce were used. The results secured are reported in a series of tables and discussions, showing the weight of the crop secured with each fertilizer on the different soils and with th different amounts of stable manure.

When the commercial fertilizers were used alone considerably better results were secured than when no fertilizers were used, but they did not force the crop rapidly enough to maturity to be profitable. The nitrate of soda generally gave better results on the clay loam than the other commercial fertilizers, but on the sandy loam it was not as beneficial as dried blood. The addition of lime to the nitrate of soda increased the yield on the sandy loam, but decreased the crop on the clay loam. The results with the other fertilizers when used without manure were variable in the different years, but drie blood generally gave the best results on the sandy soil.

When manure was added to the commercial fertilizers much better yields were secured than without it, and these yields were proportionately much better with the 5 and 10 per cent applications than with the 15 and 20 per cent applications. Of the various commercial fertilizers used with the 5 and 10 per cent applications of stable manure, the yields with dried blood in 16 out of 20 tests were better than the yields with nitrate of soda, and better in 7 out of 10 tests than with sulphate of ammonia. In 11 tests the yields were better than with a combination of dried blood and nitrate of soda, while in 9 tests the reverse was true. The general conclusions are drawn that much better lettuce crops may be forced by the addition of stable manure to commercial fertilizers than without it, but that it is not good economy to make repeated heavy applications of the manure to the same soil.

Compacting the soil made up of 33⅓ per cent of manure resulted in better yields than when the soil was not thus treated. Throughout the experiments the clay loam proved a better forcing soil than the sandy loam.

Abstracts are given of the work done in forcing lettuce by other experiment stations.

Fertilizers for forcing lettuce, F. H. HALL, S. A. BEACH, and H. HASSELBRING (*New York State Sta. Bul. 208, popular ed., pp. 8, pls. 2*).—A popular summary of the above bulletin.

Melons, A. PETTIGREW (*Jour. Roy. Hort. Soc.* [*London*], *25* (*1900*), *No. 1-2, pp. 118-127, figs. 4*).—The muskmelon is considered and directions given for its culture under glass.

Commercial fertilizers for onions, W. H. JORDAN and F. A. SIRRINE (*New York State Sta. Bul. 206, pp. 265-274*).—It was believed that onion growers in the second judicial department of New York were using excessive amounts of commercial fertilizers for their onion crop each year. Experiments were therefore begun in 1897 to test this belief. A complete commercial fertilizer mixture, analyzing 4 per cent nitrogen, 8 per cent phosphoric acid, and 10 per cent potash, which is popular with onion growers of that section, was used; and 500, 1,000, 1,500, and 2,000 lbs. per acre, respectively, applied to different plats for 4 years in succession on one field and for one year on another. The soil upon which the experiment was conducted was especially suitable for onions, being black, peaty, and friable, with a water table about 2 ft. below. The average cost of the fertilizers used and the yield of onions per acre for the 4 years are shown in the following table:

Cost of fertilizers and average yield of onions per acre.

Amount of fertilizer.	Cost of fertilizers.	Average yield.	Increase from use of fertilizers.	Cost of increase per barrel.	Profits from use of fertilizers.
		Barrels. [a]	*Barrels.*	*Cents.*	
No fertilizer		85.3			
500 lbs	$5.47	118.4	33.1	16.6	$35.84
1,000 lbs	10.94	125.2	39.9	27.4	38.87
1,500 lbs	16.41	132.0	46.7	35.1	41.90
2,000 lbs	21.87	134.4	49.1	44.5	39.44

[a] Barrel = 150 lbs.

The table shows that the profits from using the fertilizers were greatest with the first 500 lbs. applied. In the opinion of the authors, considering the variations of market price of onions from year to year and the vicissitudes in growing, the use of more than 500 lbs. of fertilizers on the soils in question was attended by danger of financial loss.

In the duplicate of the experiment, carried out for a single season, there was no increase whatever from the use of fertilizers, the soil on which the experiment was conducted being well enough supplied with these elements from the manuring of preceding years. It is believed that this unnecessary use of manures on soils already rich in plant food illustrates a common mistake of farmers engaged in intensive operations. In this test 13 per cent of the yield, when no fertilizer was applied, was small pickle onions, 3 per cent when 500 lbs. was applied, 1.9 per cent when 1,000 lbs. was applied, 3.1 per cent when 1,500 lbs. was applied, and 4.3 per cent when 2,000 lbs. was applied.

Fertilizer problems, F. H. HALL, W. H. JORDAN, G. W. CHURCHILL, and F. A. SIRRINE (*New York State Sta. Buls. 205, 206, popular ed., pp. 8*).—This is a popular summary of Bulletins 205 (see p. 1042) and 206 of the station, noted above.

Plantain cultivation in the Assam Valley, B. C. Basu (*Indian Agr., 26 (1901), No. 11, pp. 342-345*).—This article gives the characteristics of many cultivated varieties of plantain, methods of culture and manuring in the Assam Valley, diseases and insects affecting, yield and prices, use as food, fodder, and alkali, and methods of preparation. The value of the plant from the standpoints of fiber, medicine, etc., is also discussed.

Tomato culture, R. H. Price (*Texas Farm and Ranch, 20 (1901), No. 49, pp. 10, 11*).—Tomato culture in Texas is dealt with. Dwarf Champion and Acme are the only varieties recommended. A hotbed is necessary for growing an early crop, and plants are put out from May 10 to 15. It is recommended to train the vine to one long stem and tie to stakes.

Culture of truffles, E. Zacharawicz (*Rev. Vit., 16 (1901), Nos. 411, pp. 485-488; 412, pp. 518-520*).—Methods observed in France in planting, fertilizing, cultivating, and harvesting truffles are described.

Lessons in commercial fruit growing, E. S. Goff (*Madison, Wisconsin: University Cooperative Association, 1902, pp. 221, figs. 48*).—This is intended as a beginners' text-book for use in the class room. The text is stated concisely with the expectation that it will be amplified by the instructor. Orchard and small fruits, nuts, grapes, and citrus fruits are considered in the work, and these are discussed topically from the standpoint of cultural range, propagation, planting, and care of the trees; the insects and diseases affecting them; and the harvesting, storage, and marketing of the fruit. Brief summaries follow the different sections and chapters, and suggestions are given for laboratory work. The final chapter is devoted to the business management of the fruit plantation. The work will be found a convenient guide to those giving instruction along these lines.

Fruits and shrubs, S. B. Green (*Minnesota Sta. Bul. 72, pp. 321-332, 338, 339, figs. 4*).—At the Coteau farm, which is located in southwestern Minnesota, in the region of scant rainfall, wild plums, apples, raspberries, blackberries, strawberries, buffalo berries, sand cherries, high-bush cranberries, currants, gooseberries, June berries, and mulberries have been successfully grown only by the aid of forest protection. Without it, indifferent results or failure have resulted. A list is given of a number of the more important shrubs and vines that succeed best at the station. The best hedge plants for division lines and for ornamental purposes are the common English buckthorn and buffalo berry. For high-hedge purposes box elder is considered one of the best. The wild plum is considered a desirable fruit for locations having conditions similar to those at the station. Apples should be grown in rather closely planted small orchards, surrounded by windbreaks, or else in alternate rows with box elder. The most hardy varieties thus far tried are Hibernal, Patten Greening, Duchess, Peterson Charlamoff. Among the crabs, Minnesota, Martha, Pride of Minneapolis, Transcendent, Virginia, and Sweet Russet are the best tried. Raspberries and strawberries should be heavily mulched with straw. Over strawberries the mulch should be at least 6 in. thick after it has settled down. This treatment will frequently prevent the formation of "nubbins."

Fertilizing orchard trees, A. Wagner (*Wiener Illus. Gart. Ztg., 26 (1901), No. 10, pp. 345-352*).—The author discusses the use of various manures and artificial fertilizers for orchard trees, and gives suggestions for fertilizing them in accordance with the number of square meters over which the roots of the tree extend. This is determined by adding from 1 to 3 meters to the diameter of the crown of the tree. The area in square meters of the circle thus formed is easily calculated. The amount of fertilizer to apply to each square meter is given for a number of fertilizers as follows: (1) Liquid manure (with phosphoric acid or superphosphate), 5 liters in spring and summer; (2) liquid night soil (with wood ashes or a potash salt), 3 to 4 liters in spring and summer; (3) compost, 10 kg. in fall, winter, or spring; (4) stable manure, 4½ kg. in fall, winter, or spring.

When artificial manures are used the following amounts may be applied: (5) Thomas slag (containing 15 per cent citric acid soluble phosphoric acid), 40 to 60 gm. in fall, winter, or early spring; chlorid of calcium, 20 to 30 gm. in fall, winter, or early spring; nitrate of soda, 20 to 50 gm., one-half applied with the phosphate fertilizer and the other half in the spring; (6) superphosphate (containing 15 per cent water-soluble phosphoric acid), 30 to 50 gm. in winter or spring; chlorid of potash 20 to 30 gm. in winter or early spring, and nitrate of soda 20 to 50 gm., one-half to be applied with the potash and phosphate and the other half in the spring. The chlorid of potash in mixtures 5 and 6 above may be replaced by the cheaper 40 per cent potash salt, and in such case 25 to 35 gm. should be used.

Fertilizer experiments with orchard trees, flowers, and vegetables, C. H. Claassen (*Verslag Proefnem. Tuinbouw Zuid-Holland, 1898, pp. 56*).—The results are given of fertilizer experiments carried on with orchard fruits, rhododendrons, and hyacinths. Both barnyard manure and commercial fertilizers were used. Some data are also given on the results of variety tests with cucumbers and melons, and of a culture test with grapes.

Manures and fruit trees (*Bul. Soc. Cent. Forst. Belg., 8 (1901), No. 1, pp. 41–44*).—A discussion is given of the principals of fertilizing fruit trees, with specific recommendations based on the work of A. Wagner (see p. 1048).

The book of the apple, H. H. Thomas (*London and New York: John Lane, 1902, pp. 112, pls. 9, figs. 8*).—This is the sixth volume of the series of Handbooks of Practical Gardening, edited by H. Roberts. It deals primarily with apple culture in England, including descriptions of dessert and cooking varieties of apples most prominent there, and includes chapters by the editor on the history and cookery of apples and on the preparation of cider. English methods of apple culture are so different from those observed in this country that the book will be found of but little practical use to American orchardists.

Bananas (*Shamba [Zanzibar], 1901, Nov. 6, Sup. pp. 3*).—The varieties of bananas grown in Zanzibar for different purposes and their cultivation are here considered in some detail.

The Chinese cling group of peaches, G. H. Powell (*Delaware Sta. Bul. 54, pp. 32, figs. 9*).—The general characteristics, history, and classification of the Chinese cling group of peaches are given, together with historical and descriptive notes of 65 varieties. Synonyms of these varieties are also given. In this work the author has endeavored to revise the nomenclature of the group and simplify the names. The name "Chinese cling group" is believed to be more exact than "Northern Chinese race," by which the group is quite generally known, and is therefore proposed for it. The varieties of this group most largely grown are stated to be Greensboro, Carman, Thurber, Georgia, and Elberta.

Variations in olives during ripening, C. E. Zay (*Staz. Sper. Agr. Ital., 34 (1901), No. 11–12, pp. 1080–1085*).—Analytical data, including ash constituents, are reported.

The fig, R. H. Price and E. A. White (*Texas Sta. Bul. 62, pp. 17–29, pls. 12*).—A brief discussion is given of fig culture in Texas, including details for propagation, fertilizing, planting, and pruning. Various kinds of figs are classified and descriptive notes given of 20 varieties. The correct nomenclature of the different varieties has been made a special feature of the bulletin. The variety quite generally known as the Magnolia fig has been found to be identical with Brunswick, Clare, and Barnisotte. Figs are not extensively grown in Texas, and their more general use is advocated. The following varieties, mentioned in the order of their productiveness, have been successful on the station ground: Brown Turkey, Black Marseilles, White Marseilles, Brunswick, Violet de Bordeaux, Early Violet, Pitaleuse, Brown Marseilles, Negro Largo, Grosse Verte, and Angélique.

Notes on plantations of caprifig trees, G. EISEN (*Pacific Rural Press, 62 (1901), No. 24, p. 272*).—In order to secure with certainty 3 crops per season of caprifigs, the author advises the planting of several different kinds of caprifigs. The caprifig trees should also be grown in at least 2 different plantations as a guard against injury from frost and to insure a crop of caprifigs when they are wanted. One of the plantations should be on low ground out of danger of severe frost. Caprifig trees should be planted close together and at various places about the fig orchard. The trees require no pruning, but should be headed low and encouraged to sucker freely in order that there may be plenty of shade for the wasps. Caprifigs should be grown on their own roots and not grafted as standards on other fig stock, nor is it advisable to graft them on the limbs of Smyrna fig trees.

Caprification in Algiers, TRABUT (*Rev. Vit., 16 (1901), Nos. 412, pp. 501–504, figs. 3; 413, pp. 537–543, figs. 10*).—A popular discussion of fig caprification in Algiers, and a description of the Blastophaga and of its method of fertilizing figs.

On the culture of dwarf fruit trees, G. LIND (*K. Landt. Akad. Handl. Tidskr., 39 (1900), No. 5–6, pp. 369–372*).

Cacao: A treatise on the cultivation and curing of cacao, J. H. HART (*Trinidad: The "Mirror" Office, Port-of-Spain, 1900, pp. 117, figs. 9*).—This book is based on the author's 25 years' experience in the botanical department of the West Indian service. It deals in a popular manner with the culture of cacao, its preparation for market, botany and nomenclature, diseases affecting, chemistry of cacao, manufacture of chocolate, export, etc.

Coffee trees, É. DE WILDEMAN (*Les caféiers. Brussels: Veuve Monnom, 1901, pp. 43*).—A general classification is given of the species of the genus Coffea, with the usual botanical descriptive notes.

Coffee cultivation, J. T. PALACHE (*Jour. Jamaica Agr. Soc., 5 (1901), No. 9, pp. 347–356*).—Directions are given for growing coffee in Jamaica.

Coffee culture in São Paulo, A. G. DA SILVA TELLES (*O café eo estado de S. Paulo. São Paulo: "Diario Oficial," 1900, pp. 60*).

Report on coffee, with special reference to the Costa Rican product, J. B. CALVO (*U. S. Dept. State, Bureau of American Republics, 1901, pp. 15*).

The Butin Schaap method of coffee grafting, A. PREYER (*Tropenpflanzer, 5 (1901), No. 5, pp. 220–224, figs. 2*) and A. ZIMMERMANN (*Meded. 'S Lands Plantentuin, 1901, No. 49, pp. 54, figs. 32*).—The method followed by Mr. Butin Schaap in the grafting of coffee trees is described and some notes added as to its practical application. The method is essentially as follows: The scions are cut out early in the morning and transported in closed baskets to the place of using. Here each scion is cut arrow shape below the first node, and placed in a simple split 3 cm. long, either in the terminal or second bud of the stock. The side leaves are removed, except 2 of the smaller uppermost ones of the scion. The graft is tied in place with woolen yarn, but is neither waxed nor smeared over with other material. Both scion and wound are then covered over with a glass beaker. This preserves a constantly moist atmosphere about the scion and prevents its drying out. As soon as the scion and stock have grown together both the glass and yarn are removed.

Grafting coffee trees is of primary importance in districts where nematodes are abundant. These severely affect Arabian coffee varieties, but Liberian tree roots are seldom attacked. The Liberian trees are, therefore, used as stock for Arabian and other better sorts of coffee. Another advantage is the increased yields obtained from the Liberian trees when grafted with the Arabian, Maragogipe, or other improved varieties, while the quality of the Arabian coffee, etc., does not seem to be in any manner injuriously affected by growing on Liberian stock. It is suggested that this may point the way to the improvement of nonremunerative coffee plantations.

The best trees for stocks are those not less than 3 years old, and the graft is made on the central stem. Older trees that have grown too high may be cut off about 3 feet from the ground, and the strongest shoot that comes from the stump be used to graft on, the other shoots being removed. It is advised that the scion used should be taken from healthy, vigorous 6-year-old trees.

Some revelations about the cultivation, the commerce, and the use of coffee, J. C. ALVES DE LIMA (*Syracuse, N. Y.: Mason Press, 1901, pp. 16, pl. 1, map 1*).—Statistics of coffee production in Brazil and of the importation of coffee into the United States. A map is included showing the chief coffee zones of Brazil.

On the composition of some common berries, J. A. HUMMEL (*Farm Students' Rev., 6 (1901), No. 8, p. 119*). The author reports the composition of several varieties of currants, gooseberries, black and red raspberries, and strawberries.

Strawberry packages, J. M. BUISSON (*Rev. Hort. [Paris], 73 (1901), No. 20, pp. 470–472, figs. 9*).—The various packages used for marketing strawberries in the Paris market are described and illustrated.

Preparation of dried raisins, TRABUT (*Bul. Agr. Algérie et Tunisie, 7 (1901), No. 2, pp. 493–497, figs. 4*).—Sultana raisins are prepared in Algiers by first dipping them for about 2 seconds in a boiling lye solution made up of 500 gm. of caustic potash and 30 liters of water. After dipping, the grapes are spread out on trays and left in the sun 1 or 2 days. The trays are then piled up one on the other where the raisins dry without further care.

Hazelnut culture, L. SCHENZ (*Möller's Deut. Gart. Ztg., 16 (1901), No. 12, pp. 135, 136*).—Brief notes on methods of hazelnut culture, with description of 37 varieties.

Hazelnut culture, L. SCHILDKNECHT (*Möller's Deut. Gart. Ztg., 16 (1901), No. 14, p. 162*).—Soil, methods of culture, and cost and profits in hazelnut culture near Leipzig are noted. Generally the business has not proved very profitable.

Vanilla: Its culture, preparation, and commerce, H. LECOMTE and C. CHALOT (*La vanillier; sa culture, préparation, et commerce de la vanille. Paris: C. Naud, 1902, pp. 228, figs. 28*).—This is a popular account of the culture of the vanilla tree, and of the preparation of the vanilla of commerce. The book opens with a botanical account of the plant, followed by botanical descriptions of the different species of vanilla and an account of the climatic and soil conditions necessary for its growth. Directions are given for setting out a vanilla plantation, the care necessary to give it, and the means of combating insect and fungus pests. Methods of planting are discussed, together with harvesting, packing, the chemistry of the plant, commercial preparation of vanilla extract, adulterations of vanilla, and the production of vanilla in different countries. A bibliography of 58 papers on the subject is appended.

Vanilla; culture in Mexico, R. LOPEZ Y PARRA (*La vainilla; su cultivo y beneficio en la Républica Mexicana y en el extranjero. Mexico: Imprenta "El monograma," 1900, pp. 69*).

Rubber culture in Venezuela, L. MORISSE (*Sci. Amer. Sup., 52 (1901), No. 1355, pp. 21724, 21725*).—The methods of the Indians in gathering rubber in the Venezuelan rubber forests are set forth, and an account given of the extent of the forests and of some experiments in pricking rubber trees and gathering the product. During 15 days the author states he pricked 912 trees daily, securing 80 kg. of coagulated milk per day, from which 50 kg. of fine and dry caoutchouc were secured, worth 7 francs per kilogram.

Gums and gum resins from Senegal and Soudan, J. VUILLET (*Agr. Prat. Pays Chaud, 1 (1901), No. 3, pp. 327–341*).—An account is given of the production and commerce of gums and gum resins in Senegal and Soudan, with descriptions of the principal species of Acacia from which these gums are obtained, and of several other gum trees.

History of the chrysanthemum, G. E. MCCLURE (*Gardening, 10 (1901), No. 223, pp. 99–101*).—A paper on this subject, read before the St. Louis Florists' Club, November 9, 1901.

Relative to the grafting of Clianthus dampieri, S. MOTTET (*Rev. Hort.* [*Paris*], *73* (*1901*), *No. 11, pp. 256, 257, fig. 1*).—Notes on successful grafts made between *C. dampieri* and other species of the genus.

Propagation and culture of choice dracænas, A. FREY (*Amer. Gard.*, *22* (*1901*), *No. 365, p. 860*).—Methods of propagation by cuttings, roots, and stems are considered, as well as methods of topping and the treatment to be given the young plants. Seven varieties are briefly described.

Lilies, R. W. WALLACE (*Jour. Roy. Hort. Soc.* [*London*], *25* (*1900*), *No. 1–2, pp. 98–113, figs. 23*).—Some notes on the nature of lilies, their botanical classification, and cultural requirements.

Cultivation of the narcissus in gardens, S. E. BOURNE (*Jour. Roy. Hort. Soc.* [*London*], *25* (*1900*), *No. 1–2, pp. 39–53, fig. 1*).—An extended account is given of the garden culture of narcissus, including a discussion of situations and soils, planting, manuring, replanting, insect and fungus pests, etc.; and a list is given of the best sorts for outdoor culture. Some directions are also given for the cultivation of narcissus in cold frames and greenhouses.

The golden poppy, E. E. SMITH (*San Francisco: San Francisco News Company*, *1902, pp. 232, pls. 2, figs. 65*).—This book contains the botanical history of California's State flower—the golden poppy, or Eschscholtzia, and allied genera. The history of the flower, references to it in literature, its use in graphic and decorative art, economic uses, culture, and poetry and interesting items relating to it have been pleasingly brought together. A bibliography of *E. californica* is included.

Rose analysis, 1895–1901 (*Jour. Hort.*, *53* (*1901*), *No. 2770, pp. 391–395*).—The relative position of varieties of roses exhibited on the prize stands at the English National Rose Society's exhibition, for a number of years, is shown in a series of analytical tables.

Grafting of flower buds on Syringa vulgaris (*Bol. Roy. Soc. Tosc. Ort.*, *26* (*1901*), *No. 4, p. 109; abs. in Jour. Roy. Hort. Soc.* [*London*], *26* (*1901*), *No. 1, p. 220*).—A method for obtaining forced lilac flowers is briefly described. It consists in grafting lilac shoots, grown in the open and bearing flower buds, into the ends of branches of plants in the greenhouse which have already flowered. The shoots should be 15 to 20 cm. in length and the graft inserted between the wood and cortex of the stock. The buds begin development in 10 to 12 days, and in about 20 days the flowers appear.

Forcing violets, J. RUDOLPH (*Rev. Hort.* [*Paris*], *73* (*1901*), *No. 20, pp. 476, 477*).—Notes on methods of forcing under glass, in the open, and in pots.

Report on essence-producing plants in Algeria, R. SCHILLING (*Bul. Dir. Agr. et Com.*, *6* (*1901*), *No. 21, pp. 359–374*).—The geranium is the principal plant dealt with. Methods of planting, harvesting, and distilling the crop, filtering, packing, and shipping the product are reported upon in detail. Other essence-producing plants noted are *Eucalyptus globulus*, bitter orange, *Acacia farnesiana*, and thyme, the commercial importance of each being noted.

Gardens for school children, G. H. KNIGHT (*Pearson's Mag.*, *12* (*1901*), *No. 69, pp. 348–353, figs. 8*).—A brief account and illustrations are given of several school gardens in foreign countries and at Dayton, Ohio. The estimated cost of establishing a school garden for 200 children is placed at $1,500.

American gardens, G. LOWELL (*Boston: Bates & Guild Co.*, *1902, pp. 32, pls. 112, dgms. 48*).—This is a quarto publication consisting of 20 pages of introductory matter relative to the history of gardening, and 112 full-page plates illustrating 58 American gardens in different parts of the country. These illustrations are taken from the better American gardens and intended to set forth the art of gardening as it has been developed in America.

Illustrated encyclopedia of garden culture, T. RÜMPLER (*Illustriertes Gartenbau-Lexikon. Berlin: Paul Parey, 1902, pp. 936, figs. 1002*).—This work has lately undergone an extensive revision under the direction and cooperation of some of the best gardeners of Germany. It is arranged alphabetically with reference to plants cultivated in the greenhouse and garden, and to miscellaneous horticultural subjects.

FORESTRY.

The forest garden, S. B. Green (*Minnesota Sta. Bul. 72, pp. 303–321, figs. 10*).—A report is given of forest investigations begun at Coteau farm, the object being to determine the hardiness of trees, the kinds adapted to different plantings, and the rate of growth of the different trees. This region is situated in a high prairie, and is representative of a considerable area of the southwestern part of the State. The trees were planted in rows 8 to 10 ft. apart and 2 ft. apart in the row. The soil was cultivated to keep down the grass and weeds and to preserve a soil mulch. It was found that after establishing a windbreak it is comparatively easy to grow trees on the land under investigation, if reasonable attention is paid to keeping the soil cultivated about the plants. It was also found possible to produce a shelter belt and also a fuel supply at the same time. For this purpose the author recommends the use of the common white willow of that section. This will produce annually from 3 to 5 cords of firewood per acre. The nursery stock used in this experiment was nearly all grown within the State, and consisted of 48 varieties of trees, the hardiness of which is reported upon in detail.

The effect of ice storms on trees, H. H. Chapman (*Forestry and Irrig., 8 (1902), No. 3, p. 130*).—An account is given of the effect of a severe storm, accompanied by rain and ice, on trees on Staten Island. The trees were elm, beech, tulip, poplar, and black oak; and many had sound limbs broken that were 4 in. or more in diameter. White oak alone seemed to resist serious damage by the greater strength of its branches. To calculate the force which causes such destruction, a number of twigs were cut transversely and diagrams made of the thickness of twig and ice incrustation. Calculating from the relative area in cross section, it was found that twigs ⅛ in. thick were carrying from 30 to 40 times their weight of ice, and those ¼ in. thick about 20 times their weight. While the exact calculation would be rather difficult, it seems safe to say that branches 1 in. thick were called upon to support a weight more than 10 times as great as usual, and possibly considerably more. In addition to this heavy weight, the trees were subjected to high winds, multiplying the effect of the heavy burden. In many cases all the limbs of trees were broken and the crown reduced fully 90 per cent.

Colorado forest fires in 1901, H. Michelsen (*Forestry and Irrig., 8 (1902), No. 3, pp. 111–116*).—There were 140 forest fires in the forest reservations of the State during the year; the area burned amounted to 1,690 acres; and the timber destroyed was valued at $5,375. Outside the reserves, 100 square miles of timber land were burned over. The loss by counties is given, and the possible effect of the destruction of the forest cover on evaporation is commented upon.

The planting of exotic trees in southern Florida, J. Gifford (*Forestry and Irrig., 8 (1902), No. 3, pp. 116–121, figs. 4*).—Attention is called to the value of a number of exotic trees for planting in southern Florida. Among the trees suggested for such planting are mentioned the kukui nut (*Aleurites moluccana*), various species of eucalyptus, cajeput (*Melaleuca leucodendron*), camphor trees, and cork oak.

Tree planting in Maryland, A. Neilson (*Forestry and Irrig., 8 (1902), No. 2, pp. 72–75, figs. 4*).—An account is given of the carefully kept record of the tree planting that has been conducted for 80 years at Priestford Farm, Harford County, Maryland. Beginning in 1822 the farm had no timber of any consequence. At the present date it contains a wood lot of 40 acres and, in addition, has about 3,000 locust trees of various ages. All fencing material needed in the past 60 years has been produced on the farm, and a large amount of posts and other material has been sold in the meantime. In the spring of 1822 there were planted a considerable number of yellow poplars, red oaks, white ash, maples, hemlocks, and catalpas; all but the catalpas coming from nearby woods. At the present time the maples average 33 in. in diameter, the poplars 48 in., hemlocks 36 in., white ash 38 in., catalpas 30 in., and red oaks 24 in. In the same year there were planted 4,000 chestnuts from which trees were grown, and at the present time there are 70 standing in the wood lot, 40 of them of the original planting, the remainder being second and third growth from stumps. The original trees average 30 in. in diameter, while the others average 15 in. in diameter. In 1826 a lane half a mile long was planted with yellow locust seed. The trees were allowed to grow for about 30 years before any cutting was done. In 1875 posts to the value of $500 were sold. In 1901 sales were made to the amount of about $800, and prior to 1875 no record was kept of any of the cuttings. Additional notes are given of different plantings from 1826 to 1898.

Forestry in Massachusetts, W. H. MANNING (*Forestry and Irrig., 8 (1902), No. 2, pp. 80–83, figs. 2*).—Attention is called to the fact that the first settlers of Massachusetts did not find an impenetrable tangle of forests covering the State, but there were extensive openings where by fire and other means the forests had been destroyed. After the settlement of the country the woods were cut so rapidly that a scarcity of timber began as early as 1760. About 1792 the Massachusetts Society for Promoting Agriculture offered prizes for the most expeditious way of clearing lands in areas of not less than 20 acres. At the same time they conducted investigations to ascertain whether the growth of timber kept pace with the cutting. It was found that cutting so greatly exceeded the natural growth that a serious scarcity of firewood was threatened, and this led to a reversal of the former policy, and prizes were offered for forest plantations. The early plantations were made of hard wood principally, such as oaks and hickories, followed later by the white pine, and at a still later period with larches, Scotch pine, and Norway spruce. It was soon found that the foreign trees possessed no advantages over the native ones. During this time but little attention was given to the development of the existing forest growth. The attempts at reforestation are briefly traced and suggestions given for planting. At the present time the mixed forest growth has little or no value except for cord wood, and it is estimated that the production of cord wood amounts to about 1 cord per year per acre up to 30 or 40 years. In general the annual growth near towns increases in assessed value about $1 per acre up to the time of cutting. According to the author, the State census shows that farmers and other owners of wood lots throughout the State have secured a return of 5 per cent on the value of their wood lots.

Maple plantations in Vermont, G. H. MYERS (*Forestry and Irrig., 8 (1902), No. 3, pp. 123–126, figs. 3*).—An account is given of plantings of maple trees in Vermont which were the result of the offering of prizes for the best plantations. A number of small plantations were made, 7 of which still remain, and were examined by the writer during the past summer. These plantations vary from ½ to 15 acres. The methods of planting and present condition are described. In general, the artificial plantations are reported in poor condition, and attention is called to the possible results of thinning the volunteer or natural growth as means for the production of sugar orchards.

Forests of Alaska, B. E. FERNOW (*Forestry and Irrig., 8 (1902), No. 2, pp. 66–70, figs. 2*).—The author describes the forests of Alaska, calling particular attention to their availability and uses. While conceding that the forests are of considerable extent, he doubts their value for the best quality of lumber, at least under the present conditions.

Forestry in connection with the sand dunes of Queensland, A. J. BOYD (*Queensland Agr. Jour., 10 (1902), No. 2, pp. 123–125, pls. 2, figs. 2*).—A description is given of a number of sand dunes occurring along the shores of various parts of

Queensland. These dunes are rapidly encroaching upon the land in certain places, and attention is called to the desirability of checking them by forest and other planting. It is stated that marram grass and Ipomœa grow abundantly along the coast, and wherever these plants occur in thick growth the sand is fixed. After the dune has been checked a protection is afforded for forest operations, and it is recommended that plantings should be made of the cluster pine (*Pinus pinaster*) and the cypress pine, both of which seem particularly adapted to the purpose.

SEEDS—WEEDS.

Germination of clover and grass seeds (*Jour. Bd. Agr. [London], 8 (1902), No. 4, pp. 510–512*).—A report is given of a series of experiments conducted at the Vienna Seed Testing Station in which the loss in germinating power of clover and grass seed which had been stored for some years is shown. A number of varieties of clover and grass seed were tested for 5 consecutive years. The germination for the different tests is given, together with the average loss in germinative ability during the 4 years elapsing between the first and last test. Red clover lost in this time 17.5 per cent of its germinative ability, alsike 79.4, white clover 32.4, alfalfa 23, tall oat grass 51.1, perennial rye 50.9, meadow fescue 40.5, timothy 9.4, orchard grass 7.3, redtop 44.8, and sheep fescue 70 per cent. The suggestion is made that if clover and grass seeds are to be kept for any length of time, care should be taken that only seed showing a high percentage of germination is selected, and it should be protected from moisture and kept at an even cool temperature.

Germination of the seeds of some common cultivated plants after prolonged immersion in liquid air, A. D. SELBY (*Bul. Torrey Bot. Club, 28 (1901), No. 12, pp. 675–679*).—Seeds of the castor bean, yellow lupine, maize, flax, wheat, rye, cucumber, sensitive plant, serradella, and a few others, were submitted to prolonged immersion in liquid air, after which they were placed to germinate between moist filter paper. Similar lots of seed were also planted in a greenhouse and the germinations in the two conditions are reported. The seeds were divided into 2 lots, one of which was suddenly brought into the liquid air, a portion of which remained 6 hours and the remainder 12 hours. In the second series of experiments, the introduction into the temperature of the liquid air was gradual. These seed remained 24 and 48 hours, respectively, after which they were germinated. With the exception of the seed of the maize, no apparent change occurred as a result of the low temperature to which they were subjected. The kernels of maize cracked badly, showing that the hardened endosperm could not withstand the stress imposed. There was apparently no unfavorable effect on the germination of the seed that could be traced to the immersion. With sunflower, wheat, and rye the prolonged subjection of these seed to the temperature of −190° C. for 48 hours seemed to increase the promptness of the germination to some extent.

Valvular torsion as a means of seed dispersal in Ricinus, E. M. WILCOX (*Abs. in Science, n. ser., 15 (1902), No. 377, p. 456*).—In order to secure accurate data regarding the efficiency of valvular torsion for seed dispersal in the castor bean, the ground about a plant in the open field was divided into quadrants and the surface frequently cultivated, so that seeds could not be blown about by the winds after falling. The distances to which the seeds were thrown were measured from the base of the plant and are shown in tabular form. The plant was 104 cm. in height and the inflorescence, at maturity, was 36 cm. in length. The greatest distance to which any seed was thrown was 325 cm. (about $10\frac{2}{3}$ ft.)

Report on mustard spraying, M. W. DOHERTY (*Ontario Agr. Col. and Expt. Farm Rpt. 1901, pp. 26–29*).—During the past season the author conducted some demonstration experiments for the eradication of wild mustard by spraying with solutions of copper sulphate. Fields of oats, wheat, and barley, which were infested with this weed, were sprayed during the early summer and the results of the applications are given. The strength of solution used was 10 lbs. of copper sulphate to 40 or 45 gal. of water, this amount of the herbicide being applied to each acre. After having sprayed over the fields, the owners were requested to give their opinion as to the results, and the letters received are given in the report. In all cases where the application was made while the mustard was young the weed was completely destroyed; where it had sent up flower stalks and was in a hardened condition less successful results were obtained. In some instances it was thought that the second spraying could have been applied with good results. The author believes that at an expense of about 80 cts. per acre it is practicable to eradicate this weed from cereal fields, and if persisted in for a number of years no further trouble need be apprehended.

Report on the spraying of charlock and wild radish, J. R. CAMPBELL (*Yorkshire Col., Leeds, and East and West Ridings Joint Agr. Council, Garforth Expts., 1899, Pamphlet 4, pp. 12, figs. 3*).—A report is given of a number of experiments conducted with different strengths of iron sulphate and copper sulphate solutions for the destruction of charlock and wild radish. The efficiency of different machines for application is shown, and the influence of weather is indicated. The applications were made in fields of oats, barley, and spring wheat, some of which had been seeded to clover and grasses. No permanent injury was noted to any of the crops, and when applied early enough the charlock was destroyed where the solution used contained not less than 2 per cent copper sulphate or 10 per cent iron sulphate. The effect of these sprays on other plants was tested, and it was found that when sprayed with a 12 per cent solution of iron sulphate, peas and beans were somewhat damaged; carrots, parsnips, onions, and leek but slightly injured; lettuce, radish, and cress suffered considerably; mustard was completely killed; beets slightly damaged; while grass, cereals, and clover were practically uninjured. The action of the sprays on charlock is commented upon and the hypothesis advanced that the result is due to the presence in the cruciferous plants of substances which react chemically with the iron or copper salts to the injury of the plants. Summarizing his experiments, which included the spraying of 144 acres of infested grain crops, the author claims that the operation was completely successful only when plants were taken in their youngest stages. Bright, dry, calm weather is a necessary factor to success, and solutions should be applied at the rate of not less than 40 gal. per acre.

One hundred Yorkshire weeds, W. G. SMITH (*Yorkshire Col., Leeds, and East and West Ridings Joint Agr. Council, Garforth Expts., 1899, Pamphlet 12, pp. 9*).—A list is given of 100 weeds which are considered more or less troublesome. The common and botanical names are given and the duration of the plants and soils frequented are indicated.

DISEASES OF PLANTS.

Notes on some plant diseases, H. H. HUME (*Florida Sta. Rpt. 1901, pp. 86–96, figs. 3*).—Descriptive notes are given of some diseases of cantaloupe, the lettuce drop, and strawberry leaf spot. The cantaloupe diseases described are the Macrosporium blight, caused by *Macrosporium cucumerium*, and a Sclerotium disease. The Macrosporium attacks both the leaves and the vines, producing on the leaves yellowish spots which increase in size until the larger ones may attain a diameter of half an inch. The spots are well defined and after some time become more or less confluent, forming large, irregular, brownish areas on the leaves. The fruiting period of vines affected by this disease is materially shortened and the quality and flavor of fruit produced is decidedly inferior. Spraying with Bordeaux mixture, it is believed, will be efficient in protecting the plants from this disease, and experiments are to be carried out during the coming season.

The Sclerotium disease, which is due to an undescribed species, has been very prevalent, the fungus attacking the fruit and vines. Upright-growing parts of plants are not affected, the disease seeming to attack those portions in contact with the ground. Upon the fruit the attack is very noticeable, the first sign of the presence of the disease being a slight rotting on the underside of the melon, followed by the formation of a white fringe of fungus mycelium surrounding the whole fruit. This disease is difficult to control, but it is thought destroying affected plants and spraying the vines and ground with Bordeaux mixture will give relief.

The lettuce drop has proved quite destructive in some localities. The immediate cause seems to be the fungus *Sclerotinia libertiana*. The fungus is both an active and a facultative parasite and spreads with great rapidity. Owing to the lateness of its appearance, no experiments were conducted for its control, but subirrigation, removal of the diseased plants, and spraying are suggested as possible remedies.

The strawberry blight (*Sphærella fragariæ*) exists on the strawberry plants throughout the year, so that there is no necessity for the production of winter spores. For the protection of the plants thorough and repeated sprayings with fungicides are recommended. Marked differences are reported in the susceptibilty of different varieties, and a brief list is given of varieties which appear nearly free from disease and those which are badly affected.

Notes on some plant diseases, W. LOCHHEAD (*Ontario Agr. Col. and Expt. Farm Rpt. 1901, pp. 20–25, figs. 6*).—The life histories of grain rusts and the black rot of grapes are given, and suggestions offered for their prevention so far as practical means are known.

The more important fungus diseases of cultivated plants and means for their prevention, E. HOTTER (*Die wichtigsten Pilzkrankheiten der landwirthschaftlichen Culturgewächse und ihre Bekämpfung. Gratz, 1900, pp. 60, figs. 48*).—After discussing plant diseases in general and their distribution and amount of injury caused by them, a description is given of the structure and development of fungi, their life history, relation between the fungus and host plant, etc. The fungus diseases are then taken up and briefly described, being grouped together according to their relationships. Suggestions are given for the prevention of these diseases and a chapter is devoted to a discussion of the value of Bordeaux mixture as a fungicide.

Some Helminthosporium species and the diseases produced by them on barley and oats, K. P. RAVN (*Ugeskr. Landm., 46 (1901), No. 18, pp. 192–194*).

A "foot" disease of cereals, G. DELACROIX (*Extr. from Bul. Soc. Mycol. France, 17 (1901), No. 2, pp. 9, figs. 2*).—A description is given of the fungus *Ophiobolus graminis* which is parasitic upon various cereals, attacking them in the lower internodes and causing the stems to fall over in a way similar to that produced by the attacks of the Hessian fly. Mangin has concluded that this disease was primarily due to *Leptosphæria herpotrichoides* and that the Ophiobolus is of secondary importance (E. S. R., 10, p. 650). The author gives an account of a number of experiments in which wheat was grown in pots that were infested with spores and the stubble of wheat plants attacked by both fungi. In comparing the results obtained by his cultures he found that both fungi produce the same condition and that the density of planting influences to a great degree the gravity of the disease. When sown thickly the foot disease is of much greater importance in causing the plants to lodge. Notes are given in conclusion on the germination of the spores of *Ophiobolus graminis*, and its perethecial stage is described.

The downy mildew of grasses, V. PEGLION (*Staz. Sper. Agr. Ital., 34 (1901), No. 5–6, pp. 506–532, pls. 3*).—An extended study is given of *Sclerospora graminicola*, a fungus nearly allied to Peronospora. The fungus was for a number of years only known as occurring upon species of Setaria, but the list of host plants as given by the author includes wheat, oats, *Avena fatua*, couch grass, canary grass, perennial rye grass, and reed grass; and it probably occurs on redtop, creeping soft grass, reed canary grass, and sea meadow grass. The effect produced by the fungus upon its various host plants is shown and the technical characteristics of the fungus are described at length. The conditions for the appearance and spread of the disease are mentioned, and rotation of crops is recommended as one of the most efficient methods of combating it.

A new disease of potatoes in France, G. DELACROIX (*Extr. from Jour. Agr. [Paris], 1901, Sept. 7, pp. 7*).—An account is given of the appearance of a bacterial disease of potatoes in France which is attributed to *Bacillus solanacearum*. The characteristics of the disease are described at some length. There seems to be a decided difference in varieties as to susceptibility to this disease. Early varieties, such as Quarantaine and Red Saucisse, are very subject to the disease, while Richter Imperator is less so, and others apparently not at all liable. Although this disease was first reported in the United States it is not definitely known to be of American origin. In addition to this bacterial disease, the mycelia of a number of fungi are frequently observed in the stems of affected plants. The fungi noted are a form of Fusarium, *Rhizoctonia solani*, a species of Vermicularia, and a dark brown mycelium which appears to be that of *Torula convoluta*. For protection against these fungi, the author recommends rotation of crops, careful attention to fertilizers, and preliminary treatment of the seed tubers with a solution of formaldehyde.

Investigations respecting defective growth and premature decay of the sugar cane occasioned by root disease, Z. KAMERLING (*Rpt. West Java Sugar Expt. Sta. "Kagok," Pekalongan, Java, 1900, pp. 18-21; reprint from Internat. Sugar Jour., 3 (1901), Aug.*).—The early observations on root diseases of cane are briefly reported. In 1894 Wakker showed that in some cases the disease was caused by *Marasmus sacchari*, and proposed to call the disease the "dongkellan disease," from the Malay word referring to the woody lower extremity of the cane. Kobus later arrived at the conclusion that there was more than one cause of disease which resulted in a desiccation of the stems and leaves through the cutting off of the water supply. The author believes that, aside from a few doubtful cases, two distinct kinds of root disease exist in Java which occasion extensive damage to sugar cane. One of these seems to be confined to a particular variety of cane known as Louziers; the other is commonly known as root disease. This latter disease has spread considerably within the last few years, and constitutes a great danger to the sugar industry. The effect of the root disease, as shown upon the plant, is described at some length. At the beginning the root system is sound and the plant develops in a normal manner, but after a period varying from 2 to 8 months the disease appears on the lowermost roots. After the root system is attacked the demand of the leaves for water can not be supplied and the wilting becomes manifest. If at this period the plant is earthed up it may revive on account of the formation of sound roots in the fresh earth, but this effect is only temporary as the disease attacks consecutively the roots issuing from the higher nodes of the cane. The plant accommodates itself to a certain extent to the insufficient water supply by diminishing its leaf surface. The lower leaves begin to dry and roll up, so that instead of 13 or 14 vigorous leaves but 10 or 11 will be observed on the stock, and later perhaps only 3 or 4 remain. This root disease is so peculiar in its mode of appearance and the way in which it attaches itself to certain soils as to be quite characteristic, and it is believed that soil studies must be made in connection with it. It has been observed that the disease is most troublesome on old estates where the land has been under cane for many years. It seems probable that not only the available food supply must be taken into consideration, but the physical condition of the soil as well in studying this disease.

A review of the diseases and injuries of Deli tobacco, F. W. T. HUNGER (*Meded. 'S Lands Plantentuin, 1901, No. 47, pp. 53*).—Compiled notes are given of a number of the more common diseases to which Sumatra tobacco is subject. The appearance of the disease, means of spreading, and, where known, the causes and methods of combating are described. The diseases are grouped under the headings constitutional diseases, such as fasciation and abnormal growth; fungus diseases; diseases and injuries due to unfavorable atmospheric conditions; diseases attending the curing of tobacco; and unclassified diseases, such as the mosaic disease, etc.

A rust on cultivated lettuce, H. A. BALLOU (*Amer. Gard., 22 (1901), No. 366, p. 874*).—Notes the occurrence of *Puccinia prenanthis* upon cultivated lettuce. When observed it was in the æcidial stage, and while common upon the wild lettuce it apparently has not been reported as occurring upon the cultivated species. The occurrence of the fungus upon this host plant is attributed to the fact that the lettuce was grown on low, moist land, and the season being cold and wet made the host unusually susceptible.

Apple rots in Illinois, G. P. CLINTON (*Illinois Sta. Bul. 69, pp. 189–224, pls. 10*).—A review is given of the different fruit rots which have been observed on the apple in the State of Illinois. Among those mentioned are the fruit burn, which is caused by the scalding or sunburning of the apples, the brown rot, soft rot, fruit blotch due to a *Phyllosticta* sp., the black rot, and a number of miscellaneous decays that are sometimes noticed. The fruit blotch is believed to be caused by an undescribed fungus that somewhat resembles *Phyllosticta limitata*, but is distinct from that as well as related species.

The principal portion of the bulletin is occupied with a discussion of bitter rot. This is probably of widest distribution and occasions the most injury of any of the apple diseases. Spraying has been tried with more or less success for its prevention, and experiments are still being prosecuted along this line, and the results will be reported later. The appearance of the affected fruit and conditions affecting the development are described. So far the bitter rot is reported in Illinois as occurring only on the apple, although elsewhere it is known to attack the pear, peach, quince, and grape. The manner of infection and life history of the fungus are described at some length.

The summer stage, which is the one commonly known as *Glœosporium fructigenum*, was investigated at considerable length by means of artificial cultures and artificial infections. It was found that the bitter-rot fungus would develop on a variety of fruits if spores were introduced under the epidermis by means of a needle. In this way it was found possible to infect apples, pears, peaches, grapes, tomatoes, etc. The details of the artificial inoculations are given. While studying this stage the author discovered the permanent form of the fungus, which he calls the Gnomoniopsis stage. While occurring with considerable abundance in his culture media, this was observed but twice on apples, one of which was on an apple that had been inoculated with Glœosporium spores and kept for a considerable time in a moist chamber. Infection experiments were carried on in which the mature form of the fungus was developed from the Glœosporium stage and the Glœosporium stage from the mature form, thus completing the life cycle of the fungus. In following the precedent generally established for the naming of fungi—that they be named from their mature or permanent stage rather than from the summer stage—the author proposes the name be changed to *Gnomoniopsis fructigena*, a technical description of which is given.

A new species of Botrytis parasitic upon the Japanese persimmon, U. BRIZI (*Staz. Sper. Agr. Ital., 34 (1901), No. 8, pp. 767–773*).—A description is given of *Botrytis diospiri*, n. sp., and the injury it causes upon its host plant is described. The fungus attacks the fruit when approaching the period of ripening, causing its abnormal growth and preventing perfect maturity. Spraying with a 2 per cent solution of Bordeaux mixture is recommended as a preventive treatment.

Studies on the cause of grape-leaf perforations, U. BRIZI (*Staz. Sper. Agr. Ital., 34 (1901), No. 8, pp. 774–788*).—A disease of grape leaves, in which ragged perforations were made in the leaves, made its appearance rather suddenly in central Italy. Investigations by the author showed it was due to attacks of *Glœosporium ampelophagum* which was frequently associated with the common grape anthracnose.

A root mold of coffee, A. ZIMMERMANN (*Teysmannia, 12 (1901), No. 6, pp. 305–309, figs. 3*).—A root disease of coffee that had lately killed a number of trees was studied and found to be caused by a fungus which though not in fruit was very characteristic in its habit. The fungus, which the author calls the black root mold of Java coffee, penetrates the cells of the inner bark and of the medullary rays, and ramifies into the cells near the medullary rays. The hyphæ are black when old, but the young tips are almost colorless and are covered with granules of lime. The fungus uses up the starch in the cells and eventually causes the leaves to turn yellow and fall. The death of the tree follows in time.—H. M. PIETERS.

The "blorok" disease of Coffea arabica, A. ZIMMERMANN (*Teysmannia, 12 (1901), No. 7–8, pp. 419–429, figs. 4*).—A disease of the leaves of the coffee tree known by the name of blorok disease has attracted much attention. The diseased leaves are characterized by a pale spotting or rather clouded effect, the upper surface of the diseased area losing the normal green color. In this area the cells of the epidermis are shrunken and yellow, and the neighboring cells are also yellowed. A similar condition prevails on the lower surface. The diseased trees do not die at once, but are sickly for a time and eventually succumb. No parasites were found in the diseased cells, and the cause of the trouble has not yet been determined. It is thought that bacteria may be responsible for the disease.—H. M. PIETERS.

Parasites of vanilla, E. BORSAGE (*Rev. Agr. Réunion, 7 (1901), No. 4, pp. 142–149*).—Notes on attacks of various insects and fungi upon vanilla. The principal injury seems due to attacks of *Calospora vanillæ*. The different stages of the life history of the fungus and the effect produced upon the host plant are described. One striking effect is shown in the ash analysis of the stems and leaves, in which the potash and phosphoric acid are greatly reduced and the lime increased in the diseased plants.

Growing China asters, R. E. SMITH (*Massachusetts Sta. Bul. 79, pp. 26, figs. 19*).—After briefly describing the methods of cultivation of asters, the author considers in detail some of the diseases and injuries to which the garden asters are subject. One of the most common and destructive diseases is that known as wilt or stem rot. This first appears soon after the plants are set out in the bed, and is generally prevalent throughout the season. If affected plants be examined they will be found to be badly rotted just at the surface of the ground, only the hard inner woody portions remaining. This, however, is the final stage of the disease, and it may be noticed on careful examination earlier in the season when the normal color of the plants becomes affected, and usually more on one side than on the other. The disease is due to a species of Fusarium, as yet not definitely determined, and it appears that it is contracted in the seed bed as a result of crowding and too much moisture. There appears to be no evidence that it is contracted after the plants are set in the field. To avoid it the seedlings must be grown in favorable conditions, those grown out of doors or in cold frames being preferred to greenhouse-grown plants. Conditions somewhat similar to the wilt or stem rot are caused by attacks of white grub and root lice. In the case of attacks of the white grub the plant wilts at once, and by pulling it up the nature of the trouble may be discovered. The wilting and stunted growth due to root lice is less easily distinguished. The affected plants fail to grow, have a wilted, unhealthy appearance, and often remain in the bed all summer without apparently increasing in size. If pulled up, the roots will be found covered with masses of a bluish-colored root louse in all stages of development. As the life history of this pest does not seem to be fully understood, the recommendation is made that new and uninfested soil should be used in both seed and permanent beds as a preventive measure.

A second serious disease is that known as the yellow disease or blight. It is a disease of very obscure origin, which produces a bright yellow spindling growth of plants. The affected parts do not die or wilt, but do not develop properly. The effects produced by this disease are summarized. The roots appear to be well developed and normal, and while no structural changes are observed in the stems, branches, or leaves, these organs are of a pale yellow color and quite deficient in chlorophyll. There are certain modifications produced in the flower that are also mentioned. A number of causes are discussed, such as nematode worms, root lice, fungi, bacteria, varieties, effect of transplanting, heredity, property of soil, etc., from which it has been determined that none of these can be definitely ascribed as the cause of the disease. It seems that it is due to an obscure derangement of the vital functions of the plant. Brief notes are given on the aster rust, and attacks of beetles, grasshoppers, etc.

Leptosphæria vagabunda and Pleospora negundinis, C. A. J. A. Oudemans (*Proc. Sec. Sci. Koninkl. Akad. Wetensch. Amsterdam, 3 (1901), pp. 141–151, pl. 1*).—Descriptions are given of these fungi which cause diseases of trees, the first species occurring on linden and the second on Negundo. The Leptosphæria causes small oval black spots 0.5 to 1.5 cm. long on the surface of the young branches. The infection takes place through the lenticels, and as the dead tissue is cut off by a cork layer it is comparatively harmless. Associated with it was found a new species of Phoma, to which the name *P. tiliæ* is given. It is believed to be a form in the life cycle of the fungus. Experiments are reported in which a number of black spots were cut from the bark, crushed, and thoroughly macerated with distilled water, after which the mass was filtered through a Chamberland-Pasteur filter, and young shoots of healthy trees were treated with the filtrate by inoculation and by immersion. The branches changed to a reddish-brown color within a few days, while others treated in a similar manner with distilled water remained green. The disease of Negundo seems to be confined to nursery stock under 3 years old, and causes much injury. Diseased branches show discolored areas somewhat resembling those described above as occurring on the linden. In this case the infection is apparently through wounds, often at the base of the leaves. An enzym is associated with this fungus as in the former case, and is believed to be the principal cause of the injury. In both diseases the mycelia are the sources of injury, and from both of them the enzym has been separated. The mycelial filaments of the Tilia disease are colorless, devoid of partitions, and very thin and delicate; while those occurring in the disease of Negundos were brownish in color, septate, and occurred in considerable masses. The enzym of the Tilia disease acts locally; that of the Negundo may give rise to infections at considerable distance from the point of inoculation.

A disease of birch trees, R. Paulson (*Essex Nat., 11 (1900), p. 273, figs. 8; abs. in Jour. Roy. Hort. Soc.* [*London*], *26 (1901), No. 1, p. 206*).—This disease, which is reported in Epping forest and elsewhere, completely destroys many of the trees. The disease is attributed to the fungus *Melanconis hillistoma*. Hitherto this fungus has been considered to be a saprophyte, attacking only dead tissues, but the conclusion is arrived at that it occurs on the living branches, causing their death; however, as a rule, its perfect form is only found on dead branches. The course of the disease is said to be rapid.

Pestalozzia hartigii in Ariège (*Rev. Eaux et Forêts, 40 (1901), No. 17, pp. 537–539*).—The occurrence of this fungus upon young beech seedlings is reported, and it is thought to be the first record of its occurrence in France. The fungus attacked the young trees in the nursery, causing a reddish-brown discoloration at the collar of the plant. The most serious injury was done in nurseries situated at an elevation of about 1,350 meters. It is reported to have destroyed at least 30 per cent of seedlings in some localities.

The leaf-cast disease of pine, E. Ebermayer (*Allg. Forst u. Jagd Ztg., 67 (1901), Sept., pp. 309–314*).—A review is given of the various theories relative to the cause of leaf casting of pine trees, particular attention being given to the theories of excessive evaporation, frost injury, and attacks of the fungus *Lophodermium pinastri.*

Continued studies on the formation of the witches' broom rust (Puccinia arrhenatheri) on the barberry, J. Eriksson (*K. Landt. Akad. Handl. Tidskr., 39* (*1900*), *No. 5-6, pp. 346-360*).

On the organization of an international system of phytopathological experimentation, J. Eriksson (*K. Landt. Akad. Handl. Tidskr., 39* (*1900*), *No. 5-6, pp. 361-368*).

ENTOMOLOGY.

Report of the entomologist, H. A. Gossard (*Florida Sta. Rpt. 1901, pp. 58-75*).—The author continued the work of the inspection of nurseries, and reports that the nurseries within the State are carefully and effectively fumigated. The cottony cushion scale is no longer a serious enemy, having been largely destroyed by the Australian lady bug. The peach scale has also been checked by the attacks of the lady bugs. Notes are given on the habits and life history of a number of other scale insects and mealy bugs. San José scale is now reported from 25 different localities in the State. Injury to pecans is reported from *Acrobasis caryæ* and *Mineola juglandis*. The white fly was unusually abundant during the year, but its numbers were much reduced by fungus diseases, especially the red and brown fungus. One orange grove, which has been infested for at least 10 years with this insect, seems not to have suffered severely. Good results are reported from the use of resin wash in combating this insect, and the author also recommends spraying during the winter with a 10 or 15 per cent mixture of kerosene in water. Fumigation experiments were made with the assistance of C. W. Woodworth. Several patterns of tents were used for covering trees in the orchards. Details are given of the management of these tents and the time required for fumigating trees. It was found that a greater volume of gas was obtained when the sulphuric acid and water were mixed and used immediately than when the mixture was allowed to become cool. No serious injury was done to the foliage, whether fumigation was done at night, in cloudy weather, or in bright sunshine. The white fly was nearly exterminated by fumigation. It was also observed that lady bugs were not all destroyed during the process of fumigation, although many of them were stupefied, but later recovered from the effects of the gas. Brief notes are also presented on a number of miscellaneous insects.

First report of the government entomologist, 1899-1900, C. Fuller (*Rpt. Govt. Ent., Dept. Agr. Natal, 1899-1900, pp. 154, pls. 25, figs. 33*).—This constitutes the report of the author as government entomologist for Natal, and contains, in addition, a general discussion of insects and a special consideration of numerous notes on various plant diseases, weeds, etc. The plant diseases which receive most attention are oat rust, "corn blight," barley blight, potato blight, and potato scab, as well as a number of fungus diseases of fruit trees and small fruits. A study was made of the biology of *Striga coccinea*. This weed was found to fix itself upon the roots of corn, from which it absorbed a portion of its nourishment.

General directions are given for spraying orchard and garden crops, and for making a choice of spraying machinery and of insecticides. Formulas are given for the preparation of the most important insecticides. Directions are also presented for the application of hydrocyanic-acid gas in orchard fumigation.

A popular classification of insects is given, and of the important insects which receive special consideration the following may be mentioned: *Colias electra*, injuring alfalfa; *Sesamia fusca*, attacking corn; codling moth; wattle bagworms; a species of Animula which is more or less injurious to *Acacia mollissima; Egybolia vaillantina*, injurious to peaches; *Ophiuza lienardi*, attacking various species of fruit trees; cutworms; diamond-back moth; grain moth (*Gelechia solanella*); blister beetle; grain weevil; *Monochamus leuconotus*, injurious to coffee; a fruit fly belonging to the genus Ceratitis, and closely related to the species which is injurious in Cape Colony; horse botfly, jigger flea; locusts (especially *Acridium purpuriferum*); cockroaches; white ants; bedbugs; spittle insects; woolly aphis; cabbage aphis; a large number of species of scale insects; onion thrips; and ticks of various species. Each species is described and notes are given of its habits and life history, together with recommendations of the best methods for combating it.

Entomological notes and inspection report for 1901, S. A. Forbes (*Trans. Illinois Hort. Soc., n. ser., 35 (1901), pp. 142–154*).—Injury from cankerworm is reported as having shown rapid increase during the past few years. For controlling this insect in orchards, spraying with Paris green or arsenicals is recommended. For the protection of large shade trees the use of bands impassable by the female is urged; for this purpose a band of heavy wrapping paper smeared with a thick layer of printers' ink or tar, and thinned with oil to prevent drying out too soon, is recommended. Some injury to young apples from green fruit worms is reported. These insects are difficult to destroy, but are usually prevented from doing serious harm when the orchard is sprayed early in the spring. The apple flea weevil (*Orchestes pallicornis*) is reported as burrowing in the leaves in its larval condition. The beetles feed on the under surface of the leaves, eating round holes in them. The details of its life history are not known. The pear-leaf blister mite has been unusually abundant in Illinois nurseries and it is urged that all affected stock should be treated with kerosene or fumigated with hydrocyanic-acid gas before sending out. Brief notes are given on general nursery inspection and insecticide work of the State inspector and his assistants.

Annual report of the zoologist, C. Warburton (*Jour. Roy. Agr. Soc. England, 62 (1901), pp. 257–271, figs. 4*).—Especial attention is devoted to a study of the life history of the black currant gall mite (*Phytoptus ribis*). The usual remedies which have been recommended for this mite are considered unsatisfactory. In observing the habits of this pest it was noted that the mite frequently stands upon its tail end for 5 minutes or longer at a time; occasionally they spring into the air from such position and are carried off by the wind to a considerable distance. While standing in the upright position they take every opportunity to fasten themselves upon insects which may visit the currant bushes. They may thus be transported to much greater distances than they could crawl. Large numbers of them perish from year to year. A few, however, succeed in penetrating the new buds, in which situation they are found about the first of June. Buds infested with mites survive the winter. The buds may be so slightly affected that they develop in the spring, or may perish, in which case the mites leave the buds and distribute themselves by crawling. It is believed that the mites which are seen crawling about in early spring are all doomed to perish, and it is therefore not recommended that any insecticide treatment be given at that time. The period at which spraying is considered effective is about the last week in June. Brief biological and economic notes are given on *Apion apricans*, *Oscinis frit*, *Plutella cruciferarum*, carrot fly, and a number of forest and fruit tree insects, including *Cryphalus tiliæ*, *Xiphydria dromedarius*, *Oribata orbicularis*, and *Andricus glandium*.

An account of the condition and work of the laboratory of agricultural entomology at the Royal High School of Agriculture in Portici from its foundation to 1901, A. Berlese (*Relazione sullo stato e sulla attività del laboratorio di entomologia agraria presso la R. Scuola Superiore di Agricoltura in Portici. Rome: G. Bertero & Co., 1902, pp. 101, figs. 5*).—The author gives an account of the collections of insects and books belonging to the institution. The apparatus and equipment of the laboratory are described. A bibliography of the entomological publications from the laboratory from its foundation to 1901 is given. The insects which required special investigation by the staff of the laboratory are briefly mentioned. Among the important ones are *Caloptenus italicus*, *Porthesia chrysorrhœa*, *Dactylopius citri*.

Injurious insects, W. LOCHHEAD (*Ontario Agr. Col. and Expt. Farm Rpt. 1901, pp. 18–20, fig. 1*).—Brief notes are given on formulas for the preparation of Paris green, hellebore, insect powder, whale-oil soap, kerosene emulsion, and a combination of Paris green and Bordeaux mixture. The insects which were especially injurious during the season 1901 were Hessian fly, apple-tree borers, plant lice, San José scale and other species of scale insects, as well as potato-stalk borer, rose chafer, asparagus beetle, and tussock moth. It is reported that the tussock moth is at present a less serious enemy of the shade trees than it was 3 or 4 years ago.

Third report of the State entomologist and pathologist on the San José scale, and the administration of the crop-pest laws of Virginia, W. B. ALWOOD (*Richmond, Va.: C. W. Saunders, 1901, pp. 58, pls. 10, figs. 4, map 1*).—Brief notes are given on the history of the San José scale in Virginia. Copies are given of the various acts of the State legislature which have been passed regarding this insect and also of the rules and requirements for the government of the State entomologist and pathologist in enforcing the law. According to the most recent act of the State legislature the Board of Crop Pest Commissioners are authorized to inspect orchards and other premises, and are specifically charged with nursery inspection and the inspection of nursery stock shipped into the State from outside sources. The author discusses the problems connected with the inspection of imported nursery stock. It is urged that certificates of inspection should not be accepted unless they are issued from offices with which entomologists of known standing are connected. The author gives a statement of the requirements in the ordinary form of certificate of inspection in Virginia. The question of the constitutionality of inspection laws is discussed and it is argued that State inspectors should not be asked to accept certificates without reference to the qualifications of the person who signs them.

The San José scale is gradually becoming more widely distributed throughout the State. Wherever there is a city or large village in an infested county, the town property is usually found to be the center of greatest infestation. In general the local spread of the San José scale is still slight; in some instances, however, it has been of a serious nature. A list of States is given to which infested nursery stock has been traced, and the dissemination of the scale by State nurseries and outside nurseries is presented in a tabular form. The author discusses the general condition with regard to infestation by the San José scale in different States. The insect pests and plant diseases which are dealt with according to the Virginia inspection laws are San José scale, woolly aphis, peach yellows, black knot of plum and cherry, pear blight and twig blight of apple, and crown gall. A brief description is given of each one of these pests and the most effective remedies are suggested in each case. Especial attention is given to remedial measures against San José scale and the results of experiments extending over several years are summarized. It is concluded that kerosene furnishes the most reliable remedy against the scale for use on hardy fruit trees and other plants, in winter or summer. There is some danger in careless use of kerosene on peach trees and other stone fruits. Soap washes, when strong enough to be effective, are found to be more dangerous for summer work than kerosene and much more expensive. Directions are given for the preparation and application of kerosene sprays. It is urged that where only a few young trees or plants are found infested in a given locality, these plants should be destroyed, since in this way the scale may be destroyed for the particular locality. The author does not believe that the San José scale can be exterminated, but the methods in present use are sufficient to hold it in check. A list of the host plants of the San José scale are given and a detailed financial statement is appended to the report.

Treatment for San José scale in orchards. I, Orchard fumigation, F. A. SIRRINE (*New York State Sta. Bul. 209, pp. 341–372, pls. 10*).—During the winter of 1900–1901 a number of apple and peach trees which had been fumigated during the previous winter were again treated. Tests were also made in other orchards consisting of a mixture of apple, cherry, peach, pear, plum, chestnut, and walnut. Apple trees which were treated at the rate of from 15 to 25 gm. cyanid of potash per 100 cubic feet, on different days from March 23 to April 13, received no injury. Peach treas which were fumigated at the rate of 15 gm. per 100 cubic feet were not injured, while a number of trees exposed to the gas generated from 20 gm. per 100 cubic feet were slightly injured and the grass around the base of the trees was killed. The experiments demonstrated that it is unsafe to allow peach trees to be exposed to the action of hydrocyanic-acid gas for a period of 12 hours, whatever weight of cyanid of potash per cubic foot was used. Vigorous trees, including peach, may be treated with 2½ oz. of cyanid per 100 cubic feet for not more than 30 minutes, while the trees are dormant. Peach trees which are not vigorous may be injured by such treatment, but the injury is not usually permanent. Peach trees in the orchard may be treated from 30 to 60 minutes with 1¾ oz. cyanid per cubic foot, even after the buds begin to open. Walnut, chestnut, plums, and cherries will endure the same treatment as peach.

With regard to the effect of the gas on scale insects the experiments showed that fumigation may be depended upon to exterminate the San José scale on orchard trees of medium size. Experiments were made to determine the best proportions in which to mix the cyanid, sulphuric acid, and water. It was found that a slight excess of acid and from 2 to 4 times the usual quantity of water gave rapid and uniform action and satisfactory results. The smaller the pieces of cyanid the more rapid is the chemical action, and where the cyanid is broken too finely the chemicals may be thrown out of the vessel in which they are contained by the violence of the reaction.

It was found that in fumigating trees when the earth was moist about 50 per cent of the gas was absorbed by the soil. It is recommended that double the amount of cyanid generally used for nursery stock should be used in orchard work.

The author gives a detailed description in connection with drawings and figures of a hexagonal box fumigator designed for use in orchards. The chief advantages of this fumigator are that it allows a rapid and accurate estimate of the cubic contents, it may be placed around a tree without being elevated over it, it contains a minimum amount of waste space, it can be stored in a comparatively small space, and it does not break off or rub the buds. The cost of fumigation varies so exceedingly, according to the style of fumigator used and other conditions, that it can not be stated except with qualifications. When 1 oz. of cyanid is used for every 100 cubic feet of space the cost is about 12½ cts. per tree when fumigated with tents, and 18 cts. when treated with a box fumigator.

The Aphididæ of North America, W. D. Hunter (*Iowa Sta. Bul. 60, pp. 61–138*).—In this bulletin the author has compiled a list of titles of the literature on North American plant lice. A list of titles of general articles is given, followed by a catalogue of the family Aphididæ, arranged in a systematized manner with reference to literature under each species. A host index of the North American species of Aphididæ is also presented, and the bulletin is furnished with an index to the species of plant lice which are discussed. The total number of genera recognized in the bulletin is 32, and of species 325.

Familiar butterflies and moths, W. F. Kirby (*London, Paris, New York, and Melbourne: Cassell & Co., Limited, 1901, pp. 144, pls. 18, figs. 4*).—In this volume the author gives a general description of the appearance, life history, and habits of a number of common lepidoptera, including various families of butterflies and moths. Brief directions are given for the collection of butterflies and moths, together with notes on the occurrence of these insects in different seasons of the year. A number of species considered are of economic importance, and their food plants are mentioned. The plates illustrating the work are in color and well executed.

The codling moth and late spraying in Oregon, A. B. Cordley (*Oregon Sta. Bul. 69, pp. 121–160, pls. 4.*)—The author gives an account of a trip through certain parts of Oregon for the purpose of determining the extent of infestation of apple orchards by the codling moth. With regard to the question of the number of broods, it is believed that there are only 2. The various statements which have been made to the effect that 3 or 4 broods occur are not based on breeding records, but simply on the fact that larvæ and eggs may be found throughout a long season and that the different stages of the insect may be passed through in a comparatively short time under favorable conditions. The insect is described in its different stages and an account is given of its life history. At Corvallis there appears to be no relation between the time at which the apple trees bloom and the dates on which the moths emerge. Egg laying is delayed to a later date than that usually given in the Eastern States. The first eggs were observed out of doors on June 21 and deposition of eggs did not become general until June 28; the petals had fallen by April 28, or 2 months previous. Observations during the years 1898 to 1900 showed that while the blossoms fell at dates ranging from April 28 to May 10, the egg laying did not begin before the middle of June and did not become general before about June 25. In southern and eastern Oregon the egg laying may take place earlier.

A compilation of the records of the evening temperature in the neighborhood of Corvallis disclosed the fact that the temperature rarely reaches 60° in the evening during the month of May. Observations indicate that the codling moths rarely deposit eggs when the evening temperature falls much below 60° F. The eggs were found by the author in orchards at all times from the latter part of June until October 1, or later. They were found more commonly upon the fruit than upon the leaves. The length of the larval period was found to vary from 16 to 24 days. In breeding cages the moths of the first brood appeared on August 3, from larvæ which had pupated on July 21, and the moths of the second brood emerged on May 29 of the following year from eggs which had hatched September 12.

Notes are given on the various natural enemies of the codling moth, including fungus diseases, parasitic and predaceous insects, and birds. While large numbers of the larvæ of the codling moth are destroyed by fungus disease, it is not believed that this fungus could be successfully used in an artificial way in controlling the pest. The most important help in the destruction of the codling moth is rendered by birds of various species.

The greatest loss from the codling moth in the Willamette Valley and other parts of Oregon occurs after August 1. Spraying experiments were conducted for the purpose of determining the relative efficiency of early and late applications. Four applications were made with Bordeaux mixture to which 1 lb. of Paris green was added for each 200 gal. The applications were made on May 13, June 11, June 25, and August 11. One or more of the applications were omitted from some of the trees in order to determine which application was most important. These experiments showed that up to July 20 only 2 per cent of the apples were infested, whether they had been sprayed or not. The first application seemed to be valueless, and the second and third nearly so, while the fourth was apparently the only effective one. Similar experiments were repeated for 1900, the applications being made May 7 to 14, June 22 to 27, July 26 to 28, and August 31 to September 1. In these experiments the least satisfactory results were obtained with Ben Davis, of which about 30 per cent were wormy; Newtown pippins standing near them in the same orchard were almost absolutely free from codling moth, while the Baldwins were infested to the extent of about 1 or 2 per cent. Trees that were given the last 3 applications showed less than 5 per cent infestation, while those that were sprayed 4 times were infested to the extent of 3 per cent. It is believed that in order to prevent injury from codling moth as far as possible the fruit should be kept covered with a film of poison from the time when the earliest eggs are deposited until the middle of September. The author believes that the expense of banding is hardly necessary where spraying has been carefully done.

In an appendix to the bulletin E. L. Smith and J. D. Olwell give the results of insecticide work in their orchards. For a part of this practical work arsenite of soda was used, while on other trees a mixture of Paris green and London purple was applied. Both of these orchardists have found it possible to prevent to a large extent the injury of the codling moth and therefore believe that spraying for this purpose is profitable. It is stated that much of their success has depended upon spraying during the first or second week in September.

The periodical cicada in 1902, W. D. Hunter (*U. S. Dept. Agr., Division of Entomology Circ. 44, n. ser., pp. 4, figs. 2*).—The circular calls attention to the fact that brood No. X was due to appear during May in 17 or more States as well as in the District of Columbia. The usual recommendation is made not to trim fruit trees too closely during the spring; and a request is made for voluntary reports from various localities in which the cicada appears.

Insect enemies of forests and forest products, A. D. Hopkins (*Forester, 7 (1901), No. 10, pp. 250–254, figs. 5*).—Popular notes on insects injurious to forest trees and lumber, with special reference to the species which attack coniferous trees. Attention is called to the desirability of further experiments for devising practical plans for combating the attacks of forest insects.

Insects injurious to elm trees, E. P. Felt (*New York State Fisheries, Game and Forest Com. Rpt. 1899, pp. 351–379, pls. 3, figs. 7*).—Notes are given on various mechanical and chemical methods for destroying insects. An account is given of the life history, habits, and means of combating elm-leaf beetle, bagworm, fall webworm, antiopa butterfly, elm borer, and elm bark-louse.

The protection of fruit trees against animal enemies, O. Taschenberg (*Schutz der Obstbaume gegen feindliche Tiere. Stuttgart: E. Ulmer, 1901, pp. 341, figs. 75*).—This volume constitutes one part of the author's treatise on insect and fungus enemies of fruit trees. In the introduction a general account is given of the anatomy and classification of insects, and of the various physical, mechanical, and chemical means which have been adopted for destroying insect pests upon fruit trees. Especial attention is given to those insecticide methods which are best suited for preventing injuries from insects to the roots, trunk, buds, flowers, leaves, and fruits of various fruit trees. The more common injurious insects are mentioned and economic and biological notes are given on each species thus discussed.

Lantern traps and the destruction of injurious insects, V. Vermorel (*Les pièges lumineux et la destruction des insectes nuisibles. Montpellier: Coulet & Son, 1 02, pp. 64, figs. 31*).—The author gives a general historical account of the various uses to which the lantern traps have been put in collecting and destroying insects. A large number of different styles of traps are described and illustrated. A bibliography of the subject is given and a list of economic plants is presented in connection with the most important injurious insects which affect each plant. Experiments have shown that a large variety of insects may be captured in this manner, but lantern traps are especially effective in attracting butterflies and moths. A calendar is presented showing the most important injurious insects which appear during different periods of the year and which may be caught by means of lantern traps.

Fumigation methods, W. G. Johnson (*New York: Orange Judd Co., 1902, pp. 313, figs. 83*).—In this volume the author gives a general account of the use of hydrocyanic-acid gas and carbon bisulphid in fumigating various kinds of orchard trees, nursery stock, and other plants, under various conditions. The volume includes a history of the discovery of the value of this gas for insecticide purposes, the method of generating the gas, physiological effects on plants, effects on animal life, the apparatus suitable for use in orchards, cost of the application, equipment for fumigating nursery stock, construction of ventilators and floors, methods of fumigating in greenhouses and cold frames, application in mills, elevators, and other buildings, fumigation of grains and other seeds, the diffusion of gas in the air, the recent work with hydrocyanic-acid gas, and the economic value of fumigation. Abstracts are given of the laws regulating nursery and orchard inspection and fumigation in the United States, Canada, and other countries. The chapter devoted to a discussion of carbon bisulphid contains an account of the use of this chemical in fumigating seeds, fruits, plants, mills, and other buildings; in the destruction of insect pests in clothes, and in killing prairie dogs, rats, mice, and other injurious animals.

Report of analyses of Paris green and other insecticides in 1901, L. L. VAN SLYKE and W. H. ANDREWS (*New York State Sta. Bul. 204, pp. 243–250*).—The authors analyzed 40 samples of Paris green and found that the amount of arsenic varied from 56.13 to 62.87 per cent. So far as the total arsenic content is concerned the Paris green examined was of high quality, the percentage of arsenic being greater than that required by law. The amount of free arsenious oxid found in these samples varied from 0.88 to 2.64 per cent, the average being 1.28 per cent. This quantity of free arsenic is considerably below the danger limit, and the Paris green sold in the New York markets is therefore considered effective and safe. The amount of copper in the samples examined varied from 26.53 per cent to 31.14 per cent. Analyses were also made of English Bug Compound, Laurel Green, London purple, and Paris-green Bordeaux mixture.

Fungicides, insecticides, and spraying calendar, G. E. STONE, H. T. FERNALD, and S. T. MAYNARD (*Massachusetts Sta. Bul. 80, pp. 15*).—Brief directions for preparing and applying the common fungicides and insecticides, and their combinations, together with a spraying calendar.

A new fungus disease for Rutherglen bug (*Agr. Gaz. New South Wales, 12 (1901), No. 12, p. 1629*).—The department of agriculture of the Colony has imported samples of *Sporotrichum globuliferum*, and it is hoped that this fungus may be of some service in checking the ravages of *Nysius vinitor*.

Insects injurious to stored grain, J. M. STEDMAN (*Missouri State Bd. Agr. Rpt. 1900, pp. 102–107*).—Brief notes on pea weevil, species of bean weevil, *Calandra granaria*, *C. oryzæ*, *Silvanus surinamensis*, *S. cassiæ*, and the Angoumois grain moth.

Systematic catalogue of the galls of animal origin of Europe and the Mediterranean basin, G. DARBOUX and C. HOUARD (*Catalogue systématique des zoocécidies de l'Europe et du Bassin Méditerranéen. Paris: Laboratoire d'Évolution des Êtres Organisés, 1901, pp. 544, figs. 863*).—The authors classify the various gall formations, which are found on plants and which are due to animals, in a system which is based on the part of the plant which is affected. In general, plant galls may be classified into those which affect the apex of growth and those which affect the lateral surfaces of growing parts. Each general class may then be divided according to the actual structure which is attacked. Galls which affect the tip of growing parts may be arranged into classes according as the fruit, inflorescence, flower, bud, or apex of twigs are affected, while the other general classes of galls may be subdivided into those which affect the root, stem, or twig and leaf. The species of animals which cause the various plant growths belong to the following families: Eryophyidæ, Cynipidæ, Tenthredinidæ, Cecidomyidæ, Aphididæ, and Psyllidæ.

The mosquitoes of Paris, their injuries, and means of eradication, R. BLANCHARD (*Arch. Parasit., 5 (1901), No. 4, pp. 615–635*).—The only species of mosquito which the author has been able to find in Paris is *Culex pipiens*. According to the testimony of other authors, however, *Anopheles maculipennis* has been also found in the city. The author gives brief notes on diseases with which mosquitoes are supposed to be connected as carriers of infection, and on the habits and life history of these insects. In combating mosquitoes a discussion is given on the efficiency of the method of adding pyrethrum flowers to water in which mosquito larvæ are found. In destroying adult mosquitoes the use of various substances for fumigation is discussed. These substances include essence of terebinth, iodoform, chloroform, ether, flowers of pyrethrum, and a mixture of these flowers and the root of valerian (sold under the name "zanzolina"). The draining of stagnant pools and the application of kerosene to the surface of water in which mosquito larvæ are found are discussed.

Mosquito brigades and how to organize them, R. Ross (*New York: Longmans, Green & Co., 1902, pp. 100*).—A general account is given of the habits and life history of different species of mosquitoes, with special reference to the locations in which the larvæ are found. The author outlines in detail a system of organized effort for the destruction of mosquitoes in and near towns. The scheme embraces the collection and removal of tin cans, broken bottles, and other receptacles in which water might be collected and mosquito larvæ might occur. Especial attention is to be given to the drainage of pools and small ponds of stagnant water in which mosquitoes are known to breed. It is urged that in towns where mosquitoes occur in large numbers organized effort should be put forth to combat them according to approved methods. A superintendent, who should preferably be a medical or sanitary officer, is to be assisted by a number of workmen, and the men are to visit all premises in the town at regular intervals for the purpose of preventing the extensive breeding of mosquitoes. It is not hoped that these efforts will be successful in exterminating mosquitoes, even in a limited area, but it is believed that their numbers may be greatly reduced. The author reviews the more important literature on the subject and gives bibliographical references to the chief works on mosquitoes.

Insects beneficial to horticulturists, J. S. Hine (*Proc. Columbus Hort. Soc., 16 (1901), No. 1, pp. 26–29*).—Brief notes on the relationship of predaceous and parasitic insects to horticulture.

Report of the lecture on apiculture, H. R. Rowsome (*Ontario Agr. Col. and Expt. Farm Rpt. 1901, pp. 125, 126*).—It was found that by placing queens in an inverted glass carboy and then introducing drones the desired cross could easily be secured. Much difficulty has been experienced heretofore in controlling the fertilization of queens. Brief notes are also given on the economy in the utilization of partially filled sections in feeding them back to the swarms.

Bee culture, G. W. Williams (*Missouri State Bd. Agr. Rpt. 1900, pp. 71–81*).—Brief notes on the various processes connected with raising bees, including the general system of management, wintering, and bee pasture The author claims to have obtained profitable returns from the cultivation of certain bee plants exclusively for honey These plants included Simpson's honey plant, cure-all, and fig wort.

A simple fixed frame and an improved bottom board, H. R. Stephens (*Queensland Agr. Jour., 9 (1901), No. 6, p. 556*).—Brief descriptive notes on 2 cheap and convenient devices for use in beehives.

Annual report of the Royal Sericultural Station at Padua (*Ann. R. Staz. Bacol. Padova, 29 (1900), pp. 131, pl. 1*).—This report contains a number of articles relating to sericulture, among which the following may be mentioned: The work of the Royal Sericultural Station for the year 1900, E. Verson (pp. 5–11); The organization of markets for silkworm cocoons in Italy, E. Verson (pp. 15–40 and 97–104); Armature of the prolegs of the silkworm larvæ, E. Verson (pp. 41–65); A disease of spinners and rearers of the silkworm, E. Quajat (pp. 66–76); Rapid and gradual incubation, E. Quajat (pp. 77–84); Influence of the time of washing the eggs upon hatching in the spring, and upon accidental hatching in autumn, E. Quajat (pp. 85–89); Creolin in the silk industry, E. Verson (pp. 90–96). It was found that the vapor of creolin uniformly exercises a poisonous influence on the eggs of the silkworm. The mortality in the eggs may vary from 4 to 100 per cent, according to the length of time during which they are exposed to creolin. A bibliography of literature relating to sericulture which appeared in 1900 and 1901 is appended to the report.

FOODS—NUTRITION.

Report of the department committee appointed to inquire into the use of preservatives and coloring matters in the preservation and coloring of food (*London: Eyre & Spottiswoode, 1901, pp. XXXVI+497, figs. 23*).—This volume contains the detailed report of the British official committee on food preservatives appointed in 1899, together with minutes of evidence and appendices reporting a number of special investigations, experiments, and discussions or summaries. A number of these have to do with such topics as the law and practice in certain foreign countries and the British colonies as to preservatives and coloring matter in food; the use of preservatives in dairy and vegetable products, the use of preservatives and coloring matter in foods, drinks, and drugs; analyses of milk and other products with a view to detecting preservatives and coloring matters; analyses of commercial preservatives; physiological experiments, and related topics. Regarding the use of preservatives and copper salts, the recommendations of the committee (which consisted of Herbert Maxwell, T. E. Thorpe, H. Timbrell Bulstrode, and F. W. Tunnicliffe) were as follows:

"That the use of formaldehyde or formalin, or preparations thereof, in foods or drinks be absolutely prohibited, and that salicylic acid be not used in a greater proportion than 1 grain per pint in liquid food and 1 grain per pound in solid food. Its presence in all cases to be declared.

"That the use of any preservative or coloring matter whatever in milk offered for sale in the United Kingdom be constituted an offense under the Sale of Food and Drugs Acts.

"That the only preservative which it shall be lawful to use in cream be boric acid or mixtures of boric acid and borax, and in amount not exceeding 0.25 per cent expressed as boric acid. The amount of such preservative to be notified by a label upon the vessel.

"That the only preservative permitted to be used in butter and margarine be boric acid or mixtures of boric acid and borax, to be used in proportions not exceeding 0.5 per cent expressed as boric acid.

"That in the case of all dietetic preparations intended for the use of invalids or infants chemical preservatives of all kinds be prohibited.

"That the use of copper salts in the so-called greening of preserved foods be prohibited."

F. W. Tunnicliffe presented a minority report which was not averse to the reasonable use of copper salts for greening vegetables.

Experiments upon the effect of boracic acid and formaldehyde upon the live weight, growth, and food assimilation of young sucking pigs, A. D. Hall, H. S. Hammond, and F. W. Tunnicliffe (pp. 306–311, figs. 4).—Digestion and nitrogen metabolism experiments, in which boracic acid and formaldehyde were added to the rations of pigs, are reported. The authors' general conclusions follow:

"The experiments conducted with boracic acid showed a negative result attending the administration of this substance, and a combinative examination of the feces of a boracised and normal pig showed no sensible difference in the amounts of fat, nitrogen, and fiber digested in the 2 cases. Formalin gave similar results; the administration of formalin did not materially alter the rate of growth.

"Our experiments would show that the digestion of young, rapidly growing pigs, as reflected in their general health and increase in live weight, is not sensibly affected by the regular administration over a long period, of doses of boracic acid and formalin in much larger proportions than they are usually employed for the preservation of food."

Report upon certain experiments made upon the extent to which the copper ingested with artificially coppered peas is absorbed and retained by the human body, F. W. Tunnicliffe (p. 312).—Experiments with man on the effect of copper are reported, in which the amounts eaten and excreted in the urine and feces were determined. The general conclusions follow:

"From our research, we regard the conclusion justified that copper, when ingested in the form in which it occurs in carefully preserved peas, is for the most part voided directly with the feces, and differs, in so far as concerns its absorption and retention by the human body, from the ordinary salts of copper."

Report on the influence of formic aldehyde upon the metabolism of children, F. W. Tunnicliffe and Otto Rosenheim (pp. 313–336, figs. 10).—Abstracted from another publication (E. S. R., 13, p. 774).

Report on the influence of boric acid and borax upon the general metabolism of children, F. W. Tunnicliffe and Otto Rosenheim (pp. 337–354, figs. 9).—The literature of the subject is reviewed and experiments on the effect of borax and boric acid reported, in which the metabolism of nitrogen and phosphorus and the assimilation of fat were the special features studied. The conclusions which were drawn follow:

"[As regards boric acid] small doses up to 1 gm. per diem, continued for some time, exert, in healthy or delicate children, no influence upon proteid metabolism. The assimilation of the proteid food was improved in one healthy child (B). The phosphorus metabolism was unaffected in all cases. The assimilation of phosphorus was in all cases improved. The assimilation of fat was not affected. The body weight increased in all cases. The quantity of dry feces was not affected. Their nitrogen and phosphorus percentage was slightly decreased. No inhibitory effect upon intestinal putrefaction could be demonstrated.

"[As regards borax] continued doses of 1.5 gm. have no influence in healthy or delicate children upon proteid metabolism. The proteid assimilation was unaffected in healthy children, slightly depressed in the delicate child. The phosphorus metabolism was not affected in healthy or delicate children. The assimilation of phosphorus was improved in all cases, the improvement being least marked in the case of the delicate child. The fat assimilation was improved in the case of one healthy child, and unaffected in the case of the others. The body weight was increased in all cases; the increase was most marked in the case of the delicate child. The weight of dry feces and their nitrogen phosphorus percentage remained unaltered. Borax tended rather to increase intestinal putrefaction.

"[When given together] both boric acid and borax were quickly eliminated, no cumulative action being therefore probable. Neither boric acid nor borax in any way affected the general health and well-being of the children."

Digestibility of proteins, A. Jolles (*Monatsh. Chem., 22 (1901), pp. 991–995; abs. in Jour. Soc. Chem. Ind., 21 (1902), No. 2, p. 132*).—The author has shown in earlier investigations that there are differences in the constitution of proteids, and that the constitution influences the portion of nitrogen which is converted into urea on oxidation. Experiments with man were undertaken to learn the comparative nutritive value of casein and fibrin, the former yielding about 73 per cent of its nitrogen as urea and the latter about 45 per cent. In the casein period 16.7 per cent of the total nitrogen of the food was absorbed, and in the fibrin period 34.3 per cent. According to the author, therefore, the physiological nutritive value of the proteids as regards nitrogen depends on the amount of the urea forming groups. The hexone bases were apparently less completely utilized than the nitrogenous bases, since they could be detected quantitatively in the feces.

Sixth report on food products, E. H. Jenkins (*Connecticut State Sta. Rpt. 1901, pt. 2, pp. 95–102*).—The State laws regulating the sale of foods are quoted, and details of the work of the station in carrying out the provisions of the law are given. During the year, 1,686 samples were examined.

Milk and cream, A. L. Winton, I. F. Harris, and M. Silverman (*Connecticut State Sta. Rpt. 1901, pt. 2, pp. 102–118*).—Of samples of milk analyzed during the year, 8.5 per cent were found to be adulterated, the greater part by skimming or watering.

Added preservatives, either formaldehyde or borax, were found in 9 samples. One sample of cream was found to contain formaldehyde.

Coffee, A. L. WINTON (*Connecticut State Sta. Rpt. 1901, pt. 2, pp. 119–122*).—Seven samples of coffee beans and 50 of coffee were examined, 5 of these (all ground coffee) were found to be adulterated.

Jellies, jams, and preserves, A. L. WINTON, A. W. OGDEN, and C. LANGLEY (*Connecticut State Sta. Rpt. 1901, pt. 2, pp. 122–134*).—Jellies and similar products and their process of manufacture are briefly described. Analyses of 66 samples are reported. Nineteen per cent of the samples were found to be pure, 51 per cent adulterated, and 30 per cent marked compound.

Tomato catsup, chili sauce, and other sauces, A. L. WINTON and A. W. OGDEN (*Connecticut State Sta. Rpt. 1901, pt. 2, pp. 135–144*).—During the year 106 samples were examined; 21 contained no added preservative, and 20 no artificial coloring matter.

Crême de menthe, crême de violette, crême de rose, and other cordials, A. L. WINTON, A. W. OGDEN, and C. LANGLEY (*Connecticut State Sta. Rpt. 1901, pt. 2, pp. 144–148*).—Of the 28 samples of cordials examined, all but 6 contained added coloring matter, 3 contained added vegetable dyes, and the others chemical colors.

Vanilla extract, A. L. WINTON and M. SILVERMAN (*Connecticut State Sta. Rpt. 1901, pt. 2, pp. 149–162*).—Of the 62 samples examined, 15 were found to be unadulterated.

"Vanilla crystals," A. L. WINTON and M. SILVERMAN (*Connecticut State Sta. Rpt. 1901, pt. 2, pp. 162–163*).—According to the authors, a flavoring material called "vanilla crystals" consisted of sugar with the addition of a small amount of vanillin and coumarin.

Lemon extract, A. L. WINTON and A. W. OGDEN (*Connecticut State Sta. Rpt. 1901, pt. 2, pp. 163–174*).—Fifty-one of the 66 samples examined were found to be below the standard; 4 samples were marked compound.

Orange extract, A. L. WINTON and A. W. OGDEN (*Connecticut State Sta. Rpt. 1901, pt. 2, pp. 175, 176*).—Analyses of a number of samples are reported.

Miscellaneous flavoring extracts, A. L. WINTON (*Connecticut State Sta. Rpt. 1901, pt. 2, pp. 177, 178*).—A number of fruit flavoring extracts were examined.

"Frostlene," A. W. OGDEN (*Connecticut State Sta. Rpt. 1901, pt. 2, p. 179*).—Three samples of this material for making icing, etc., were examined.

The use of coal-tar dyes in foods, A. L. WINTON (*Connecticut State Sta. Rpt. 1901, pt. 2, pp. 179–182*).—A general discussion of the subject.

The adulteration of tea with tea fruit, A. L. WINTON (*Connecticut State Sta. Rpt. 1901, pt. 2, p. 183, fig. 1*).—Tea fruit was identified as an adulterant of tea.

"Puregg," A. L. WINTON and A. W. OGDEN (*Connecticut State Sta. Rpt. 1901, pt. 2, p. 184*).—Judging by an examination this material consisted of desiccated eggs, with a small amount of coal-tar dye and salicylic acid.

Fungicide, A. L. WINTON and M. SILVERMAN (*Connecticut State Sta. Rpt. 1901, pt. 2, pp. 184, 185*).—This material, which is recommended for preserving cider and sweet wines, contained, according to the authors, a large amount of sodium benzoate.

"Hyper-samphire," A. L. WINTON and M. SILVERMAN (*Connecticut State Sta. Rpt. 1901, pt. 2, pp. 185, 186*).—From an analysis of this material, which is sold for preserving eggs, "it appears that over two-thirds of the mixture consists of common salt, the remainder being free salicylic acid, sodium salicylate, and small amounts of sulphites, bisulphites, and sulphates. One and one-third ounces of a mixture of 3 parts of salicylic acid and 1 part of sodium bisulphate, costing not more than 15 cts., would have about the same value as 4 ozs. of hyper-samphire for use in the preserving solution described."

Spices, A. L. WINTON and M. SILVERMAN (*Connecticut State Sta. Rpt. 1901, pt. 2, pp. 186–193*).—Details of the examination of 216 samples of bulk spices are reported, of which 29 per cent were found to be adulterated.

Cream of tartar, A. W. OGDEN (*Connecticut State Sta. Rpt. 1901, pt. 2, pp. 194, 195*).—The examination of 41 samples of cream of tartar is reported.

Macaroni, spaghetti, vermicelli, and noodles, A. L. WINTON and A. W. OGDEN (*Connecticut State Sta. Rpt. 1901, pt. 2, pp. 196–202*).—The authors examined 83 samples of Italian pastes and noodles. The proximate composition is reported, as well as data regarding the presence of added coloring matter, etc.

Miscellaneous examinations, A. L. WINTON, A. W. OGDEN, and M. SILVERMAN (*Connecticut State Sta. Rpt. 1901, pt. 2, pp. 202–204*).—Konut, said to be a cocoanut product; cooking oil, consisting largely or entirely of cotton-seed oil, and a number of samples of butter, flour, baking powder, spices, etc., sent by private individuals were examined.

Microscopic investigation of fruits, A. L. WINTON (*Connecticut State Sta. Rpt. 1901, pt. 2, pp. 225, 226*).—Brief statements are made concerning the microscopic investigations which the author has undertaken with fruits.

Food products examined for the dairy commissioner in the twelve months ending July 31, 1901 (*Connecticut State Sta. Rpt. 1901, pt. 2, pp. 205–207*).—Brief statements are made concerning the examination of a number of samples of butter, molasses, and vinegar.

Meats and meat products at the Paris Exposition of 1900, H. E. ALVORD (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1900, pp. 223–234*).—A descriptive article.

Food grains of India, A. H. CHURCH (*London: Chapman & Hall, 1886, pp. XI+180, pls. 35; Sup. 1901, pp. VIII+23*).—The major portion of this volume consists of a reprint of the first edition, containing a botanical description and chemical analysis of a large number of cereals, legumes, etc., used as food in India. The supplement contains similar data for grains examined since the first edition was published, including among other materials Polish millet (*Paspalum sanguinale*); black Burmese rice (*Oryza sativa*); bamboo seed (*Bambusa tulda*); buckwheat of the higher Himalaya (*Fagopyrum tataricum* var. *himalaica*); and gorgon fruit (*Euryale ferox*).

Grain foods in Manchuria, H. B. MILLER (*U. S. Consular Rpts., 68 (1901), No. 255, pp. 541–543*).—Brief notes are given on the use of tall millet, wheat, imported flour, beans, maize, and vermicelli by the Chinese in Manchuria.

Further notice on milling qualities of different varieties of wheat, E. H. GURNEY and G. NORRIS (*Agr. Gaz. New South Wales, 12 (1901), No. 2, pp. 1402–1425*).—Continuing previous work (E. S. R., 11, p. 242), the authors give in tabular form details of the milling properties of 98 samples of wheat.

Recent experiments with sweet potatoes (*West Indian Bul., 2 (1900), No. 4, pp. 293–302*).—Tests on drying and grinding sweet potatoes are reported, as well as an analysis of the resulting sweet-potato flour.

Peas, beans, vetches, and their milling products, A. KOEHLER (*Landw. Vers. Stat., 55 (1901), No. 6, pp. 401–434, pls. 2*).—An extended summary of investigations on this subject.

New or little known oil-bearing seeds of the French colonies, E. HECKEL (*Les graines grasses nouvelles ou peu connues des colonies françaises. Paris: A. Challamel, 1902, pp. IV+187, figs. 32*).—Oil-bearing seeds are described and discussed, and in many cases analytical data are reported.

Olive oil: Its source, production, character, and uses, F. BOEHM (*London: F. Boehm, 1901*).—The subject is treated as follows: (1) Botanical origin, habitat, and character of the plant; (2) method of preparing the oil; (3) geographical distribution of the trees; (4) production and export of various countries; (5) chemical and physical characters of the oils; (6) pests which attack the orchards; and (7) uses.

Concerning the composition of sweet raisin wine, A. SCHNEEGANS (*Arch. Pharm., 239 (1901), No. 8, pp. 589–591*).—The composition of 3 sorts of raisin wine is reported. Two samples were made from Zante currants and the third from raisins from Asia Minor.

Food and drugs, C. J. HIGGINSON (*London: Effingham Wilson; rev. in Analyst, 27 (1902), Apr., p. 136*).—A second edition, revised and enlarged, of this volume which, according to the sub-title, is designed as a manual for solicitors, public analysts, inspectors, etc., and contains a consolidation of the various food acts of Great Britain.

Handbook of hygiene, T. WEYL (*Handbuch der Hygiene. Jena: Gustav Fischer, 1901, Sup. 1, pp. 74+36+85, figs. 6, dgms. 17*).—This volume contains 3 papers, viz, Notes on school hygiene and that of the profession of teaching, by L. Burgerstein; The hygiene of labor in an atmosphere of compressed air, by P. Silberstern; and The hygiene of the alcohol question, by A. Delbrück.

Handbook of public health, laboratory work, and food inspection, O. W. ANDREWS (*London: Baillière, Tindall & Cox; Portsmouth: Charpentier & Co., 1901, pp. 292, figs. 74*).—This volume is divided into 3 parts. The first considers the inspection of meat, fish, and poultry intended for human food; the second the inspection of water, air, and milk, and other food stuffs, as well as alcoholic beverages. In the third part meteorology and the influence of various atmospheric phenomena on health and disease are treated of.

Hygiene of the stomach, a practical dietetic guide, E. MONIN (*L'hygiène de l'estomac; guide pratique de l'alimentation. Paris: Octave Doin, pp. XV+432*).—The principal animal and vegetable foods are discussed, as well as condiments, beverages, diet, and related topics. A new edition.

Report on dieting of pauper lunatics in asylums and lunatic wards of poorhouses in Scotland, J. C. DUNLOP (*Glasgow: James Hedderwick & Sons, 1902, pp. 98*).—A number of dietary studies are reported and discussed, and suggestions for improvement are offered

ANIMAL PRODUCTION.

The excretion of phosphoric acid by carnivora and herbivora, W. BERGMANN (*Arch. Exper. Path. u. Pharmakol., 47 (1901), pp. 77–81; abs. in Chem. Centbl., 1902, I, No. 3, pp. 219, 220*).—The author calls attention to the fact that dogs ordinarily excrete phosphoric acid in the urine, but when calcium carbonate is fed they excrete the phosphorus in the feces. The author shows that if sodium phosphate is injected subcutaneously it is eliminated through the kidneys, even if calcium carbonate is supplied in the food. The diminished amount of the phosphoric acid in the urine when the diet contains an abundance of calcium carbonate is regarded as due to the fact that it is not absorbed, and not to the excretion of absorbed phosphoric acid through the intestine. In experiments with herbivora (sheep) the phosphoric acid subcutaneously injected was excreted in the feces. Glycerin phosphoric acid when subcutaneously injected was excreted by a dog in the urine and by a sheep in the feces as inorganic phosphoric acid.

Note on the cleavage of sugar from protein, J. WOHLGEMUTH (*Berlin. Klin. Wchnschr., 37 (1900), pp. 745–749; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 6, p. 250*).—A number of experiments are reported.

The effect of sugar on the organism, P. ALBERTONI (*Centbl. Physiol., 15 (1901), pp. 457–459; Chem. Centbl., 1902, I, No. 1, p. 59*).—Experiments with a dog showed that grape sugar increased the action of the heart. Data are recorded concerning the resorption of grape sugar in the intestines.

Effect of sodium nitrate on the metabolism of dogs, E. ROST (*Arb. K. Gesundheitsamte, 18 (1901), pp. 78–99; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 5 (1902), No. 3, pp. 121, 122*).—The effects of large, medium, and small doses of saltpeter were studied. Neither small nor large doses affected the general condition, appetite, or body weight. Small doses did not affect metabolism or the secretion of urine. Larger doses increased the secretion of urine and diminished the metabolism of nitrogen.

Velvet bean as forage and food, H. K. Miller (*Florida Sta. Bul. 60, pp. 457–462, 465, 466*).—In a digestion experiment with 2 steers the average coefficients of digestibility of green velvet-bean vines were as follows: Dry matter, 69.3; protein, 73.3; fat, 81.3; crude fiber, 59.6; and nitrogen-free extract, 82.4 per cent. The average coefficients of digestibility of velvet-bean hay of poor quality were as follows: Dry matter, 74.2; protein, 68.8; fat, 78.7; crude fiber, 78; nitrogen-free extract, 75.7; and ash, 20.4 per cent. The nutritive ratios of the digested portion in the 2 tests with green velvet-bean vines were 1:5.3 and 1:5.7. Similar values for the 2 tests with velvet-bean hay were 1:12 and 1:11.4. Using the same coefficients of digestion obtained with the poor hay, it is calculated that the nutritive ratio of good velvet-bean hay cut when the pods were well formed would have a nutritive ratio of 1:6. The details of the experiment are recorded in both cases.

Relative to the food value of the beans, it is stated that in many cases stock seem reluctant to eat the material at first, but do so greedily upon becoming accustomed to it. The following table shows the composition of the beans and of the beans and pods:

Composition of velvet beans.

	Bean and pod.	Shelled bean.
	Per cent.	*Per cent.*
Water	12.28	11.46
Protein	17.13	22.69
Fats	4.61	6.60
Crude fiber	14.25	7.56
Nitrogen-free extract	47.72	48.53
Ash	4.01	3.16

Furze, whin, or gorse (*Jour. Agr. and Ind. South Australia, 5 (1901), No. 4, pp. 320, 321*).—Notes on the feeding value and methods of feeding gorse.

Feeding stuff inspection, C. D. Woods and J. M. Bartlett (*Maine Sta. Bul. 80, pp. 41–64*).—In compliance with the provisions of the State Feeding Stuff law, analyses have been made of a number of samples of cotton-seed meal, gluten meal of different brands, gluten feed, germ-oil meal, linseed meal of different brands, flaxseed meal, calf meal, animal meal, beef scrap and similar poultry feeds, commercial breakfast food by-products, and mixed feeds, bran, middlings, and red dog flour. The results obtained are discussed, especial attention being given to condimental feeds and similar products.

Pressing forage, M. Ringelmann (*Ann. Inst. Nat. Agron., 24 (1897–1900), No. 16, pp. 203–216*).—Experiments are reported on the mechanical work required to compress alfalfa hay and straw of different sorts, as well as considerable data on related topics.

American breeds of beef cattle, with remarks on pedigrees, G. M. Rommel (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 34, p. 34, pls. 23*).—After a brief historical review of the subject of cattle raising in America, the author discusses the characteristics of the principal breeds and such related topics as pedigrees and herd-books. A list of the breeders' associations in the United States is included.

Steer feeding, G. E. Day (*Ontario Agr. Col. and Expt. Farm Rpt. 1901, pp. 56–58*).—Two tests with steers are reported. In the first the comparative value of corn silage and roots are studied. For 147 days, 6 steers averaging some 1,110 lbs. each, gained 1,464 lbs. on a ration of silage, hay, and meal. Six similar animals during the same period gained 1,407 lbs. on a ration of roots (turnips and mangel-wurzels), hay, and meal. The dry matter eaten per pound of gain in the 2 cases was 12.62 and 13.95 lbs., respectively. Both silage and roots were fed in the proportion of 4 lbs. to 1 of hay. The same grain ration was fed to both lots. According to the author, "The cost of producing a ton of silage was considerably less than that of a ton of mangels; and since silage contains, according to our estimates, twice as much dry matter as roots, the cost of producing a ton of dry matter was very much lower in the case of the corn crop.

"Making every allowance for errors, for variations in conditions, and for the uncertainties of a single feeding experiment, we must still admit that silage compared with roots is a cheap and useful food for fattening steers. While roots may be more expensive than silage, we would be sorry to miss them from the bill of fare provided for our stock. They are very beneficial to the health of breeding stock, and are especially valuable for young animals."

In the second test peas and corn were compared. Four steers, averaging about 1,120 lbs. each in weight, gained 1,160 lbs. in 35 weeks on a grain ration of pea meal. Four similar steers in the same time gained 1,254 lbs. on a ration of corn meal and 4 steers on a ration of corn and peas (1:1) gained 1,219 lbs. In addition to the grain all the steers were given like amounts of hay, silage, and roots. The 3 lots consumed 4.139, 3.823, and 3.901 lbs. of grain, respectively, per pound of gain. According to the author "in this experiment, corn maintains its reputation as a fat producer. When the main object is the production of fat, probably no single kind of grain excels corn. Peas may generally be depended upon to do better in combination with other grains than when fed singly. The close, heavy nature of pea meal renders it difficult to digest, and consequently it should be mixed with something of a lighter nature, such as oats or bran. Mixing corn meal with pea meal apparently improved the fattening value of the latter, although corn meal, in a somewhat less degree, possesses the objectionable heavy nature of pea meal, and can not be regarded as an ideal substance to mix with it." This test was a continuation of previous work (E. S. R., 13, p. 379).

Steer feeding, H. E. Stockbridge (*Florida Sta. Rpt. 1901, pp. 35–43, pl. 1*).—Using 4 lots of 4 steers each, the comparative merits of sweet potatoes and cassava roots were tested, and the relative value of corn meal and shelled corn. On a ration of 10 lbs. of pea-vine hay, 4 lbs. of cotton-seed meal, and 35 lbs. of sweet potatoes and costing 21.4 cts. per head daily, lot 1 gained 496 lbs. in 70 days. On a ration containing 35 lbs. of cut cassava roots in addition to the same amount of pea-vine hay and cotton-seed meal, as above and costing 13.5 cts., lot 2 gained 576 lbs. On a ration of 20 lbs. crab-grass hay, 5 lbs. cotton-seed meal, and 5 lbs. of corn meal costing 19.5 cts., lot 3 gained 542 lbs., and lot 4 on a ration containing the same amounts of crab-grass hay and cotton-seed meal with 5 lbs. of shelled corn and costing 18.7 cts., gained 552 lbs. All the steers weighed about 450 lbs. each at the beginning of the test. As pointed out by the author, the greatest gain was made on the cassava ration, which was also much the cheapest. The importance of the cassava crop for stock feeding is insisted on, earlier work of the station being quoted (E. S. R., 12, p. 778).

Cattle food substitutes, a warning to feeders, L. A. Voorhees and J. P. Street (*New Jersey Stas. Bul. 156, pp. 7*).—Analyses are reported of several commercial feeds which, judged by their composition, are very costly in proportion to their true feeding value. They were found to contain comparatively little protein and fat and a high percentage of carbohydrates. The authors note that each dollar expended per ton for standard feeds at present prices should secure 1 per cent protein and 0.2 per cent fat. Wheat bran, it is calculated, would furnish many times as much protein and fully as much fat at much less cost than the carbohydrate feeds under discussion.

"The criticism will be naturally made here that the purchaser is not getting the carbohydrates in this small tonnage of high-grade feed that he should and would get in the lower-grade goods. But comparisons of feeds in general with the standard feeds are usually made on the supposition that the object of the purchase is protein and fat. That the purchase of protein is the usual purpose of purchased feeds can hardly be denied, since materials of considerable protein content are the only ones suitable as additions to the feeding materials of the farm. These usually comprise an abundance of carbohydrate feed to such an extent, indeed, that more native carbohydrates of better quality are often wasted on the farm by being used as bedding, etc., than are furnished by the feed substitutes under discussion. Materials, then, which are low in protein, and hence contain relatively large amounts of carbohydrates, are useful only to those who raise nothing themselves—for example, city feeders of horses and stall-fed cattle."

Value of condiments in the feeding of bullocks, J. A. Voelcker (*Jour. Roy. Agr. Soc. England, 62 (1901), pp. 299–307*).—In view of the high value attributed by many feeders to condimental feeds, locust-bean meal and molasses, the author tested such materials with 4 lots of 4 steers each, weighing on an average 1,095 lbs. at the beginning of the trial. Lot 1 was fed a basal ration consisting of linseed meal, decorticated cotton-seed cake, and maize meal, 1 : 1 : 1. The amount at first was 6 lbs. per head daily and later larger amounts. In addition, hay, oat-straw chaff, and wheat were fed *ad libitum*. Lot 2 was fed the same ration, except that one-half the maize meal was replaced by locust-bean meal. In addition to the basal ration, lot 3 was fed a condimental mixture made up of licorice, aniseed, gentian, fenugreek, coriander, caraway, cumin, and ginger. On an average, an ounce of this mixture was fed per head daily sprinkled over the other feeds. Lot 4 was given a little cane-sugar molasses diluted with an equal amount of warm water and mixed with the chaff. The feeds used were analyzed. The test began November 22. On March 25 the steers in lot 3 were thought ready for market and were disposed of for slaughter. Others were disposed of at intervals, the last on April 29. The average gain in weight of the 4 lots was 281, 229, 226, and 253 lbs. The percentage of carcass to live weight was 58.85, 58.52, 57.25, and 59.34, respectively.

"The result of this experiment is clearly to show that no case can be made out from it for any of the virtues supposed to belong to spice and condimental foods, but that bullocks will fatten just as well and as economically on a well-chosen mixture of ordinary foods. The average gain per head was higher with the ordinary feeding than with any of the others, and the money return practically as high, too. Nor did it turn out that the use of the condiments enabled the bullocks to consume more bulky food like straw and hay chaff. Of the additional materials the best was molasses, this giving results practically equal to those of the ordinary feeding. There is, however, with its use a tendency to "looseness" in the animals, which must be checked by not giving it in too great a quantity. One pound per day of molasses among 4 bullocks was found to be about the limit.

"Spice did not do so well as molasses, and though it is true that the animals fed with it were judged to be soonest ready for the butcher, their carcass percentage was the lowest of all, and the money return not so great in the end. The earlier bringing out was probably due to the individual animals rather than to their food. Judgment must be withheld in respect to the use of locust-bean meal, owing to 2 of the bullocks fed on it being indisposed during part of the experiment, but there is nothing in the general results as regards the others, and the ultimate return from them, to warrant the belief that it would have shown better results than the ordinary feeding.

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"Lastly, it may be interesting to note (as the question of feeding bullocks in boxes as against open yards has often been raised in connection with the Woburn experiments) that the box-fed lot did quite as well as those in the yards."

Ocean transportation of cattle and horses (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1900, pp. 87–90, pls. 6*).—A brief descriptive article.

Early feeding of mangels to sheep; and gorse as food for sheep, J. A. VOELCKER (*Jour. Roy. Agr. Soc. England, 62 (1901), pp. 308–316*).—Continuing earlier work on the value of mangel-wurzel and gorse for sheep (E. S. R., 11, p. 773), a test was begun with 4 lots of 12 sheep each, weighing on an average 111 lbs. Lots 1 and 4 were fed mangel-wurzels; lots 2 and 3 Swedish turnips; lots 1 and 2 gorse; and lots 3 and 4 meadow hay, while all the lots were given linseed cake. The feeds were analyzed. The test began November 9. Some of the sheep were fed February 15, others at intervals, the last on March 18. The average gain per head in the 4 lots was $35\frac{5}{6}$, $32\frac{4}{11}$, $33\frac{1}{4}$ and $39\frac{6}{11}$ lbs. The author notes that mangel-wurzels gave better results than Swedish turnips, and that gorse was inferior to hay. "One pound of gorse did not replace $\frac{1}{4}$ lb. of hay chaff with any advantage."

Experiments with swine, G. E. DAY (*Ontario Agr. Col. and Expt. Farm Rpt. 1901, pp. 58–62*).—In the first of the 2 tests reported the value of roots as part of a ration was studied with 2 lots of high-grade Yorkshire pigs, averaging 42 lbs. each in weight, and 2 lots of 5 similar animals averaging 55 lbs. each in weight. Lots 1 and 2 were fed barley and middlings, and lots 3 and 4 corn and middlings, lots 2 and 4 receiving an amount of raw pulped mangel-wurzels in addition, equal in quantity to the grain ration. Early in the test the corn or barley and middlings were fed in the proportion of 2 : 1, latter in the proportion of 1 : 1, and at the close of the test in the proportion of 1 : 2. In 28 weeks the average daily gain per pig in the 4 lots was 0.639, 0.857, 0.677, and 0.757 lb., respectively. The corresponding dry matter eaten per pound of gain was 4.39, 3.80, 4.25, and 4.03 lbs. The pigs were slaughtered and the quality of the bacon judged by an expert. According to the author "the feeding of equal weights of roots and meal gave more rapid and more economical gains than the feeding of meal alone. The hogs fed roots produced bacon of superior quality to those which were not fed roots.

"In connection with the above it must be remembered that the quality of roots used was a very moderate one, and the excessive use of roots might have an opposite effect."

Continuing earlier work (E. S. R., 13, p. 380), a test was undertaken to compare feeding pigs on pasture and in pens, and to determine the effect of rape fed with meal upon the firmness of bacon. As in earlier work, 6 breeds commonly raised locally for the export bacon trade were included. The larger and stronger animals, numbering 16, were pastured; the smaller and less thrifty, numbering 18, were fed in pens. The test began July 6. The larger pigs were sold October 14, the remainder were fed until November 12. All the pigs were given dry barley and middlings 2 : 1, *ad libitum*. Those fed indoors received all the green feed they would eat in addition, at first tares and later rape, consuming on an average 4 lbs. per head daily. The pigs fed out of doors were pastured at first on rape and tares, later on rape, consuming on an average 4.33 lbs. of green feed per head daily. The 2 lots consumed, respectively, 3.95 and 5.23 lbs. of grain per pound of gain. The pigs were slaughtered and the bacon judged by an expert, the breeds ranging as follows: Yorkshire, Berkshire, Duroc Jersey, Poland China, Tamworth, and Chester White. The principal conclusions follow :

"In this experiment, feeding hogs on pasture proved a very expensive method, whereas feeding in pens with the same kinds of food gave reasonably economical gains. The outside hogs ate more meal and made slower gains than those fed inside. . . . All the hogs produced bacon of satisfactory firmness. This result confirms the result of a previous experiment with rape, and goes to show that a reasonable supply of green feed with a liberal meal ration produces a good quality of bacon. Succulent food tends to keep animals thrifty, whether it be green food or roots, and thriftiness is conducive to firmness in the bacon produced. . . . [As the] proportion of green feed to meal is practically the same as the proportion of roots to meal which we have used with good results, it seems safe to assume that the use of equal weights of succulent food and meal tends to produce bacon of firm quality. The time required to attend to the outside hogs was just about half of that required for those inside."

Feeding experiments, H. E. Stockbridge (*Florida Sta. Rpt. 1901, pp. 16–22, pl. 1*).—Statements are made concerning steer-feeding tests not yet reported in full. The author also briefly reports a test of the comparative gains made by 5 razorback and 6 Duroc Jersey pigs, fed alike from birth until they were 14 months old. At this time the average live weight of the razorbacks was 214.4 lbs., and the Duroc Jersey 216.3 lbs.; the average dressed weight of the former 170.6, of the latter 164.2 lbs. "The native razorback animal produced on an average from the food consumed 6.4 lbs. more of marketable meat than his full-blooded rival, quite contrary to usual expectation." In discussing the comparative merits of native and blooded stock, the author calls attention to the fact that the blooded pigs possess advantages, especially in the matter of early maturity, which make them especially valuable for crossing with native stock. "It is an unquestioned fact, however, that the meat of the native is of incomparably superior quality, and that when properly handled and given suitable and adequate feed and attention the native crowds his blooded rival in the race, and can be made as profitable as he is hardy."

Tankage as a food for pigs, C. S. Plumb and H. E. Van Norman (*Indiana Sta. Bul. 90, pp. 205–216*).—Using 4 lots of 4 pigs each, weighing 58 lbs. on an average, the authors studied the value of tankage as a part of a ration. The tankage used was of the sort known as "crushed," and is generally sold as a fertilizer. Like all such material, it contained a high percentage of nitrogen and phosphoric acid. Lots 1 and 4 were fed grain and tankage 10 : 1, the grain ration of the former consisting of corn meal and of the latter of corn meal and shorts 1 : 1. Lot 2 was fed corn meal and tankage 5 : 1, and lot 3 corn meal only. The feed was mixed with water to a thin slop. In the 127 days covered by the test the average daily gain of the 4 lots was 1.16, 1.23, 0.67, and 1.14 lbs. per head. The largest amount of grain, 15.75 lbs. per day, was consumed by lot 4; the smallest, 14 lbs. by lot 3; lots 1, 2, and 4 consuming, respectively, 1.54, 2.98, and 1.57 lbs. of tankage daily. The cost of feed per pound of gain in the 4 lots was 3.8, 4, 5.2, and 3.6 cts., respectively. At the close of the test 2 pigs in each lot were slaughtered and the organs, etc., examined. The conclusion was drawn that as regards the carcass no differences were observed which could be attributed to the rations fed. According to the authors the condition of the pigs during the test was of much interest. The lots fed tankage had noticeably silkier hair, and the appearance of the skin was fresher and mellower than that of the corn-fed lot. In marked contrast to the others the corn-fed pigs did not eat with relish after the experiment was well started. That this was due to the corn ration was shown by a supplementary feeding test in which the 2 pigs remaining in lot 3 (the corn-fed lot) were put upon a ration of corn meal and tankage 5 : 1, and fed for a period of 49 days. After the tankage was added to the rations, the authors state that the condition of the pigs was markedly improved and the 2 pigs gained on an average 1.79 and 1.3 lbs. per head daily.

Separator skimmed milk as food for pigs, L. A. Clinton (*New York Cornell Sta. Bul. 199, pp. 137–156*).—From 1898 to 1901 the comparative merits of different proportions of grain and skim milk for producing pork economically were studied. The first test was preceded by a preliminary period of 6 days' duration, during which raw and cooked potatoes were compared when fed with a corn-meal and skim-milk ration. Each of the 4 lots used contained 4 pigs each. In 2 lots the animals weighed on an average some 77 lbs. and in the remaining lots some 40 lbs. On cooked potatoes the heavier lot gained 1.4 lbs., the lighter lot 10.9 lbs. On raw potatoes corresponding gains were 3.1 and 11.7 lbs. Considering the period as a whole, the total gain on a ration containing potatoes was 27.1 lbs., the feed required per pound of gain being 16.2 lbs. potatoes, 17.9 lbs. skim milk, and 1 lb. corn meal.

"In view of the fact that potatoes, cooked or uncooked, are often used as a food for pigs, it may seem strange that such unfavorable results were secured in the present case. When, however, we study the weather conditions which prevailed while the experiment was in progress, and consider that the pen in which the pigs were kept was somewhat damp and cold, the cause of the trouble is not difficult to locate."

After feeding all the pigs on corn meal and skim milk until they were in good condition, they were again divided into 4 lots of 4 each. For 46 days lots 1 and 3 were fed gluten meal and skim milk and lots 2 and 4 corn meal and skim milk, the proportion of skim milk to grain in each case being about 3 : 1. At the beginning of the test the 4 lots weighed, respectively, 349, 362, 190, and 194 lbs. The total gains made were 214, 297.5, 157.5, and 219 lbs., the cost of a pound of gain being 2.7, 2.5, 2.4, and 1.9 cts.

In the second test 9 lots of 4 pigs each were used. Lots 1 and 4 were fed skim milk and corn meal, 6 : 1; lots 2 and 5, skim milk and mixed grains, 6 : 1, the grain mixture consisting of 4 parts of corn meal to 1 part of wheat middlings; lots 3 and 6, skim milk and corn meal, 3 : 1, and lots 7, 8, and 9 the same rations, respectively, as lots 1, 2, and 3, with bone meal in addition in the proportion of 1 oz. per 100 lbs. live weight. At the beginning of the trial, which covered 45 days, the lots ranged from 197 lbs. in the case of lot 5 to 303 lbs. in case of lot 9. The total gain ranged from 207 lbs. with lot 9 to 275 lbs. with lot 8. The average cost of a pound of gain in all the lots was 2.9 cts. According to the author, gains were made most economically when the ration of grain to milk was about 1 : 3.

In the third test, which was made with 8 lots of 4 pigs each and covered 65 days, the most economic gains, costing 2.7 cts. per pound, were made with lot 3, when corn meal and skim milk were fed in a proportion of 1 : 6.7. The most expensive gains, costing 3.9 cts. per pound, were made with lot 6, fed corn meal and skim milk, 1 : 2.3. The average gain ranged from 107 lbs. with lot 7 (fed grain to skim milk 1 : 6.8) to 133 lbs. with lot 3. The total weight of the 8 largest pigs at the beginning of the trial was 663 lbs.; the total gain was 632, or 95 per cent of their weight at the beginning. At the beginning of the trial the 8 smallest pigs weighed 465 lbs., and gained 578 lbs., or 124 per cent of their weight at the beginning. In other words, the larger gains were made by the smaller pigs. "The most profitable returns from pigs are usually secured by turning them off when they reach a weight of from 150 to 175 lbs."

The fourth test, which covered 74 days, was made with 6 lots of 6 pigs each, the ratio of grain to skim milk in the ration ranging from 1 : 2.4 with lot 2 to 1 : 8.2 with lot 3. The grain ration consisted of corn meal or corn meal and wheat middlings, 4 : 1. For a part of the test a ration of corn meal, beet-sugar molasses, and skim milk, 2 : 3 : 5, was fed to lot 2. After 3 days 2 of the pigs died, apparently from poisoning, as was shown by a post-mortem examination. Two pigs were added to the lot in place of these, and after the bad effects of the molasses had been overcome the lot was included in the test proper. Considering the test as a whole, the cheapest gains, costing 3.2 cts. per pound, were made on corn meal and skim milk, 1 : 2.5, with bone meal in addition, the most expensive gains costing 4.4 cts. per pound on corn meal and skim milk, 1 : 6.6.

The fifth test was made with 5 lots of 6 pigs each and covered 75 days. Lot 2 was fed corn meal and skim milk, 1:3, the other lots grain and skim milk, 1:6, the grain ration consisting of corn, except in the case of lots 4 and 5, when corn meal and wheat middlings, 4:1, were fed. Lots 3 and 5 received some bone meal in addition to the other materials. All the lots were fed large amounts from the start. The cheapest gain, costing 4 cts. per pound, was made by lot 3, the most expensive, costing 5.1 cts. per pound, by lot 5. In this and all the tests the live weight and dressed weight were compared.

"As a result of 5 years' work it is found that most economic returns are secured with skim milk when corn meal is the grain used. The proportion of corn meal to skim milk may be varied without apparently affecting results. In no case should the amount of skim milk fed be greater than the pigs can quickly and easily consume."

The value of corn, skim milk, and whey for fattening swine, A. M. Soule and J. R. Fain (*Tennessee Sta. Bul., Vol. XV, No. 1, pp. 16, figs. 6*).—During a period of 60 days the possibility of feeding pigs under local conditions was tested with 3 lots of 3 and 1 lot of 2 grade animals. Lot 1 was fed corn meal mixed with water, lot 2 the same grain mixed with skim milk. Lot 3 was fed skim milk and corn meal at first, and later whey, corn meal, and wheat meal. Lot 4 was fed skim milk, cowpea hay, and corn meal. The attempt was made to feed lot 3 some sorghum silage in addition to the ration noted, but as only 5 lbs. was eaten in 15 days, it was discontinued. At the beginning of the test all the pigs weighed some 145 lbs. each. In 60 days the average daily gain per pig in the 4 lots was, respectively, 1, 2.3, 2.2, and 2 lbs. The corresponding cost of a pound of gain was 3.9, 4.2, 3.4, and 5.2 cts. Lot 1 required 4.6 lbs. of grain per pound of gain. Lot 2 required 2.2 lbs. of grain and 11.2 lbs. of skim milk. Similar values for lot 3 were 1.7 lbs. corn meal, 0.4 lb. wheat meal, 2.5 lbs. skim milk, and 8.5 lbs. whey. Lot 4 required 2.9 lbs. of corn meal, 1 lb. chopped cowpea hay, and 12.5 lbs. of skim milk.

As shown by slaughter tests the food had a marked effect on the carcass, the dressed weight in the 4 lots being 73.6, 78.5, 76.2, 77.4 per cent, respectively, of the live weight. Rating pork at 5.5 cts. per pound, the authors calculate that corn meal was worth 66.7 cts. per bushel and skim milk 28.3 cts. per hundred pounds. According to the authors the experiments indicate that pig feeding can be made profitable on Tennessee farms, that ordinarily enough feed is wasted on the farm to fatten a number of pigs, "that intelligent methods of feeding bring a fair profit, and that the farmer should ordinarily finish his own animals, as they will then bring the highest market prices."

Market classes of horses, G. M. Rommel (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 37, pp. 32, pls. 12*).—The condition of the horse market in recent years and at the present time is spoken of. The author also discusses the general essentials of market horses, paying special attention to the different classes. Of these the more important are draft animals and harness and saddle horses. It is stated that the bulletin consists chiefly of information gathered from breeding establishments, horse markets, and hunt clubs.

Report of manager of poultry department, W. R. Graham (*Ontario Agr. Col. and Expt. Farm Rpt. 1901, pp. 112–124, figs. 20*).—Brief statements are made concerning the poultry kept during the year at the Agricultural College, the eggs produced, and the chickens hatched. Feeding tests are also reported. On an average the eggs produced by 2 lots of 12 Barred Plymouth Rock hens during May, June, and July cost 6.32 cts. per dozen; those produced by the same number of Andalusians, 5.38 cts. per dozen. In each case a cock was kept with the hens, and both lots were given the same care and were fed similar rations.

Different grain rations were tested with chickens fed in coops for periods of 2 weeks. The following table summarizes the results obtained. In the case of ration

No. 2 the figures quoted represent the average of 2 trials, in all other cases of 3 trials, with lots containing 12 chickens each:

Comparative merits of grain rations for chickens.

Rations.	Average weight of lot at beginning.	Total gain in two weeks.	Grain eaten per pound of gain.[a]	Cost of a pound of gain.
	Pounds.	*Pounds.*	*Pounds.*	*Cents.*
Ration No. 1: Corn meal, shorts, pearl oat dust, animal meal, 5 : 4 : 1 : 1	47	11.5	3.3	3.91
Ration No. 2: Corn meal, ground buckwheat, pearl oat dust, 2 : 2 : 1	48.3	15.8	2.6	3.46
Ration No. 3: Corn meal, ground buckwheat, pearl oat dust, 2 : 1 : 1	47.5	11.7	3.4	4.61
Ration No. 4: Corn meal, pearl oat dust, 2 : 1	48	9.3	4.3	5.75
Ration No. 5: Pearl oat dust	48.2	12.8	3.0	4.84

[a] In every case an amount of milk practically equal to the grain was also eaten.

According to the author, ration No. 1 was economical, but it was objectionable since it had a tendency to produce yellow flesh, which is regarded as undesirable in the best local markets. Ration No. 2 was regarded as the most palatable and produced fine, white flesh at a moderate cost. Ration No. 3 was similar to No. 2, except that it contained more corn meal and hence was less suitable for warm weather. The author notes that it produced a somewhat cream-colored flesh. Ration No. 4 was regarded as the least satisfactory of all. On account of the excess of corn it was not palatable and was undesirable for warm-weather feeding. When oats are moderate in price, ration No. 5 is regarded as satisfactory.

Tests were also made with chickens of different weights to learn the comparative merits of different methods of feeding. Each lot contained 12 chickens, the average weight of the chickens in the different lots ranging from 2.75 to 4.33 lbs. at the beginning of the trial. In 24 days the greatest gain, 22.75 lbs., was made by the lot fed in fattening crates for 2 weeks from a trough and for 10 days with a cramming machine. These chickens averaged 4.33 lbs. each at the beginning of the trial. The cost of a pound of gain was 5.68 cts. and the selling price 11 cts. per pound. The smallest gain, 9.75 cts., was made by the lot fed in a pen, each chicken having a floor space of about 5 sq. ft. The average weight of the chickens in this lot at the beginning of the trial was 2.75 lbs., the cost of a pound of gain 7.78 cts., and the selling price 9 cts. per pound. Considering the results as a whole, the author concludes that chickens weighing 3.5 lbs. are most desirable for fattening purposes; that the practice of fattening in crates is to be commended, and that by using a cramming machine a chicken can be finished and given a finer appearance when dressed than when fed in the ordinary way.

"It was also shown that the crated birds, and those fed by the machine in addition, were far more profitable than those fed loose. Some experiments have also been conducted where a supply of roots was added to the grain ration. The results thus far obtained seem to indicate that there is no advantage in feeding roots. Potatoes, however, give an extra amount of gain in flesh, and at a moderate cost may be regarded as an economical food."

Brief statements are made concerning the ducks raised during the year. When 10 weeks old Pekin ducks dressed 5.5 lbs., Rouens 4.5 lbs., and Indian Runners 4 lbs. According to the author the Pekin ducks gain more rapidly than the others. The Rouen ducks are as large when mature, but grow more slowly. The Indian Runner ducks are a small breed, but lay remarkably well. A test was briefly reported on forcing young ducks from the seventh to the tenth week by feeding them with a cramming machine. According to the author this showed that a "duck will eat as much of its own free will as we were able to give it by the machine. The results might be very different with older ducks."

Poultry west of the Rockies, F. B. Clewette (*Los Angeles: Author, 1902, pp. 123, figs. 6*).—A treatise on poultry raising with special reference to local conditions. The experience of a number of individuals is included.

Chinese incubators, G. D. Brill (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1900, pp. 247–253, pls. 3, figs. 3*).—A descriptive article on incubators and the management of chickens and ducks in China.

International live stock exposition of 1900 (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1900, pp. 63–68, pls. 9*).—A descriptive article.

DAIRY FARMING—DAIRYING.

Market milk: A plan for its improvement, R. A. Pearson (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1900, pp. 158–193, pls. 10*).—The importance of a pure milk supply is emphasized and a plan for the improvement of market milk somewhat similar to one already in operation in several cities is fully outlined.

"A responsible body of citizens who are interested in an improved milk supply, and having the confidence of the community, should be organized as a milk commission, to have full control of the work proposed. The commission should select and secure the advice and assistance of four experts—a veterinarian, a physician, a bacteriologist, and a chemist—all more or less familiar with the conditions and possibilities on dairy farms. The commission should send to each dairyman who supplies milk to the city a circular naming all the particular conditions which should be found on every farm where milk is produced for city use, and announcing that when any dairyman notifies the commission that he is fully conforming to the conditions specified, or endeavoring to do so, his dairy will be inspected; and, if it is found to comply in letter and spirit to all the requirements, his name will be placed upon an 'approved' list and he will receive an official indorsement in the form of a certificate . . . which he can use in any proper manner to assist in securing new trade." The proposed measure is entirely voluntary on the part of the dairyman.

The personnel and duties of the milk commission and other features of the plan are discussed and a set of requirements suitable for incorporation in an agreement between the dairyman and the commission is given. An account is also given of dairies under similar supervision in Philadelphia and New York City, circulars of information, forms of reports, etc., used in each case being given in appendixes.

The author discusses under methods of purifying milk the removal of dirt and bacteria by centrifugal separation and the use of filters, the prevention of bacterial growth by the use of antiseptics and cold, sterilization and pasteurization of milk, etc. "Upon the whole, the expediency of pasteurization as well as sterilization of milk, except in special and exceptional cases, may be considered doubtful."

On the increase in the fat content of milk during the same milking, M. Skov (*Mälkeritid., 14 (1901), No. 48, pp. 789–794*).—The evening milk from one cow in advanced lactation was separated into 13 portions and the morning milk into 17 portions, and the fat content of the different samples was determined. The former series of samples increased from 0.7 to 8.9 per cent, and the latter from 0.7 to 9.6 per cent. The author finds that the results of fat determinations in different portions of the same milking show 4 periods. In the first, consisting of 2 or 3 samples, the milk contains less than 1 per cent of fat. In the next 2 samples there is a sudden rise in the fat content. In the following 8 or 10 samples the fat content is quite uniform, being somewhat above normal. In the last sample taken there is a sharp rise in the fat content of 4 or 5 per cent. Experiments with several fresh cows showed similar results, except that the third interval was somewhat longer. Extremes of 0.8 per cent of fat in the first portion of a milking and 13 per cent in the last portion were repeatedly observed.

Portions of the four different parts of the milkings mentioned were collected separately until enough cream was secured to make churnings, and the butter fat obtained in each case was examined by the Reichert and Huebl methods, and for refractive index. The Reichert numbers found did not differ materially, and but small differences were observed in the iodin absorption numbers and the refractive indexes for the 4 samples, the former being 38.4, 39.7, 39.2, and 38.2 for samples 1 to 4, respectively, and the latter 52.6, 53, 53, and 52.5.—F. W. WOLL.

The dairy maid's book, N. OEDEGAARD (*Budeibogen. Christiania, Norway, 1902, 2. ed., pp. 60*).—A prize essay on the feeding and handling of dairy stock, written especially for dairy maids (*Budeier*).—F. W. WOLL.

Successful dairying, J. KLEIN (*Erfolgreiche Milchwirtschaft. Berlin: Paul Parey, 1902, pp. 358, figs. 95*).

The liberation of volatile sulphid from milk on heating, L. F. RETTGER (*Amer. Jour. Physiol., 6 (1902), No. 6, pp. 450–457*).—The author finds, in confirmation of the observations of Niemann and Oppenheimer, that sulphid is given off on heating normal milk above 85° C. This is believed to be in all probability hydrogen sulphid, and to be due to the partial decomposition of the milk proteids. The amount of sulphur liberated was very small, but was sufficient to be easily recognized by the blackening of lead acetate paper and lead acetate cotton as well as of the decoloration of dilute potassium permanganate solution. As might be expected from the low content of proteids, pure milk yielded much less of the volatile sulphid than whole milk, while skim milk when perfectly fresh gave off more sulphid. Alkalis and alkaline-reacting phosphates were found to facilitate this decomposition of the proteids, while acids and acid-reacting phosphates retarded it. Hence the amount of sulphid liberated depends largely on the reaction of the milk.

"What part this liberation of sulphid may take in rendering milk injurious is a question of practical significance. The reaction is in itself conclusive evidence that the milk suffers a change in composition. The important question arises: 'Does sterilization and pasteurization render it injurious for prolonged use?' There is some evidence that scurvy in infants results from the use of milk sterilized by boiling. May this result be connected with alterations in the proteids, permitting the liberation of volatile sulphid?"

On the thermal death point of tubercle bacilli, B. BANG (*Mälkeritid., 14 (1901), No. 42, pp. 677–679*).—Experiments were made with tuberculous milk heated in a closed metal vessel, through the cover of which a thermometer was inserted. The apparatus was kept in a deep water bath of constant temperature and shaken steadily so as to insure a uniform heating of all particles of milk. Tuberculous milk heated to 60° C. for 1 minute or less caused pronounced tuberculosis by inoculation into the abdominal cavity of rabbits. Milk kept at 60° for 5 minutes also caused tuberculosis, but to a less extent. Heating for 15 minutes reduced the effect still more, only half the number of animals becoming tuberculous. Milk heated to 65° for a moment caused a rather slight, but still recognizable tuberculosis. On heating at 65° for 5 minutes the bacilli were killed. The same result followed heating for a moment to 70, 75, 80, and 85°. Feeding experiments with milk heated to 60° for 2 minutes gave negative results.

In case of continuous pasteurization the author considers 80° the lowest safe temperature for destroying tubercle bacilli, and believes that the Danish pasteurization law may be modified without danger to allow pasteurization at this temperature in creameries, the Storch color test (E. S. R., 10, p. 384) being used to ascertain whether the skim milk has actually been exposed to this temperature.—F. W. WOLL.

Report of the professor of dairying, H. H. DEAN (*Ontario Agr. Col. and Expt. Farm Rpt. 1901, pp. 44–55*).—Experiments in cheese and butter making are reported and a record is given of the dairy herd for the year ended November 30, 1901.

Experiments in the care of milk for cheese making led to the following conclusions: "Aeration of milk without cooling below 70° is not sufficient to prevent milk from becoming overripe during the night in hot weather. Cooling night's milk to a temperature below 70° is necessary in order to have the milk reach the cheese factory in a condition suitable for the manufacture of good cheese. Cooling to 50° and the addition of a culture to control flavor has not yet proved entirely satisfactory."

In each of 12 experiments during May and July from 600 to 1,500 lbs. of milk was divided into 2 lots, to one of which $3\frac{1}{3}$ oz. of rennet per 1,000 lbs. of milk was added at a temperature of 86° and the curd cooked to 98°, and to the other lot 5 oz. of rennet per 1,000 lbs. of milk was added at a temperature of 82° and the curd cooked to 94°. "The use of an extra amount of rennet and the adoption of lower temperatures than is customary for renneting and cooking gave an increased yield of cheese, but as cured in an ordinary curing room it developed too much acid, and the quality was inferior. In the one trial where cheese was cured in cold storage, the quality of the cheese was equally good, and there was a gain in the amount of cheese produced equal to about $1\frac{1}{4}$ lbs. per 1,000 lbs. milk."

Washing curds in experiments during 1901 caused a loss on an average of about 1 lb. of cured cheese per 100 lbs. of curd. There was little difference in the quality of the cheese from washed and unwashed curds.

In each of 16 experiments during May and June 2 cheeses were made from the same lot of milk, one of which was cured in a well-lighted room at an average temperature of 64.6° and an average percentage of moisture of 79.3, and the other in a dark room at an average temperature of 66° and a percentage of moisture of 76.4. There was little difference as regards loss of weight in curing, quality of cheese, and amount of mold between the cheese cured in the light and in the dark rooms.

In a series of experiments cheeses were placed in cold storage at 40° fresh from the press and after being kept 1, 2, and 3 weeks in an ordinary curing room. One cheese in each experiment was also cured in the ordinary way at 65°. The details of the experiments are to be published later in bulletin form when the work is completed. "We may anticipate these results by saying that, so far as the work has gone, it indicates that cheese may be cured at a temperature of 40°, in about 3 to 4 months' time, and that the quality of cheese cured in cold storage is superior to that cured at ordinary temperatures. The results also indicate that the sooner the cheeses are placed in cold storage after being made, especially in hot weather, the better the quality of the cheese, and the less loss by shrinkage."

In experiments in butter making 5, 10, 15, 20, and 25 per cent of pure culture was added to the cream. The comparison showed that with 5 per cent of culture the cream ripened in about 15 hours and with 25 per cent in about 5 hours. The highest average score for flavor was obtained by ripening at a low temperature with the smallest amount of culture. Several different pure cultures were compared in another series of experiments. A culture prepared at the station with a mixture of whole milk, skim milk, and buttermilk gave no better results than one prepared with skim milk alone.

Experiments to determine the effect of different methods of making butter upon the content of moisture and salt are briefly reported and summarized as follows: "There was very little difference in the average moisture and salt content of butters churned at temperatures between 44 and 58°. Butter churned into lumps had the lowest moisture content, and that in fine grains the lowest salt content. The lots churned into the size of corn grains had both the highest moisture and highest salt content of any in the series. The moisture and salt content was about the same when washed with water at temperatures between 40 and 60°. The same is true of samples washed once and twice, other conditions being equal. Butters unsalted contained the least moisture and those salted at the rate of three-quarters of an ounce per pound of butter contained the most moisture. The salt content of the finished butter does not appear to have any constant relation to the amount of salt added to the butter. On the average, more than half the salt applied to the butter passed off in the working. In some determinations of the moisture pressed out by working, it was found to contain from 23 to 24.5 per cent salt. . . . The butters made from unpasteurized milk had a higher percentage of moisture than those made by pasteurizing at from 140 to 160°, less than the lots pasteurized at 186°, and about the same as those made by heating the milk to 195° before separating."

Notes are given on tests of the "Virginia Cattle Food" and the Columbia air churn, on the milk supply of the college dairy, and on feeding experiments with calves.

The average yearly production of the 19 cows in the dairy herd was 8,114 lbs. of milk and 283.44 lbs. of fat. The largest yield was 11,379 lbs. of milk and 380.06 lbs. of fat produced by a pure-bred Holstein.

On the advantages of a low ripening temperature for cream in butter making, L. F. Rosengren (*Landtmannen, 12 (1901), No. 1, pp. 7–11*).—The writer finds that cream may be ripened to advantage below 12° C. in 20 to 22 hours by the addition of 8 per cent of a pure-culture starter. The best arrangement as to temperature of the cream during ripening is to start the ripening process at such a temperature that the cream at the end of the ripening period will have the right temperature for churning. A low ripening temperature was not found less favorable than a high temperature as regards the quality of the butter, while the clean and fresh odor in both ripening vat and churns obtained at the low temperature was very noticeable.

It was observed in a number of trials that cream pasteurized at 85° C., and then cooled to 10° C., afterwards increased 1 to 2° in temperature, irrespective of the room temperature. It is suggested that this increase may be due to a gradual change taking place in the physical condition of the butter fat, which is accompanied by liberation of heat.—F. W. WOLL.

Experiments in butter making and cheese making, F. B. Linfield (*Utah Sta. Bul. 73, pp. 54, pls. 3*).—This is the first bulletin of the station dealing particularly with butter and cheese making and covers work extending over a number of years.

Butter making (pp. 5–19).—Average data are given for some 80 tests of 6 makes of power seperators and 22 tests of 2 hand separators from which the conclusion is drawn that "all styles of separators will do close skimming if they are properly run." The tests of the power separators were made in various creameries throughout the State. Suggestions are given for getting the best results from a separator.

The fat content of skim milk, buttermilk, and whey was determined by the Babcock test, using different kinds of bottles and by chemical analysis. The comparison showed an average of 0.2 per cent more fat by chemical analysis than by the Babcock test with the double-necked bottle.

The results of 30 churning tests at creameries and 50 at the station are arranged according to the fat content of the cream and averaged. "These tests would appear to show that under average conditions, cream testing 30 per cent fat will churn more exhaustively than cream with a low per cent of fat." The results of experiments are noted as showing that the temperature of churning may vary considerably with satisfactory results. In 67 tests with cream showing an acidity of 0.4 to 0.64 per cent, the acidity seemed to have little or no effect upon the exhaustiveness of churning. A preliminary test of the quality of butter made from cows fed on alfalfa as compared with that from cows fed on corn fodder is reported. The butter from cows fed on alfalfa had a higher color and a firmer body than the butter from cows fed on corn fodder. It had a pronounced and peculiar flavor which, however, was not considered objectionable to those accustomed to it.

Method of making Cheddar cheese (pp. 21–40).—The making of Cheddar cheese is discussed at some length, the principal object being to call attention to points frequently overlooked by cheese makers.

Experiments in cheese making (pp. 41–51).—Data are given for 165 trials showing the yield of cheese from milk containing from 3.4 to 4.8 per cent of fat. One hundred pounds of milk testing 3.4 per cent of fat made 10.15 lbs. of green cheese, or 2.94 lbs. for each pound of fat in the milk, and 100 lbs. of milk testing 4.8 per cent of fat made 12.09 lbs. of green cheese, or 2.52 lbs. for each pound of fat in the milk. On an average 100 lbs. of milk made 11.31 lbs. of green cheese, or 2.77 lbs. for each pound of fat in the milk. The loss in weight in cheese cured at the station for 1 month was 6.94 per cent and for 6 months 9.30 per cent.

Cheese made by the "dip-curd" process, in which the curd is stirred for 10 or 15 minutes after dipping, salted and pressed immediately, cured quickly but was soft and lacked uniformity. It lost 13.5 per cent in weight in 1 month.

The fat lost in whey averaged 0.15 per cent, practically no difference being observed in this respect in milk testing 3.4 to 4.7 per cent of fat. A temperature of 86° F. for renneting was found most satisfactory. In experiments during 1900 cheese was cured in (1) cold storage at 45 to 50° F., (2) in a curing room at 60 to 65° for 1 month and then in cold storage, and (3) in the curing room for the whole time, data for the physical examination for the cheeses being given. The loss in weight was practically the same in each case. The results of curing at a low temperature were not entirely conclusive.

A study of enzyms in cheese, L. L. Van Slyke, H. A. Harding, and E. B. Hart (*New York State Sta. Bul. 203, pp. 215–244*).—Enzyms in cheese are shown to come from bacteria, milk glands of cows, and rennet. In the investigation here reported bacterial action was for the most part excluded by the use of antiseptics. Of the 2 phenomena of cheese ripening, namely, the chemical decomposition of casein and the formation of flavors, the study was concerned chiefly with the former. The literature of this phase of the subject is briefly reviewed, and the methods of chemical analysis used are outlined.

Chloroform was added to skim milk containing only a trace of fat in amounts varying from 2.5 to 30 per cent by volume and the percentage of nitrogen in soluble form in the different samples was determined at frequent intervals for 192 days. The bacterial content was small in all cases. In general, there was a marked progressive increase during this period in the amounts of soluble nitrogen, which varied but little in samples treated with different percentages of chloroform, indicating that the restraining action of chloroform upon enzyms is slight. Two series of samples were prepared from whole milk and melted butter fat to contain, respectively, 10 and 20 per cent of fat. Chloroform was added to each series in amounts ranging from 2.5 to 20 per cent. Determinations of the soluble nitrogen and the bacterial content of the samples for 112 days showed practically no influence upon the antiseptic value of the chloroform due to the different amounts of fat. The germ content was higher than in the preceding series of experiments, but several reasons for this are offered.

In one series of experiments with whole milk a comparison was made of the effect of 15 per cent of ether, 3 per cent of chloroform, and a mixture of 2.9 per cent of ether and 2.1 per cent of chloroform upon the activity of enzyms. The increase in soluble nitrogen was more rapid where the ether was used, but the bacterial development, consisting almost entirely of one kind, was also greater. "This experience has made us slow to accept as trustworthy any results obtained with the use of ether, when the conditions are not constantly controlled by quantitative examination of the bacterial content." In another series of experiments a similar comparison was made of 4 per cent of chloroform and 0.1 per cent of formalin. The total soluble nitrogen at the end of 152 days averaged 45.62 per cent in the formalin series and 60.63 per cent in the chloroform series, showing a greater restraining influence of the formalin upon enzym action. The bacterial content in all cases was low.

In connection with the last series of experiments the relation between bacteria in the udder and enzyms in the milk was investigated. It was found in additional experiments that the number of bacteria in the strippings from different quarters varied greatly, the back right quarter showing usually above 500 per cubic centimeter and the front left quarter less than 100. Determinations at intervals for 105 days showed a corresponding variation in the production of soluble nitrogenous products in the milk from the different quarters. "It may be held that the presence of these bacteria has merely stimulated the production of an extra amount of galactase, but many of these bacteria are able to bring about the liquefaction of gelatin, a fact which suggests that they have played a part in enzym formation within the udder. However, it is impossible to assign even an approximate value to the work performed by bacteria within the udder in the production of their enzyms until we understand the conditions which relate to the normal formation of galactase."

Cheese was made from 125 lbs. of milk to which 3.5 lbs. of chloroform had been added, and was ripened under a bell jar in an atmosphere of chloroform. The cheese was found to contain 15 per cent of chloroform. The composition of the cheese was compared at different intervals with that of a normal cheese cured under ordinary conditions, and with a cheese coated with paraffin to lessen the loss of moisture and make it in that respect similar to the chloroform cheese. The amounts of nitrogen rendered soluble in the 3 cheeses during 15 months after they were taken from the press were, respectively, 27.70, 38.66, and 44.14 per cent of the total nitrogen. The ripening process in the chloroform cheese was proportionately much slower during the early portion of the period. In a similar experiment 0.2 per cent of lactic acid added to the milk increased the ripening process to a marked degree. At the end of 12 months cheese made with chloroform showed 22.60 per cent and cheese made with chloroform and lactic acid 31.65 per cent more soluble nitrogen than when fresh. In each of the above experiments the chloroform cheese was unsalted. In salted cheese made with chloroform and compared with the above the soluble nitrogen formed in 12 months was reduced from 22.60 to 17.20 per cent, and in the chloroform cheese made with lactic acid from 31.65 to 19.65 per cent, showing a restraining influence of salt upon the activity of enzyms.

Data are given showing the character of the chemical changes taking place in normal and in chloroform cheese. The following comparison is given:

"(1) In the normal cheese at the age of 1 month the amount of amids was 1.8 lbs. for each pound of albumoses and peptones. This ratio increased until at 9 months it was 8.7, nearly 5 times as great as at the end of 1 month.

"(2) In the chloroform cheese the amount of amids was not quite one-fourth of the amount of albumoses and peptones at the age of 1 month. The relative amount slowly increased, until at the end of 9 months the amount of amids was nearly equal to that of albumoses and peptones.

"(3) In the chloroform cheese no ammonia had appeared at the end of 9 months; in the normal cheese nearly 1 per cent of the total nitrogen was present as ammonia at the end of 1 month, and this amount steadily increased."

The authors conclude that there is some agent at work in normal cheese which is not active in cheese made with chloroform, and state that their efforts are being directed to the identification of this agent.

Conditions affecting weight lost by cheese in curing, L. L. VAN SLYKE (*New York State Sta. Bul. 207, pp. 275–305, figs. 6*).—A systematic study of this subject has been made at the station for the past 3 years. The curing rooms and the means of controlling temperature and moisture in use at the station are described, as is also the determination of atmospheric moisture by the hygrometer.

The chief conditions affecting the loss of weight in cheese during curing, which for practical purposes may be considered as due entirely to the loss of moisture by evaporation, as stated by the author, are (1) the percentage of moisture originally present in the cheese, (2) the texture of the cheese, (3) the temperature of the curing room, (4) the size and shape of the cheese, and (5) the proportion of water vapor present in the air of the curing room.

Considerable experimental data concerning these conditions are reported. It was found that cheese containing the most water loses the most in weight. In one experiment cheese containing originally 55 per cent of water lost 16.8 per cent in 4 weeks, while cheese containing 35 per cent of water lost only 5.7 per cent. The more open the texture of the cheese, the greater the loss of water by evaporation. An increase in the loss of weight follows an increase in the temperature of the curing room. In one test reported cheese cured at 55° F. lost 8.1 per cent in weight in 6 months, while cheese cured at 70° under conditions similar in other respects lost 11.1 per cent. In another test cheese cured at 32° lost 3 per cent in weight in 5 weeks, while cheese cured at 55° lost 4.6 per cent. Two cheeses 3 and 7 in. in height and uniform in diameter lost, respectively, 17 and 12.4 per cent of moisture in 6 months. Cheeses having diameters of 7 and 15 in. and approximately the same heights lost, respectively, 13.1 and 10.1 per cent of moisture in 6 months when cured at 65°. The results show an increase in the loss of weight corresponding to a decrease in either height or diameter of the cheese. Cheese cured in an atmosphere saturated with moisture gained nearly 2 per cent in weight during 15 months, while cheese cured in a room containing 75 to 80° of moisture lost over 11 per cent. Many other illustrations of the above points are given.

The results are discussed in regard to their practical application to dairymen and consumers of cheese. The author considers that cheese should contain not less than 33 per cent of moisture at the time of consumption.

In discussing the prevention of loss of moisture in curing cheese the advantages of central curing rooms are pointed out and the construction of special curing rooms in each cheese factory is considered, the description being based upon Wisconsin Station Bulletin 70 (E. S. R., 11, p. 186), from which illustrations are also taken.

Some problems in cheese curing, F. H. Hall, L. L. Van Slyke, H. A. Harding, and E. B. Hart (*New York State Sta. Buls. 203, 207, popular ed., pp. 16, fig. 1*).—A popular summary of bulletins 203 and 207 of the station noted above.

Assistance offered to creameries and cheese factories, F. C. Harrison (*Ontario Agr. Col. and Expt. Farm Rpt. 1901, pp. 77–79*).—Brief notes are given on difficulties which have arisen in cheese factories in different parts of the Province. These have included gassy fermentations, bad flavors, and pigment in cheese, a fishy flavor in butter, etc.

Dairy products of the Paris Exposition of 1900, H. E. Alvord (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1900, pp. 194–222, pls. 6, maps 7*).—A full descriptive account is given of the dairy exhibit at the Paris Exposition, together with statistical data and other information concerning the dairy industry in the countries represented. A list of awards made to exhibitors of dairy products from the United States is appended.

VETERINARY SCIENCE AND PRACTICE.

The historical development of the theory of animal diseases, W. Dieckerhoff (*Die Theorie der Thierkrankheiten in ihrer geschichtlichen Entwickelung. Berlin: August Hirschwald, 1902, pp. 30*).—This pamphlet contains an address delivered in the Veterinary High School at Berlin on the occasion of the recent celebration of the birthday of the German Emperor. The history of various theories proposed for explaining animal diseases is discussed from the earliest times to the present. Especial attention is given to the theories entertained by Greek and Latin writers and by the continental writers from the time of the middle ages up to the middle of the past century.

Twelfth annual report on the veterinary service in Hungary, F. Hutyra (*Jahresber. Vet. Ungarn, 12 (1900), pp. 154*).—This report contains an account of the organization and number of veterinarians in government service, the extent of various diseases in the country, and rules and regulations adopted for preventing the spread of infectious diseases. Special attention is given to rinderpest, anthrax, rabies, glanders, foot-and-mouth disease, pneumonia, sheep pox, mange, swine erysipelas, swine plague, and hog cholera. A brief report is given on experiments in preventive inoculation against anthrax, swine erysipelas, and blackleg.

Annual report on investigations in the field of veterinary medicine, Ellenberger et al. (*Jahresber. Leist. Geb. Vet. Med., 20 (1900), pp. 267*).—A classified discussion of the literature on the subject of veterinary science during the year 1900. Bibliographical references are given and author and subject indexes are appended to the volume.

The Tenth International Congress of Hygiene and Demography, E. A. de Schweinitz (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1900, pp. 260, 261*).—Brief notes on this Congress which was held in Paris from August 10 to 16, 1900. The work of the Congress was conducted in 8 sections devoted to parasitology and the biology of micro-organisms as applied to hygiene. Notes were given on papers which were presented on toxins in preserving meats, on yellow fever, and other subjects.

Studies on the content of red blood corpuscles in the blood of domesticated animals, A. Storch (*Inaug. Diss., Univ. Bern, 1901, pp. 52*).—The author made an extended series of counts of the number of red blood corpuscles in a given quantity of blood, in the case of different animals. These studies were made by means of improved devices especially designed for this purpose. The average number found in a cubic millimeter of blood of different animals in different stages of life is given in tabular form. These statistics cover the different sexes as well as the different ages of domesticated animals. In general it was found that male animals have more red blood corpuscles than female animals. A general belief that new-born and young animals possess relatively more red blood corpuscles than mature animals was not corroborated, as a whole, for the blood of sheep, goats, and hogs during the first few days of life contain fewer red blood corpuscles than later. The calf possesses a relatively larger number of red blood corpuscles than the mature beef animal.

The occurrence of metachromatic granules in spore-bearing bacteria, and contributions to the knowledge of the Babes-Ernst corpuscles, E. Krompecher (*Centbl. Bakt. u. Par., 1. Abt., 30 (1901), Nos. 10, pp. 385–395; 11, pp. 425–428, pls. 7*).—In cultures of *Bacillus anthracis*, *B. concentricum*, and *B. anthracoides* on agar, potato, and gelatin, the author demonstrated the presence of granules which were stained bright red with carbol-methylene blue, and retained their color even when the staining solution was raised to a comparatively high temperature. First one granule appears in the central portion of the bacillus; after 2 days the color of the granule is gradually changed from a diffuse rose to an intensive red. Later other granules appear in the central portion of the bacillus, and these granules may considerably increase in number and persist after the cell body of the bacillus is gradually disintegrated. It is believed that these granules are in some manner related to the formation of spores, for the reason that the granules appear among spore-bearing cultures, and that they show a decided resistance to the action of heat. The Babes-Ernst corpuscles may exist in the body of the bacillus at the same time with the granules which are described by the author, but the first-named corpuscles are easily distinguished from the granules by the position of the former in the periphery of the body of the bacillus. Babes-Ernst corpuscles were found in spore-bearing bacilli, in *B. anthracis* and *B. alei*. According to the author's observations, the Babes-Ernst corpuscles are not distinctly related to the degree of virulence of the bacilli.

A classification of forms of hemorrhagic septicæmia, J. Lignières (*Ann. Inst. Pasteur, 15 (1901), No. 9, pp. 734–736*).—The organisms which produce hemorrhagic septicæmia are considered as having a number of characteristics in common. They are not stained by the Gram method, do not liquefy gelatin, and produce acute septicæmic lesions. The author classifies the diseases which should be included under this term into the following groups: (1) The type of fowl cholera which is also common to all birds and rabbits; (2) swine plague; (3) hemorrhagic septicæmia of sheep; (4) cattle plague; (5) typhoid fever or influenza of horses, including its various forms and complications, such as contagious pleuro-pneumonia and pneumonia-enteritis, and (6) dog distemper.

Animal parasitology, M. NEVEU-LEMAIRE (*Parasitologie animale. Paris: Société d'Éditions Scientifiques, 1902, pp. 212, figs. 88*).—The author gives a discussion of the life history and habits of the Amœbæ and other protozoa, as well as the various tapeworms, trematodes, round worms, mites, myriapods, and insects which are known to be constantly or occasionly parasitic in man. A large proportion of the species which are considered are also parasitic in various domesticated animals.

Eleven miscellaneous papers on animal parasites, C. W. STILES, A. HASSALL, W. A. FRANKLAND, and LOUISE TAYLER (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 35, pp. 61, pls. 5, figs. 38*).—This bulletin contains the following articles:

Treatment of round worms in sheep, goats, and cattle (pp. 7–14).—Previously noted from another source (E. S. R., 13, p. 593).

The disinfection of kennels, pens, and yards by fire (pp. 15–17).—It being known that the burning of grass on the prairies is sufficient to disinfect pastures of parasitic nematodes, it is recommended that pens and yards in zoological parks be periodically burned over at intervals of 10 to 30 days by means of a cyclone burner, such as was used by the gypsy-moth commissions of Massachusetts.

Brief notes are also given on *Eimeria stiedæ;* species of Eimeriella; on various parasites; trematodes parasitic in the human eye; a case of vinegar eel infection in the human bladder; a number of parasitic worms of oriental distribution, which may possibly infest American soldiers in the Philippines; and spurious parasitism due to partially digested bananas.

The protozoa as parasites and pathogenic organisms, considered from a biological standpoint, F. DOFLEIN (*Die Protozoen als Parasiten und Krankheitserreger nach biologischen Gesichtspunkten dargestellt. Jena: Gustav Fischer, 1901, pp. 274, figs. 220*).—In this volume the author discusses the classification of protozoa, parasitism, the influence of parasitism upon the parasites, and protozoa as parasites. The greater part of the volume is occupied with a detailed discussion of special groups and species of protozoa which are concerned in producing diseases of animals and plants. Among the more important diseases which are discussed as due to the presence of protozoa are tsetse-fly disease, dourine, surra disease, blood dysentery of cattle, malaria of birds and of man, Texas fever, horse sickness, the pox disease of carp, and silkworm disease. The volume includes a discussion of a large number of parasitic protozoa of less economic importance and gives details of the structure, life history, and parasitic habits of all species concerned. Full bibliographical references are given in connection with the different chapters.

The Strongylidæ in the fourth stomach of domesticated ruminants and the stomach-worm diseases, W. STÖDTER (*Die Strongyliden in dem Labmagen der gezähmten Wiederkäuer und die Magenwurmseuche. Hamburg: A. Leferre, 1901, pp. 108, pls. 14*).—This is an inaugural dissertation, and in it an attempt is made to give a systematic monograph of the genus Strongylus. The author recognizes 7 species of this genus, viz, *contortus, ostertagi, curticei, harkeri, retortæformis, oncophorus,* and *filicollis.* In addition to the species of Strongylus, the author discusses *Œsophagostomum venulosum* and *Monadontus phlebotomus.* In a discussion of the systematic position of these species 16 names are considered, part of which are reduced to synonyms of the 9 species which are believed to be well defined. Detailed notes are given on the anatomical characters, life history, and injurious effects of each species. The prophylactic and therapeutic treatment usually recommended for the various species is also discussed. Experiments were made on *S. contortus,* during which the conclusion was reached that this species is not viviparous. A bibliography of 126 titles is given.

Researches on the attachment of certain Uncinariæ to the walls of the intestines, A. Rizzo (*Atti. R. Accad. Lincei. Cl. Sci. Fis. Mat. e Nat., 9 (1900), II, No. 3, pp. 107–115, figs. 2*).—The author investigated the method of attachment and pathological effects caused by *Uncinaria radiata* and *U. cernua.* He found that the first species produces a papilla in the walls of the intestines, at the expense of the submucous connective tissue. The hooks and chitinous teeth with which the worm is provided serve to lacerate the tissue of the intestinal wall. At the point of attachment a constant inflammatory reaction is produced, but this effect is not very marked or of great extension. The lesions produced by *U. radiata* are much more serious than those caused by *U. cernua.*

Pathological conditions found in meat inspection, D. E. Salmon (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1900, pp. 52–62*).—This is an article which was read at the meeting of the American Medical Association held in Atlantic City, N. J., June 5 to 8, 1900. Detailed notes are presented on a number of cattle, sheep, and hogs inspected by the Bureau of Animal Industry, the diseases which were discovered during this inspection, and the number of cases condemned. During the 2 years from July 1, 1897, to June 30, 1899, 8,831,927 cattle were inspected. Of this number 19,454 entire carcasses were condemned and 23,106 additional carcasses were condemned in part. During the same period 11,110,776 sheep were inspected and 8,394 carcasses were wholly condemned; also 44,841,779 hogs were inspected, and 106,555 carcasses wholly condemned. Of the whole number of cattle carcasses which were condemned 26 per cent were affected with actinomycosis and 36 per cent with tuberculosis; and of those cases in which only parts of the carcass were condemned, 13 per cent were affected with actinomycosis and 1 per cent with tuberculosis. The beef cattle which are sent to large abattoirs are remarkably free from tuberculosis, only 1 case in 1,500 or 2,000 being found by inspection for the 2 years. Brief notes are given on a number of other diseases found during inspection. Special mention may be made of pseudotuberculosis of sheep, nodular tæniasis, and various animal parasites, such as the common tapeworms in their larvel and adult stages, the hydatid disease caused by echinococcus, and trichina.

A practical guide to meat inspection, S. Stockman (*New York: William R. Jenkins, 1902, pp. 295, pls. 14, figs. 79*).—This volume, published as the fourth edition of the text-book of T. Walley, has been rewritten and somewhat enlarged by the editor. The subjects which are discussed in the book include the historical development of meat inspection, the method of inspection, general pathological conditions, post-mortem changes in meat, inflammatory conditions, diseases of the blood, bacterial diseases, diseases caused by animal parasites, unclassed diseases, and food poisoning in man. A brief bibliography of the literature of meat inspection is appended to the volume.

Verminous diseases of cattle, sheep, and goats in Texas, C. W. Stiles (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1900, pp. 356–379*).—An unusual outbreak of disease due to parasitic worms occurred in certain parts of Texas and an investigation of the cause of the trouble was made by the author. The outbreak had already been studied to some extent by Dr. W. Folsetter, and his report on the circumstances of the outbreak, the post-mortem findings, and various treatments which were tried is included in the present article. It was found upon investigation that the cattle and sheep were attacked by a number of parasitic worms in the fourth stomach, intestines, and bronchial tubes, or in all of these organs at the same time. In cattle the fourth stomach was infested in about one-third of the cases with *Strongylus contortus;* in some cases hundreds of the parasites were found in a single stomach. *S. ostertagi* was found in all the cattle which were examined during the second investigation of the matter. This species is smaller than *S. contortus* and may be free in the stomach but is usually found encysted in the stomach wall. Experiments in treating cattle for this parasite were all failures. The fourth stomach of sheep was found be infested with *S. vicarius* as well as *S. contortus*. No post-mortem examination was made on goats, but it is believed that they were infested with the same parasites which were found in sheep. In the intestines of cattle 2 worms were found, *Uncinaria radiata* and *Œsophagostoma columbianum*. In the intestines of sheep the last-named species of worm was found, as well as *U. cernua* and a tapeworm (*Thysanosoma actinioides*). In the bronchial tubes of cattle *S. micrurus* was found in considerable numbers, while in sheep *S. filaria* was found.

The author gives a general discussion of the various lines of treatment which have been proposed by different authors for lungworms. From the experience of Drs. Folsetter and Knight as well as from that of the author, it is believed that the value of tracheal injections in the treatment of lungworms has been much overestimated. The use of gasoline expelled many intestinal worms but apparently had no effect on lungworms. Turpentine and oil of cloves also gave negative results. In one instance a steer was kept under the influence of chloroform for $\frac{3}{4}$ hour without producing any effect upon the lungworms. In the treatment of intestinal worms various remedies have been recommended, including bluestone, gasoline, coal-tar creosote, thymol, and other substances. In experiments with coal-tar creosote it was found that if the liquid entered the lungs the animal died promptly. When administered carefully, as much as $6\frac{2}{3}$ oz. may be given to an adult sheep without fatal results. In the author's experiments sheep treated with this substance showed marked improvement within a few days after receiving a single dose. Tests were made with thymol to determine the proper size of dose to be administered and the effectiveness of the chemical. It was found that as much as 80 to 100 grains may be administered to a sheep and 240 grains to full-grown cattle without causing ill effects. In the author's experiments thymol was administered in solution in alcohol in doses of from 32 to 48 grains. Thymol appeared to be unusually effective in destroying intestinal worms, but was without effect on tapeworms. The experiments of Theobold indicate that thymol is also of great value in expelling round worms from hogs and horses. Brief notes are given on the various methods of drenching animals, on the life histories of the parasites mentioned, and on measures of preventing infestation by these worms. It is recommended that all affected animals should be immediately separated from the rest of the stock, that pure water should be furnished for drinking purposes, and that low, wet pastures should be properly drained in order to remove the conditions which are favorable for the development of the lung and stomach worms.

The cattle ticks (Ixodoidea) of the United States, D. E. Salmon and C. W. Stiles (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1900, pp. 380–491, pls. 25, figs. 192*).—The authors give detailed biological and economic notes on the species of cattle ticks which are known to infest cattle in the United States and on a number of other species which may at any time be imported from neighboring countries. Ixodoidea is accepted as the name of a superfamily containing 2 families, Argasidæ and Ixodidæ. An analytical table is given for the determination of the species belonging to these families. Thus far 8 species of ticks are reported as infesting cattle in the United States, viz: *Argas miniatus*, *Ornithodoros megnini*, *Boophilus annulatus*, *Dermacentor reticulatus*, *D. electus*, *Ixodes ricinus*, *I. hexagonus*, and *Amblyomma americanum*. A general account is given of the anatomy and life history of ticks in general. Each of the 8 species mentioned is described in detail and notes are given on the habits, life history, and distribution of each species. A bibliography of literature relating to ticks is arranged in alphabetical order and appended to the paper.

Texas fever, M. Francis (*Texas Sta. Bul. 63, pp. 60, figs. 10, chart 1*).—In order to obtain good results from blood inoculation it is necessary to keep the cattle free from ticks until they recover from inoculation fever. This may be accomplished by confining the animals in a small pasture in which it is known that the ticks are exterminated. The best time of the year for importing Northern cattle is between November and March, for the reason that the inoculation fever is less severe during cool weather. The most suitable subjects for inoculation are young cattle from 10 to 16 months of age. Sucking calves sometimes endure several inoculations without serious results, but weaned calves from 4 to 6 months of age often develop serious symptoms during inoculation fever and lose flesh and strength to an excessive degree. The practice of the author is to vaccinate cattle for blackleg immediately on arrival; about 2 days later they are inoculated for Texas fever. The blood for this purpose is usually taken from a 2-year-old immune animal carrying a reasonable number of ticks. The first injection of blood should be small—from ½ to 2 cc., or 1 cc. as a standard size. During the period of inoculation fever the animals should be well-fed on a nutritious diet. The inoculation fever appears after from 8 to 10 days and persists for from 4 to 8 days. The fever usually terminates about 20 days after inoculation. At this time the temperature may fall rapidly and may become subnormal. Deaths frequently occur at this period if animals are neglected. When the temperature falls too low stimulants should be administered. A secondary period of fever may begin about 30 days after inoculation, and persist for 8 to 10 days. It is similar to the first and in calves may be as severe as the primary fever. A third period of fever may appear in from 37 to 46 days. Recovery usually takes place about 60 days after inoculation and animals should not be allowed to become infested with ticks before that time. If the inoculation fever is severe a second dose will not be necessary; the animals may simply be subjected to gradual infestation with ticks. Where second inoculation is resorted to it should be made about 67 days after the first inoculation, and the size of dose should be about 1 cc. During 2 years 1,251 animals have been inoculated at the Texas Station, and of this number 116, or 9.21 per cent, died. This may be accepted as a fairly approximate estimate of the death rate. The greater part of the bulletin is occupied with a detailed history of the inoculation fever in various animals upon which experiments were made.

Live stock sanitary service (*Missouri State Bd. Agr. Rpt. 1900, pp. 24–30*).—A brief account of the State veterinary law with reference to quarantine and control of contagious diseases of live stock. Especial attention is given to immunization of cattle against Texas fever, and to control of tuberculosis among cattle.

Immunizing pure-bred cattle against Texas fever for the Southern trade, J. W. CONNAWAY (*Missouri State Bd. Agr. Rpt. 1900, pp. 255–262*).—The author gives a general account of the experiments in progress at the Missouri station in the improvement of practical methods for immunizing cattle against this disease.

Missouri quarantine proclamations (*Missouri State Bd. Agr. Rpt. 1900, pp. 371–380*).—A statement of the regulations adopted in the State with reference to the control of Texas fever and tuberculosis.

The relation of bovine tuberculosis to that of man and its significance in the dairy herd, H. W. CONN (*Connecticut Storrs Sta. Bul. 23, pp. 1–8*).—This article contains a general discussion of the present attitude of investigators concerning the relationship between human and bovine tuberculosis. As the result of Koch's investigations, it has become apparent that the danger of transmission of the disease from animals to man or from man to animals has perhaps been exaggerated. The seriousness of tuberculosis in dairying, however, is as great as ever, and it is urged that the precautions which have hitherto been taken in preventing the spread of the disease among dairy cows should not be abandoned.

Transmission of tuberculosis, S. BIELER (*Chron. Agr. Canton Vaud, 14 (1901), No. 19, pp. 467–471*).—This is a controversial article occasioned by Koch's announcement of the differences between bovine and human tuberculosis. The position is taken that it is highly improper to abandon the various sanitary methods which are already in operation for preventing the transmission of tuberculosis from man to animals or animals to man.

Summary of results of experiments with tuberculous cows, C. S. Phelps (*Connecticut Storrs Sta. Bul. 23, pp. 9–20*).—The facts and conclusions contained in this article have been previously published in essentially the same form. (E. S. R. 13, p. 993.)

The bacillus of tuberculosis, E. A. de Schweinitz (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1900, pp. 262–280*).—This paper was read before the section of bacteriology and parasitology of the Thirteenth International Medical Congress held in Paris August 4 to 10, 1900. The author gives a general discussion of the source of infection with tuberculosis, varieties of tubercle bacilli, distribution and diagnosis of the disease, bovine tuberculosis, the relationship between bovine and human tuberculosis, and the treatment of the disease. On the last-named subject the author mentions details concerning various forms of treatment which have recently been advised for controlling tuberculosis in man.

The free distribution of blackleg vaccine, V. A. Nörgaard (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1900, pp. 35–51, figs. 4*).—During the fiscal year 1900 the Bureau of Animal Industry prepared and distributed 1,076,150 doses of blackleg vaccine among 6,142 stockmen in 40 States and Territories. The region which is worst infected with blackleg is the area between the Mississippi River and the Rocky Mountains, extending from Canada to the Gulf of Mexico. Among the Eastern States Virginia seems to be the only one in which the disease prevails to a serious extent. The disease has gradually increased in extent since stockmen began to improve native breeds and replace them with modern breeds of a less active nature and of a decreased resisting power to disease. Reports were received from 1,980 cattle owners, concerning 369,258 head of stock. The total amount of loss from vaccination was 0.69 per cent, but allowing for mistakes in vaccination, the loss is estimated at 0.55 per cent. Quotations are given from a number of letters written by prominent stockmen who used blackleg vaccine to a greater or less extent.

The Thirteenth International Medical Congress, E. A. de Schweinitz (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1900, pp. 254–259*).—A brief report of the proceedings of this Congress which met in Paris in August, 1900. During the sessions of the Congress more than 6,000 physicians from different countries were present, and the United States was third on the list in the number of members. Brief notes are given on some of the more important papers which were read during the meetings; these include discussions of toxins and antitoxins, tuberculosis, and malaria.

On the morphology of the anthrax bacillus, A. Hinterberger (*Centbl. Bakt. u. Par., 1. Abt., 30 (1901), No. 11, pp. 417–424, pl. 1, fig. 1*).—The author was able to demonstrate clearly the capsule of the anthrax bacillus, by means of the silver-staining method of Van Ermengem. The clear double contour lines of the capsule, when treated in this manner, indicate that the capsule is to be considered an integral part of the bacillus and not a product of treatment by artificial methods. Besides the well-known capsule of the anthrax bacillus, the author described a much larger and broader membrane, of less definite character. The latter membranes are not produced by swelling of the capsule proper, but seem to be a distinct part or organ of the body of the bacillus. An elaborate method was devised for the demonstration of threads connected with the body of the anthrax bacillus. While it was not definitely determined by the author that these threads in all instances stand in organic union with the bacillus, the evidence points in that direction, and it is suggested by the author that the threads should be called mycelia and treated as homologous with the mycelia, or vegetative portion of higher fungi.

Does the anthrax bacillus form spores under strictly anaerobic conditions? R. Slupski (*Centbl. Bakt. u. Par., 1. Abt., 30 (1901), No. 10, pp. 396–400, figs. 2*).—The author gives a detailed description of an apparatus for securing absolutely anaerobic conditions for making the cultures of bacteria. At first anthrax bacillus grew luxuriantly and formed spores in some cases. Upon examination, however, it was found that this was due to a defect to the apparatus, which had allowed oxygen to enter. After the defects were remedied no spores were formed. The anthrax bacilli which were cultivated under such conditions, grew out in long threads and showed a granulur disintegration.

Influence of alcohol on the natural immunity of pigeons to anthrax and on the course of anthrax infection, S. J. GOLDBERG (*Centbl. Bakt. u. Par., 1. Abt., 30 (1901), Nos. 18, pp. 696–700; 19, pp. 731–741*).—A critical review is given of the literature relating to physiological and toxic effects of alcohol, especially as demonstrated in the treatment of diseases. In order to determine the influence of alcohol upon immunity to infectious diseases and upon the course of such diseases, the author tried experiments on pigeons in their relation to anthrax. The general results of the experiments may be summarized as follows: Pigeons, which are naturally immune to anthrax, succumbed to inoculation with anthrax as soon as moderate or large doses of brandy were administered. Chronic alcohol intoxication was found to cause a considerable decrease in the natural resisting power of pigeons toward anthrax. Small doses of alcohol given along with fatal doses of anthrax culture for the purpose of determining its possible therapeutic effect showed that alcohol has no true therapeutic value in the treatment of this disease and that many of the pigeons which were given alcohol died sooner than those which were not so treated.

The geographical distribution of actinomycosis of cattle in Bavaria, J. MITTELDORF (*Inaug. Diss., Univ. Bern, 1901, pp. 30, pl. 1*).—The author made a careful survey to determine the distribution and relative frequency of this disease in various parts of Bavaria. The distribution is discussed in connection with a map of 4 colors, showing localities in which cattle are infested to the extent of from 0.01 to 0.09 per cent, from 0.1 to 0.9 per cent, from 1 to 2.9 per cent, and from 3 to 12 per cent, respectively. No differences were observed in susceptibility of native and pure bred races of various sorts to the disease. The highest percentages of infestation are observed in moist, swampy localities. Of the 3,621 cases of actinomycosis upon which notes are made in this dissertation, 75.5 per cent occurred in the head and neck, 23.3 in the tongue, 0.77 per cent in the abdomen, 0.05 per cent in the udder, 0.24 per cent in hogs, and 0.11 per cent in horses.

Coli bacteria and the common bacteria of mammitis in cows, H. STREIT (*Inaug. Diss., Univ. Bern, 1901, pp. 48*).—The author made culture studies of 12 races of coli bacteria and 9 of ordinary mammitis bacteria. The original cultures were obtained from a great variety of sources. Details are given concerning the culture of these different bacterial forms from various culture media. It was found during the author's investigations that the most frequent bacteria observed in mammitis of cows belong to the coli group. They occur in various forms which are peculiar to this group, the greatest number belonging to typical coli races. Other forms are found intermediate between these and aerobic forms. The character of different races undergoes important modifications by long-continued culture. By this means one form may be modified into a form which may be considered as belonging to another race. According to the author's investigations the bacteria of mammitis are frequently found in the intestines, and it is believed that they most frequently make their way into the udder from this point by means of the circulation and from the outside world through the milk openings.

Spotted kidney in calves, K. VAERST (*Inaug. Diss., Univ. Bern, 1901, pp. 21, figs. 12*).—The literature on the subject is reviewed, in connection with a short bibliography. Tables are presented showing the weight, length, breadth, thickness, and number of spots in the kidneys showing this affection. Great differences of opinion have prevailed regarding the cause of spotted kidney, and the fitness of such kidneys for food. Experiments made by the author showed that no infectious material was contained in such kidneys, and it is concluded that the white spots in these kidneys are embryonic tissue which has not undergone the usual modifications. Affected kidneys are not only harmless, but tests indicate that the flavor of spotted kidneys is better than that of normal kidneys.

Salt sickness, H. E. STOCKBRIDGE (*Florida Sta. Rpt. 1901, pp. 43–54, pls. 4*).—For a number of years complaints were made of the prevalence of a disease known as "salt sickness" in various parts of the State. The subject was investigated by the author, in connection with W. E. French and J. E. Ennis. As the result of these investigations it was found that so-called salt sickness was not a disease, but merely a condition of starvation due to animals being confined on poor pasture, consisting of dry wire grass and other inferior vegetation. When the animals were properly fed or changed to good range or pasture they uniformly recovered.

Lead ore in sugar-beet pulp, J. A. WIDTSOE and L. A. MERRILL (*Utah Sta. Bul. 74, pp. 55–62*).—Complaints having been made at the station concerning disease and death among cattle eating sugar-beet pulp, an investigation of the subject was made with the result that the trouble was found to be due to lead ore in the pulp. The freight cars in which the sugar-beet pulp was shipped had been previously used for transporting lead ore and had not been cleaned. As a result sufficient quantities of the lead ore were shoveled out along with the pulp to cause the death of a number of cattle. The material which was found in the sugar-beet pulp proved on analysis to be mainly sulphid of lead with an admixture of sulphid of iron. A faint trace of rasenic was also present, but no copper or other poisonous metals were found. The symptoms of the animals poisoned with these substances are described. Affected cattle first refused to drink, then withdrew from the herd and laid down with the head drawn toward the flank. Constipation was uniformly present. There was loss of control of the voluntary muscles and an increased quantity of saliva was observed. The mineral substances already mentioned were found lodged against the sides of the stomachs on post-mortem examination. Three ounces of lead ore were obtained from a piece of the first stomach 6 in. square. The desirability of having freight cars cleaned before being loaded with sugar-beet pulp is suggested. As treatment for lead poisoning large doses of Epsom salts (2 lbs. per animal) are recommended. When symptoms of recovery appear iodid of potash may be given in 2-dram doses 3 times per day for the period of a week.

The work against sheep scab, D. E. SALMON (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1900, pp. 69–86*).—The author gives a copy of an order of the Bureau of Animal Industry concerning the dipping of sheep which are affected with sheep scab. In order to make the work against sheep scab more thorough and effective special sheep inspectors were stationed at various points where greatest demand was made for dipping diseased sheep. Details are given in tabular form concerning the number of sheep dipped in various locations and the effectiveness of the treatment. Of 515,112 sheep subjected to only one dipping, 86 per cent were cured and 14 per cent remained infested with the scab mite. Three dipping solutions were used in treatment for scab, viz, nicotin and sulphur; extract of tobacco and sulphur; and lime and sulphur, prepared according to the formula of the Bureau of Animal Industry. All these dips proved to be about equally effective.

The treatment of sheep scab, REGENBOGEN (*Berlin. Thierärztl. Wchnschr., 1901, No. 33, pp. 501–503*).—Statistics are presented showing the great prevalence of sheep scab in different parts of Germany since the year 1879. The methods which have been recommended for treating the disease are considered as defective in many particulars. In general, 2 forms of treatment have been adopted—the hand treatment by smearing insecticide substances upon scab areas, and complete dipping into an insecticide substance. The author experimented with a proprietary substance sold under the name of "Akaprin." This substance in a 4 per cent solution with water at a temperature of 30° C. destroys the scab mites in one dipping of from 4 to

5 minutes' duration, in connection with brisk rubbing of the affected parts of the skin with brushes. No poisonous effect of the solution was observed, either in the ordinary dipping or in cases where some of the solution happened to be swallowed. The normal condition of the wool was not affected, either in its firmness or color. The cost of the solution is believed to be such as to make it suitable for practical application.

Malaria of horses, A. THEILER (*Inaug. Diss., Univ. Bern, 1901, pp. 32, pls. 4*).—The symptoms and course of this disease in horses are described from the author's observations and from general experience with the disease. Malaria of horses is considered distinct from surra, since the latter is not caused by malarial parasites, but by flaggellate infusoria. The appearance of the plasmodium of the disease in its different stages is described in detail. Malaria is considered identical with the disease described by Wiltshire in 1883 under the name anthrax fever, and also with the disease commonly called biliary fever. Ordinary malaria affects only certain individual horses in a herd, but it may occur in an epizootic manner. The diagnosis can be made with certainty only by demonstration of the parasites in the blood. Acute cases run a course of from 2 to 5 days, while chronic cases may result in death after a period of from 2 to 4 weeks. The prognosis in the case of this disease will be determined largely by the quality and frequency of the pulse. If the animal successfully passes through the period of fever, a secondary period of icterus persists for a considerable time, and may prove fatal. If the disease is observed during its earliest stages, the administration of quinin 3 times per day in doses of from 6 to 10 gm. will frequently effect a cure.

The elbow boil of horses and its treatment, D. KALLMANN (*Inaug. Diss., Univ. Bern, 1900, pp. 7, figs. 11*).—In an investigation of this subject the author found that comparatively few cases of the disease occur when horses stand in stalls furnished with stone floors. The symptoms, course of development, and pathological anatomy of the disease are described in detail. It was found that as a rule this affection is a form of bursitis olecrani, and is not due to bruises from any part of the shoe. The term elbow boil is considered, therefore, more applicable than calk boil. The best results in treating this disease were obtained by the injection of tincture of iodin. The fluid contents of the boil were first removed by a hypodermic needle, and the iodin was then injected into the bursa. If no subsequent discharges were observed, no further treatment was required; otherwise, the injection may be repeated, or if suppuration takes place the bursa may be cut open and removed, in which case the wound will require daily treatment for about 2 weeks. A bibliography of 62 titles is appended to the dissertation.

The constant occurrence of pathogenic micro-organisms, especially the bacillus of swine erysipelas, in the tonsils of pigs, C. BAUERMEISTER (*Inaug. Diss., Univ. Bern, 1901, pp. 53*).—The author's studies were made largely upon material obtained while practicing meat inspection in the abattoir at Hanover. It was found that the tonsils of pigs almost always contain pathogenic organisms, especially the bacillus of swine erysipelas. The organisms were for the most part found in the ducts of the tonsilar glands and those of the soft palate. It was frequently observed that stiff portions of food, such as crushed and split grains, etc., had become inserted into the ducts of these glands or into the tissue of the tonsils, in some cases causing slight lesions. The penetration of these foreign bodies furnishes excellent conditions for pathogenic organisms to obtain a foothold in such locations. Inoculation experiments upon various experimental animals showed that the micro-organisms found in such places are pathogenic. The most interesting fact in connection with the bacillus of swine erysipelas is that this organism was found in a large percentage of the perfectly healthy pigs. Under ordinary circumstances it does not seem to spread from the tonsils so as to cause a general infection, but it is believed that its frequent occurrence there may account for many outbreaks of this disease which have been observed where the method of infection could not be determined.

Apoplectiform septicæmia in chickens, V. A. Nörgaard and J. R. Mohler (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 36, pp. 24, pls. 4*).—An acute and fatal chicken disease occurred on a farm in Virginia and caused the death of about 200 birds. The authors made post-mortem examinations on chickens which had died of the disease. Hemorrhages were found in the subcutaneous and muscular tissue. A blood-colored exudation was found in the body cavity. The liver was enlarged and covered with a plastic exudate. The meninges of the brain were injected with blood and the cerebral ventricles contained a large amount of discolored serum. Pullets seemed to be most susceptible, hens next, and roosters and capons least. The disease in the latter assumed a less acute form. The period of incubation was not definitely determined, but the interval between infection and death appeared to be from 24 to 48 hours. In many cases death occurred so suddenly that the preliminary symptoms were not observed. Where the course of the disease was longer the feathers became ruffled and the bird exhibited a state of extreme depression. Affected fowls lay down and died without a struggle. A specific micrococcus in the form of a streptococcus was isolated and cultures of the organism were made. It is aerobic or facultatively anaerobic. It grows both on solid and liquid media, growth being most rapid at a temperature of 37° C. Detailed notes are given on the behavior of the organism upon various culture media. Exposure of the organism for 11 minutes to a temperature of 60° C. is fatal, but growth occurs after a 10-minute exposure to this temperature. Cultures were sterilized by exposure of 4 minutes to a temperature of 70° C. Cultures were also sterilized by drying over night in an incubator. The organism was destroyed by an exposure for 30 seconds in a 2.5 per cent solution of carbolic acid, for 2 minutes in a 1 per cent solution of carbolic acid, for 1 minute in a solution of corrosive sublimate in the proportion of 1 to 2,000, for 4 minutes in a 1 per cent solution of creolin, or for 2 minutes in a 0.25 per cent solution of formalin.

Inoculation experiments were made on various animals. An intravenous injection of 0.1 to 0.5 cc. bouillon culture 24 hours old produced the disease in chickens and caused death in from 48 hours to 4 days. Intramuscular inoculations in chickens produced no effect. Feeding virulent cultures produced death in from 4 to 13 days. Chickens fed on the viscera of rabbits which had succumbed to the disease died in 10 days. Intravenous injections in ducks produced death on the twelfth day, but subcutaneous or intramuscular injections as well as feeding on virulent material produced no effect. Intravenous inoculations produced death in pigeons, but intramuscular inoculations were negative. In rabbits fatal effects were produced by intravenous or intrapleural inoculations. Inoculation in the body cavity of white or gray mice proved fatal in about 48 hours. Experiments with dogs showed that inoculation in these animals produced a lameness but not fatal effects. Sheep and guinea pigs appeared to be completely refractory. It was found by further experiments that immunity to the disease may be produced in susceptible animals by the use of the filtrate of bouillon cultures, sterilized bouillon cultures, or serum from artificially immunized animals.

Bacteriological studies on the bacteria of the alimentary tract of chickens, R. Rahner (*Centbl. Bakt. u. Par., 1. Abt., 30 (1901), No. 6, pp. 239–244*).—The purpose of the investigation reported on in this article was to secure evidence on the question of the effect of various bacteria in the alimentary tract of chickens. It was found that the species of bacteria and the relative prevalence of different species varied exceedingly according to the amount and nature of the food from which chickens fed. The only species of bacteria which is considered by the author as constantly present in the alimentary tract of chickens is *Bacterium coli*. When other bacteria are present in large numbers, this species may temporarily lose its importance, but after a short time it rapidly multiplies so as to regain its usual importance.

The Brunswick chicken plague, JESS (*Centbl. Bakt. u. Par., 1. Abt., 29 (1901), No. 19, pp. 755-757*).—A disease which bore certain resemblances to fowl cholera, roup, and arsenic poisoning, was investigated by the author. It was found that affected birds exhibit the first symptoms of disease about 3 days after exposure to infection. As a rule death occurred about 7 days after the beginning of the disease. A microscopic study of diseased fowls showed the presence of several pathogenic organisms, one of which appeared to be that of fowl cholera, while the others were distinct and were found in greatest abundance in diseased patches which occurred in the throat. The author believes that the disease is therefore due to a mixed infection. Attention is called to the necessity of exercising care in disinfecting poultry yards and buildings in order to prevent the spread of the disease.

The diseases of the cat, J. W. HILL (*New York: William R. Jenkins, 1901, pp. 123, pls. 10*).—In this volume the author has brought together a discussion of the symptoms, causes, and remedies for all of the diseases which commonly affect domesticated cats. Special chapters are devoted to diseases of the respiratory organs, diseases of the stomach, of the intestines, of the skin, of the ear, of the eye, mammary glands, and nervous system. The problems connected with abandoned cats, with the feeding and washing of cats in health, and the destruction or disinfection of diseased cats are also discussed. One chapter is devoted to general diseases, infectious or otherwise; and accidents, together with their treatment, as well as poisons and the proper antidotes also receive due consideration.

A method for simple determination of the value of chemical disinfectants, T. PAUL (*Entwurf zur einheitlichen Wertsbestimmung chemischer Desinfektionsmittel. Berlin: Julius Springer, 1901, pp. 54, figs. 8*).—Especial attention is called to the desirability of simple methods for rapid determination of the real value of disinfectants which are proposed for practical use in the destruction of pathogenic organisms in houses and stables, after the occurrence of infectious diseases. As a rule the methods proposed for such determination are considered defective, or as based upon inconclusive experiments. It is urged that experiments along this line should be conducted in a more uniform manner and with all factors under better control, in order that reliable results may be obtained. The virulence of the organisms to be used in the experiments must be carefully determined and care must also be exercised in an accurate determination of the solution in which the organisms are placed, and the strength of the solution of the disinfectant.

Studies on bacillol, F. PASZOTTA (*Inaug. Diss., Univ. Bern, 1901, pp. 35*).—From the numerous experiments conducted by the author, it was concluded that bacillol is soluble in water under all circumstances, and forms constant solutions. When bacillol is applied, in concentrated form, to the skin it is slightly caustic like lysol. It is considered a powerful antiseptic and deodorizer. It is to be obtained more cheaply than most other similar drugs. It should be administered in the same way as lysol or creolin. When given internally it causes a slight increase in salivation and an increased cardiac and respiratory action. In large doses it may cause motor paralysis or trembling. It is rapidly excreted by means of the kidneys.

Zoological materia medica. History of drugs of animal origin, H. BEAUREGARD (*Matière médicale zoologique. Histoire des drogues d'origine animale. Paris: C. Naud, 1901, pp. 396, figs. 145*).—The general anatomical characters of mammals are discussed, with special reference to the structures which are concerned in the production of substances used for medical purposes. In connection with the consideration of various species of mammals, reptiles, fishes, crustaceans, insects, worms, and sponges, the anatomical and chemical character of the various drugs which are obtained from each species are mentioned and critically discussed. The work contains a valuable and convenient summary of the present state of knowledge concerning various drugs of animal origin.

Contagious diseases of animals in foreign countries, G. F. Thompson (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1900, pp. 492–502*).—Brief statistical notes concerning the prevalence of diseases among domestic animals in Great Britain, Switzerland, France, Sweden, Denmark, Belgium, Netherlands, Germany, Norway, Hungary, and Italy.

The literature of veterinary science and related subjects, from April 1, 1889, to December 1, 1901, R. Schoetz (*Die Litteratur der Veterinärwissenschaft und verwandter Gebiete vom 1. April 1889 zu 1. Dezember, 1901. Berlin: Author, 1902, pp. 112*).—This bibliography includes a list of the books which have appeared on the subject of veterinary science from April 1, 1889, to December 1, 1901, a list of periodicals in which veterinary articles appear almost exclusively, and an alphabetical list of the literature according to subjects. The first list of books is arranged alphabetically according to authors.

TECHNOLOGY.

Manufacture of chocolate, P. Zipperer (*Die Schokoladen-Fabrikation. Berlin: M. Krayn, 1901, 2. ed., pp. 306, pls. 2, figs. 99*).—After a brief discussion of the geographical distribution of cocoa, appearance of the tree and fruit, cultivated varieties, commercial importance of the industry, composition of cocoa beans and shells, and the food or other materials added to chocolate in its preparation, the author takes up at length and in great detail the manufacture of various cocoa preparations, giving many illustrations of the machinery used in the different processes. Following this, chapters are given on the preservation and packing of prepared cocoa, motive power, arrangement of manufacturing establishments, chemical and microscopical investigations of cocoa preparations, and laws relative to cocoa commerce. In the appendix analyses are given of 74 preparations, in which cocoa enters, and a bibliography of 14 papers on cocoa and chocolate. The volume is intended more especially for the use of manufacturers, food chemists, and builders of cocoa manufacturing establishments.

Fruit growers' manual for canning fruit, etc. (*Auburn, Cal.: Hemlow-Meriam Co., 1901, pp. 78*).—This is a concise manual giving estimates as to the cost of canning factories of various sizes, and recipes for the canning of fruits, vegetables, meats, fish, eggs, milk, etc.

Improvements in sugar refining during the last twenty-five years, T. L. Patterson (*Jour. Soc. Chem. Ind., 20 (1901), No. 11, pp. 1088–1091*).

The manufacture of maize starch, G. Archbold (*Jour. Soc. Chem. Ind., 21 (1902), No. 1, pp. 4–9, fig. 1*).

The preparation of orange essence (*Rev. Cult. Coloniales, 9 (1901), No. 82, pp. 85, 86*).—A note on methods of preparation observed in Sicily.

Some practical hints on cider making, R. N. Grenville (*Jour. Roy. Agr. Soc. England, 62 (1901), pp. 40–49*).—The author reports the results of his experiments in cider making for a number of years. He strongly advises that cider pomace be strained through cotton cloths instead of through manila cloths or straw, as is commonly done. Between every 4 cloths a wooden grating is placed, which helps to keep them in place and distribute the pressure. Cider has been very successfully filtered by the use of Lumley's German filter, using paper pulp as a medium. The cider seems to be in best condition for bottling when the specific gravity ranges between 1.025 and 1.015.

Cider making, F. Ingoult (*Semaine Agr., 21 (1901), Nos. 1062, pp. 301, 302; 1063, pp. 310, 311*).—The author presents in a popular manner the results of his 30 years' experience in making cider. All the details, from gathering the fruit by hand to the cellar storage of the cider in bottles, are included.

Normandy cider, HERTSLET (*Jour. Agr. and Ind. South Australia, 5 (1901), No. 2, pp. 124–128*).—This is a general review of the cider industry in Normandy, with special reference to the methods pursued in the department of Calvados. Methods of gathering the apples, crushing them, pressing the pulp, fermentation, and storage of cider are briefly touched upon.

Use of casein in clarifying wines, A. MUNTZ (*Dairy, 14 (1902), No. 158, pp. 41, 42*).—In experiments by the author casein was used very satisfactorily in clarifying wines. Both white and red wines are reported as completely clarified by casein without any depreciation in quality. Casein is considered as having the advantage over similar products used for this purpose of not acting on the tannin. Other advantages are its purity, keeping properties, and low cost. Directions for using are given.

The mannitic fermentation of wine, P. SCHIDROWITZ (*Analyst, 27 (1902), No. 311, pp. 42–48*).—An account is given of this sickness or disease of wine due to bacteria, with analytical methods for the detection and estimation of mannitol.

The expressed oil industry in the United States, K. PIETRUSKY (*Oesterr. Chem. Ztg., 4 (1901), No. 9, pp. 204–206*).—A description of the production of cotton-seed, linseed, maize, peanut, castor, olive, and cocoanut oil in the country indicated. Some statistics are included.

AGRICULTURAL ENGINEERING.

Practical hints on the construction of drains, S. F. MOORE (*Drainage Jour., 23 (1901), Nos. 7, pp. 179–183, figs. 3; 8, pp. 207–211, figs. 4; 9, pp. 237–240, figs. 5; 10, pp. 268–272, figs. 2; 11, pp. 299–301, figs. 3; 12, pp. 324–326*).—This article gives directions and suggestions regarding the laying of tile on curves, cutting tile, surface inlets, location of inlets, lands most favorably situated for drainage, and testing tile.

Results of irrigation in Wisconsin, G. H. PATCH (*Forestry and Irrig., 8 (1902), No. 5, pp. 198–202, figs. 4*).—An account of irrigation by means of canvas hose under the direction of Professor King, of the Wisconsin station.

Water storage of Cache Creek, California, A. E. CHANDLER (*Water Supply and Irrig. Papers, U. S. Geol. Survey, No. 45, pp. 48, pls. 10, figs. 8*).—This paper discusses the topography and physical features of the region studied, stream measurements, irrigation works, underground waters, tributaries to Cache Creek in Capay Valley, and the suitability of Clear Lake for storage purposes.

Reconnoissances of Kern and Yuba rivers, California, F. H. OLMSTED and M. MANSON (*Water Supply and Irrig. Papers, U. S. Geol. Survey, No. 46, pp. 57, pls. 8, figs. 18*).—This bulletin contains 2 papers. The first, by F. H. Olmsted, relates to the physical characteristics of the catchment area of the Kern River. "In this paper the author describes the drainage basin and estimates the amount of water coming from it and the power available from a complete utilization of the various portions of the stream. He also discusses the utilization of this power in pumping for irrigation." The second paper, by M. Manson, relates to Yuba River, and "discusses the physical conditions and storage possibilities of this stream, bringing out particularly the importance of preserving the forest cover on the upper catchment basin and, if possible, increasing this by artificial means, and shows by estimates the possible increase of available water through complete afforestation of the area."

Operations at river stations, 1900 (*Water Supply and Irrig. Papers, U. S. Geol. Survey, Nos. 47, 48, 49, 50, 51, 52, pp. 575*).—These bulletins contain data similar to those published in previous reports (E. S. R., 12, p. 897).

Geology and water resources of Nez Perces County, Idaho, I. C. RUSSELL (*Water Supply and Irrig. Papers, U. S. Geol. Survey, Nos. 53, 54, pp. 141, pls. 10, figs. 14*).—These papers discuss the geology, physiography, water supply, and economic geology of this region. They include also a bibliography of artesian waters and appendixes giving elevations in Nez Perces region and notes on Portland cement.

Geology and water resources of a portion of Yakima County, Washington, G. O. SMITH (*Water Supply and Irrig. Papers, U. S. Geol. Survey, No. 55, pp. 68, pls. 7, figs. 8*).—This is a continuation of studies reported by I. C. Russell in 1893 and 1896 (E. S. R., 9, p. 737), and relates to the geography, geology, and water resources (surface and underground).

Methods of stream measurement (*Water Supply and Irrig. Papers, U. S. Geol. Survey, No. 56, pp. 51, pls. 12, figs. 4*).—This material has been compiled from various reports and letters of instruction, and is intended to embody not only a description of the operations, but in some cases minute directions which may assist the hydrographers and serve to increase the accuracy of results. It is designed not only to assist and guide the hydrographers employed by the Survey or working in cooperation with it, but also to exhibit as nearly as possible the degree of accuracy of the operations and of the computations of results.

Preliminary list of deep borings in the United States. Part I, Alabama-Montana, N. H. DARTON (*Water Supply and Irrig. Papers, U. S. Geol. Survey, No. 57, pp. 60*).—This is a preliminary list of borings to a depth of 400 ft. or more.

Storage of water on Kings River, California, J. B. LIPPINCOTT (*Water Supply and Irrig. Papers, U. S. Geol. Survey, No. 58, pp. 101, pls. 32, figs. 2*).—This is a report of investigations in which "the drainage basin of Kings River has been explored and preliminary surveys and estimates prepared sufficient to justify the statements that works can or can not be economically constructed at certain localities. . . . The situation on Kings River is to a certain extent typical of that along a number of important streams of the West, and as a result of this investigation it is believed that the reclamable area can be greatly extended by the construction of storage works and also of power plants by means of which, through electrical transmission, pumps can be operated at small expense out on the broad valleys."

The hydrography of Colorado, A. L. FELLOWS (*Forestry and Irrig., 8 (1902), No. 5, pp. 205–210, figs. 2*).—A brief account of methods and results of water measurements.

The silt problem in connection with irrigation storage reservoirs, J. C. NAGLE (*Trans. Texas Acad. Sci., 4 (1901), No. 3, pp. 33–46*).—A brief discussion of this subject based on results of investigations carried out under the supervision of E. Mead, in charge of irrigation investigations of this Department, and reported in detail elsewhere (E. S. R., 13, p. 999).

Brack land in relation to irrigation and drainage (*Agr. Jour. Cape Good Hope, 20 (1902), No. 7, pp. 397–405*).—This is a discussion of the nature and reclamation of alkali lands found in certain parts of South Africa. In the opinion of the author "the only and radical cure for brack land, and preventive of slow accumulation of alkali by irrigation, is an adequate system of underdraining."

Machinery at the general agricultural conference at Paris, M. RINGELMANN (*Jour. Agr. Prat., n. ser., 3 (1902), Nos. 17, pp. 537–541, figs. 5; 18, pp. 574–579, figs. 9; 19, pp. 602–606, figs. 11*).—Brief descriptions with illustrations are given of seeding and tillage implements, harvesting machinery, motors and mills, and miscellaneous farm machinery displayed at the last agricultural conference at Paris.

The German agricultural machinery industry at the beginning of the twentieth century, H. PUCHNER (*Vrtljschr. Bayer. Landw. Rath., 7 (1902), No. 2, pp. 111–119*).—A brief discussion of this subject.

Roller and ball bearings in agricultural machinery, A. NACHTWEH (*Fuhling's Landw. Ztg., 51 (1902), Nos. 1, pp. 28–30; 2, pp. 41–43*).—A discussion of their relative merits.

Agricultural machines for peanuts, F. MAIN (*Jour. Agr. Trop., 2 (1902), No. 10, pp. 103–105*).—Discusses briefly the essential features of machines for harvesting, thrashing, and hulling peanuts.

Tests of rice hulling machines, M. RINGELMANN (*Agr. Prat. Pays Chauds, 1 (1901), No. 3, pp. 286–292*).—Tests of 3 different makes of rice hullers are reported.

Test of a machine for preparing fiber, M. RINGELMANN (*Agr. Prat. Pays Chauds, 1 (1901), No. 3, pp. 293–301, figs. 2*).—Tests of a machine invented by H. J. Boeken, Düren, Germany, on leaves of *Agave rigida* var. *sisilana* and *Fourcroya gigantea*, and the stems of *Musa paradisiaca* are reported.

Road improvement (*Missouri State Bd. Agr. Mo. Bul., 1 (1902), No. 10, pp. 32, figs. 5*).—Report of proceedings, including abstracts of address delivered at the tenth annual meeting of the Missouri Road Improvement Association. The subjects discussed were dirt roads, road making in southeast Missouri, qualifications of road overseers, roads and rural mail delivery.

Ventilation of farm stables, J. B. REYNOLDS (*Ontario Agr. Col. and Expt. Farm Rpt. 1901, pp. 11–15, figs. 3*).—A system of ventilation by means of pipes extending to the floor of the stable and terminating at the peak of the roof in revolving cowls is described. The pipes are so arranged that the air enters for the most part at the floor in front of the stalls, the foul air passing out by means of pipes leading from the ceiling of the stable to the roof of the barn.

Cold storage, J. B. REYNOLDS (*Ontario Agr. Col. and Expt. Farm Rpt. 1901, pp. 6–11, figs. 3*).—A brief report of the results obtained with the Hanrahan system of cold storage installed at the college (E. S. R., 13, p. 394) is given, attention being called especially to the importance of a good system of air circulation in order to prevent dripping and mold and to insure a supply of comparatively dry and pure cold air.

MISCELLANEOUS.

Agriculture, W. P. BROOKS (*Springfield, Mass.: The Home Correspondence School, 1901, vol. 1, pp. XVII+199, figs. 55, map 1; vol. 2, pp. XXIV+201–541, figs. 119, map 1; vol. 3, pp. XXI+543–855, figs. 122*).—This series of books was prepared for use in the correspondence course in agriculture offered by the Home Correspondence School of Springfield, Mass. They deal in simple language with the scientific principles which underlie the various operations of a farm, and furnish "sources of practical information permanently valuable for reference." Volume 1, entitled Soils and how to treat them, "treats of the composition and food of plants and tells from what sources the necessary elements are derived. This serves as an introduction to the study of soils, which embraces a brief consideration of the action of the various agencies which have helped to form and to improve them. Especial attention is paid to the action of agencies which are now active; and the means which the farmer may take to promote such action are carefully pointed out. The peculiarities of the different classes of soil and their suitability to different crops are discussed. Then follows a careful study of soils in their relation to air, water, and heat. The chemistry of soils, with especial reference to composition and the more important chemical changes which go on in them, is treated at length. Following this the various operations which have for their object the amelioration of the soil are fully treated. This section includes a careful explanation of the objects, results, and methods of tillage and a description of the principal tillage implements. Drainage is treated at considerable length, as also is irrigation."

Volume 2, entitled Manures, fertilizers, and farm crops, is intended for use in connection with volume 1 and deals with the composition, adaptations, and proper methods of use of manures and fertilizers. Green manuring and crop rotation are given special attention. Plant diseases and insect injuries are considered and the nature, uses, soil adaptations, and manuring of each important farm crop is discussed, with details as to planting, culture, and harvesting. The implements found most useful in connection with the culture of the various crops are briefly referred to.

Volume 3, entitled Animal husbandry, discusses the general principles of stock feeding, breeds of cattle, horses, sheep, swine, poultry, the principles of animal breeding, feeds and feeding standards and related topics.

Tropical agriculture, H. A. A. NICHOLLS (*New York: The Macmillan Co., 1900, pp. XXIV+312, figs. 16*).—This work was written as a text-book on tropical agriculture for the West Indies, adapted for use in the colleges and higher schools of that colony. The first part of the work discusses soils, plant life, manures, irrigation, tillage, pruning, budding, and grafting, and the principles of agriculture generally; while the second part is devoted to detailed cultural operations for various tropical products, such as coffee, cacao, tea, sugar cane, fruits, spices, tobacco, drugs, dyes, and tropical cereals and other food plants. Especial attention has been given to the details of the different cultural operations, the book being intended more particularly as a guide for the young and inexperienced.

Fourteenth Annual Report of Arkansas Station, 1901 (*Arkansas Sta. Rpt. 1901, pp. 6+123*).—This includes the organization list of the station, a brief report of the director, and a financial statement for the fiscal year ended June 30, 1901. Reprints of Bulletins 66–70 on the following subjects are appended: Oat experiments (E. S. R., 13, p. 545), investigations of swine diseases in Arkansas (E. S. R., 13, p. 896), soil improvement and forage experiments (E. S. R., 13, p. 840), some muskmelon experiments (E. S. R., 13, p. 850), and cowpea experiments (E. S. R., 13, p. 843).

Annual Report of Florida Station, 1901 (*Florida Sta. Rpt. 1901, pp. 97*).—This includes the organization list of the station; a report of the director reviewing briefly the work and publications of the station during the year; a subject list of station bulletins; financial statements for the fiscal years ended June 30, 1900 and 1901; and reports of the agriculturist, chemist, entomologist, and the botanist and horticulturist, giving the results of work noted elsewhere in this issue. Reprints of Bulletins 56–58 of the station on the following subjects are appended: The cottony cushion scale (*Icerya purchasi*) (E. S. R., 13, p. 472), top-working pecans (E. S. R., 13, p. 559), and pomelos (E. S. R., 13, p. 557).

Fourteenth Annual Report of Louisiana Stations, 1901 (*Louisiana Stas. Rpt. 1901, pp. 12*).—An account is given of the work at the Sugar Station at Audubon Park, the State Station at Baton Rouge, and the North Louisiana Station at Calhoun. The report also contains the organization lists of the stations and a financial statement for the fiscal year ended June 30, 1901.

Seventeenth Annual Report of Maine Station, 1901 (*Maine Sta. Rpt. 1901, pp. 200*).—This is made up of reprints of Bulletins 70–78 of the station as follows: Oats as grain and fodder (E. S. R., 13, p. 240), feeding stuff inspection (E. S. R., 13, p. 270), fertilizer inspection (E. S. R., 13, p. 236), experiments with fungicides upon potatoes in 1900 (E. S. R., 13, p. 360), the manurial value of ashes, mucks, seaweed, and bone (E. S. R., 13, p. 332), analyses of miscellaneous food materials (E. S. R., 13, p. 577), the horticultural status of the genus Vaccinium (E. S. R., 13, p. 648), fertilizer inspection (E. S. R., 13, p. 634), and finances, meteorology, index (E. S. R., 13, p. 1002).

Twentieth Annual Report of Ohio Station, 1901 (*Ohio Sta. Rpt. 1901, pp. XXI*).—This includes the organization list of the station, a financial statement for the fiscal year ended June 30, 1901, a brief report of the director, and a list of acknowledgments.

Thirteenth Annual Report of Texas Station, 1901 (*Texas Sta. Rpt. 1901, pp. 113–137*).—This includes the organization list of the station; a report on the publications, organization, and work of the station by the director; resolutions adopted by agricultural organizations in Texas concerning the station, departmental reports, a subject list of station bulletins, and a financial statement for the fiscal year ended June 30, 1901.

Seventeenth Annual Report of the Bureau of Animal Industry, 1900 (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1900, pp. 642, pls. 98, figs. 238*).—This contains the report of the chief, reviewing at some length the work of the

Bureau during the year; 16 articles noted elsewhere in this issue and 4 articles already noted from other sources as follows: Plant poisoning of stock in Montana (E. S. R., 13, p. 283), rabies—its cause, frequency, and treatment (E. S. R., 13, p. 286), poultry raising on the farm (E. S. R., 13, p. 983), and information concerning the Angora goat (E. S. R., 12, p. 1077); brief miscellaneous articles entitled Mexican cattle industry, American horses in Switzerland, horse breeding in Belgium, American horse meat in Denmark, sheep and wool statistics of Russia, how sheep scab was stamped out in New Zealand, poultry raising in Belgium, eggs, poultry, and meat in Great Britain, egg exports from Russia, meat in South Africa, the ingredients of oleomargarine, oleomargarine in France, the utilization of packing-house offal, largest refrigerating plant in the world, Cape Angora goatskins, exports of deerskins from British Columbia, export of bones and bone ash from Uruguay, egg exports from Madeira, horse and dog meat as food in Germany, and muzzling of dogs in Germany and Great Britain; a translation of the Imperial German meat inspection law; statistics of the animal industry of Australasia; tables showing the receipts and shipments of live stock at the leading stock centers and estimates of the production of wool in 1900, and the rules and regulations of the Bureau of Animal Industry issued in 1900.

Proceedings of the sixth annual meeting of the American Association of Farmers' Institute Workers, held at Buffalo, New York, September 18 and 19, 1901, edited by A. C. TRUE, D. J. CROSBY, and G. C. CREELMAN (*U. S. Dept. Agr., Office of Experiment Stations Bul. 110, pp. 53*).—This includes a list of the officers and members of the association, the constitution and by-laws, a brief historical note on the organization and the previous meetings of the association, and the detailed proceedings. The membership comprises the superintendents of farmers' institutes in the different States. W. L. Amoss, of Maryland, is president; W. L. Hutchinson, of Mississippi, vice-president; and G. C. Creelman, of Ontario, secretary-treasurer.

Press bulletins (*Ohio Sta. Bul. 128, pp. 233–247*).—Press bulletins on the following subjects were issued during the year: Present situation in Ohio with respect to the ravages of the chinch bug, a seven-year comparison of varieties of wheat, a warning against fraud, suggestions to wheat growers, fertilizers on wheat, tuberculosis in cattle, announcement concerning sugar beets, Ohio sugar-beet work for 1900 and 1901, seeding lawns and permanent pastures, a bulletin on plant diseases, alfalfa, and treatment for the cankerworm.

Review of the world's commerce, introductory to commercial relations of the United States with foreign countries during the year 1901 (*U. S. Dept. State, Bureau Foreign Commerce, 1902, pp. 227+III*).

Imports and exports of animals and animal products, G. F. THOMPSON (*U. S. Dept. Agr., Bureau of Animal Industry Rpt. 1900, pp. 535–556*).—A statistical review for the year 1900.

Agricultural returns for 1900 (*London: Board of Agriculture, 1901, pp. 41*).—Statistical tables showing acreage under crops and grass and number of horses, cattle, sheep, and pigs in the United Kingdom, with particulars for each county of Great Britain.

The world's hop crop of 1901, G. E. BALDWIN (*U. S. Consular Rpts., 67 (1901), No. 255, pp. 525, 526*).—Tabulated statistics.

Observations on agriculture and stock raising in Northern Mexico, T. VON NATHUSIUS (*Deut. Landw. Presse, 28 (1901) Nos. 87, pp. 727, 728, figs. 4; 90, pp. 751–753; 93, pp. 775, 776, figs. 2*).

Agricultural conditions in France, GRANZ (*Deut. Landw. Presse, 28 (1901), Nos. 73, pp. 615–617; 74, pp. 623, 624; 75, pp. 629, 630*).—A discussion from an economical point of view giving some statistics concerning the size of farms.

Agricultural industry, F. CONVERT (*L'industrie agricole. Paris: J. B. Baillière & Son, 1901, pp. 444*).—An inventory of the agricultural resources of France at the beginning of the twentieth century. It discusses climate, soil, population, cereal crops, potatoes, sugar beets, oil-yielding plants, fiber crops, hops, chicory, tobacco, the vine, the olive, and animal industry.

Portugal from an agricultural standpoint, B. C. C. DA COSTA and L. F. DE CASTRO (*Le Portugal au point de vue agricole. Lisbon: Government, 1900, pp. 965, pls. 72, figs. 140, maps 16*).—This extensive work on agriculture in Portugal was published by order of the Portuguese Commission to the Paris Exposition of 1900. The work is divided into 3 parts, treating of the soil, agricultural products, and rural life, respectively. Agriculture in the Azores and on the island of Madeira is included in the discussions.

Agriculture in Denmark, R. SCHOU (*L'agriculture en Danemark. Paris: Librairie agricole de la maison rustique, 1900, pp. 329+47+58, pls. 23*).—This work, prepared under the auspices of the Danish Commission to the Paris Exposition of 1900, discusses in a general way the different phases of Danish agriculture. The text is in Danish and French.

Agriculture in Finland at the close of the nineteenth century, G. GROTENFELT (*L'agriculture en Finlande vers la fin du 19 siècle. Helsingfors, 1900, pp. 131, pls. 13, maps 5*).

The management of an estate in Silesia, H. BÜTTNER (*Mitt. Landw. Inst. Univ. Breslau, 1 (1901), No. 5, pp. 53–187*).—An extensive article treating in detail of the management of a large estate. The article is intended as a contribution to the study of farm management and agricultural bookkeeping.

Agriculture in Japan (*L'agriculture au Japon. Paris: M. de Brunoff, 1900, pp. 117*).—This treatise on Japanese agriculture was published under the direction of the Imperial Commission of Japan to the Paris Exposition of 1900.

Agriculture in Indo-China, A. GREVERATH (*L'agriculture en Indo-Chine. Paris: Augustin Challamel, 1900, pp. 166, map 1*).—A planter's guide-book discussing briefly the agricultural regions of the country, the opportunities for colonizing and improving certain sections and the crops to be cultivated.

Farming in India, W. A. VINCENT (*Agr. Students' Gaz., n. ser., 10 (1901), No. 5, pp. 140, 141*).—A popular note on the condition of the Indian farmer.

Markets and marketing, D. TALLERMAN (*London: Simpkin, Marshall, Hamilton, Kent & Co., Ltd., 1899, pp. VIII+108, pl. 1*).—This volume contains a number of papers describing methods by which the author believes farmers may more profitably market their products.

Successful farming; how to farm for profit, W. RENNIE, Sr. (*Toronto: Wm. Rennie's Sons, 1900, pp. 312, figs. 133*).

Catalogue of the periodicals and other serial publications in the Library of the U. S. Department of Agriculture, JOSEPHINE A. CLARK ET AL. (*U. S. Dept. Agr., Library Bul. 37, pp. 362*).—The catalogue includes the periodicals and other serial publications up to the end of the year 1900, exclusive of the publications of the United States Government and of the agricultural colleges and experiment stations.

Convention of Farmers' Institute Workers.—The American Association of Farmers' Institute Workers held a three-day session in Washington, D. C., June 24–26. About 70 members were present, including representatives from Canada and nearly all parts of the United States. Assistant Secretary J. H. Brigham, of this Department, delivered the address of welcome.

The annual address of the president of the Association, W. L. Amoss, dealt with the purposes of the convention, the improvement and possible unification of methods, and the general progress of farmers' institute work. Following his address five-minute reports by the different members were presented, showing the work of the various States and provinces during the preceding year along farmers' institute lines.

During one of the evening sessions of the association, Secretary Wilson delivered an address on the work of the U. S. Department of Agriculture and its relation to agricultural education, especially as calling attention to the need of it. Secretary Wilson insisted that agricultural education must begin with the child. He commended the plan observed in Missouri of summer meetings in which many teachers were given instruction in agriculture at the college.

W. J. Spillman spoke on The farmers' institute worker and his methods. One of the essentials of an institute worker is that he be practical. It is not necessary, however, that he be a worker on the farm. The best man to send out in the beginning is a scientific man who is practical. Ability is worth more than experience. In the discussion of this subject, Mr. G. McKerrow stated that in Wisconsin they wanted a man that stood high morally in the community and who stood out prominently as the best corn, potato, or clover grower, or the best breeder, dairyman, or all-around farmer. Wisconsin also required that its institute workers keep in close touch with the work of the experiment stations and of this Department. Extensive use is made in that State of charts showing good forms of farm animals, buildings, and appliances, and models of these when possible. More can be taught in a few minutes from an object lesson than from a long talk. Feeding and fertilizer charts are also used. Prizes are offered at many of the institutes for certain farm products and these judged and criticised in the presence of the audience. Hon. John Hamilton stated that in Pennsylvania their ideal corps of institute workers consisted of (1) a good all-around scientific and practical man, (2) a man who thoroughly understood the scientific side of agriculture, and (3) a successful practical farmer of high moral standing actually engaged in farming.

In presenting the subject of the farmers' institute as a factor in creating a desire for an agricultural education, Hon. John Hamilton, of Pennsylvania, stated that the need of such an institution must first be felt. Farmers' institutes can help in creating this desire by securing institute workers who are superior to the audience in the things they discuss. They must then present superior matter in a superior way. It was urged that abstracts of the latest bulletins should be read at farmers' institutes, and farmers encouraged to write for these publications. The great need of the present is to create a desire in the child for agricultural education.

Dr. E. B. Voorhees discussed the farmers' institute as a promoter of closer intimacy between farmers and experiment stations. He brought out the point that station work must be practical in order to inspire confidence in the farmer. Larger plats must be used—large enough to be called a crop. Station workers also often get ideas as to lines of work to follow at farmers' institutes.

Director A. C. True, of the Office of Experiment Stations, discussed the subject of the farmers' institute as a medium for developing the mutual interests and relations of farmers and the U. S. Department of Agriculture. Doctor True urged the necessity of a permanent organization in this Department whose purpose should be to work to secure a more thorough organization of the farmers' institutes in the States and Territories and of the present association of farmers' institute workers, so that it might become in a real and true sense international, and constitute a link between the Department and the farmers. Such an organization would act as a clearing house for the association. As it now is, only one meeting is held each year. An agency is needed in the Department to work all the time. Such an agency would be a cooperating one. It would collect and publish information along farmers' institute lines, both in this country and abroad, furnish institute workers regularly with literature, advise and assist institute workers by reason of its broader outlook, and endeavor to establish the work in States where it is not now carried on. Such an organization could send out lecturers to the round-up institutes. Work along the lines here indicated has already been begun in a small way. It is developing along the lines of the Office of Experiment Stations' work and is now being supervised by that Office.

The subject of agricultural teaching in the public schools was discussed by Prof. C. C. James and Dr. E. B. Voorhees. Instruction along agricultural lines should be given teachers in the normal school. This teaching should deal with the science and not the practice of agriculture. The normal school will train teachers in agriculture just as soon as there is a demand for such teachers. Farmers and farmers' organizations should, therefore, create this demand and then see that agriculture is placed on the programme of the rural school.

Other papers read and discussed at the meeting were Teaching of domestic science in the rural districts in Virginia, by Miss Breed, and Methods of teaching such subjects, by Miss Emma S. Jacobs; Livestock judging in Canada, by G. C. Creelman; and Farmers' institutes by the railroads, by M. T. Richards.

At the business session of the meeting, Prof. W. C. Latta was chosen president for the ensuing year and J. G. Lee vice-president. G. C. Creelman was reelected secretary-treasurer. It was decided to hold the next meeting in Toronto the last full week in June, 1903.

The Washington meeting was the largest ever held by the association, and counted one of the most profitable.

Miscellaneous.—The Summer School of Chemistry and Biology at Wesleyan University opened auspiciously early in July. Thirty-seven persons were enrolled for the course, most of them teachers. They came from four State universities, one medical school, a considerable number of colleges, technical schools, high schools, and other institutions.

The Bureau of Plant Industry of this Department will establish a wild garden of native shrubs, herbaceous plants, and annuals on the Monument grounds adjacent to the Department. These will be arranged for landscape effect rather than by orders, and, together with a collection of economic plants, which is to be established also, will constitute a modified form of the botanic garden. Prof. Charles F. Wheeler, of the Michigan Agricultural College and Experiment Station, has been appointed in the Bureau and will have charge of these economic gardens and collections. In addition to the above, Professor Wheeler will determine the distribution to be made of new kinds and varieties of seeds and plants introduced by the Bureau under the seed appropriation, and will work up some of the reports which have accumulated on the tests of these introduced plants at various places in the country.

The Dairy Division of this Department has recently had made under its supervision 200,000 lbs. of butter for the Navy Department. This butter is for the officers' use and is the year's supply. It was made largely from pasteurized cream, and was packed in 3-pound cans, without any preservative. The butter was made by a Kansas creamery. Butter similarly put up has kept well for a year and over, some cans recently opened being in good condition.

E. E. Faville, who for three years past has been superintendent of the National Farm School at Doylestown, Pa., has resigned his position.

We note from a recent number of *Science* that at the meeting of the Royal Society of Canada, Section of Geological and Biological Sciences, in the latter part of May, Dr. William Saunders, director of the Central Experimental Farm at Ottawa and of the four branch farms connected with it, gave an interesting illustration of the progress which is being made in introducing fruits and plants into the Northwest. A hardy Siberian apple, which bears a fruit little larger than an Ontario haw, has been crossed with the Ontario apple. The result was the production of a fruit about an inch in diameter. About 400 of these have been crossed, and last year there were 30 trees and this year there will be about 70 bearing fruit. The cross retains the hardiness of the Siberian apple, but the more it is crossed the nearer the product comes to the Ontario fruit. Results of experiments in crossing English and American currants and gooseberries, plums, and cherries with hardier varieties of these plants have not in all cases been successful, but enough has been accomplished to show that hardy varieties of Ontario fruits may be produced in the Canadian Northwest.

Through an oversight attention has not been called to the new scientific review devoted to dairy subjects, which was inaugurated late in 1901. The publication is a bimonthly of 24 pages, entitled *Revue générale du lait*. It is devoted exclusively to scientific works relating to milk and its products, and contains original articles as well as reviews. A classified bibliography is also given in each number. It is published at Brussels under the direction of M. Henseval, director of the dairy station at Gembloux; H. Weigmann, director of the dairy station at Kiel; and L. Gedoelst, professer in the veterinary school at Cureghem-Brussels, and with the collaboration of a number of prominent investigators, including H. W. Conn and H. L. Russell in this country. The numbers thus far received indicate it to be a high-grade journal which should prove of much value to specialists desiring to follow up the scientific contributions on milk and its products.

A novel publication, and one which marks a new departure in the literature of science, is the *Revue bibliographique des sciences naturelles pures et appliquées*, the initial number of which appeared in April. The purpose of the review is to give lists of the titles of papers published in the principal French, German, English, Italian, Swiss, and Spanish periodicals. The field covered is that of general biology, anatomy and physiology, zoology, botany, agriculture and the agronomic sciences, geology, mineralogy, and mining industry. The contents are arranged topically and by countries, and each number contains an index and a list of the periodicals reviewed. Comments on the character of many of the papers sufficient to give an idea of their scope are given by specialists. The review is published in the French language and will appear monthly. Judging from the first three numbers, agriculture and the sciences relating to it will receive a large amount of attention. This subject is subdivided into general articles and agronomy, arboriculture and horticulture, viticulture, zootechny, aviculture, apiculture, etc. The review should prove helpful in following up the current periodical literature, and as time goes by will become valuable as a means of looking up the fragmentary literature on any subject.

A new edition (the fifth) of Dr. Adolf Mayer's *Lehrbuch der Agrikulturchemie* is being issued, the first part, on the nutrition of plants, having been received. This work, which has become one of the classics in agricultural literature, was first published in 1870. The present edition, as indicated by the first part, is thoroughly revised and enlarged and brought up to date. One fault of the previous editions has been the lack of an index, which even the quite full table of contents does not take the place of in so large a work. The present edition, unfortunately, is open to the same objection.

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A. C. TRUE, DIRECTOR

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BULLETINS OF THE OFFICE OF EXPERIMENT STATIONS.

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