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Waters on "Obtusilobata" Forms of Ferns.

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"Obtusilobata" Forms of Some Ferns.

BY C. E. WATERS.

ANY ONE who knocks about in the woods with his eyes open sees many curious departures from the normal order of things in plant life. During the past summer, especially, my attention has been called to some unusual forms of fertile fronds of ferns that may be of interest to the readers of THE PLANT WORLD.

The fertile portion of many ferns is often much contracted, at times little more than the veins and spore-cases being left. In others the contraction is not so marked, but the green tissue remaining is rolled around the fruit-dots. It looks as if there were not enough material to produce the spores and the normal amount of green material at the same time. Conspicuous among the ferns that act in this way are the sensitive fern, ostrich fern, narrow-leaved chain fern, and the royal, interrupted and cinnamon ferns. Every reader of this article is probably familiar with most of these species. It often happens that incompletely fertile fronds are met with that form an interesting series between the ordinary sterile and fertile ones.

The sensitive fern (*Onoclea sensibilis*) is familiar to every one. The divisions of the fertile frond are tightly rolled around the fruit-dots, thus forming little berry-like bodies that are clustered along the midribs of the pinnæ. When the fern grows in meadows or by the roadside, it often happens that it is cut down in midsummer. The growing end of the rootstock is always well provided with immature fronds, and some of these are sent up in a hurry to finish out the season and store up a food

supply for the next summer. Most of these second-growth fronds are small and sterile, while true fertile ones are rarely ever formed. Instead we find a whole series of forms. Some are merely sterile ones with the pinnæ deeply cut into obtuse lobes; hence the name *obtusilobata* which was given this form. Some of these fronds become more deeply lobed with their margins more or less revolute, thus approaching the fertile type, as is shown also by the presence of scattered indusia that look like whitish scales on the under side (5). Some of these pinnæ have the lower lobes contracted while the upper ones are flat and spreading; or only the lower pinnæ may be contracted while the tip of the frond is nearly normal. These fronds are shorter-stalked than the ones less deeply lobed. From them it is but a step to still shorter fronds with smaller and more revolute lobes that begin to bear sporangia as well as indusia. The limit with these mutilated plants seems to be reached when fronds are produced with the divisions berry-like, but smaller than usual, and with the pinnæ spreading instead of growing nearly parallel with the stalk. This one little point shows that they have not entirely lost their sterile character, if we may so express it. Still other fronds are completely sterile on one side, but bear normal fertile pinnæ on the other.

The ostrich fern (*Struthiopteris Germanica*) has fertile pinnæ that are commonly described as being "pod-like or necklace-shaped." The two halves of each pinna are rolled in toward the midrib, thus forming two tubes enclosing the sporangia. A cross-section of a pinna reminds one of the muzzle of a double-barrelled shotgun, but the surface of the pinna shows constrictions here and there corresponding to the spaces between the lobes of the pinna. Hence the use of the word "necklace," for the pinna may suggest a double row of beads. When the ostrich fern is cut down early in the summer it may also send up what we will call "obtusilobata" forms for lack of any other name. We are less familiar with this species than with the sensitive fern, for it is not only rare but it also fruits very sparingly in Maryland. The illustration (8) was made from a specimen sent from A. A. Eaton of New Hampshire, who wrote that the "ferns were cut down just before fruiting (July 2) and these came up." The upper part of the frond and the tips of the middle pinnæ are like those of small sterile fronds except that the lobes are represented by large teeth and the edges show a tendency to be revolute. The latter becomes more pronounced at the bases of the middle pinnæ. To generalize, passing from the tip to the base of the frond, or of a middle pinna, it is first wholly leaf-like, then scattered indusia appear and the edges become more and more revolute. In my specimens there appear to be no spore-cases, and the lowest pinnæ do not look quite like the true fertile ones.

It is interesting to note that in both of these species the lower part of the frond is usually most like the true fertile condition.

The sterile frond of the narrow-leaved chain fern (*Woodwardia angustifolia* or *W. areolata*) is mistaken by beginners for that of the sensitive fern. The fertile frond is taller, has a dark brown stem, and its pinnæ are long and narrow and are not connected (except near the tip) by a broad green wing, but only by slight ridges on the rachis. Where the fern is at all plentiful it is easy to find all sorts of intermediate forms, three of which are shown in the illustration (1, 2, 3). As they depart from the fertile type, the pinnæ change from linear to lanceolate, bear fewer fruit-dots and are thinner in texture, while the ridges become wing-like. This is shown in the case of the two larger fronds in the illustration. The transition is not always symmetrical. On one side of the frond at the left the pinnæ are like the usual fertile ones, those on the opposite side being sterile except the upper three or four that bear some fruit-dots. A bit of a normal fertile pinna is shown at 4. The middle frond (2) represents a peculiar sterile form that is found in all sizes, some of them being as tall as the fertile ones. Now and then the lower pinnæ bear a few fruit-dots. Some of these have yellowish-green stems, but others show by their dark stems and contracted pinnæ an approach to the fertile fronds. There is no evidence that these forms were produced by any injury to the plants.

In the Osmundas — that is, the royal, the interrupted, and the cinnamon ferns — the fertile portion is reduced to the stalks and the midribs and veins upon which the nearly sessile sporangia are borne. A form of the cinnamon fern (*O. cinnamomea frondosa*) with partially contracted fertile fronds has long been known. A bit of a pinna is shown at 6, while at 7 is a tip of a normal fertile pinna. It will be seen that the spore-cases are scattered along the edges or near them, and are not clustered in fruit-dots of any definite shape. Here again this condition seems to be brought about by an injury to the plant early in the season of growth. The first fronds of the plant from which our specimen was taken were destroyed by fire early in the season.

A curious form of the interrupted fern (*O. Claytoniana*) which has been named *dubia* seems to resemble this form of the cinnamon fern. We have never seen specimens, but the "sterile and fertile intergraded, as some of the pinnæ were wholly fertile and others bore both fertile and sterile pinnules. Some of the pinnules even were in shape and texture like the sterile pinnules but had sporangia at their edges." According to the discoverer, A. J. Grout, this form does not seem to be due to "mutilation or peculiarities of nutrition." The cutting of the sterile fronds is also somewhat different from the normal.

In a swamp where there is keen competition for existence, I saw last

summer a couple of fine large plants of the royal fern (*O. regalis*) shaded by the surrounding bushes, but apparently healthy. In August, when they were first seen, it appeared that nearly all the fronds had been fertile at the tip (9), but the empty spore-cases had dropped off. A large number of pinnules on the upper pairs of pinnæ looked "queer," and were found to be more or less contracted and fertile (10). The one in the illustration represents the average. Some were scarcely contracted and had very few spore-cases on them, while others, not more than an eighth of an inch wide, bore spore-cases all along their edges. Here again there was no evidence of early mutilation. The sterile pinnæ were of the usual size, and the fronds were tall and healthy in appearance. It is not impossible that there was some injury done to the young fronds before they uncoiled, but I hardly think such is the case.

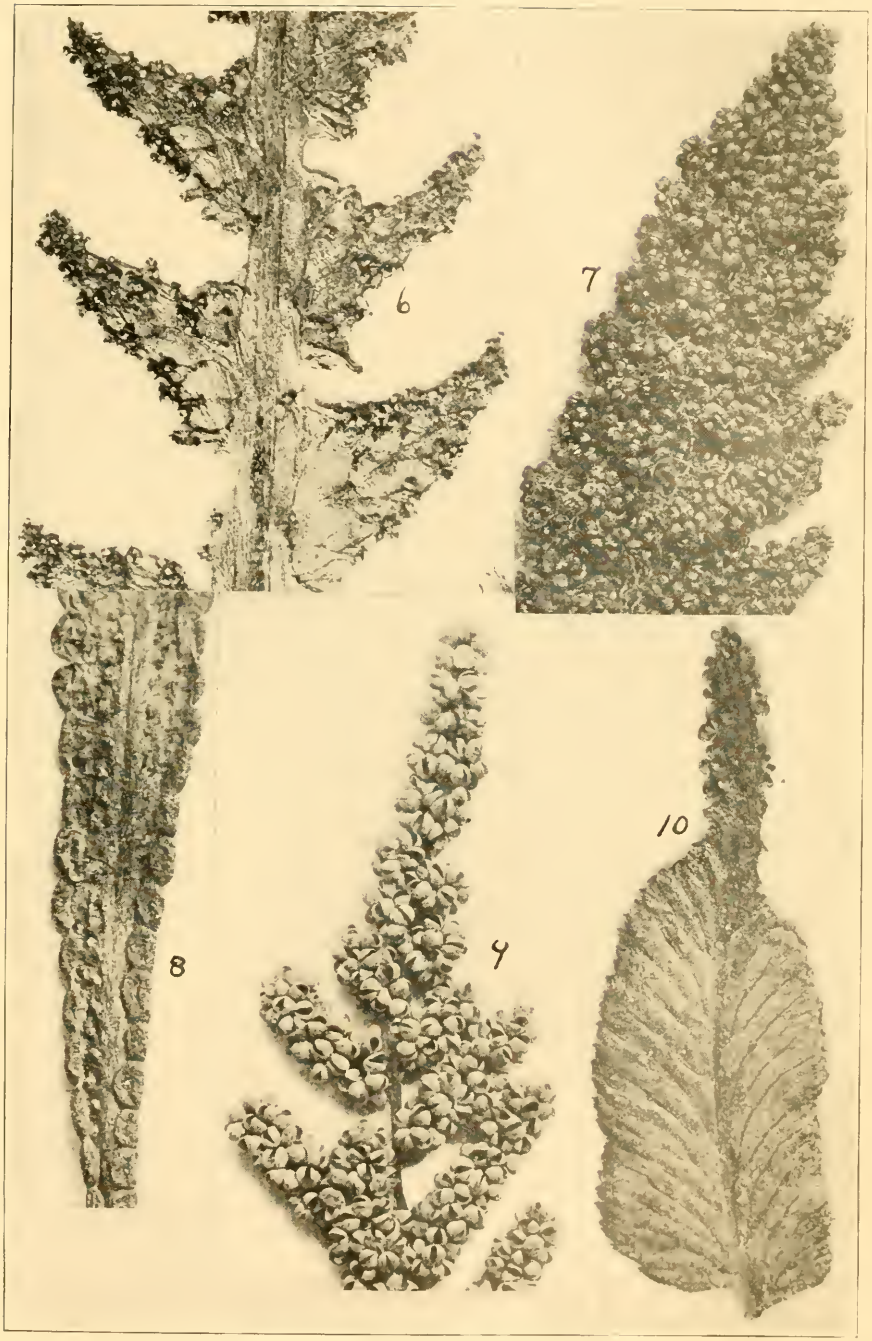
There are many curious transition forms between the contracted fertile pinnules and the broad sterile ones of the climbing fern (*Lygodium palmatum*), but they are of the same general order as those of the royal fern. The fertile portion of one of these pinnules is contracted while the rest of it is of the usual size.

I have thus hurriedly discussed these ferns, but hope enough has been said to show that there is an interesting inter-relation between the fertility and the amount of green tissue in these species. The article will have served its purpose if it leads others to make observations along related lines.

The Preservation of Our Native Plants.

By Ruth E. Messenger.

Nature has made so lavish an expenditure of beauty, delicacy and grace in our native plants and wild flowers, that the most careless of us can not but be attentive to her plea for their protection and preservation. Among the varied interests of our lives, perhaps we do not realize that her voice is being raised in feeble remonstrance against the destruction all around us of her fairest gifts. Still, such are the facts. It is sadly true that many of our choicest species are rapidly becoming extinct; that the gathering of great quantities of ferns, holly, laurel, fringed gentian and the like, has entirely stripped many localities of these beautiful plants; that the destruction of forests, particularly in our own State, has reached alarming proportions. It is equally true that the interest of the people must be aroused in defense of their favorites; that by appeal to the public, or by State legislation, some means must be found to check the evil before it has progressed further.



Waters on "Obtusilobata" Forms of Ferns.

Probably the country districts surrounding cities suffer most from the destruction of wild plants. It is here that flower dealers obtain the great quantities of dogwood, gentian, mayflowers and laurel sold each year, for railroad lines bring city and country into such close contact that shipments may be readily made. Then, too, numbers of city children belonging to the poorer classes are taken out upon excursions by charitable societies during the summer months. It is a well-known fact, that from the mere desire to destroy, these children often tear to pieces many a plant and bush, not being satisfied with a generous supply of wild flowers to take back home. School children also, with just enough natural science to teach them to recognize a variety of flowers and not enough to teach them care in picking and gathering, do much harm. Aside from these there is a large class of people who in gathering bunches of flowers and leaves pull the plants out of the ground, roots and all, or carelessly tear and break the stems. Probably they do not know that their action may lead to serious results. In fact, it is to ignorance that much of the destruction can be traced.

On the other hand, even members of botanizing expeditions and collectors of herbariums are often to blame for aiding in the extinction of some rare species. Well acquainted with the results, they deliberately gather all the flowers from one plant, whole plants, or in some cases where a form is very scarce, as many specimens as they can find in one place. Our fringed gentian, as well as some ferns, is liable to such treatment.

Under ordinary circumstances, plants reproduce in sufficient numbers to provide for all demands upon them. Animals and birds feed upon their leaves and fruit. Insects and unfavorable weather destroy them in large numbers. Yet Nature more than meets the emergency. But when such terrible inroads are made on our shrubs, bushes and wild flowers as have been recounted, nothing less than complete extermination can be expected. Reproduction is prevented, not only by the removal of the plants themselves, but by injuring them so that their growth is retarded. By breaking off the branches of the rhododendron, for instance, which bear in a cluster of leaves the flower buds for the following year, growth is practically stopped. Or, as in the case of collectors, mentioned above, reproduction may be seriously affected by gathering all the specimens of a flower to be found in one place. If the plant be an annual and be thus mutilated it can not, of course, be replaced by the natural method of seed-sowing.

In the immediate vicinity of New York City the mayflower has suffered more than any other wild flower. Several years ago it grew in comparative abundance all around us, but owing to the extensive gathering of it is now completely exterminated. In fact the mayflowers sold

on our streets to-day are brought from Massachusetts, New Jersey, and the South, regions from which they must also disappear. Being one of the first spring flowers to raise its head above the woodland carpet of dead leaves, it is especially welcome as a sign that snows and frosts are past and as a promise of summer near at hand. It is very hard to resist the temptation to gather it, as, "modest, simple and sweet," it fills the spring woods with beauty and fragrance. No wonder this flower is sought after and the demand for it is so great! Still, it is better to enjoy the mayflower's charm less often than not to have it at all. And we shall certainly lose our favorite if it continues to be picked so extensively for the market. It is a slow-growing plant, thriving best in its wild state, and under the most favorable conditions is not found in great abundance. How then can it survive when the runners are carelessly torn up and sent to the city, there to be shorn of blossoms?

During the winter the evergreens, especially the holly, laurel and ground pine, suffer injury. These plants are so largely used for decorative purposes that enormous quantities are brought to the city every year. At first thought it seems that Christmas would lose half its charm if there were fewer Christmas decorations. But can anything which is maintained at such a cost as is the supply of Christmas evergreens be really charming to the thoughtful man or woman? It probably will mean in time the loss of more than one species if something is not done to prevent this sale.

In considering the necessity for preserving our native flowers, shrubs, and bushes, we are reminded of our trees and woods. Is there not a like necessity and, in fact, a greater one for protecting our forests? The loss from cutting and burning to which our tracts of woodland are every year liable is no doubt well known to most persons. However, we can not be reminded of it too often while there is yet time to repair the injury. Trees in their relation to commerce, manufactures, climate and to man himself have countless uses. Yet in clearing land for cultivation and in supplying the yearly demand for timber, innumerable trees are sacrificed. The hundreds of trees cut down annually to make railroad ties gives a good idea of what the total destruction must be. What is there to take the place of forests in tempering climate, assuring regular rainfall, and therefore indirectly providing the sources of our great rivers?

In New York State the Adirondack forests in particular are being destroyed to an alarming extent. The Forest Preserve Board in their latest annual report call attention to this state of affairs. They cite not only the timber-cutting, but also the introduction of two new industries—the manufacture of barrel staves and "wood alcohol"—which require large tracts of hardwood as well as softwood trees. These three industries may be pursued to any extent in the enormous tracts belonging to companies.

The last two being associated for purposes of economy,—the hardwood trees are used for staves and the smaller species as fuel for the retorts of the "wood alcohol" factories. To quote from the report: "The cutting for these factories ends in a complete denudation of the tract, everything being taken, even to the smallest saplings, which are split into barrel hoops. Nothing is left but a stump field strewn with the dead brush from the twigs and tops. Fire is almost sure to follow, after which the gray rocks appear among the blackened stumps."

Hopeless as the situation seems, it may be wonderfully improved by determined effort. If thoughtful people will look upon the subject of preserving native plants in its proper light, and use discrimination in dealing with it, there need be no fear of danger. Public opinion, once aroused to the emergency, will be sufficiently powerful to make the necessary change.

In dealing with the sale of wild flowers on city streets, the refusal to purchase such flowers will put a speedy end to their collection for the market. No person, knowing the facts of the case, should purchase gentians, mayflowers, sabbatia, smilacina and others thus presented for sale. No one with sound judgment can refuse to aid in their protection. It will be remembered that a few years ago the Audubon Society made an appeal in behalf of the birds. A statement of the cruelty being practiced and a request for aid met with a ready response. To-day the movement for the protection of birds has hundreds of loyal supporters. If public interest can be enlisted in such a cause as this, it can also be relied upon to support a kindred cause.

To those who gather bunches of flowers while walking through the woods and fields, merely to enjoy their bright colors and their fragrance, a word of warning will be all that is necessary. Care should be taken not to pull up the roots in any case, as an important means of perpetuation of the species will be thus ignored. And it is sometimes very difficult to take the plant and not the roots, especially when a plant is delicate and grows in marshy places. For this reason gentian and marsh-marigolds must be gathered very carefully. It should also be remembered that stems must be cut and not torn or broken, for as a result of unnecessary mutilation further growth is often prevented. The popular collection of strips of birch bark for use in making fancy articles offers still another opportunity for careless destruction. If only the outer layers of the bark are removed, no harm is done; but if such deep incisions into it are made that the flow of sap to branches and leaves is cut off, the life of the tree is endangered.

As for botanists and collectors, doubtless they, for the most part, realize how necessary it is to use discrimination in gathering rare plants and ferns. Mr. George E. Davenport in his interesting leaflet upon the

subject urges all collectors of herbarium specimens to use great care when dealing with ferns. He strongly advises collecting fronds only and these when fully matured for the next season's growth, remarking, "that by going about it in the right way, one can satisfy any reasonable desire for herbarium specimens without exterminating plants."

As a striking instance of the fact that we have many flowers to pick freely even if some forms should be left unmolested, a bill providing for the destruction of various forms has just come before the State legislature. No later than January 7th this bill was introduced requiring, if passed, that all wild carrots, daisies, common Canada thistles, Russian thistles, and wild lettuce must be destroyed by the owner of the property on which they are found. So there can be no doubt that these flowers may be picked in any amount. Nor are they by any means the only such. Sedges, grasses, spring beauty and particularly violets may also be gathered extensively: these last, because they are provided with two kinds of flowers. They possess not only the well-known ones, but also inconspicuous cleistogamous flowers. Fertilized in the bud and hardly apparent to the casual observer, these of course escape gathering and furnish a convenient method of reproduction. Other flowers, among them the dicentra, are decreasing in numbers, but not very slowly. However, they may still be taken if they are not picked in large quantities.

As united and organized effort always proves effective — a fact amply proved by the work of the Audubon Society — the formation of societies to protect native plants would no doubt do great good. Societies of this kind in Europe have had splendid results from their work. In our own country there are a few already formed for the purpose. In addition to these, many botanical clubs have given their endorsement and aid, among them the New England Botanical Club, the Massachusetts Horticultural Society and the Torrey Botanical Club of New York City. The work at present consists in the publication and distribution of leaflets, by which means the matter is being brought before the public.

Not only in caring for the birds, but in another connection referring directly to our subject, have the people expressed their willingness to hear any reasonable appeal. The celebration of Arbor Day is a fine instance of their co-operation. The admirable custom of planting trees upon this occasion is doing its part toward restoring our woods. Moreover, it is establishing an important precedent. Every year thousands of trees are planted and the general public is reminded that there is necessity for preserving our forests.

In New York State there has been for years a constitutional provision setting apart certain forest land which shall be kept forever wild and undestroyed. Large tracts, also, have been purchased by the State in the Adirondacks and Catskills with a view to protecting the watersheds. A

timber right upon these lands has been given to lumbermen, but at the same time the interests of the State have been carefully looked to.

State legislation as a result of all other efforts is no doubt the most important means of preserving native plants. With the hearty co-operation of the public, with the well-directed aid of societies, with the regulations already in force in different States, further action of our law-making bodies will become a certainty. Every State in the Union has its game laws. Why can not every State in the Union protect its plants by like means? Connecticut has already taken measures to preserve some of her species in this way. Her sister States will do well to follow her example.

The time has come when we must take action, when we must put forth some strong effort to save the treasures of our fields and forests. We dare no longer turn aside from the plea that Nature is so feebly making and pass on heedless of her cry for help. We can not allow our favorite flowers to be lost because of carelessness and ignorance, or our forests to be devastated in commercial or industrial enterprise. That boasted.patriotism of ours and that love of nature should be used to good purpose in such a cause as this. What is our patriotism worth if it fail in so practical a test? Of what value to us our love of nature if it do not make us keenly appreciative of her appeal? For, after all, is it not honest, patriotic, and loving effort, first and last, that will make the most forcible impression and be the most certain means of securing attention and support?

New York City.

Dimorphism in the Shoots of the Ginkgo.

By G. N. Collins.

Persons to whom the ginkgo is familiar have doubtless noticed the two kinds of shoots, but those who have not examined the trees closely probably think of the short, rough branches with fascicled leaves as lateral, and the long, smooth branches with three-ranked leaves as terminal. This is, however, only partially true, for while there is a tendency for terminal shoots to make rapid growth and for lateral shoots to remain stunted, branches can frequently be found terminating in a fascicle of leaves, and a rapidly expanding shoot will often be seen growing from the side of a branch.

The two kinds of branches, as shown in the plate, are quite distinct, and there seems to be no intermediate stage. One is characterized by a very slow growth, seldom more than one-eighth of an inch in a year; this extreme shortening causes the really three-ranked leaves to appear fascicled. The leaf scars of succeeding years are also brought very close together, thus giving the shoot its rough, corrugated appearance. These rough shoots are seldom more than one inch long, and are more commonly seen on the large branches in the inside of the tree. (Plate 3, fig. 3.) Branches of this description can be found which, judging from the number of leaf scars, are at least ten years old, but which during that time have made a growth of less than one inch.

The other style of shoot, on the contrary, grows rapidly; the leaves are plainly three-ranked, often one and a half or two inches apart, with smooth bark between them. (Plate 3, fig. 2.)

It would appear that there must be some physiological reason for this pronounced dimorphism, and it seems reasonable to look upon the amount of light a shoot receives as the determining factor. The short shoots may be considered somewhat as adventitious or dormant branches, which, without encumbering the tree with useless material, and without expending energy on leaves that elaborate little nourishment, are in readiness to produce a branch whenever the conditions change and a branch in that particular place becomes desirable. This would be, of course, the case if light were present.

These dormant branches, as they may be called, are also to a certain extent self-pruning; if after a number of years no branch seems to be called for, that is, if there is not sufficient light, the shoot becomes discouraged and drops.

If, on the other hand, a shoot that is receiving plenty of light and consequently making rapid growth is thrown in the shade, the process is reversed and the shoot at once ceases its rapid growth and goes into a dormant state awaiting a return of the stimulating light. If this should occur the branch will again resume its normal rate of growth. (See plate 3, fig. 1.)

An apparent exception to the exposed shoots making rapid growth may be noticed in what appear like fascicles at the end of many of the rapidly growing branches. When the leaves appear in the spring they stand close together and are separated afterward by the elongation of the shoot. This seems in most cases to take place more rapidly at the base of the year's growth, so that frequently a few leaves at the tip of the shoot fail to become separated. It was not observed whether the fascicled leaves of the dormant branches were entirely due to the failure of the shoot to elongate during the summer or whether the leaves from the first are borne in a different manner. The greater number of leaves borne on the rapidly

Fig. 1. Fig. 2. Fig. 3.

Collins on Dimorphism in Ginkgo Shoots.

Fig. 1—Branch showing alternate periods of rapid growth and dormant condition. Fig. 2—Rapidly growing shoot, part of one year's growth. Fig. 3—Dormant shoot of ten to fifteen years' growth. All very slightly reduced from natural size.

growing shoots, however, seems to indicate that there is a difference from the first.

What appears to be a real exception is occasionally found on the very end of some of the longest and most exposed branches, as if growth were arrested for fear of the branch becoming top-heavy, or perhaps because the nourishment provided at the end of such slender branches is not sufficient to support rapid growth. Occasionally a tree shows arrested growth in nearly all its branches. This may be due to the tree as a whole receiving insufficient nourishment.

On the contrary, there appear to be no exceptions to the rule that the growth of the shaded inside branches is always arrested; the only shoots from old wood inside the tree found to be making rapid growth were a few that drooped and thus immediately reached the light, or, in very rare cases, where the old wood was exposed to the direct rays of the sun.

Water-shoots, so common in many plants, which in some fruit trees represent such a waste of energy that pains are taken to remove them, are entirely absent in the ginkgo. Inside branches that appear to have been water-shoots at one time can be seen, but in every case their growing points are now in a dormant condition, and it seems reasonable to suppose that the elongation of these branches took place at a time when they had access to the light. These dormant branches that take the place of water-shoots waste little energy until a longer branch would be able to elaborate useful material and thus be of service to the tree as a whole.

This economical method of procedure seems much more rational than that more commonly practiced by other plants where each shoot goes ahead independently and, if in the shade, makes the more rapid growth in its effort to reach the light, exhibiting as it were a lack of that spirit of co-operation present in the primitive ginkgo.

EVEN amid the January snows in certain warm swamps, in the beds of shallow running brooks and around springs which do not freeze, the sturdy skunk-cabbage is stoutly pushing its hardy sheaths up into the world of frost. You who in the spring pass with disdain this homely habitant of the swamp because of its fetid breath, wait until, tramping through the snow of a winter landscape, you come suddenly upon the brownish-green spear-heads of this dauntless forerunner of the spring bravely thrust above the protecting earth. You never will forget it. It seems as if in the instant of that first glimpse the winter had been dealt its death-blow. There is proof that already are the forces of the spring at work. You will linger long, and thereafter will admiration mature into something akin to affection for this ill-smelling denizen of the swamp.—*Country Life in America.*

Briefer Articles.

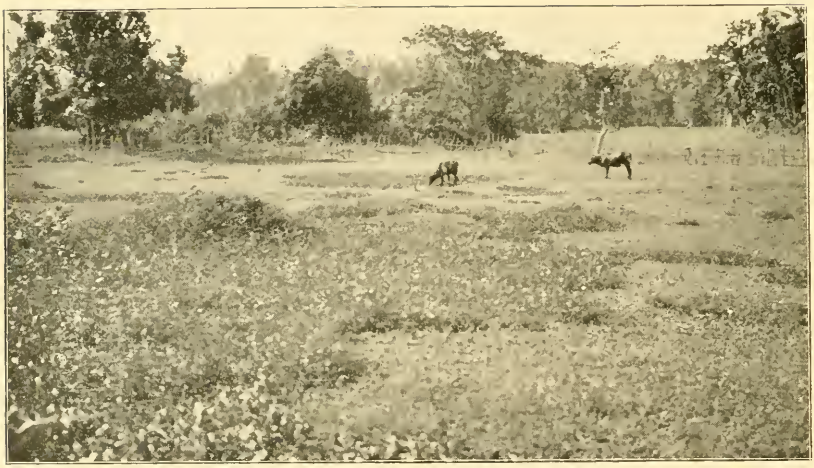
THE THUNDER FLOWER.

SCIENCE, as every one knows, is very often the interpreter of legend, as often almost as it is the destroyer of myth and superstition. A notable instance of this happy fate has just been discovered by the *Garden* in relation to the humble and familiar wild flower, the stonecrop (*Sedum tectorum*), a flower which is known in the lake region as the thunder flower, in Belgium as *dunder blomen*, and at Arras as *fleur de tonnerre*.

In the pages of the *Pharmaceutical Journal* our contemporary has discovered the following interesting explanation of this ordinary name: Two pharmacists, it is related, were once walking together, when they stopped to admire a fine profusion of the stonecrop on the roof and the outbuildings of a primitive farm house. The tenant, an aged but hale and hearty woman, informed the men of science that a building was protected from thunderstorms by the stonecrop, and she told how that very house was saved by its intervention. "In my grandfather's time," she said, "the lightning struck the roof and turned the thunder flowers all to a jelly, but the house was saved, and that is why it is called the thunder flower." In defense of this pleasing theory, which sounds so very much like a legend, the *Garden* points out that the stonecrop is very probably a natural lightning conductor, seeing that it is succulent and full of water. And another authority adds: "There is no reason in life why the explanation should not be correct." The ubiquity of the name certainly adds weight to the theory and justifies a decisive scientific opinion on the matter.—*The London Globe.*

TARO alias TANIER.

AFTER an age of deplorable confusion regarding the nomenclature of two of the principal tropical root crops, it seems to be finally settled that none of the Taro varieties are of the genus *Xanthosoma* and that none of the true Taniers, or Yautias, are *Colocasias* or *Caladiums*. The apparent interchange of the local names of these plants, together with their similar growth habit, caused the old botanists to jump to the conclusion that both were the same species. Innumerable mistakes have been made in catalogues and lists, *Colocasia* almost always doing double duty; but, thanks to the taxonomic courage of Mr. O. F. Cook, the Yautias and Taniers now rest securely within the genus *Xanthosoma* and, although botanists can scarcely hope to see the flowers of the cultivated species, a few years more will probably find the twenty-five or more species definitely separated.



Fairchild on the Sensitive Plant as a Weed in the Tropics.

The scene shows a field in Ceylon nearly covered by a dense growth of the sensitive plant (*Mimosa pudica*). Plate loaned by the *Botanical Gazette*, through the courtesy of Prof. J. M. Coulter.

It is quite possible that the Taro and the Tanier were the first plants to be cultivated by man — which means that they have been aids to civilization for at least 100 and perhaps for over 300 centuries.

Mayagüez, Porto Rico. O. W. BARRETT.

THE SENSITIVE PLANT AS A WEED IN THE TROPICS.

EVERY ONE who has travelled much in the tropics knows that *Mimosa pudica* is a weed which gives considerable trouble to the planters, but so far as I am aware no photographs of the way it luxuriates have been published. It may be interesting to those who have not seen the plant in its own home to look at a photographic reproduction of a large patch of it which I observed recently in Ceylon.

I was returning from Peradeniya to Colombo and the train stopped for a few minutes at a way-station in the lowlands, an hour's ride from the city, just long enough, in fact, to allow me to get a snap shot of a field quite disfigured by Mimosa. The cattle pastured in the field had eaten the herbage closely around the plant, leaving it strictly alone, and as it crept across the meadow it killed out all other plants, forming a dense deep patch of spiny, creeping stems and delicate pink blossoms, which resembled miniature dandelion or thistle heads gone to seed.

The leaves were all expanded horizontally as I approached, but when my feet shook the soft earth, like a hermit crab draws into its shell or a coral pulls in its tentacles, the plants in the radius of the shaken ground quickly folded their leaflets together and dropped their leaves into the characteristic position of rest which every one knows who has seen the living plant.

To one acquainted only with the delicate specimens in European and American greenhouses, the novelty of walking over such beds of it in the tropics does not soon wear off. I have been on railway lines whose embankments were covered with Mimosa, and watched with keen amusement, as the train advanced, the quick falling of the leaves like the progress of a roller on the seacoast.

In Ceylon the planters complain that it is among their most troublesome weeds, and one sees it everywhere in the cocoanut groves and tea plantations. Though highly interesting and valuable in a botanical laboratory, *Mimosa pudica* is quite useless on a tropical estate.— *David G. Fairchild, in The Botanical Gazette.*

The Wild Flower Preservation Society of America.

THE BALTIMORE CHAPTER.

The first local Chapter of the Society was organized at Baltimore on December 19, 1902, at the conclusion of an illustrated lecture on "Vanishing Wild Flowers," delivered by Mr. Pollard, the secretary of the Society, in Hopkins Hall. The success of the undertaking was due mainly to the interest and activity of Dr. C. E. Waters, of Johns Hopkins University, and the newly-formed Chapter wisely selected him as the first president. The other officer is the secretary-treasurer, Miss Elizabeth A. Smyth, and the Chapter has also elected an executive council of five members, consisting of those prominent in educational work in the city. The full list of officers and members will be published later when the Chapter is ready to submit a report on its work. At present it has a membership of sixteen. Under the Constitution of the Society it is entitled to be a self-governing body, and will have charge of the work for plant protection in Baltimore and vicinity.

THE ANNUAL MEETING.

The first annual meeting of the Society was held in the lecture hall of the National Museum at Washington at 4 P. M., December 27, President Coville in the chair, and about 25 members in attendance. The annual report of the Board of Managers, already published in THE PLANT WORLD, was read and ordered accepted and placed on file. Abstracts of the reports of the secretary and of the treasurer were read and approved. The secretary then announced the result of the correspondence ballot for four members of the Board of Managers, the vote being as follows:

Total number of ballots cast	38
Mrs. N. L. Britton	36
Dr. L. H. Bailey	28
Mr. E. L. Morris	26
Dr. C. E. Waters	22
Prof. C. F. Wheeler	18
Mr. C. F. Saunders	9
Dr. H. H. Rusby	6
Mrs. C. A. Hoyt	5

Mrs. Britton and Messrs. Bailey, Morris, and Waters were announced as duly elected managers for a term of three years each.

The organization of the Baltimore Chapter was reported upon by its president, Dr. C. E. Waters, who briefly outlined the proposed efforts of the members.

There being no further business, the meeting was adjourned *sine die*. Immediately afterward a lecture was given in the same place by Prof. Francis E. Lloyd, of the Teacher's College, Columbia University, New York, on "The Colors of Flowers." Prof. Lloyd's remarks were illustrated by a number of beautifully colored lantern slides belonging to Mr. Cornelius Van Brunt, of the New York Botanical Garden.

THE BOARD MEETING.

The Board of Managers held a meeting at the Cosmos Club in Washington on the evening of December 29, the president in the chair, and present Dr. MacDougal, Mr. Morris, Dr. Waters and the secretary. The election of officers for the ensuing year was the first order of business, and on separate motions duly carried the secretary was authorized to cast the vote of the Board for each of the present incumbents, a vote of thanks being added in the cases of the secretary and treasurer. The latter was authorized to pay outstanding bills for printing, etc. After discussion as to the best methods of increasing the Society's membership, the secretary was directed to prepare a draft of a circular letter for submission to persons interested in botany, subject to the approval of the Executive Committee.

The itinerary of a lecture tour in the West was submitted by the secretary, and upon motion it was voted that the trip be authorized, and that a sum not to exceed $50 be appropriated in partial payment of the expenses. There being no further business, the Board adjourned *sine die*.

NOTES.

The secretary invites correspondence from those interested in the aims of the Society in cities throughout Ohio, Indiana, and West Virginia. He proposes to lecture only where there is already sufficient botanical activity to form a suitable nucleus for a local chapter. He will also be glad to obtain plain or colored lantern slides illustrating the native plants most in need of preservation; and will purchase such as are available.

A supply of reprints still remains of the various essays published by the Society. These will be sent in quantity to any one who will promise to distribute them.

It is the judgment of the Board that all our present efforts should be devoted to enlarging our membership rolls. The earnest request is made that every member of the Society should secure on the "Daisy Chain" principle two additional members within the coming month. For those whose purses will not permit them to extend financial aid, this is the

best possible way of helping the Society. Samples of THE PLANT WORLD will be furnished, if desired, so that you can exhibit the magazine to your friends as an added inducement for them to enroll.

The addresses of the officers and a concise statement of the objects of the Society will be found in this and subsequent issues of THE PLANT WORLD, for reference when needed.

THE annual report of the Secretary of Agriculture contains some interesting information in regard to American-grown commodities, such as tea and tobacco.

The work on the growing of American tea was continued during the year at Pinehurst, near Summerville, South Carolina, in co-operation with Dr. Shepard. There are now about one hundred acres in tea gardens. The yield of tea in these gardens last year was about 4,500 pounds, and this year will be about 9,000 pounds of marketable tea. During the year careful attention was given to reducing the cost of the production of tea, with very satisfactory results. A tea farm will be established in Texas if suitable land and co-operation can be secured.

The commercial success of the shade-grown Sumatra tobacco in the Connecticut valley has now been fully assured, and the plan adopted by which last year's crop, after being carefully cured and sorted under the direction of the Department's experts, was catalogued and offered for sale at public auction under the supervision of the committee of tobacco brokers, with Hon. E. Stevens Henry, M. C., as chairman, proved highly satisfactory. Much credit is due the members of the committee for the time and expense they personally contributed in the interest of this investigation. The ordinary tobacco grown in the open fields in Connecticut brings from 18 to 20 cents a pound. The average price paid for the shade-grown tobacco was $1.20 a pound. The cost of this tobacco, baled and ready for market, averaged 51½ cents a pound. The net profit per acre on the best crop raised, on a lot of about six acres, exceeded $1,000 per acre. The reports from cigar manufacturers show that the leaf of this Connecticut-grown Sumatra tobacco has successfully stood the test of manufacture. At the present time the Department is advising and instructing thirty-eight growers in Connecticut and Massachusetts cultivating 645 acres of shade tobacco. It may be said of this line of Department work that it has demonstrated our ability to produce a leaf for which about six millions of dollars have annually been paid to foreign countries.

Editorial.

WE EXTEND to our present and past subscribers, and to those who we hope will become subscribers in the next twelvemonth, a cordial New Year's greeting. THE PLANT WORLD comes before you newly robed, and may be depended upon hereafter to appear promptly about the middle of each month. That we have been irregular during the past year is due to the fact that the journal has heretofore been printed outside of Washington, and the publishers have been powerless to prevent delays on the part of printer and binder. We have now secured the services of competent local printers, and the magazine will henceforth be under the direct supervision of our business manager.

THE NEW volume marks some changes in the usual contents of THE PLANT WORLD. Our Supplement, after running through three years, has now been carried to its conclusion. For the present we shall discontinue this feature, and four pages will be added to the regular issue; this space will be devoted to a new department, the "Home Garden and Greenhouse," under the management of Dr. Knowlton, who will secure the co-operation of some well-known horticulturists. It will consist of short, crisp articles and notes, telling how plants may be grown for pleasure or for economic use; the care of the window garden and the "back yard" will receive special attention.

WE SHALL take under consideration the preparation of a Dictionary of Plant Names in America, to be published as a Supplement in 1904. Many requests for this have come from our subscribers, and the work would not be without value.

THE Wild Flower Preservation Society will occupy its usual space, and will print essays from time to time for general distribution. The series of articles on Guam, by Mr. W. E. Safford, will be resumed, and with its attractive illustrations will doubtless prove one of our most interesting contributions. We solicit articles on plant life from any reader of this magazine, and for the first time we are able to offer free subscriptions in exchange for accepted manuscripts. Our future prospects are bright, and we trust that 1903 may be a notable year in the history of THE PLANT WORLD.

THE American Association for the Advancement of Science, together with various affiliated societies, has just closed a very successful meeting in Washington. That the plan of meeting during convocation week is likely to prove a popular innovation is shown, not only by the large at-

tendance, but by the fact that the next meeting is set for the closing week of this year. The next meeting will be at St. Louis. There were four distinct botanical organizations holding meetings at the same time, and as a result it was impossible for one to follow papers of interest being presented simultaneously. As the membership in the actual organizations is largely made up of the same individuals it would seem better for all interests to devise in future a means of consolidation. If the papers scheduled for presentation before all the bodies were arranged by subjects, it would be possible to avoid two papers on the same topic being read at the same moment. This plan was followed by the Geological section of the Association and the Geological Society of America, and the result was highly satisfactory. If it is worth while for the various botanical organizations to meet at all in conjunction with the American Association, why not go a step further and secure a more perfect coordination?

THE War Department has recently issued a report of the Forestry Bureau of the Philippines, by Capt. G. P. Ahern, in charge, in which is given lists of the different kinds of timber, woods used for fire-wood, dye-wood, rubber, etc. The author gives a brief description of the forests of the Philippines and concludes that if the proper safeguards are adopted they will prove not only a source of great revenue, but may be maintained without serious depreciation.

AS THE result of a test made among the school children of Chicago it is reported that fully 100,000 children in that city are totally ignorant of the names of the commonest flowers, mixing lilies, roses, hyacinths and everything into a hopeless jumble.

It seems extraordinary that such a state of things can be; yet parallel cases have been found elsewhere and it must not be thought that the schools of Chicago are peculiar in this respect. It was shown but a short time ago that the average school child was totally ignorant of the meaning of the most ordinary words, which, though in daily use, were repeated parrot-like.

A great scare has gone through the press because these children of the Chicago schools were unable to tell the difference between a rose and a violet, and did not know the names of the dandelion and of the buttercup. Boston, for instance, raises an outcry against the public school system of the second largest city in the United States, but after all it shows nothing and leads to nothing. If the children are not taught and properly taught they can not be expected to know, and the fact is that the lashings should be given, if at all, to the teachers rather than to the children.—*American Gardening*.

The Home Garden and Greenhouse.

CONDUCTED BY F. H. KNOWLTON.

BY THE time this reaches our readers the spring catalogues of seedsmen and florists will have begun to make their appearance, and although the ground may be covered with snow and everything locked in the embrace of winter, it will be time to begin thinking and planning for next summer's flowers. It is a mistake to wait until it is actually time to set out the plants or put the seeds in the ground before giving the matter any thought. This is why so many fail of success. Each intending purchaser should know the kind of soil he has to deal with and whether heavy or light, the usual temperature that may be expected during the hot months, and the facilities for supplying sufficient moisture to the plants grown, and then select such as experience or a careful guide have found adapted to the needs in question. A large proportion of the commonly grown plants will succeed with a moderate amount of attention, but it is an altogether mistaken idea to suppose that one's duty is over when the seeds are planted, and even the planting of the seeds is by no means fortuitous. Some seeds, as for example those of sweet peas, will germinate under five or six inches of soil, while others will be smothered under soil a quarter of an inch deep. When it is recalled that the whole world has been laid under tribute to supply our commonest cultivated flowers, it is small wonder that a common course of treatment will not succeed for all. The needs and requirements of each species must be studied and met, so nearly as possible, before success will crown the effort. It is far better to have a half-dozen well grown specimens of even a common species than a yard full of poor, starved, uncared-for examples. If you are a beginner do not be led astray by the seedsman's glowing account of some "novelty," but stick to the old, established favorites until you are surer of your ground. Grow a bed of nasturtiums and grow them well, then next year extend your scope. If you are a real lover of flowers you will not be long content with the "easy" species, but will attempt some of those more difficult to manage. You will doubtless meet with some disappointments, but remember that each success makes further success more certain.

The Paper White Narcissus.—Have any of our readers tried this for winter blooming? If not, we would earnestly advise them to try a dish, and we are sure they will never be without them thereafter. They are of the simplest culture, being forced in water without soil, although they can of course be grown in pots of soil if desired. The bulbs, which are about 3 inches long and 1½ inches in diameter, may be procured of

almost any dealer; the cost is about 40c. a dozen or approximately $1.50 per hundred. They should be placed in a flat glass dish and the spaces around them filled with small stones or coarse sand, not of course for nutriment, but simply to keep them from falling over when the leaves and flowers have grown. Fill the dish with water until the bulbs are about two-thirds covered, then set the dish in a cool, dark place — as a closet or cellar — for at least two weeks. At the end of this time the bottom of the dish will be filled with a tangled mass of white roots, and the narrow leaves will be showing. The dish should now be brought out and placed in the sunlight and in the temperature of an ordinary living-room. The leaves and flower stalks will push rapidly and in ten days or two weeks the flowers will begin to unfold. They are snow white and delightfully fragrant, and last for two weeks or more if not in too warm a room.

Temperature of Water for Plants.—It seems to be the generally accepted opinion of florists and gardeners that watering plants with cold water is detrimental to growth, but until quite recently no one has apparently undertaken to ascertain just how cold the water may be without producing this result. The idea is especially wide-spread that plants grown under glass or in a living-room are injured by water colder than the air immediately about the plants. With a view to ascertaining the facts in the case the Wisconsin Experiment Station undertook a series of tests a few years ago, and the results are set forth in a bulletin that is full of interesting matter. Plants were grown under glass and in the open field and in all cases the results were similar. Thus coleus planted in lots of equal size and vigor were watered with water at 35°, 50°, 65°, and 86° F. At the end of 60 days it was impossible to note any difference, and when the experiment was repeated with water at 32°, 40°,70°, and 100° the result was the same. Beans watered with water at 32°, 40°, 70°, and 100° were equally vigorous, in fact water at 32° and 40° gave the best results. Lettuce watered with water at 32° yielded slightly more than the other lots. From these experiments it was concluded that for vegetable and flowering plants commonly grown under glass ordinary well or spring water may be used freely at any time of the year without warming.

A Good Greenhouse Plant.—A plant that should be more common in ornamental greenhouse cultivation is *Ardisia crenata*, a handsome evergreen shrub of the Myrsine family and a native of the tropics. It is a rather slow grower, having a bushy, rounded crown, thickly set with thick, dark-green leaves which are about two inches in length and have the margins crenate. The chief attractiveness of this shrub is in the bright red berries, of which it bears a profuse crop, which remain on the plant in attractive condition until another crop is matured, or for a

period sometimes of eighteen months. I have a fine specimen which was used as a table decoration on Christmas, 1901, the berries being very attractive. This plant still retains the first crop of berries and during the past summer has grown a second and much larger crop, and was made use of in decorating the past Christmas. One objection to this plant is the frequent dropping of the lower leaves, thus giving it a "leggy" appearance. It is said that a plant may be flowered in eleven months from the seed, and as it is very easy to grow, it would seem that it would become popular if more widely known. With the increasing scarcity of holly for Christmas decoration it is suggested that *Ardisia crenata* be grown to take its place in a measure, not, of course, as cut branches, but as a pot plant.

Calla Lily Disease.—A bacterial disease has been found attacking the bulbs, and sometimes the roots and leaves also, of the calla lily in the greenhouses around Washington, D. C. As a rule, the bulb shows the disease most frequently near the top, in which case the bulb is almost entirely destroyed before the leaves indicate that the plant is diseased. The diseased plants have been treated with lime, sulphur and dilute formalin with some success, but the best results were obtained by changing the soil in the beds or in growing the plants in pots, and in the proper management of the greenhouses. The organism causing the trouble is described as a rod-shaped motile bacterium.

The Water Hyacinth.—There has been a statement recently going the rounds of the daily press to the effect that the hyacinth has run wild on the rivers and other inland waters of Florida, covering the surface with a solid mass of vegetation and sending their roots eight feet through the water to the muddy bottom. It is expressly implied that this is the hyacinth *par excellence*, the bulbous plant so prized for its fragrant trusses of bloom on our lawns in early spring. As a matter of fact, this is far from the truth. The plant in question is the so-called water hyacinth (*Piaropus crassipes*), a member of the pickerel-weed family, and not even remotely related to the true hyacinth, which is, of course, a member of the lily family. It has leaves with curious inflated petioles, which form a rosette on the surface of the water and a spike of handsome pinkish-lavender flowers which are perfectly scentless. It is a native of India and was introduced into Florida by a Mr. Fuller, who imported the plants about fifteen years ago and had them growing in a lake on his estate near Palatka. The plants increased so rapidly that to rid himself of the superabundance he threw the surplus into the St. Johns River. They increased with such astonishing rapidity that they finally covered the surface for miles, impeding navigation and otherwise causing alarm, but they disappeared as suddenly as they came. On this point Mr. A. H. Curtiss, of Jacksonville, says in a former number of this journal (Vol. III,

p. 38): "But at length, in the summer of 1896, there came about a marvelous change. The compacted hyacinths, covering tens of thousands of acres, so to speak, left the lakes and creeks of the upper St. Johns and started for the lower reaches of the river. Down they came by millions and hundreds of millions. Hundreds of miles of shore were banked deep with drifts of decaying plants. All other aquatic and littoral plants were exterminated. Small boats were blockaded, and it was difficult to navigate the river with boats large or small. Jacksonville, a city of 30,000 inhabitants, was in a state of alarm. It was expected that the hyacinths would increase from year to year, and many feared that the river would thus be closed to navigation. By the end of fall all the hyacinths were either rotting on the shore or swallowed up by the ocean. It was fully expected that the following year would witness another hyacinth invasion more formidable than the first, but that year had in store another and more agreeable surprise, for scarcely a plant was seen on the river, nor has there been since."

According to experiments made by the California Experiment Station, the English oak (*Quercus robur*) appears to be one of the most rapidly growing hardwood trees thus far grown in the State. The Asia Minor willow (*Salis Salmoni*), planted from cuttings in 1895, was 32 feet high in October, 1897, with trunks 32 inches in circumference.

The forest reserve of Burma, according to a recent report, now embraces 17,836 square miles, from which there was an income of more than $2,000,000 during the year 1900–01. The principal forest product is of course teak timber, but other products are coming in. During the year 10,000 acres of para rubber (*Hevea brasiliensis*) were planted.

The latest estimate places the total number of apple trees of bearing age in the United States at something over two hundred millions. This is nearly three trees to every person. These trees yield more than one hundred and seventy-five million bushels. Not all these apples are consumed at home, for in years of full crop more than three million bushels go abroad. Yet the apples kept at home are more than two bushels for every adult and child. We are a nation of apple-eaters. This fact may not be to our credit, however, when we remember that a good part of all these apples are Ben Davis and other kinds that a refined and cultivated taste would not choose for its desert. Yet probably half our people never raise an apple; and of the half who do raise them, but a small percentage grows for market; and of those who grow for market, only a part make a profit from the business. Yet there is money in apple growing.—*Country Life in America.*

Book Reviews.

FIRST STUDIES OF PLANT LIFE. By *George F. Atkinson.* Boston. Ginn & Co. 1902.

The key-note of this little book — and, we may add, the key-note that should guide all nature study — is struck in the introduction when it is stated that "The child cares very little about the forms of things; he is far more interested in what things do. Things which are in action, which represent states of action, or which can be used by the child in imitating or "staging" various activities or realities, are those which appeal more directly to him and which are most powerful in impressing on his mind the fundamental things on which his sympathies or interests can be built up." It is of little moment to the child whether the leaves of a plant are lanceolate or palmate; it is the question of what the leaves do for a plant that interests him. In a series of short, clearly-written chapters Professor Atkinson explains the activities of plants, such as how the seeds behave when germinating; how the seedlings come up from the ground; how the living plant uses water to remain firm; how the root lifts water; how the plant gives off water; how starch is made; how plants breathe, etc., in fact just the questions that every "live" boy and girl would naturally ask. There are also chapters in which the life story is told of a sweet pea, an oak, a fern, a moss, and a mushroom, and a final section recounting the battles of certain plants in the world. The "Struggle of a White Pine" may be read by many older persons with interest, as well as the struggle of plants against wind, for territory, and finally the disposition of plants into societies. The book is thoroughly illustrated, and altogether seems to us to be of the many that have thus far appeared the nearest to the ideal of what a book of this kind should be. It can not fail to be a success in the field it is intended to cover. F. H. K.

EUCALYPTUS CULTIVATED IN THE UNITED STATES. By *Alfred J. McClatchie.* U. S. Dept. Agric., Bureau of Forestry, Bulletin No. 35. 1902.

Since, as the author states, the eucalypts are now grown in America, especially in the southwestern United States, more extensively than any other exotic forest tree, the present treatise is valuable and timely. After discussing briefly the home of the eucalypts, their introduction into various parts of the world, their botanical characteristics and general

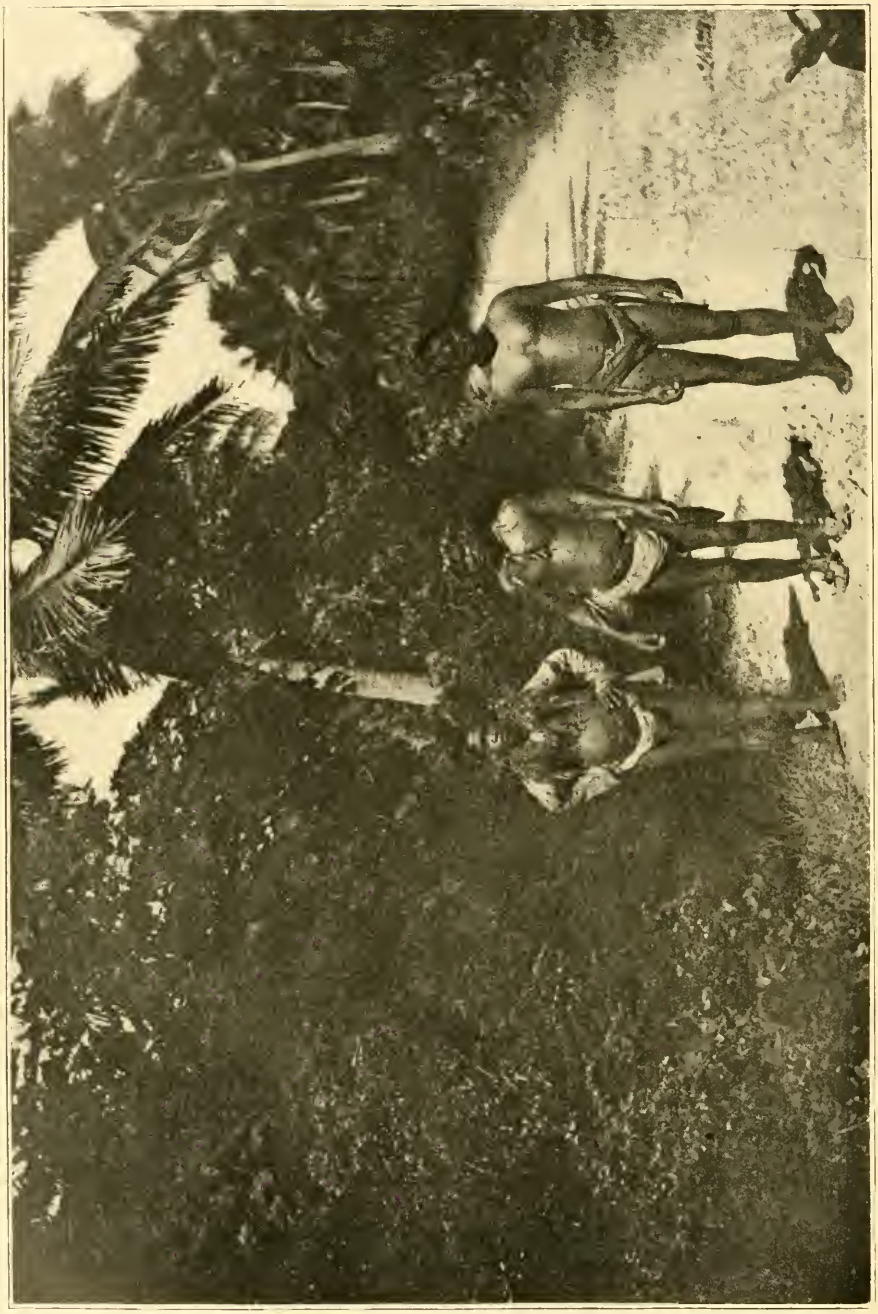
uses in this country, he takes up the more than forty species that attain the dignity of forest trees and describes each very fully. The characteristics, climatic adaptations and uses are fully treated, the result being a monograph along these lines. The book is profusely illustrated with beautiful full-page half-tones, the character of each species being clearly shown by photographing a spray of leaves, flowers and fruit against the trunk as a back ground. There are also "keys" by which the species treated may be identified, based on the bark, leaves, fruit, cores and general botanical characteristics. It is a very valuable contribution to a subject of increasing importance. F. H. K.

GREEK AND LATIN IN BIOLOGICAL NOMENCLATURE. By *Frederic E. Clements*. University Studies, Vol. III, No. 1, University of Nebraska. December, 1902.

Under this title Dr. Clements has presented to the working systematists of the country an elaborate essay, embracing a full discussion of the Latin and Greek languages as the etymological basis for nomenclature, and a series of suggested rules for present and future practice in plant naming.

Those who have followed the technical publications of the past few years have observed the growing carelessness of our younger authors in their choice of specific and generic names. One is forced to realize, after a comparison of recent with older publications, that American classical scholarship, at least among botanists, is on the wane. The reason for this is to be found in the much greater latitude allowed by the colleges in their scientific courses, whereby the student of to-day is permitted to attain his degree with a knowledge of little Latin and less Greek. Hence we have in botanical science a mushroom growth of such names as "Parkensis," "Yellowstonensis," "graminoides," "Neowashingtonia," and the like, which should cause a blush of shame on the part of each and every one of their perpetrators.

Dr. Clements recommends that as the language of science is admittedly Latin, we should decline to admit generic or specific names that are not either Latin or Latinized Greek words. This will dispose of all so-called "caconyms" and result in a much purer and more effective nomenclature. Some of his recommendations seem to the reviewer a trifle too radical, for example, the rule abolishing the use of personal specific names, and that declaring against the use of anagrams. Few of these propositions could be effectively made retroactive; but as rules for future practice they should commend themselves to the attention of all serious-minded taxonomists. C. L. P.



Road to the village of the Caroline Islanders on the Island of Guam. The vegetation on the left is the verbenaceous shrub *Clerodendron inermis*.

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Extracts from the Note-Book of a Naturalist on the Island of Guam.—III.*

BY WILLIAM E. SAFFORD.

August 16, 1899.—Frequent showers throughout the day. Began to prepare my garden for planting the seed given me by Mr. Haughs and other friends in Honolulu. Put the blue water-lily seed in a bowl of water. Ground damp; surface covered in many places in the plaza by a green gelatinous lichen or alga; examined some of the archives in the palace and found them damp and soggy, paper eaten in places by termites and edges mildewed, but ink good and black; the writing for the most part beautiful; earliest record observed, the trial of a governor for having given supplies, in 1710, to an English corsair, who was "not only an enemy of Spain, but a heretic as well, and a subject of the Protestant Queen Anna." Some of the letter-books of the Spanish governors very interesting, revealing the Spanish colonial policy and the various experiments of the governors in trying to make the Marianne Islands self-supporting. These letter-books began after the independence of Spanish America, when the government of the islands was transferred from Mexico to Manila. Fitted a room in the second story of the palace for my office.

The governor this day issued two orders, the first prohibiting the sale or issuing of intoxicating spirituous liquors in this island to any person

* Continued from October, 1902, issue. Begun in September, 1902.

who was not a resident of the island prior to August 7, 1899; and the second prohibiting on and after September 15 the importation of whisky, brandy, rum, gin, aguardiente, or other intoxicating spirituous liquors, except by special license issued by the government. These orders became necessary by the cheapness of the liquor distilled by the natives from the fermented sap of the coconut palm, of which the supply is practically unlimited, and which has had a very bad effect upon a number of the *Yosemite's* crew visiting the shore.

Monday, August 21.—This is the first day since our arrival without afternoon showers. Shoes and books mouldy from the dampness; vegetation in plaza growing rank and dense close to my windows.

Went with my secretary, José de Torres, to the hill back of the city of Agaña. Walking south through the quarter known as San Ramon, we took the road which leads to the inland village of Sinahaña. As we were about to ascend the hill, a native past middle age came out of a picturesque house of masonry, a little man with most polished manners, who introduced himself as Don José Herrero, saying that he celebrated making my acquaintance, and placed himself and his house at my disposition. I found Don José to be very well informed about island history, and was very much entertained by his conversation. He joined us in our walk and took us to his ranch on the edge of the high land overlooking the town. The slope behind the palace is covered with a fine grove of coconuts planted by his father, Captain José Ganga-Herrero, who was governor of the islands just after the independence of Mexico.

Near Don José's house was a small plantation of coffee loaded with fruit. On the left-hand side of the road up the hill a shrubby Bauhinia with bilobed leaves and large pale yellow, ill-smelling flowers; dense thicket of lemoncito (*Triphasia aurantiola*) not now in bloom, thorny shrubs with glossy trifoliolate leaves, sending up shoots from the roots and consequently well adapted for hedges. Found a few lemoncito berries remaining on the bushes, orange-scarlet in color, filled with a somewhat gummy, bitter-sweet pulp, with a flavor like Curaçao liquor. Don José said that the fruit makes an excellent *dulce* when boiled with sugar, but that it is somewhat astringent; climbing among the bushes, vines of *Abrus precatorius*, with delicate, pinnate leaves, clusters of pale purple flowers, and pods the ripe ones of which had burst open, showing bright scarlet seeds; wild ginger common (*Zingiber zerumbet*); many bushes of Clerodendron and the introduced "Tintan-china," a Cestrum with dark-colored berries; *Urena lobata*, called "Dádangsi" by the natives, a shrubby malvaceous plant with palmately lobed leaves and tough stems, not now in bloom.

Path steep; on top of hill Don José's ranch; in a small thatched hut a wooden cross, before which Don José reverently bowed and said a

prayer. Near by a fine field of maize, patches of pumpkins, small water-melons, beans, mandioca, and egg-plant. Around the garden-patches were strips of bark of *Hibiscus tiliaceus*, like a long ribbon, forming an enclosure. These are for the purpose of keeping out the deer, which are very abundant on the island and do great harm to the maize and to young coconuts; it seems strange that they will not cross the ribbons of bark. Although more than sixty years of age, Don José is very active; he climbed a coconut tree and brought me a young nut to drink. At the brow of the hill the Sinahaña road passes through a deep cut; across this a tangled thicket of lemoncito and wild yams, several calabash trees (*Crescentia alata*) marking the site of an ancient ranch, a number of *Anona reticulata* trees, reminding me of our papaws (Asimina), and a few screw-pines of the species called "Kafô" by the natives. Cutting our way through the thicket we came to the crest of the hill, from which we had a most magnificent view of the town below, the palm-fringed beach, the turquoise-colored lagoon and the line of milk-white breakers separating it from the indigo sea. On our right lay the broad valley almost entirely taken up by the "Cienaga," or swamp, through which the Agaña River makes its way seaward. Made up my mind to buy this hill-top, if possible. Don José said it is the property of his nephew Don Vicente Herrero, who makes no use of it, and that it is very stony and fit for nothing but raising chickens.

Down the hill to Don José's house, where we stopped for a cup of chocolate. The cacao was grown on a ranch owned by Don José in a sheltered valley near Fonte, not far from the village of Sinahaña. The chocolate beans had been toasted by one of his daughters, ground on a stone *metate* with a cylindrical stone *mano* (utensils introduced in the early days from Mexico together with maize and cacao), and thickened in its preparation by flour or arrowroot. It was of fine flavor. With the chocolate was served excellent bread and butter, the bread made from flour imported from the United States and the butter from some passing ship (tinned). One of Don José's daughters was married this morning to Shebata, the Japanese merchant, a most respectable young man. Before his marriage he was baptised by Father Palomo, receiving the baptismal name of José. Accompanied Don José in the evening to the home of his daughter Doña Joaquina de Kaminga, where the newly-married couple were staying. Don José took with him his violin and two of his sons took a guitar and mandolin. It was delightful to hear the lively old gentleman play the "Fisher's Hornpipe" and "Rory O'More," tunes he had learned in the palmy days when scores of whaling vessels used to visit Guam each year, and when the crews would come ashore for relaxation after their long and arduous cruises, "often dancing all night," said Don José, "and spending money like water." After the assembled company had

danced a few waltzes, Don José's youngest son, Jesús, was prevailed upon to dance a fandango, which the little fellow did most gracefully.

August 22.—The first day of good weather since our arrival. Company A of Marines were transferred from the *Yosemite* to Agaña, taking up their quarters in the recently built school house, the "Colegio de San Juan de Letran." This building was constructed from an endowment fund bestowed on these islands in 1673 by Maria Ana of Austria (after whom the Marianne Islands were named), the second wife of Philip IV. It is interesting to note that the benefits from it were enjoyed by the natives down to the time of the American occupation. Captain Ingate, of the Marine Corps, took up his residence in Agaña; brought with him his zither; we passed the evening very pleasantly at my quarters playing zither duets.

The Governor has issued the following order, dated yesterday: "For the protection of Government interests and as a safeguard for the residents of Guam against the machinations, devices, and schemes of speculators and adventurers, it is hereby ordered that all persons who claim ownership of land in this island or its dependencies are prohibited from selling or transferring any portion of such property without first obtaining the consent of the Government. Violation of this order may be punished by fine or imprisonment, or both."

Thursday, August 24.—Good weather; no rain. To Lake Matanhanom, the source of the Agaña River, to plant the blue water-lily seeds, which have sprouted; enclosed them in balls of soft mud and sunk them in the lake; saw a number of fish in the lake; near by, a plantation of cacao and a patch of Manila hemp (*Musa textilis*) growing rankly without care; these planted here several years ago by an agricultural society; the Musa, here called "Abaká" as in the Philippines, not utilized by the natives, who have very good textiles for their ordinary needs in Hibiscus bark and Pandanus leaves; not far from lake patches of pineapples, apparently perennial; the swamp through which the river oozes apparently a former lagoon; hillocks now rise from it like islets on which grow coconut and betel-nut palms; noticed a fine mango tree on the border of swamp; natives had built fires under it and had hacked the trunk and larger limbs, for the purpose, they said, of making it bear. The mangos do not bear well here; some years the crop is a failure; mangos more highly prized than any other fruit.

Saturday, August 26.—No rain. Up at dawn. From my window I saw a procession pass. The priest, carried in a sedan chair, was going to administer the sacrament to some dying person. All the natives are Catholics. I was struck with the perfect assurance they seem to feel that those who die enter into a future life, and that for their ultimate happiness they need simply a good confession and the last rites of the

Fig. 1. above, village of the Caroline Islanders on the Island of Guam; fig. 2. a native dance of these people.

Church. This is indeed a comfort, especially for those they leave behind. At the death of a little child the bells are rung as though for a wedding, and frequently the most cheerful music is played on a violin or other musical instrument as the procession leaves the church.

On my wheel to Punta Piti, the landing place of the port. Road good as far as the village of Asan; beyond it had to dismount in places and wade through mud; breakfast at Don José Wilson's: eggs, coffee, and tortilla; island coffee excellent; in canoe to ship; water smooth; fine view of the living coral on the bottom and hosts of bright-colored fishes, deep-blue starfishes, and creeping holothurians; passed very close to Apapa or Goat Island, and noticed the rich vegetation; signal flags on various points about the harbor, erected by the surveying party of the *Yosemite*. Arriving on board, found awaiting me an invitation from the priest of Agat to attend a *fiesta* of the patron saint of his village, Santa Rosa de Lima, to be given the last day of the month. The natives have been looking forward to this for some time. The Governor, however, has issued the following order: "Public celebrations of feast-days of the patron saints of villages, etc., will not be permitted. The Church and its members may celebrate their religious feast-days within the walls of the church, chapel, or private residence in accordance with regulations for the maintenance of public peace; and unless otherwise ordered, the only public holidays recognized will be Sundays, and the holidays authorized by the United States Statute Laws, and by the proclamations of His Excellency, the President of the United States." This order has caused great disappointment among the natives, many of whom make each feast-day an excuse for stopping all work, usually prolonging the celebration two or three days.

Sunday, August 27.— Called on Don Juan de Torres, Auditor of the Treasury. He lives in a large house of masonry not far from the beach; met his wife Doña Juliana Perez. The rooms of Don Juan's house are very large; the floors of polished Afzelia wood; some of the furniture is of island manufacture and the rest brought from Manila by some former governor; a piano of good tone and in remarkably good tune (Don Juan's brother is an accomplished musician); a good library, including the various codes — criminal, commercial, and civil — of the Spanish colonies, also works on natural history. In the grounds surrounding the house many introduced trees, shrubs, and flowering plants, including the fragrant *Lawsonia alba*, called "Cinamomo" by the natives, and the climbing Asclepiadaceous plant *Pergularia odoratissima*, called "Mil-leguas" (Thousand-leagues) from the great distance to which its spicy odor reaches. Got cuttings of these plants for my garden. Among the flowers growing in pots and boxes Doña Juliana had tuberoses, dahlias, and carnations. Jasmines and several ornamental Codiæums, Panax, Grapto-

phyllum, and an ilangilang tree grew near the door. In the afternoon visited the cock-pit with several officers from the ships, but soon left. Cock-fighting is the only amusement of the natives; it seems to me to be a cruel and degrading sport. The most eager better at the fight was a Filipino named Angeles, an excellent cabinet-maker, beneath whose house there are always a dozen cocks tethered to stakes, crowing and trying to get at one another.

Leaving the cock-pit, Ingate and I walked to the village of the Caroline Islanders, who have been living for a number of years on this island. A number of these people sought refuge here in 1849, the islands on which they lived having been swept by great waves caused by earthquake. These people do not cultivate the soil. They live on fish, shellfish, wild yams, bread-fruit, bananas, plantains, and other fruits, and occasionally eat pork and chickens. None of those living on this island are Catholics. They speak their own language, retain their primitive customs, and have not intermarried with the people of Guam. Their houses are not raised from the ground; they are the poorest habitations I have ever seen with the exception of those of the Tierra del Fuegians; they have no floor, not even a pavement of gravel, but sleep on the ground. Yet there seems to be little sickness among them, and most of them have splendid physiques. Both the men and women performed a dance for us; going through certain motions and giving utterance to a sort of monotonous chant, slapping their bodies, and winding up with bursts of laughter. Some of the women had painted their faces with turmeric and annatto (*Bixa orellana*), plants and trees of which we saw growing near their village. They hesitated to give us coconuts to drink, because, as we afterwards learned, the coconut trees did not belong to them. Saw a pit in which fermenting bread-fruit was stored, and saw them make the ill-smelling stuff into cakes and bake them. They had plenty of chickens and pigs, the latter of which were tethered to stakes.

The Carolinos have the lobes of their ears perforated and the holes so distended that they hang like loops. Suspended from the loops they frequently wear heavy skeins of beads and discs of tortoise-shell, and sometimes they utilize them for carrying their cigars or other articles. The men wear only a sort of V-shaped bandage, passing around the waist and between the legs. The women wear a pliable mat reaching from the waist to the knees, held in place by a broad belt, which is often ornamented with artistic rectangular designs, and most of them wear beads of shell and coconut shell about the neck. Some of them wear their hair long and coiled at the back of the head, others wear it loose and bushy. The men wear their hair short. It is usually curly but not woolly. Sometimes it is straight and glossy. They anoint it with coconut oil, and often wear a scarlet hibiscus or some other bright-colored

flower in it. Indeed both the men and women are fond of wearing flowers and fragrant leaves. In Plate 5 are three Caroline Islanders adorned with flowers and leaves according to their custom when going to the city. The women carry a small finely-woven bag strapped to their waist, in which they carry their tobacco and betel nut outfit.

The Guam people treat the Caroline Islanders kindly, but look down upon them as savages and heathen. On one occasion I asked a Chamorro lady why the ladies of Guam do not wear flowers in their hair when going to a fandango. She replied: "Why, Señor, do you take us for Carolinas!" Some of the Carolinos are beginning to wear clothing when coming to the city, having been told that the Americans objected to their scanty costume. It looks indecent to see a trouserless man walking along the streets wearing a modern hat and a white shirt which conceals his breech-cloth; whereas, in his native costume, his brown skin seems to clothe him amply.

[In Saipan, one of the northern islands of this group, a colony of Carolinas has been living for many years (since 1839). These are said to be more civilized than those living in Guam. In one of the letter-books of the Guam archives I came across a communication made in 1849 by the Governor, Don Pablo Perez, to his superior, the Captain General of the Philippines. Don Pablo had just returned from a visit of inspection to the northern islands of the group. He reported that the Caroline Islanders established on Saipan showed evidence of becoming somewhat civilized. He examined the boys and girls in the school in reading and in the Christian Doctrine and found them "like parrots which talk without understanding what they say, but showing evidence of zeal and careful attention on the part of the school-master." The absence of priests from that island, he said, would make them slow in fitting themselves for receiving the water of Holy Baptism; but he charged earnestly the alcalde and the school-master to devote all possible care to the improvement of the Carolinos under their charge, and above all, to keep an eye upon their morals. A few days after his return from the tour of inspection a canoe arrived at Guam with eight Caroline Islanders from the island of Satawal, about 450 sea miles S. S. E. of Guam, and on the next day two more canoes of the same kind arrived from the island of "Lamuseg," one with ten men and fifteen women and the other with ten men and six women, all in a state of misery and almost dead from hunger and exposure. They were cared for by order of the governor, and permission was given for them to remain in these islands. "This emigration, from the evidence I was able to get from them," says the governor, "was caused by a great earthquake followed by an inundation, which swept over the island for several hours, destroying all their crops and the greater part of their fruit trees, in consequence of which the survivors, including those

arriving here and a few others who for lack of boats remained in the stricken islands, decided to migrate. Many had perished in the flood and others who had tried to save themselves by climbing trees were swept away by huge waves.'' They said that after they had regained sufficient strength some of their number wished to return to bring back all those left behind. From the statements of these people the governor came to the conclusion that the earthquake which had wrecked the islands of the refugees was that of the 25th of the preceding January, which had caused great damage to the island of Guam.]*

[TO BE CONTINUED.]

Notes on the Flora of Central Chile.

By George T. Hastings.

Northern Chile is a desert; southern Chile a forest. Central Chile has the cacti and thorny shrubs of the desert and many of the trees and plants of the south. Irrigation is necessary if crops are to be grown, since rain falls only in winter. The fields and lower mountain slopes, which are green and covered with flowers in early spring, become dry and gray when summer begins.

With the exception of an acacia (*A. Cavenia*), a small tree rarely exceeding twenty feet in height, which grows in the desert soil, trees are only found along the rivers. The trees of central Chile belong mostly to orders not represented in the eastern United States — Monimiaceae, Lauraceae, Myrtaceae, etc. The only amentiferous tree is a willow (*S. Humboldtiana*); maples, elms, basswoods, and conifers are absent, and the Rosaceae are represented by only two genera and three species of dry-fruited trees, one of which, the quillai or soap-bark (*Quillaja saponaria*) is probably the best known tree of the region. The bark of this tree is used in large quantities for washing woolens and silk and as a hair tonic, and it, or an extract of it, is exported in considerable quantities. The wood is soft but durable, and is much used for the heavy carved stirrups used in the country as well as in constructing carts, houses, etc.

The shrubs represent a great variety of orders, the greater number being thorny. In fact the prevailing type of vegetation on the hills and lower mountain slopes are thorny shrubs. Some of the Compositae are of this class and many shrubby Umbelliferae have the leaves reduced to pinnate thorns.

Owing to the nature of the country — presenting in close proximity

*The bracketed portion of text is an addition to the Journal made at a later date.—W. E. S.

seacoast, plains, valleys, and snow-capped mountains — species are relatively numerous; individuals, nevertheless, are few. One misses the meadows, woods, and roadsides with their luxuriant vegetation, and instead wanders over hillsides covered with scattered bushes, finding here a little red amaryllis, there a white lily and farther on a yellow calceolaria, a tiny composite, or one of the Umbelliferae, but a second specimen of the same species may not be found in an afternoon's botanizing. In the mountains it is somewhat better, for near the rivers and brooks the vegetation is more abundant, with here and there a level, swampy tract crowded with species of Hydrocotyle, Ranunculus, Portulaca, mustards, grasses, sedges, and rushes and shaded by the magnolia, *Drimys Winterii*.

On the dry mountain sides are cacti, some tall and columnar, others low and globular, but all to be avoided. There is also the *puya*, one of the Bromeliaceae, with yard-long leaves edged with sharp, curved teeth, and a stout stalk five or six feet high bearing a great bunch of blue-green blossoms.

One finds with these some curious Compositae—some shrubby, others climbing, often bilabiate, with brilliant heads of deep red or yellow flowers; large clumps of calceolarias, red, yellow, orange, or mottled; with occasionally a small quillai tree, or a *litie*, an ally both in family and properties of the poison sumac.

The timber line is not sharply defined, as trees and large bushes are so scattered, but when one reaches the narrow-leaved *Kageneckia*, one of the Rosaceae, it means the limit of tree growth. Here is often found clumps of a low bush with inflated, triangular pods, a representative of the maple family, and also tufts of thorny Umbelliferae, dwarf Compositae, delicate little red or yellow oxalis, and here and there a beautiful pink or red amaryllis, with several small blossoms, and sometimes also a species with one large flower on a naked stalk.

A very noticeable order cultivated in the United States, native here, is the Tropaeolaceae, the nasturtium family. It consists of one genus with numerous species, all attractive plants, some very showy. The Myrtaceae includes several trees and shrubs, all aromatic, with large clusters of white flowers.

The Loranthaceae comprise a number of very showy parasites. One leafless species grows on the cactus and has large clusters of red flowers. It is mistaken by the natives for cactus flowers.

The only Gymnosperm of this region is one of the Gnetaceae (*Ephedra Andina*), an equisetum-like shrub; in the south however are araucarias and cypress.

The Compositae are very abundant and nearly one-third are bilabiate.

A very interesting genus is Calandrinia, of which some one hundred

and fifty species have been described for Chile; they bear showy red, pink, or white flowers. Some species are found in the low foothills, others grow at the edge of snowbanks high in the mountains. Calceolarias are found everywhere—some are small shrubs, others herbaceous, all have small flowers; but as the flower-clusters are large they are nearly as showy as the greenhouse varieties.

The Liliaceae, Amaryllidaceae, Oxalidaceae, Euphorbiaceae, and Violaceae are all more numerous than in the eastern United States. The Violaceae especially have some peculiar species—some are shrubby, others near the line of perpetual snow are of an arctic type, the tiny leaves covered with soft hairs and the dark purple blossoms scarcely a quarter of an inch across. To pick a bunch of violets would be very difficult, even from the shrubby forms, for they, like all other plants, are widely scattered.

The only milkweed I have found is a delicate vine with inconspicuous flowers. The Ericaceae is represented by only a few species, all in the south. Rosaceae and Ranunculaceae are not numerous. The tree forms of the Urticaceae are entirely absent, as are also hickories and walnuts. Orchids are rare and usually green or white with small blossoms. No arums are found in the country. Sedges are few, but grasses make fully as large a proportion of the plants as in other parts of the world.

Although represented by different genera, here as in the United States, the great dominant orders are: Compositae, Gramineae, Leguminosae, Rosaceae, Liliaceae, Scrophulariaceae, Labiatae, Umbelliferae, and Cruciferae.

Instituto Ingles, Santiago de Chile.

Conditions of Plant Growth on the Isle of Pines.

By W. W. Rowlee.

The Isle of Pines has an area of nearly a thousand square miles. It is about one-fifth as large as Jamaica and is as large as all the other islands that immediately surround Cuba would be if put together. It lies about thirty miles south of western Cuba, from which it is separated by a very shallow archipelago, the islands of which are small coral keys covered for the most part with a dense growth of mangrove. The island lies on the southern verge of the plateau, the northern part of which is the

Hastings on the Flora of Chile.

The two figures show the same scene taken near Santiago; the upper in the moist, the lower in the dry season.

island of Cuba. From its southern shore the sea bottom rapidly descends to the immense depths of the Caribbean Sea. Against it constantly beats the equatorial current from the southeast as it passes through the Strait of Yucatan into the Gulf of Mexico. That this stream is an important agency in the dissemination of plants throughout the Antillean region can not be doubted. It is here that Humboldt found the Palms and Pines meeting, the former characteristic of the tropics, the latter of the north temperate regions.

The Isle of Pines is nearly bisected by a bay which penetrates nearly one-half way across the island from its western side, and from the head of this bay swampy land stretches almost continuously to the eastern shore.

The southern part is rocky but not mountainous, and according to reports is heavily timbered with hard woods, such as mahogany, West Indian Cedar, Sabicu, Granadilla and other valuable timber trees. The harborless sea shore and the almost impassable swamp have rendered these forests so inaccessible as to prevent their exploitation.

The northern and larger part of the island consists of a rolling tableland in its highest parts scarcely more than 300 feet above tide. The most conspicuous physiographic feature of this part of the island are the mountains, which rise abruptly in isolated masses from this tableland to a height of from 500 to 1600 feet. The principal ones are Sierra Canada, Sierra Caballos, and Sierra Casas. The last two form parallel chains several miles in length extending north and south in the northern part of the island and end in abrupt headlands near the sea. The mountains are peculiar in that they rise very abruptly from the plain, their lower slopes being almost perpendicular masses of broken rock. There are no foot-hills and the statement made by residents on the island that the surface water on the plains drains toward the mountains is apparently true. The rock is a metamorphosed limestone, in many places affording beautiful marble. The marble of which Morro Castle at Havana is built was quarried on this island. The mountains have scarcely any soil and but little humus, yet support an abundant vegetation over their entire surface.

The soil of the plains is quite varied. It is porous but not sandy, and is fertile. In the valleys it is dark and supports a dense vegetation. The flora of the island taken as a whole is xerophytic in its tendency. Upon the mountains this tendency manifests itself most strikingly. Not only do plants grow upon the naked rocks but many plants such as bromelias, orchids and aroids grow upon the trees and shrubs without any direct connection with terra firma. Among the trees here were species of Clusia, Ficus, and Cecropia, as well as others not identified. On the rocks mingled with them were Plumerias, Bilbergias, Fourcroyas

and Cacti in great profusion. Palms were abundant particularly on the perpendicular faces of the mountains, and were kept in constant motion by the sea breeze.

The flora of the mountains is very different from that of the plains, and strangely enough the pines are confined to the plains. To the ecologist the mountains afford a most interesting study and there also remains much to be done before anything like a satisfactory list of the species can be written. The island is completely surrounded by a mangrove zone. Here as elsewhere it is the plant that reclaims the sea. The ocean current and tide sweeps through it, carrying the debris from other lands and the roots of the mangrove retain it. It is practically a pure growth, as few other plants can exist under such conditions. It is limited inland by tide water and is the favorite abode of the cayman, many of which may be seen from a ship in passing. Immediately behind the mangrove zone comes a belt of palms, among which are small savannahs in which grasses and sedges form a sward. Nowhere else in the trip were seen such numbers and varieties of palms growing. It reminded one of the palms of the Amazon. Some were palmetto-like, others bore pinnate leaves. Very few were in flower at the time of our visit in January, and the time at our disposal did not warrant our trying to identify them.

Three regions not sharply delimited may be distinguished in the interior of the northern part of the island — the savannahs, the pine lands, and the stream banks.

The Malpais River is so named from the wet savannahs in the central part of the island through which it flows. The savannahs also extend to the uplands and have steadily increased in size as the natives have burned them over to improve the pasturage. Besides sedges and grasses there are many other herbaceous plants, especially species of Leguminosae. They make up a thick sward. All show by their form and the texture and vesture of their leaves a decidedly zerophytic adaptation. Scattered everywhere through the savannahs are arborescent palms, mostly of the palmetto type. One species with perfectly rotate leaves and fibrous sheathing bases to their petioles was everywhere seen. Its identity has not yet been determined. The sheaths enclosed each other on the stem and when separated had the appearance of fibrous cornucopias. Thirty to fifty could be taken from one plant.

The pine lands resemble those of our own gulf region. The pine predominates over considerable areas. They are best developed on the higher ground. They have palms mingled with them everywhere, especially in the lower lands. The kinds of pine have been discussed by the writer in another place. There has been heretofore little done upon their affinity, but in general they have been referred to *Pinus cubensis*.

The natives distinguish several kinds and select certain ones for construction. In many of them are large black termites' nests. Not only does the termite infest the island, but ordinary ants are present in large numbers and build large mounds in the savannahs and pine lands. They are a serious obstacle to agricultural pursuits and have been beyond doubt an important factor in determining the character of the native vegetation.

Finally, along the streams the vegetation shows the least zerophytic tendency, and closely approaches the conditions found in humid tropical regions. Several plants of the Banana family occur here, also many ferns and orchids. The trees are mostly broad-leaved and large. Palms abound, also shrubs of many kinds. The soil is rich and very porous. If it were not for the overflow in the rainy season, its agricultural value would be very great.

In conclusion, it may be said that the island presents the greatest diversity of conditions. The agriculture of the island although in a primitive condition shows this. Tomatoes, potatoes and other crops grown in the north grow well and at the same time oranges, mamey, guava and all sorts of tropical fruits flourish. It may be truly said that here the vegetation of the temperate and tropical zones meet.

THE timber consumption for railway ties and telegraph poles equals the timber crop for 1,000 acres of virgin forest.

THE navel orange has been known in this country for some thirty-odd years and is often spoken of as a recent production. As a matter of fact it has been known for considerably over two hundred years, the first reference to it, so far as known, being in the large ten-volume work on trees and fruits published by John Johnson in 1662. The Bahia navel orange is still cultivated in Bahia, "where it is regarded as superior to other varieties cultivated in the province."

THE list of officers for the Gray Memorial Botanical Chapter of the Agassiz Association for the year 1903 is as follows: President, Mr. Chas. C. Plitt, Baltimore, Md.; General Secretary, Mr. George P. Ells, Norwalk, Conn.; Treasurer, Mr. Roscoe J. Weble, Garrettsville, Ohio. The Executive Council consist of the above and Mr. J. Ford Sempers, Aiken, Md.; Mr. J. C. Buchheister, Griffins Corners, N. Y. We are asked to state that any earnest student of botany is eligible to membership in the Chapter. The work is conducted by correspondence, and those interested may obtain full information by addressing either of the officers.

Briefer Articles.

A BOTANISTS' MECCA.

NOT long ago I was interested in looking over the package of Hart's-tongue, *Phyllitis scolopendrium* (or *Scolopendrium vulgare*, as it is more commonly known) preserved in the D. C. Eaton herbarium at Yale University, to note what a good proportion of our noted botanists have made this fern an object of especial search at out-of-the-way Chittenango Falls, Madison County, New York. There were fronds collected by Dr. Torrey, and others by Clinton in 1863. Some were marked by the familiar initials D. C. E. to indicate the late Professor Eaton's pilgrimage; and still others there were, collected by Dr. Underwood. Indeed, it was the collecting of the Hart's-tongue here and in the Jamesville region nearby that aroused in the latter botanist that interest in fern study which has made it his chosen specialty.

It seemed so likely that Dr. Gray from his home in Oneida County, adjoining, must also have visited the Falls that I was prompted to inquire whether specimens of his collecting were to be found in the Gray Herbarium at Harvard. This proved to be the case; and I have since learned from Mr. G. S. Miller, jr., of at least one visit Dr. Gray made to the Falls in company with the former's grandfather.

The whole region is one of extreme interest botanically, and only last summer a party consisting of Dr. and Mrs. Britton and other members of the Torrey Botanical Club, with Dr. Underwood as guide, paid the Jamesville locality a visit. It was here, too, that Paine made his investigations on the rarity of the fern, in the early '60s; and it is safe to say that many other botanists, besides numerous amateurs, of whose specimens we have not such definite records, have enjoyed similar expeditions.

U. S. National Museum, Washington, D. C. WILLIAM R. MAXON.

GERMINATION OF THE COCOANUT.

AS THE cocoanut comes to our markets it is deprived of its husk. This husk is of a coarse fibrous structure and covers the nut so thickly that in its original form the fruit is broadly oval, the nut occupying an excentric position with the "eyes" directed toward the stem end of the fruit. In its natural habitat the cocoa palm grows abundantly near the water, and as the fruit falls from the tree it often floats about until it comes to rest in some shallow place and there germinates. The husk not only makes the fruit lighter, but probably serves under any condition by virtue of its absorptive quality to keep the seed more moist and so facilitate germination. Many of the nuts imported in the husk for our work were germi-

nated by keeping them about half covered with earth, saturated, and at tropical temperature.

The germ of the nut is to be found under one of the so-called "eyes" at the end. The longitudinal ridges separate the hard coat into three parts, which evidently were once the three parts of an ovary which bore three seeds, one for each division or carpel. The seeds have become reduced to one, which fills all the space within the hard shell which is in reality a part of the ovary wall. The fertile carpel may be detected as the one lying in the largest angle formed by the divergent ridges at the end of the nut.

When the nuts are kept under proper cultural conditions for about three months the first signs of germination will be evident by the appearance of the shoot through the husk above and the roots below. By this time the germ, which is in its resting condition cylindrical and lying perpendicular to the surface of the nut, has elongated and pushed its inner end into the cavity of the nut and the other end outward. The outer end develops the stem and roots. The inner end expands into an oval body which ultimately, after about ten months, fills the entire cavity. This expanded inner end is the cotyledon, which functions as an absorbing organ. Wherever this cotyledon comes in contact with the meat of the nut it softens, dissolves, and finally absorbs it. The surface of the organ is covered with villiform structures and corrugations which give it much the appearance of a stomach turned inside out, and as far as function goes that is just what it amounts to. Wherever the endosperm has not been attacked by the cotyledon it remains as palatable as ever and apparently unaltered.

* * * * * * * *

The food reserve in the cocoanut lasts about a year after germination has begun. During this time the plant gets much of its nutriment from the soil and the air. The proportion of water diminishes from the cotyledon to the tips of the leaves and there is a corresponding increase in the amount of solid matter. The substance of the cotyledon, the stem and the roots, contains much more mineral matter than is to be found in the endosperm and the leaves. The problems of nutrition in this plant which are suggested by these observations have not yet been attacked, but they will no doubt afford some very interesting facts at some future date.—*J. E. Kirkwood, in School Science.*

At a recent meeting of the Torrey Botanical Club Dr. H. H. Rusby described a curious floating orchid of the genus Habenaria which he found in the Delta of the Orinoco. This plant was growing where the water beneath was fifteen feet deep.

The Wild Flower Preservation Society of America.

POPULAR interest in nature study is usually at its lowest ebb in winter time, when the attention is apt to be absorbed by other things. It is gratifying therefore that the Society is still gaining ground and enrolling new members from all parts of the country. A circular letter has been prepared, calling attention to the work of the Society and its future aims, and this letter will be sent to as many teachers as possible. All of our present members are earnestly requested to cooperate by sending to the secretary lists of persons who should receive these letters and the literature published by the Society.

THE movement for the increase of public parks in various municipalities will be actively pushed. In many cases the only effective method of protecting a station for a rare plant is by setting the region aside as a park and placing it under police surveillance. The value of municipal cooperation in this respect is well illustrated in the city of Washington, where the National Rock Creek Park, a tract of many acres, in absolutely wild condition, is one of the most attractive regions in which to observe the native flora. The valley of the upper Potomac, on the other hand, though naturally much more attractive in flora and scenery, is being rapidly denuded of its rarer plants, being without protection of any sort. Efforts are now being made to have this region also set aside as a park.

WHEN the spring comes it behooves the teachers of nature-study classes to exercise great care in their choice of plants for analysis. The average school course does not require a wide variety of material, and it is nearly always possible to find some common species to illustrate every group under investigation. Do not even run the risk of showing a bunch of rare orchids to your class, for the chances are that one of them will make a visit to the spot later and gather every one of the blossoms. Better a little deficiency in the knowledge of structural relationships and a stronger appreciation of plant life as a whole. These may seem to be trivial observations, but it must be remembered that all such considerations are novel to the average child intelligence, and that general mental training is really the most important factor of education.

BY AN accidental error, we omitted to state that the article by Miss Messenger on "The Preservation of Our Native Plants," in the January issue, was published through the courtesy of the New York Botanical Garden.

Editorial.

WITH the completion of Mr. Pollard's work on the "Families of Flowering Plants," which we have printed in serial form as a supplement to this journal during the past three years, there have come to us numerous requests for the book as a separate bound volume. We have about one hundred and fifty sets of the supplement, and our first intention was to offer this stock for sale at once. But owing to the difficulties experienced with incompetent printers, the pagination, chapter headings, etc., of the brochures contain many errors, and they are printed on two different grades of paper. We have therefore decided to sell no copies whatever of the present supplement. Instead we shall have the edition neatly bound in paper, and will offer one copy free to every one raising a club of five new subscribers, in addition to the regular agent's commission of twenty per cent on each subscription. These copies will be ready about March 15. In the meantime it is Mr. Pollard's intention to thoroughly revise the supplement, to insert additional matter and new illustrations wherever necessary, and to publish the book during the coming year.

PURSUING further the subject of popular plant names, we reprint herewith the letter to which we referred in the January issue of THE PLANT WORLD, sent to us by the Chairman of the Nomenclature Committee of the Botanical Club, American Association for the Advancement of Science. The writer's name is withheld.

WASHINGTON, D. C., *Dec. 14, 1902.*

Prof. N. L. BRITTON,

DEAR SIR: Pardon me, a stranger, for addressing you, but I hope the nature of my message will justify me. I know not to whom I could more appropriately write on this matter.

I, for one, desire a single English name for each plant for use among English-speaking people throughout the United States. You have already set a good example, so far as circumstances would permit. What we want now is a committee appointed by some national botanical authority, say here in Washington this month, to eliminate all the English or vernacular names but one for each plant, so that when asked by a non-botanist what a given plant is we could, like the ornithologists, give confidently and definitely its single name, adding, when there is occasion or opportunity, that it is known by other names in other localities, but "the botanists have concluded to adopt this one to the exclusion of all others for all the United States," or words to this effect. This would be more satisfactory to both the inquirer and the instructor, and would do a little, I think, in the direction of "popularizing science," which has been my specialty ("hobby") for the last forty years.

I hope such a committee will be appointed by the botanists here this month. I, for one, would be willing for you to act alone as such a committee; indeed, I would greatly prefer it. The bird men, although they have an almost fixed scientific name for each bird, scarcely ever use it, such is the fixedness of the vernacular name, while we botanists have no fixed nomenclature, either scientific or vernacular!

I am aware that in any given locality we have about five times as many species of plants as of birds; but this fact is really no objection or even obstacle to the utility of a fixed vernacular. I have lately concluded that it is good for every nation to have a fixed vernacular name for every species in "natural history." Respectfully yours, —— ——.

It would undoubtedly go far toward popularizing the science of botany if all or even the majority of our plants were known each by a single vernacular name. It is not, however, strictly true that in the sister science of ornithology the common names are "fixed." The flicker or yellowhammer is known by as many or more aliases than are some of our plants, while many birds, such as the chewink or towhee, are provided with two names of more or less general usage. Popular plant names arise to satisfy local necessities, and are the result of local conditions. It would be difficult to fasten an alien name upon the people of any given community, and the process of unifying popular plant nomenclature would be quite as impossible as the attempt a few years ago to establish Volapük as the universal language. There is a step in the right direction, however, which can easily be taken, and we have expressed ourselves strongly in its favor in these columns heretofore. We refer to the use of the generic name of the plant as its common name. There is now a long list of these in general use, many of them out-and-out Greek or Latin words, such as Rhododendron, Chrysanthemum, Verbena, Magnolia, Nasturtium and the like. We can see no good reason why the list should not be greatly extended, and such names as Cyperus, Phacelia, Helianthus, Oxalis, etc., used freely for the common plants to which they belong.

While discussing this subject we can not refrain from expressing disapproval of the practice which has grown up in recent text-books of providing not merely every genus, but every species, with a so-called common name, the author manufacturing one when ignorant of any existing designation in the vernacular. Dr. Gray very wisely forebore to do this, and inserted only such explanatory names as were in actual use. These creations could not possibly be employed, either in conversation or in literature. Suppose an author were to begin the account of a botanical trip with the following:

"After a long walk I came to the edge of an attractive bog filled with Knieskern's Smooth-fruited Beak-Rush, and the Weak-stalked Club-Rush. Thinking that closer exploration might result in finding the dainty Apic-

ulate Blue-eyed Grass and the Clasping-leaved Twisted-Stalk, I worked over the region very thoroughly, and was rewarded by the discovery also of a little pool containing Drouet's White Water-Crowfoot and the Alga-like Pondweed."

The above names were taken at random from one of our standard manuals. Can any one imagine what would become of the literature of popular botany if such horrible phrases were to be taken seriously? It may have seemed to some of our readers that we admit technical names too freely to our pages; and one of our aspiring contemporaries has invented the marvellous adjective "untechnical," which it applies to itself, and which it conceives THE PLANT WORLD is not. But we think that in view of the above remarks our readers will agree that scientific names are better than coined names, and that an article free from unduly technical language is always readable when it is of the right sort.

SHOE pegs use up annually the crop of 3,000 acres of the second growth of hard-wood land.

MR. G. N. COLLINS has written an interesting treatise on "The Mango in Porto Rico" (Bull. 28, Bureau Plant Industry, U. S. Dept. Agric.), in which he describes the various varieties and mode of cultivation of this valuable tropical fruit. The book is handsomely illustrated with photographs.

ACCORDING to the *St. Petersburger Zeitung*, cotton culture in one of the cotton-growing districts of Bokhara has declined in consequence of the too great eagerness of the local government to get as much revenue as possible out of the cultivators. The use of American cotton seed having given better results than were obtained from the seed of the native cotton, it seems to have been concluded that cotton-growers using the former could afford to pay a heavier tax than those employing the latter. Notice was therefore given, according to the journal named above, that future cotton plantings in which American seed was used would be taxed to the amount of one-half of the crop, whereas if native seed were used the proportion of the crop exacted would be only one-third. The result appears to be that cotton-growers are abandoning the use of American seed; for although the total crop is larger when this seed is used, the difference is not great enough to offset the heavier taxation, and the cultivator consequently gets the best returns for himself by using the less productive seed. It may be observed that a payment of one-third or one-half of the crop must be in the nature of a rent charge rather than a tax.—*Crop Reporter*.

The Home Garden and Greenhouse.

CONDUCTED BY F. H. KNOWLTON.

[The editor of this department will be glad to answer questions of a relevant nature, and also to receive short articles on any phase of this subject.]

Chrysanthemums.— The Chrysanthemums that were in such glory a few weeks ago are of course things of the past, but it is now time to be thinking of next autumn's supply. Perhaps many of our readers as they were looking over the Chrysanthemum Show last fall were moved by the impulse to try a hand at the problem, yet were discouraged at the outset by the improbability of being able to equal those on exhibition. Right here let me say that it is not at all necessary to grow so-called specimen plants in order to get the fullest amount of pleasure. A specimen plant grown to a single stem and a single gigantic flower is all right as such, but it is more or less of a monstrosity, and directly contrary to the natural habit of the plant. A plant which is permitted to retain at least six or eight strong branches, each bearing one or two flowers, is far more decorative and satisfactory under most conditions than when grown to a single stem. The latter are only effective when massed, while the former are thoroughly enjoyable everywhere. The manner of propagating chrysanthemums is very simple. In exceptional cases only are the old plants grown on to a second flowering, as the results are not satisfactory. After flowering the pots should be set aside in any convenient place, as a cellar or in a cool dark part of the greenhouse. They should not be allowed to become dust dry, but given sufficient water to keep them from drying out. Here they may remain until February or later, when they may be brought into the light and warmth and given one thorough watering and then kept moist. In a few days shoots or "suckers" will begin to come up from the underground stems. As soon as these are from 3 to 5 inches high they should be broken off, and after the removal of some of the lower leaves, plunged in the cutting box, which should be supplied with moderate bottom heat. As soon as they are rooted they should be potted in 3- or 4-inch pots, using a good soil of loam, well rotted manure, and a little sand. They should be kept growing without check, being shifted into larger pots as required. Commercially they are transferred to the benches in the greenhouse where they are to bloom, but very good results indeed may be secured by planting them out in the ground after all danger of frost is passed. They should have a good rich garden soil and plenty of water, and should be potted in large pots, disturbing the roots as little as possible, some time in September. The manner of pruning, disbudding, and subsequent flowering will be more fully described later. Small rooted cuttings of even the best varieties may be purchased for a moderate sum if one does not care to take the trouble of rooting them.

Poinsettia.—For some weeks past the florists' windows and flower stalls have been bright with the gorgeous vermilion-red leaves of the Poinsettias, or *Euphorbia pulcherrima* as it should properly be called. It is a native of tropical or subtropical portions of Mexico, where it forms under favorable conditions bushes 10 or 15 feet in diameter and 5 to 10 feet in height. It was introduced into cultivation about 1833 by one Dr. Poinsett, of Charleston, S. C., whence of course its common name. It is grown very successfully out of doors in many parts of the world, as Southern California, the Mediterranean region, and is said to have attained its maximum development on the mountains of South India at an elevation of 6,000 feet, where there is an average rain-fall of about 50 inches. The leaves are from 4 to 6 inches long, ovate-elliptical or lanceolate and often toothed or lobed below, but becoming narrower above and bright vermilion-red in color. The flowers are small and rather inconspicuous, being of the well-kown Euphorbia type. As the plant is a native of warm countries it is necessary with us to grow them in greenhouses where they ordinarily flower from November to March. They may be propagated in a variety of ways, but principally by cuttings of hard wood, struck in bottom heat and potted off in small pots or plunged in benches or even in soil out of doors during the summer. Small plants 6 or 8 inches high with leaves to the pot, may be struck as late as August, and prove very effective. In England they are preferred of small size, but in this country they are perhaps most frequently grown to 2 or 3 feet in height. A closely allied species is known as the Mexican Fire Plant or Fire-on-the-Mountain (*Euphorbia heterophylla*). It is an annual plant 2 or 3 feet high, native from the Eastern and Central United States to Peru.

Calla Lilies.—California is beyond question the paradise for this plant in this country. There they remain out of doors the year around and produce a mass of bloom that seems incredible when compared with the ordinary pinched specimen one sees in the East. The Calla is withal a fairly successful house plant when well cared for and may give a number of good blooms during a winter, but it is of course much more responsive when grown in a cool greenhouse. It requires a rich soil and a plentiful supply of water, and when about to bloom is benefited by a weekly watering with liquid manure. It is a great favorite with the red spider and should be frequently sponged off with water, which will keep them down. After blooming it is usually recommended that the plants be dried off completely and allowed to so remain for some months, but I find that they served as well when simply set aside and supplied with just enough moisture to keep them fresh and green. About the first of September they are repotted and are then in position to start growing at once without the necessity of making a wholly new set of roots. Some two dozen plants treated in this manner have been blooming profusely for two months in the greenhouse,

and at the present time bear from one to several flowers. Have any of our readers had similar experience in handling callas?

Paper White Narcissus.—We have been asked as to the disposition of these plants after they are through blooming. If it is desired to keep them after blooming it would be best to plant them at first in earth, but this may be done after they have been forced in water, but they are never as satisfactory for the second blooming, and as they are so cheap it is best to throw them away. The trouble of caring for them for a year, together with the usually poor reward, makes it hardly worth while. It is perhaps scarcely necessary to state that a succession of these flowers may be had by starting them at intervals of two weeks.

A Curious Begonia.—A begonia of rather common cultivation is *Begonia phyllomanica*, a native of Brazil, with stems 2 or 3 feet high and obliquely-cordate light-green leaves 4 to 6 inches in length, these being fringed, and somewhat laciniate on the margin. The flowers are pale pink in color and borne in profusion. Its chief interest, however, lies in its tendency to produce innumerable minute plantlets on the stems, petioles, and more especially the upper surface of the leaves. A small plant in my greenhouse has several of the leaves with the upper surface almost concealed by the little plantlets. This plant makes a luxuriant growth, and stands the temperature and conditions of an ordinary dwelling house very well, although it is not nearly so decorative as many other varieties.

Geraniums from Seed.—Although geraniums (pelargoniums) are very easily propagated from cuttings, it is also easy to grow them from seed. The seeds, which are half an inch or more long and very narrow and irregular, should be barely covered with very fine, sifted soil and kept moist but not wet. They germinate in about two weeks and when the plants have grown two or three leaves they should be pricked out and potted. If started early in the spring they may be planted out during the summer and grown on for winter blooming. Most of the plants grown from seed will be common kinds, but it is very interesting to watch them come into bloom and occasionally a really fine new variety may be chanced upon. The weakly plants are more liable to prove valuable in the end, as the strongest usually belong to the robust varieties.

Pansies in the Washington Parks.—For the parks in this city, pansy seed is sown in August, and by the last of October or the first of November the plants are 1 or 2 inches high. They are then put in the beds where they are to bloom. Unless the season is an unusually severe one they come through with little or no loss, and start as soon as the warm days of spring come. Several thousand plants are often placed in a single bed and prove very effective, especially when made up of mixed colors without formal grouping.

Book Reviews.

A COURSE IN BOTANY AND PHARMACOGNOSY. By *Henry Kraemer*. 8vo, 384 pages. $3.50. Philadelphia, 1902.

This book has been prepared to meet the needs of students who intend to make pharmacy their life work, and it is but proper that it should be adapted to their needs, for as the author well says: "It does not seem desirable to employ the same manner of treatment in teaching different classes of students whose ultimate aims are in many cases quite diverse." The book is divided into parts, the first being devoted to the cell, with a full account of its organized and unorganized contents, wall, forms, etc., and the second to the vegetative and reproductive parts of plants. In these pages the student will doubtless acquire all the information necessary to an understanding of the main object, which is, of course, pharmacognosy. In this portion, which takes up the larger part of the book, descriptions are given of crude vegetable drugs as well as drugs in the powdered form. There are "keys" for the study and identification of various substances, and a series of well-executed plates, showing the structure of various plant organs. The information in the latter portion is very full, and should prove of great value in this study. It is one of the best books treating of this subject. F. H. K.

INTRODUCTION TO BOTANY. By *William Chase Stevens*, Professor of Botany in the University of Kansas. 12mo, pp. V, 436. Key and Flora pp. 127 additional. With many illustrations. Boston, D. C. Heath and Company. Price complete, $1.50; without Key and Flora, $1.25.

A generation ago the student of botany was obliged to make his selection of text books from the works of Gray and Wood, the various grades of which satisfied all requirements. The enormous increase of our knowledge during the past decade in the branches of cytology, histology, morphology, and embryology has created a demand for more modern works in the secondary and high schools, and this demand has resulted in a tremendous output of volumes. But it is a curious fact that in all these later text books some essential elements seem to be lacking. The authors being in most cases specialists, have given undue prominence to certain portions of their theme, or in the effort to conform to modern thought have forsaken that simplicity of language so essential in works intended as manuals of instruction. It is a pleasure to record the fact that to the mind of the present reviewer Professor Stevens has approached more nearly than any of his contemporaries the ideal text book of botany.

The plan of the work is, to a certain extent, unique. Each chapter consists of two sections; the first is devoted to a series of suggested laboratory experiments, the attention of the student being directed to the more important observations to be made in connection with these experiments, but in no case is the actual result described or foretold. This renders a superficial use of the book impossible. The second section of the chapter is devoted to a discussion of the topic at issue, general information being given on points that can not well be understood by laboratory investigation. These discussions add much to the value of the book for the general reader who wishes to obtain some insight into the science of botany without attempting a detailed course of study.

As an appendix to the work is inserted a Key to the leading families of Spermatophytes, with a flora including a number of common and well-known species. In the mind of the reviewer this is a useless adjunct, for it tends to produce a distorted impression of the genera and families, and judicious use of any standard manual would serve the same purpose. We can not indorse the opinion that students of botany in schools should attempt a course in systematic botany. It is a higher branch of the science which should be relegated to the college curriculum; and it demands a large measure of preparation in the study of evolution, ecology, and morphology before it can be approached with advantage.

We therefore recommend most unreservedly Professor Stevens' book, which we understand can be obtained without the Key, and we feel assured that when its excellent features are noted it will be widely adopted in the schools of the country. C. L. P.

ANNUAL REPORT OF THE STATE BOTANIST OF NEW YORK FOR 1901. By *Charles H. Peck*. Albany, N. Y.

Professor Peck states that 374 species have been added to the herbarium, 57 of which were not before represented. Sixteen species are described as new. The additions and new species are chiefly fungi. The last part of the report is devoted to edible fungi. Eleven species are added to the former lists. Colored plates of these as well as of 7 of the new species described are given. We regret to learn from the report that during the past few years some of the collections have been stored. Some of these are now found to be missing and others destroyed by dampness and insects. It would seem poor policy on the part of a commonwealth to accumulate valuable scientific material only to allow it to be destroyed on account of the lack of proper provision for its care. Prof. Peck deserves great credit for the work he has accomplished, especially when one considers the lack of facilities provided him. C. L. S.

Agaña River in Guam, showing growth of *Potamogeton* and *Chara* in the water, with Coconuts and *Hymenocallis* on banks.

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Extracts from the Note-Book of a Naturalist on the Island of Guam.—IV.*

BY WILLIAM E. SAFFORD.

Friday, September 1, 1899.—A few nights ago a young man was accidentally shot while hunting deer. The deer are very abundant on this island and cause great damage to corn and to young coconuts. He was lying in wait for them near his own cornfield. Hearing a slight noise, he got ready to fire, when a shot was heard and he was struck with a bullet. He thinks that some one mistook him for a deer and on finding out the mistake ran away for fear of prosecution. He was carried to town the next day and the little Spanish doctor was called upon to dress his wound. This he did as well as he could without antiseptics of any kind, washing the wound carefully with hot water and thoroughly cleansing it; but the wounded man's temperature had already begun to rise, and blood poisoning had probably begun. There was no medicine of any kind in the town and no medical officer from the ship. Several marines complained of being ill, and said that they were not in fit condition for work. Dr. Grunwell, of the *Yosemite*, was accordingly ordered to Agaña, and came to live on shore last Tuesday. He went with the Spanish doctor to visit the wounded man, and said that the doctor had done all that could have been done for him with the means at his disposal. The building used by the Spaniards as a military storehouse has been converted into a

* Continued from February issue. Begun in September, 1902.

hospital, and yesterday the wounded man was carried there on a litter, accompanied by all of his family.

To-day I received visits from three Spanish friars, who begged that they might be allowed to remain on the island. They said that they would become American citizens or do anything the Governor might order, if he would only let them stay. I forwarded their request to the Governor, who is still on the *Yosemite*. One of them, Fray Francisco Resano, has been living for several months on the island of Saipan. He arrived here on the Japanese schooner the other day, thoroughly disgusted with the state of affairs on Saipan. He says that the Spanish governor of that island, Don Eugenio Blanco y Leison,— *Caballero de la Gran Cruz del Merito Militar con distintivo Rojo y Gobernador Politico Militar de las Yslas Marianas, etc.*— is a savage. He is colonel of a volunteer regiment of Macabebes, natives of Luzon, who aided the Spaniards in the late war with the Tagalos. This governor with the long title has shown an utter disregard for the rights of individuals and has been grossly disrespectful to the clergy, showing himself to be autocratic and tyrannical. He even threatened to have a man named Antonio Diaz shot for having expressed his opinion that Don José Portusach and his brother-in-law, Captain Harrison, had the right to certain islands in the north of this group which they had leased from the Spanish government and had planted in coconuts. It is supposed that the northern islands will soon be sold by Spain to Germany. At present certain widows of Spanish officials are obliged to live in Saipan in order to draw their pensions from Spain. If the islands are sold I do not know what these poor people will do ; they can not afford to go with their families to Spain and live there. The ladies in question were born and brought up on this island, and are descendants of Spanish officials who married here. I do not know what Germany can want with the northern islands. They have no good harbors and it is very difficult to land on some of them. One of the islands, Tinian, is of historical interest from the glowing account of it in "Lord Anson's Voyage Round the World." Anson had lost many men with the scurvy. He had been sent to the South Seas to annoy the Spaniards, and in 1742 was obliged to stop at Tinian for repairs and in order that his crew might recuperate.

Received the following communication from the Gobernadorcillo of Merizo, the village at the southern extremity of this island, in reply to a complaint made by a lady of Agaña who owns a coconut plantation in that vicinity.

"SENOR GOVERNOR: Immediately after having received the superior communication of your excellency dated the 28th of last month relating to the complaint of Señora Regina Sigüenza concerning the damages done to the cocal belonging to her on the island of Dano I caused to appear

Mr. Saffords' residence; Coconut newly planted.

North side of the plaza of Agaña, showing tribunal and Mr. Safford's house. Coconuts one year old.

before me the man in charge of the said estate, asking him which and who are those who entered it causing injury to the coconuts planted there; and indeed he cited four individuals, named Felipe Mansapit, Joaquin Ti-Quiongeo, Augustin Fegur, and Francisco Babasta.

"Another individual, named Pantaleon de San Nicolas, presented himself before me, making a similar complaint, to the effect that the individual Clemente Mansapit, brother of the before-mentioned Felipe Mansapit, had stolen from his plantation 13 coffee plants which had been planted there, some fruit of cacao, sugar cane, and bananas.

"All of these persons I have in confinement in this tribunal, awaiting the superior action of your excellency as to whether they be sent before your superior authority or suffer the appropriate punishment in this village.

"For all which I beg your excellency to have the kindness to take action, in case you approve of this my first official report, so that there may be no mistake.

"May God guard you many years.

"*The Gobernadorcillo*,

"MERIZO, *1st of September, 1899*. PEDRO DE LA CRUZ."

The action of the Gobernadorcillo was approved, and orders given that the punishment be carried out in the village where the offenses had been committed; that the property be restored; and that if the offenders could not pay the fines imposed, they be compelled to work on the roads in the vicinity of the village.

Saturday, September 2.—The wounded man died this morning between 2 and 3 o'clock. The doctor and I went to the hospital to see him but found his body gone. At the house of the afflicted parents we found the body laid out. All of his relatives had been summoned and the little house was crowded with people. We were offered betel-nut and native-made cigars on a tray and a glass of native *aguardiente*, distilled from the fermented sap of the coconut. Preparations had evidently been made for a kind of wake. The relatives seemed to feel perfectly confident of the dead man's ultimate happiness; for he had been properly shriven and had received the last offices of the church. I assisted the doctor, who removed a carbuncle from the arm of a little boy. He is gentle, kind, and zealous, and will find plenty of work among these poor people. There is some fever among them. The doctor has called attention to the water they drink, which he thinks is the cause of sickness among them and among our men.

The chief engineer of the *Brutus* came to Agaña to-day to select a site for a water-distilling plant. Went with him along the river; found it in many places to be nearly stopped up with water plants (*Potamogeton* and *Chara*) and the surface covered with decaying oranges with which the natives wash their clothes. In places the banks lined with beautiful white-flowered spider-lilies and overhung with coconut-palms. All of

the houses have wells near them; but as there are no sewers for drainage, the doctor thinks it unsafe to drink well-water. Noticed some eels ("Hasule") and other fish ("Pulan")* in the river; in the high grass a rail and on the bank a bittern.

Sunday, September 3.—Took breakfast this morning with Father Palomo. Received visits from two old women of Merizo who had walked all the way from that village to Agaña to make complaints against the Gobernadorcillo. The first one, Benita Barcinas, stated that shortly after the seizure of the island by the Americans the Gobernadorcillo had wrongfully taken possession of a part of her land and had given it to one of her neighbors. He had borrowed the copy of her title to the land, and while in his possession he had mutilated it, substituting incorrect measurements for the original ones, which he had erased. On comparing the copy with the original title in the archives of the government I found that it had been altered. The marks of erasure were distinctly visible. The other old woman stated that the same Gobernadorcillo had imprisoned her son, charged with stealing 13 plants from his son-in-law, while as a matter of fact the said son-in-law had stolen 22 coffee plants from her son. The Gobernadorcillo was ordered to appear before the court in Agaña to answer these charges.

Monday, September 4.—Having been notified that my present quarters will be required as barracks for Company B of the Marine battalion, I bought a house this day from Doña Rufina Quítugua y Pangelinan. It is situated on the north side of the plaza, nearly opposite the palace, and is separated from the tribunal by a vacant lot belonging to Mr. Atanasio Taítano y Perez. On each side of the house there is a garden shut off from the street by a solid wall of masonry. There is no entrance to the house from the street. The entrance to the yard is east of the house. Steps lead to a terrace which connects the house with the kitchen, and the entrance to the house is at the rear, from the terrace. It is interesting to trace the evolution of the better class of Guam houses from the primitive habitation of the natives. The latter are raised from the ground about three or four feet on posts. In their rear is usually a kitchen also raised on posts. Both the dwelling and the kitchen have a substantial frame-work of wood with sides either of boards or woven reeds, the latter often coated with mud to make the texture air-tight. They are thatched either with coconut leaves or with fringes of Nipa-palm leaflets strung on reeds, which are the more durable. For greater convenience the kitchen and house are often connected by a raised passage or bridge. In some of the Guam houses solid walls of masonry are built in between the supporting posts, the kitchens remaining as in the primitive type. In others both the kitchen and the dwelling rest on walls of masonry; while

* *Kuhlia rupestris.*

in the best houses there is a lower story in each used as a store-room, or "*bodega*," and the connecting bridge is replaced by a solid terrace of earth, faced with lateral walls of masonry. My house has a frontage of 46 feet 2 inches, and a depth of 25 feet. It has a large parlor or living-room in the middle and a bed-room on each side of this. The masonry walls of the bodega are built very thick in order to resist earthquakes. The windows have no glass, but are closed by sliding wooden shutters. An interesting feature of the house, and one which I have never seen elsewhere than on this island, is a projection on each corner of the front, with open-work sides for ventilation. In these are placed filters or earthen jars of water which can drip to the ground below. They are also used for keeping provisions of any kind which require to be kept cool, as the wind can blow through them from any direction, north, east, south or west. The floor is of polished ifil wood (*Afzelia bijuga*). The roof of the dwelling is of tiles. The kitchen is thatched with coconut leaves. In the garden are growing tropical fruits of several kinds. On the east side there is a well, and on the west there is a dome-shaped oven for baking bread or bread-fruit.

When I told the Governor that I intended to buy a house for myself he said he had expected that I would live in the palace and become a member of his mess. The only room available for me, however, would have been in the rear of the palace, very small, and lighted only by a transom over a door which opens onto the rear balcony. If I should live in the palace I would not feel free to invite people to come and see me, and I anticipate many pleasant musical evenings with Don José Herrero and his sons and other friends among the islanders. And then it will be a luxury to dig in my own ground and feel that I own my garden. I shall establish a nursery and try to introduce such useful plants into the island as I think adapted to the climate. I think it very strange that among the many introduced species now growing here there are no chirimoyas, alligator pears, mangosteens, durians, nor "Polynesian chestnuts" (*Inocarpus edulis*).

* * * * * * * * *

A request having been made by a number of the principal citizens of Guam that the Philippine ex-convicts living upon this island be sent back to Manila, I made an investigation and found that, although many of those whose names were upon the list furnished me were bad or worthless men, yet some were thrifty, hard-working citizens, skilled cabinet-makers, rice-planters, etc. I was told that there had been a disturbance between some Chamorros and Filipinos on Easter Sunday, and it was feared there would be an outbreak on the part of the Filipinos. The officer in charge of the *Nanshan*, then at anchor here, who was the only naval officer in the island, issued an order prohibiting people from being in the

streets from 9 P. M. to 5 A. M. except in cases of necessity, and took a list of those having fire-arms in their possession. I was also informed that several of the Filipinos had had law-suits with Chamorros, and that among them was the principal cabinet-maker of the island, who had a fine plantation and was a thrifty man, in spite of his fondness for cock-fighting. By order of the Governor the names of the better class of Filipinos were taken off the list, and orders were issued for the arrest of the others, who were confined in the tribunal for safe-keeping to await transportation to Manila on the *Nanshan*. In the evening I received calls from two poor women, wives of arrested Filipinos, who brought with them their little children and with tears begged that their husbands might not be taken from them, saying that they were good men and had never been law-breakers. Upon investigation I found that these men provided well for their families. The name of one man had been placed on the list by mistake. Martin Dumanal, a respectable rice planter, had been arrested in place of Martin Pagal, a man of bad character. Took their names off the list, and as I had been authorized by the Governor to use my own discretion in the matter, I released them.

Tuesday, September 5.—The Filipino ex-convicts, fifteen in all, were marched down to Piti this morning and embarked on the *Nanshan* for transportation to Manila. A number of women collected at the jail, some holding little children in their arms and weeping, running after the men as they marched out of town and handing them little baskets and bags of food. All the Filipinos looked decent. At the last moment two of them received clean shirts and trousers from women, so that they might not go on board in the working garments in which they had been arrested.

Busy all morning signing passports for people about to leave on the *Nanshan* and the *Jan-ho-maru*, the Japanese schooner, which will stop at the island of Saipan, north of Guam. The little Spanish doctor goes to Manila. He came to me this evening saying that he was afraid his son would desert him at the last moment; that the boy was in love with a Guam girl, and declared that he would not leave her. He begged our assistance in case the boy should refuse to go with him. The Governor has refused to let the friars remain; they all seem to be in great distress on account of leaving the island.

This day moved into my new house. After having arranged my furniture and books I light my lamp (kerosene, from the store of Shebata, the Japanese trader) and fall to work on the Guam vocabulary and phrase-book I am compiling. In this work I am greatly assisted by Father Palomo and Don Juan de Torres, from whom I take rough notes, to be written up when I get home. While I tap away on my typewriter my dog begins to growl and there is a knock at the door.

[TO BE CONTINUED.]

Another Use for the Royal Palm.

By William Palmer.

In the June, 1901, issue of this journal (Vol. IV, p. 107) I gave a brief account of some twenty uses of the Royal Palm (*Oreodoxa regia*) which I had observed among the people of western Cuba. During a trip last year to the eastern end of the island, although I gave little attention to the matter, I was able to make an addition to the list, an interesting and most useful one on occasions, as will be seen.

With Lieutenant Wright, of the 5th U. S. Infantry, the officer in charge of the city of Baracoa, who had kindly offered to be of assistance, and a Cuban as an interpreter, we set out to visit a cave located in the woods of a hill some miles to the eastward across the bay from the city. Near the hill we obtained the services of a guide, and after a weary tramp along the worst apology for a road I had ever seen we reached the cave. My object was to secure here as many specimens of bats as possible, for the cave was said to contain three species in countless numbers. It was simply a hole in the porous limestone rock some ten feet in diameter, and it formed a drain into which the rain-water of a rocky gully poured, finding a channel to the sea. A huge-trunked tree stood at one side of the opening, and myriads of rootlets streamed like an enormous head of hair from some distance up the trunk well down into the opening. Learning from the Cuban the nature of the cave and the character of the egress of the bats, I at once decided to wait until dusk and capture as many bats as possible with my butterfly net as they left the cave. As this did not suit the arrangements of the Lieutenant and the interpreter, they soon left, and the Cuban and I patiently waited for darkness. At dusk a few bats emerged, but as the gloom increased they came in much greater numbers, so that by hard work in the dark, swinging the net rapidly backwards and forwards over the opening, we secured eighty specimens of four species.

When at length I felt satisfied with the evening's work I found myself alone in the woods with a strange Cuban and with no knowledge whatever of any means for finding the road. But I felt sure my guide would, and so it proved; for on reaching the side of the gully the Cuban searched for a palm tree and secured several of the old, dry, fallen leaves. Breaking off the bases he made a bunch of them, and lighting a match soon had a flame at the upper end, thus producing a very good torch. With this we began to thread our way through the dark woods, and eventually found the road. At times the flames grew dim as the accumulating carbon prevented a regular consumption of the leaves, so he simply rubbed the end

of the bunch on the ground, taking care not to extinguish the flame or to ignite the adjacent dry grass or rubbish.

On another trip to the cave a few days later I used my acetylene lamp, which proved as interesting to my guide as his torch had been to me.

At another time, after a hard day's work botanizing on El Yunque mountain, I agreed to accompany two American boys and an ebony Cuban patriot on a night expedition to a rocky mountain torrent for the purpose of catching "camarones," a species of large crustacean common in these cool streams. My special duty was to carry the game and incidentally to get wet by wading in at times a few inches of cold mountain water, and again at times to plunge into a depth of several feet. The numerous boulders, the black night, and deeper pools added to the charms of the situation. One of the boys carried a large armful of the dried palm leaves, while at first I also had a goodly bunch. The other boy carried the torch, an always wavering flame requiring frequent rubbings against the rocks to increase its brilliancy. The negro, bare-legged, and with a machete in his right hand, searched through the pools, and when a victim was seen deftly cut it in two or otherwise so disabled it that I was able to secure it readily with my butterfly net. The blackness of the night, the wild rocky gorge, the cold, clear water of a tropical jungle, the rapid movements of the negro and the still more rapid strokes of his weapon, and the loud and constant vociferations of the eager boys, combined to produce an effect at once startling and ludicrous to the beholder, and one to be held long in the memory. My place in the rear of the party gave me an opportunity to note the lurid effects as the brightening torch lighted up the surrounding forest, and occasionally I was able to stuff into my pockets some unusual or rare plant that I could reach. It seems strange that while on a previous trip to dryer western Cuba, I had been able to obtain a fair series of the Grass Fern (*Vittaria sp.*). But on this trip to a region much more moist, in which ferns were very much more plentiful, I had seen none, though they were always sought for, except on this one night. Now and then, as I rolled over the boulders or waded in the pools I had an opportunity between the frequent captures of the game to scan the trunks of the trees that grew at the edge of the stream, and was finally able to secure a good pocketful of this drooping, unfernlike fern, much of which was gathered with the aid of that most useful article, my butterfly net, the plants being scraped off the tree trunks where they grew beyond the reach of my hand.

RECENT observations and experiments made at the Vermont Experiment Station indicate that the common field horse-tail (*Equisetum arvense*) is poisonous to horses; not, however, in the green state, but only when in the form of hay.

Spontaneous Fission of Olive Trees in Palestine.

By Charles A. White.

The olive is the most abundant tree of Palestine. It grows upon the wild rocky hillsides and in the valleys by nature's planting, and less frequently in cultivated grounds. It is never a large tree, but many of those which one sees there are evidently very old — some of them perhaps hundreds of years old. A few are well formed, but they are often gnarled and misshapen. They are rarely, if ever, arranged systematically like orchard trees, but I occasionally saw small, compact groups or clusters of them from two to five in number. In some groups they stood so closely together that their branches necessarily interlocked, but in others they were several feet apart. Such groups, although most of the trees are more or less distorted, are suggestive of artificial planting; but upon examining a considerable number of them, as well as separate trees, I became satisfied that each group of the kind referred to had originated by spontaneous fission of an original tree. That is, I found olive trees in various stages of vertical fission of the trunk upon lines corresponding with its medullary rays. At first the cracks extended only a little deeper than the thickness of the bark, but in others they had evidently become deeper and deeper until the parts thus delimitated formed prominent vertical lobes and finally separated into individual trees. Each original crack occurred upon a slightly irregular line extending down to the roots from between the bases of the principal branches, and the number of cracks was apparently determined by the number of such dominant branches. Each one of those branches thus became the crown of a separate tree, and each new tree appropriated its portion of the original roots. Each separate trunk thus produced by fission was as fully covered with bark as was the original tree, and the new vertical coat was doubtless produced by the prompt inflowing of new bark from the split edges of the old, just as the wounds of trees are usually healed. As the fissures deepened, the new bark evidently followed so closely that little or no exposure of interior woody fiber occurred.

What were the conditions of woody growth that caused the original surface cracks I do not know, but similar cracks in other trees are known to occur. The crowding of new bark into the resulting fissures evidently aided in separating the parts of the original tree from one another, but that aiding force ceased with the severance of contact, and I am not able to offer a satisfactory explanation of the further separation of the parts.

Still, all the original roots which belonged to each separate part were upon only one side of it, and it seems probable that their underground growth had a tendency to draw the unsymmetrical new tree in their direction, especially as there was little or no similar opposing force. Such a result of growth force would be no more remarkable than that which is produced by many other plants, the *Wistaria* for example. The slender, swaying lianes of this woody climber, when they have secured a firm upper hold, are often drawn so strongly toward the ground that they become as taut as the shrouds of a ship, and even injure by their tension the buildings upon which they climb.

Plate 10 is copied from a photographic view of the Garden of Gethsemane, a small portion of the east side of the Valley of Jehosaphat, and a part of the southeastern base of the Mount of Olives. Within the walls of the garden there are about a dozen each of cypress and olive trees. Seven of the latter are very old, their huge trunks being deeply and rudely lobed and fissured, and some of them partially, but not fully, divided. All the trees shown outside the garden walls are olives, most of which are single trees of normal growth, but some of them, especially of those in the foreground,are in pairs and clusters. Each pair or cluster, although the component trees are now fully separate, has evidently originated by fission of a single tree, as explained in the foregoing remarks.

Smithsonian Institution.

Botanizing in a Cactus Bed.

By Charles Francis Saunders.

The Eastern plant student on his first visit to Southern California has a number of new things to learn, one of which is that a sunburnt, desolate-looking, turfless hillside, dotted with clumps of savage tuna-cactus sprawling about in all sorts of threatening attitudes and frequently as high as a man's head, is by no means to be despised as a collecting ground. As a matter of fact the plant-lover may visit such a hillside day after day when the winter rains have quickened vegetation into growth, and be confident of entertainment every time, for the variety of plant life that gathers about these cactus clumps and thrives among their stings and prickles is surprising. Doubtless such plants find comfort in the comparative shade of the great flat joints, which insures them a longer enjoyment of the night dews than would be possible on the more exposed places where there is no relief from the persistent sunshine.

Right out of the heart of such fastnesses of spines the sunny blooms of the California Oxeye often rise in great yellow masses, and in the

The Garden of Gethsemane near Jerusalem, showing olive trees.

tangle of nestling grasses that make winter provender for sheep in what seems a wilderness, the scarlet heads of the Indian Paint-brush flash out, like gaily-dyed feathers in an Indian brave's hair. Here, too, we find the tufted dusty-green leaves, like miniature palm crowns, of the white sage, which makes in summer when it blooms California's best bee pasture; and here of course we may be sure of at least a species or two of that genus which the novice in the flora of the far west finds to be a special trial to his patience, Eriogonum. The ill-smelling bladderpod, its yellow flowers suspending from their midst the swollen, bladdery seed-vessels that give the plant its English name, takes with equal kindness to such situations, and what with its inherent malodor and its cactus hedge, is about as well protected from intruders as a plant need desire. Neighbor to it, like as not, is the showy wild four-o'clock, whose involucred, brilliant calyx, invariably mistaken by every beginner in botany for a corolla, leads him a weary chase into the slough of despond before he learns its name.

The little purple-flowered filaree and alfalfa's spiny-fruited cousin, the bur-clover—two plants that seem to have taken a contract to carpet Southern California—excite no special wonder when found in the thick of our cactus bed, but is is something of a surprise to see from within these inhospitable walls of spines the purple banners of the wild sweet pea swing out in pleasant companionship with the brodiaea's round heads of blue. Equally surprising is it to find pretty gardens of delicate ferns snuggling about the cactus roots—the California gold and silver ferns and the birdfoot Pellaea reposing in beds of Selaginella. And, of course, here also is the ubiquitous Artemisia, or sagebrush—a plant whose aromatic fragrance is borne to us on almost every breeze in Southern California, and makes a tramp through any sunlit chapparal an excursion that even the blind may enjoy.

These are not a tithe of the floral riches which may be discovered on such forbidding hillsides, but they will perhaps serve to show that like the dog whose bark is worse than his bite, the cactus is not so bad a neighbor as its appearance would indicate.

Pasadena, Cal.

Dr. W. A. Cannon, of the New York Botanical Garden, has been appointed resident investigator for the Desert Botanical Laboratory of the Carnegie Institution, the establishment of which was announced in a previous issue of The Plant World. The advisory board of the Laboratory, consisting of Mr. Frederick V. Coville and Dr. D. T. MacDougal, is now making a reconnaissance of the Mexican boundary region, for the purpose of selecting a suitable site for the laboratory.

Briefer Articles.

TWO NEW STATIONS FOR ELLIOTTIA.

It may interest some of the readers of The Plant World to know that during my travels in Georgia last summer I obtained evidence in a rather unusual way of two stations unknown to botanists for the rare shrub of the Heath family, *Elliottia racemosa*, some account of which appeared in this journal last May. On my travels I carried with me a number of photographs taken in Georgia during the two preceding years, among them some of the *Elliottia*, including the one which was reproduced in the May number. These photographs I showed to several of my friends and other people I met, and in Valdosta in September I found a gentleman who recognized the *Elliottia* as a plant he had seen growing near his home at Stillmore, in Emanuel County. Later in the same month, in Moultrie, I met a gentleman who claimed to have seen the same plant in Screven County.

Both gentlemen were positive in their identification of the *Elliottia*, and their description of its habitat and time of flowering agreed with my own observations, so that I have no reason to doubt their statements. It is noteworthy in this connection that Screven and Emanuel Counties are both adjacent to Burke County, in which *Elliottia* was first discovered, and to Bulloch County, in which I found it last year, as well as to each other.

Roland M. Harper.

College Point, N. Y.

A HARBINGER OF SPRING.

When we speak of certain flowers as being harbingers of spring the mind unconsciously pictures a freshly green bank whereon are peeping forth bright-petaled and fragrant blossoms emerging to the accompaniment of the bluebird's cheery call, but as a matter of fact the real forerunner of our floral procession has neither poetic name nor bright-hued or fragrant flowers to recommend it, nor is its coming heralded by bird song. Weeks before even early spring, with its willow catkins and crimson maples, the skunk cabbage has braved the rigors of winter and sent up along the swamp-border its hooded clusters of minute flowers. Even if covered with snow or bound solid in an icy covering it melts a tiny chamber for itself and its vital activities go on with an energy perhaps acquired by some ancestor of glacial times. That it had such an ancestor is attested by a fossil representative that must have been near of kin, in the Miocene lake beds of Nevada. Certain it is that although the last of its kind it possesses a vigor of constitution that is equalled by

The Skunk Cabbage at Home. Photographed by Mr. J. B. Norton.

The First Flowers of Spring. Photographed by Mr. J. B. Norton.

few and perhaps surpassed by none. At the time it blooms there is naturally but little insect life abroad, yet it must have the assistance of these humble friends in transferring the pollen from pistil to stigma; and it is forthcoming, for at bright midday, when the temperature in the shadows may be but little above the freezing point, a few sluggishly-flying insects are making their first excursions abroad, and attracted by the—to us—unsavory lure, enter the hood and the deed is done. By the time the neighboring plants have awakened into life the ovules have been fertilized, and no longer needing the warm hood the latter has become a shriveled and unsightly mass.

The magnificent views of the skunk cabbage which we are able to present were made by Mr. Jesse B. Norton at College Park, Maryland, on February 15, 1903. F. H. KNOWLTON.

THE ASA GRAY BULLETIN HONORED.

A FEW weeks ago I received from Dr. Benjamin D. Woodward, formerly Assistant Commissioner-General to the Paris Exposition of 1900, a letter inquiring as to the present owner or legal successor of *The Asa Gray Bulletin*. The letter gave no reason why this information was desired, and as I was ignorant of the fact that the late Mr. Thomas A. Williams had exhibited his journal at Paris I naturally felt some curiosity in the matter. Satisfactory proof having been given to Mr. Woodward of the transfer of the *Bulletin* to THE PLANT WORLD, I received in due time the announcement of an award of the "Grand Prix" in the class of American periodicals. This award carries with it no medal, but merely a handsomely engraved diploma of large dimensions, the center of which is occupied by a statement of the exhibit for which the award is made, while the border consists of a number of figures illustrating art, science, literature, poetry, etc. As the entry was made by Mr. Williams personally, the diploma will be sent to Mrs. Williams after a photograph has been made for the use of THE PLANT WORLD. It is unfortunate that the two men who did so much to improve the *Bulletin* and to make it worthy of the honor bestowed by a foreign government should not be able to reap the reward of their activity. No explanation was given of the delay in making the award. CHARLES LOUIS POLLARD.

IN THE item giving the list of officers for the Gray Memorial Chapter of the Agassiz Association, published in our last issue, the name of the treasurer is misprinted, and should be Mr. Roscoe J. Webb.

The Wild Flower Preservation Society of America.

NEWS FROM THE BALTIMORE CHAPTER.

On the evening of February 20, Dr. C. E. Waters, the president of the Chapter, gave an illustrated lecture on "Botanical Tramps around Baltimore" at the Johns Hopkins University to members of the Chapter and their friends.

In beginning his lecture, Dr. Waters reminded his hearers that owing to the situation of their city, Baltimoreans were especially fortunate in being able to have access to the botanical treasures of the Coastal Plain as well as of the Piedmont Plateau. By means of description and lantern illustrations, the audience was taken on an extensive tramp starting from Glen Burnie in the Coastal Plain, proceeding to the classic botanical grounds of the Patapsco River between Relay and Ilchester, and crossing the Piedmont, with a stop at Gwynn's Falls, to the Gunpowder at Loch Raven.

Characteristic views of these regions, groups of their peculiar ferns and flowers, and well-imitated notes of their bird associates, gave to his hearers a very real sense of woods and fields. The object of the lecture being to arouse an interest in the cause of wild flower protection, Dr. Waters called the attention to the necessity of restraining the collecting instinct as well as the bouquet habit, but his strongest appeal was indirect, in that he made his audience feel towards the rarer plants strong ties of personal friendship.

Immediately after the lecture the Chapter held a short business meeting, at which Mr. Pollard, who was present, explained certain questions about the annual dues that were brought up. Among other business, the action of the committee looking to the labelling of the trees in the city parks was approved.

The Chapter has been strengthened by the addition of a number of new members, so that there are now 28 on the roll.

Elizabeth A. Smyth, *Secretary-Treasurer.*

OUR EDUCATIONAL WORK.

The following letter, in type-written fac-simile, is being sent out to a large number of persons interested in nature study. Our members are earnestly requested to aid the Secretary by furnishing him local lists of persons who might be induced in this way to join the Society:

DEAR———: The Board of Managers of the Wild Flower Preservation Society of America respectfully requests the privilege of electing you as a member thereof, believing you to be in cordial sympathy with the objects of the organization. The annual dues are one dollar a year, this sum entitling members to the official organ of the Society, "The Plant World," a sample copy of which is mailed to you herewith under separate cover, and also to other publications of the Society.

The enclosed leaflet gives an outline of our work and aims. Our chief endeavor is directed toward the protection of native plants from the complete extermination now threatening such species as the mayflower or trailing arbutus, the holly, the mountain-laurel, etc.

The list of officers, all of whom serve without compensation, includes, as you will notice, some of the most prominent botanists in the country. The Society is in urgent need of funds with which to carry out its proposed efforts. Will you not contribute your quota toward the preservation of the natural beauties of forest and field?

Very sincerely yours,
CHARLES LOUIS POLLARD, *Secretary*.

THE following article, sent to the *New York Sun* by Mr. Wm. T. Davis several years ago, has been brought to our attention by Mrs. N. L. Britton. The lapse of time has made more forcible the facts which it presents, and it is herewith printed for the information of our members:

CHRISTMAS TREE HARVEST.

"No fewer than 1,500,000 Christmas trees are used in New York and the New England States every season," said an old woods operator of the Pine Tree State, "and of that number at least three-fifths grow on the bleak hillsides of eastern and northern Maine, where the harvesting and shipping of Christmas trees to the towns and large cities along the Atlantic Coast are conducted on a large scale. Well-paying employment is thus furnished to hundreds of young farmers and timbermen, and at a time, too, when finances are low and demands for ready cash are proportionately many.

"More than 95 per cent of the Christmas trees which reach the New York and other extensive markets from Maine are black balsam fir, a coarse-grained, white-wooded product of the sub-arctic belt, which, together with the dwarf gray birch and bitter willow shrub, forms the final hedge of vegetation around the North Pole. All the rest are hemlocks, pines, and now and then arbor-vitae trees. Of course pines and spruces are easier to get, and in many parts of the United States they are almost entirely used, but the general adoption of the fir in the East is due to its many superior ornamental features and adaptation to Christmas purposes. Another reason perhaps is that after several centuries of inquiry and experiment no one has ever discovered any possible use for the fir other than its entire fitness as a Christmas emblem.

"As do most great enterprises, the harvesting of Christmas trees owes its inception to New York men. About twenty-five years ago a party of duck hunters from the metropolis went to Maine on a yacht, coasting along the eastern shore of Penobscot Bay from Orland to Brooklin. This was a period in which farmers and timber-land owners were speculating as to how long it would be before the entire State was given over to fir trees. Several observant members of the party remarking the millions of young firs which crowded the headlands, concluded that such symmetrical bushes would make excellent Christmas trees, and, with characteristic metropolitan enterprise, at once opened negotiations with the farmers for the purchase of a few cargoes.

"At first the farmers thought the New Yorkers were simply having a huge old lark at their expense, never having encountered anybody so foolish and unsophisticated as to buy firs. But when the visitors opened their pocket-books and offered their money they were convinced of their sincerity. So they fell to with a will and loaded several schooners with the Maine hills' worthless growth. At various ports as far south as Boston the tree-filled vessels touched, discharging trees at each port.

"The business was an immense success from the very start, and the original members of the Christmas tree syndicate made money hand over fist. After a while they sold out at a profit to other concerns, and they made money too. Others learning of their success, entered the Christmas tree field and so within twenty-five years from the time the first load was sent out, fir lands have advanced in price from $100 for a township—a trifling matter of some 23,000 acres—to $10 and $15 for a single acre. It only took them about ten years to strip off all the trees on the seaboard, after which the Christmas bush suppliers went inland, sending their wares to Boston and New York by the train loads.

"When the business was first opened no more than four schooners were employed and their united cargoes contained no more than 5,000 trees. To-day six times that number of vessels skirt along the coast as far south as New York, while dozens of train loads are sent to various points of distribution in the State of New York and the New England States. Last year 1,000,000 trees were shipped from Maine.

"Harvesting the Christmas trees is conducted in no careless or haphazard sort of way. Not every fir will answer the purpose. The ideal tree should be intensely green, symmetrical, straight and graceful, with an abundance of limbs stiff enough to hold up the donations and ornaments they are designed to bear. So those engaged in harvesting first survey the field and mark out a number of thickets of sizable firs. One man, an expert, does the cutting, while another follows closely in his wake and sorts the fallen trees into bundles of equal length, binding them together with stout spun yarn. Then a teamster, driving a pair of

horses attached to a hayrack, makes up a load of the bundles and hurries off to the nearest wharf or railroad station. From there the trees go to the wholesalers in the large cities in bulk, to be disposed of in lots to suit the retailers.

"Although the trees are necessarily bulky and expensive to ship, there are large profits in the business, for it is a very poor acre of fir land which will not yield 5,000 trees, and allowing $10 an acre for stumpage, $30 an acre for labor and cartage, and $50 an acre for freight, the trees do not cost two cents apiece delivered in Boston or this city. The price of the smallest tree in the cities seldom if ever falls below 25 cents—ascending from that sum to a maximum of about $5—so it may be readily seen that so long as they can find customers, the men who handle Christmas trees are in no danger of becoming poor.

"But the benefit which accrues to the Pine Tree State from this selling of Christmas trees is by no means confined to the dollars which come from labor and stumpage. Land grown up to firs is not only worthless from the lumberman's point of view, but it must be cut over and burned before anything else will grow on it. Prior to the development of the Christmas tree industry fir lands were so entirely valueless that they were held exempt from taxation by the town assessors. When, however, the tree hunters came along and removed the incumbering growth the farmers were encouraged to burn off the denuded hills and sow grass seed among the ashes. In this way were acquired fine pasture lands, and eventually mowing fields which afforded food for many herds of cows and sheep. Thus thousands and thousands of acres have been reclaimed, and every Christmas contributes heavily to the increase of Maine's taxable basis.

"Fir trees are not the only Christmas greens which come from the Pine Tree State. Deep in the pine woods among resinous needles and broken limbs, there grows a creeping vine-like plant known commonly as the ground pine and termed by the botanists, lycopodium. The giant lycopodium of the coal strata is identical in structure with this creeping evergreen. Every fall the country children go to the pine woods and tear up great stacks of ground pine, which is afterward sorted, pressed into boxes or sacks, and sent to the cities, where it is used in making wreaths, festoons and streamers for auxiliary holiday adornment.

"The coral-red berry of the wild raisin which grows by fence sides and on waste land all over Maine is not so imposing in its festive appearance or as renowned as the English holly, yet it is a much-sought article for Christmas decorative purposes. The boys and girls in the country districts scour the pastures and commons for these plants every November, bind them in artistic little bundles and pack them in boxes for shipment. The sale of Yuletide berries and such minor accessories bring to the children of Maine between $2,000 and $3,000 every year."

Editorial.

We feel assured that not only botanists throughout the country, but all persons having at heart the welfare of our Government scientific institutions, will rejoice to learn that Congress has provided for the erection of a new building for the National Museum at a total cost of three and a half million dollars, of which $250,000 is made available during the coming fiscal year. The unfitness of the present building is apparent to every one who has visited Washington. It is a huge, barn-like structure, with no adequate accommodations for storage, having offices for the most part suggestive of attic cupboards, a roof which leaks with every shower, an apparent average summer temperature of 110, and an apparent average winter temperature of 20. Furthermore, the Museum is filled to overflowing with valuable scientific material, much of which is at present practically inaccessible, and under these conditions it has been difficult for the curators and their assistants to carry on their work satisfactorily.

The regents of the Smithsonian Institution will soon take under consideration the question of an exact site for the building, and the arrangement of details in the provisional plans which have been adopted. The Museum will now have an opportunity to develop to an extent hitherto impossible, and will take its place at the head of our great scientific repositories.

The New York Botanical Garden has added another to its long list of notable achievements in the establishment of what are to be known as "resident research scholarships." In the words of the announcement which appears in the *Journal of the New York Botanical Garden* for February, these scholarships "are designed to meet the needs of professors or instructors in colleges, officers of museums, or other botanists of equivalent training or experience, who desire to use the facilities of the Garden for continuing investigations already commenced, or for carrying out investigations which require facilities additional to those at their command at home." Applications are to be made to the Director-in-Chief, who is empowered to make grants at his discretion. The value of each scholarship is $50 a month, but no one person may hold a scholarship for a period exceeding six months at one time.

The value of these scholarships to students wishing to avail themselves of the vast opportunities for study offered by the Garden, but hitherto financially unable to remain in residence for the requisite period, will be very great. The results of the special investigations will be published under the direction of the Garden.

The Home Garden and Greenhouse.

CONDUCTED BY F. H. KNOWLTON.

[The editor of this department will be glad to answer questions of a relevant nature, and also to receive short articles on any phase of this subject.]

Farfugium grande.—Having been quite successful for many years with this plant for home decoration, I wonder that it is not oftener found among the collections of plant lovers. It is indeed a handsome plant. As the yellow flowers are not very pretty, the bud stalks should be pinched off so that the strength of the plant will go more towards developing the beautiful foliage. These leaves are nearly round, large, glossy and leathery, of a deep green, variously spotted with white or pale yellow, no two being alike, some having few spots, others thickly covered.

The Farfugium likes plenty of pot room, a loose, rich soil (I use woods earth, good garden soil and a little sand) and plenty of water, except when it is resting, which mine does in the late summer. Then it is watered sparingly till I repot it in the fall when it soon puts on new life.

This plant does not like to be moved about, but prefers a place in an east window where it can get the early morning sun and does not want much of that, indeed I have had it do nicely in a north window without any sun.

It should be frequently washed or showered to keep off the dust, but the leaves are so smooth that is little trouble. A species of aphis seems to be the only pest that troubles this plant and a warm bath of Ivory soap suds soon makes an end of its depredations. A shady spot and plenty of water is all it asks in summer. Ours is kept on a north porch and seems to like that situation. Mrs. L. W. RUFF, Laurel, Md.

A Curious Begonia.—We are so accustomed to seeing Begonias with unequal-sided, but nearly entire, leaves, that an apparently compound-leaved one is a novelty. Such an one is *Begonia palmata*, which has leaves nearly circular in outline and composed of ten or twelve long, narrow, finely-toothed leaflets or rather segments. The stems, which grow to a height of two or three feet, are dark red, as are the mid veins of the leaflets below. The flowers are rather small and white and are not especially attractive, the whole plant being odd rather than handsome, although a finely-grown example with leaves down to the pot is well worth growing.

Starting Seed.—By the time this reaches our readers, or even earlier, the seeds of many of the garden plants and annual flowering plants should have been started. Such things as tomatoes, lettuce, cosmos, scarlet sage, verbenas, castor-oil bean, asters, and the host of annuals, can advantageously be started in flats or boxes in the greenhouse or even

in a sunny window of the living-house. When they are an inch or two high they should be pricked out and potted in small pots, and should be shifted once if needed.

Propagating Shrubs.—It is perhaps not generally known, but the ordinary flowering shrubs, such as Hydrangeas, Forsythias, Spiraeas, Weigelias and the like, may be very easily propagated. Cuttings of the ripened wood five or six inches long should be taken in the fall or winter and tied up in bundles with the cut ends all one way. These bundles should be buried in soil in a cellar, the corner of a cold frame or the open ground, with the butts up, and covered with three or four inches of soil to prevent their drying out. In the spring, when the ground has become dry enough to work, a mellow bed should be prepared and the cuttings set in trenches six inches apart and with one bud showing above the surface. Nearly all of them will take root during the summer and will be ready to transplant to their permanent location the following spring. It is said that cuttings may be taken as late as June, but it is better to take them before growth has started. Currants and gooseberries are propagated readily in this manner.

The Cold Frame.—This is such a valuable adjunct to the vegetable and flower garden, and is withal so easily and cheaply made, that no enterprising amateur should be without one. The standard size of sash is 3 by 6, and is preferably of cypress wood, as this resists the wet and dry and hot and cold conditions to which it is subject better than any other wood. The cost should be about $2.25 per sash, glazed, and they can be procured of any good lumber dealer. The location for the bed should be well drained and, if possible, in a place somewhat sheltered and facing to the south. The frame may be constructed of good sound 1-inch lumber, although thicker lumber will of course last longer. This frame should be about 18 inches high at the back and 12 or 14 inches at the front, and should be sunk for several inches in the ground and the earth banked up around the outside nearly to the top. If there is good drainage the soil inside may be somewhat lower than the outside level. It is, perhaps, hardly necessary to say that the soil should be rich and finely pulverized. Most of the garden vegetables may be advantageously started in the cold frame and thus secure several weeks' growth before it would be possible outside. Radishes, lettuce, tomatoes, cabbage, etc., may be started long before these could be planted out-of-doors, or if one wishes to have early flowers it offers equal facilities. Early pansies may be secured by sowing the seed in August and transplanting to the cold frame when the plants are of convenient size. In the latitude of Washington they will need no protection but the glass, but further north a covering of old carpet or especially-made mats may be necessary. As soon as the sunny days of March come the plants will start, and by early

April will be in full bloom. The manner of growing violets in cold frames is given in another place.

The Cutting Box.—While the cutting box is more widely useful in a greenhouse where it can have the benefit of bottom heat, it is, nevertheless, an indispensable adjunct to every flower lover's outfit. It is simply a box of any convenient size, and about 4 inches deep, filled with clean, sharp, rather coarse sand. Care should be taken that there is no organic matter in the sand, as it would induce that dread of all propagators—damping off. In the greenhouse, where the heat can be regulated, almost anything "rootable" can be made to strike root, but in an ordinary dwelling house it can be used with a fair measure of success. It should be placed near a stove with the heat as regular as possible, and must be kept moist, although not necessarily wet. The cutting box is perhaps most useful to the amateur in summer, when it can be placed in some moderately shaded place and used to start plants designed for winter blooming, such as geraniums, heliotropes, begonias, etc.

Violets in a Cold Frame.—In *Gardening* for February 15, 1903, Mr. Robert Klagge gives the following directions for growing single violets in a cold frame: "As the single are hardier and better croppers in spring, I will treat of them. Plants may be taken by division or by rooting runners. Put into 2-inch pots and plant outdoors in the first part of May. If you have plenty of room plant them twelve inches apart in rows thirty inches apart so they may be cultivated with horse-power. If this is not the case they should be planted one foot apart each way. Hoe and cultivate frequently and keep off all unnecessary runners to have nice bushy plants by October. Then they may be taken to their winter quarters. The soil should be a good loam with one-eighth well-rotted manure worked in. Choose a cloudy day for planting, water well, and when established remove all bad leaves. The distance apart to plant in the frame depends upon the size of the plants. Keep the glass off until the ground is frozen quite hard. After it is necessary to put it on, give plenty of air. As the weather gets cold mats and shutters will have to be put on. Bank up outside the frame with about a foot of cold manure, kept in place by boards or stakes. As long as the violets are frozen the shutters may be left on, but as the weather gets warmer airing must be attended to regularly. Never admit strong sun while the plants are frozen. Always keep the decayed leaves picked off. The varieties are numerous, but California and Prince of Wales are perhaps the best for this purpose."

Height at which to set Plants in Pots.—When repotting house plants this spring, or at any other time, remember to set the plant slightly lower than it stood originally; and always leave some space between the earth and the upper rim of the pot.

Anæsthetized Trees.—The stunted trees and shrubs of the Japanese have been the envy and wonder of the gardeners the world over. But a German chemist now comes along and does something which even the Japanese could hardly be expected to do. He has prepared a fluid that has the power when injected into the tissues of a plant near its roots of anæsthetizing the plant. As a result of this injection the plant does not die but stops growing, maintaining its fresh green appearance though its vitality is apparently suspended. Changes in temperature seem in no wise to affect the foliage, for the plant blooms in the open as well as in the most carefully constructed greenhouse. As might be expected, the composition of this fluid is shrouded in the greatest mystery.—*Scientific American.*

Book Reviews.

MESSAGE FROM THE PRESIDENT OF THE UNITED STATES TRANSMITTING REPORT OF THE SECRETARY OF AGRICULTURE IN RELATION TO THE FORESTS, RIVERS AND MOUNTAINS OF THE SOUTHERN APPALACHIAN REGION. Washington: Government Printing Office. 1902.

It is well known that the forests of the Southern Appalachian region are being rapidly removed, thereby destroying the most beautiful mountain region to be found east of the Mississippi, and Congress has been asked to set aside this area as a national park. With the view of obtaining full information on the subject the Secretary of Agriculture was authorized by Congress to expend a sum not exceeding $5,000 in making a full investigation of the matter, and the book before us is his report of this study. It is prefaced by a message from the President urging the action of Congress. In this report, which fills 210 quarto pages and is illustrated by 78 full-page plates besides many maps, profiles, etc., we have a very full account of this region, including descriptions of the Appalachians, the forest covering, climate, injury by fire and water, geological structure, hydrography, etc. In the form of appendices are reports by special investigators, as "Lumbering in the Southern Appalachians," by W. W. Ashe and H. B. Ayres, and "List of Shrubs in the Southern Appalachians," by W. W. Ashe. The illustrations are superb, especially that in color showing the Rhododendrons in bloom, and should go a long way in convincing Congress of the necessity of acting at once. The effect of stream action where the forest covering has been removed is portrayed in a manner that should awaken apprehension before the whole region is reduced to a rocky waste. It is to be hoped that action will not be delayed. F. H. K.

THE INFLUENCE OF LIGHT AND DARKNESS UPON GROWTH AND DEVELOPMENT. By *Daniel Trembly MacDougal.* (Memoirs of the New York Botanical Garden. Vol. II, p. 1–319; fig. 1–176. January 20, 1903.)

Occasionally there appear in this country the published results of some botanical investigation which, because of the thoroughness and care with which it has been prepared, causes every American botanist to rejoice at the renewed evidence of the high place his chosen science is taking at home and the constantly increasing recognition accorded it abroad. Such a publication has recently appeared, written by Dr. D. T. MacDougal, Director of the Laboratories of the New York Botanical Garden, and it is to be hoped that aside from its scientific value, the work may also serve as an example of what a finished piece of research of this kind should be.

After an exceptionally full and complete résumé of all the important literature upon the subject, thus giving the necessary historical basis for the succeeding parts, detailed observations are given upon nearly one hundred species of plants which have been cultivated for a considerable time in various degrees of darkness and light. Instead of all of these species being closely related and propagated in practically the same manner, as has been the practice of former investigators along this line, Dr. MacDougal experimented with plants representing numerous habitats, from the aquatics to spiny xerophytes, and these were grown from bulbs, cuttings, seeds and by every other method that was possible. As might be expected from such a wide range of types and conditions, the general considerations deduced from the observations are numerous and quite conclusive. A mere enumeration of them can give no idea of the vast amount of interesting and valuable information set forth. The effect of darkness and the consequent etiolation upon the growth and development of the tissues, organs and members of climbing plants, aquatics, succulents, woody perennials, etc., is shown in the greatest detail and there is also much that is new and important relating to various storage organs and their ability to serve the plant when its normal methods of forming organic food are prevented.

The various theories as to the nature of etiolation are briefly summed up and it is shown that no single explanation previously set forth is sufficient to account for all the conditions which are produced by absolute darkness. The fundamental principle is established that in all species there is the greatest difference between the morphological differentiation in the tissues of etiolated and non-etiolated plants. That this differentiation is unquestionably due to the action of light upon the plant at the proper time is abundantly shown, thus offering a fine demonstration of the fact that growth and development are independent and easily separable

processes. "It is to be seen therefore that the phenomena of etiolation rest upon, and consist in the behavior of the plant consequent upon the absence of the morphogenetic influence of light." This conclusion is still further emphasized in the chapter treating of the illumination of etiolated plants, where the effect of light upon etiolated specimens of *Arisaema*, *Asplenium*, *Peltandra*, etc., is shown to be truly morphogenetic.

The stimulative influence of light which produces morphological differentiation is found to be due not to any direct effect upon any particular organ or tissue, but that the stimulus may be received and transmitted from one part to another, even being communicated to organs not yet formed. The only conclusion that can be drawn with regard to the differences observed in continuous and discontinuous light is that the stimulus necessary for morphogenetic action is in the alternate effect of light and darkness, rather than in light itself.

The influence of etiolation upon chemical composition is considered and the final chapter of the memoir is concerned with the rate and mode of growth as affected by light and darkness. That light retards growth has been accepted as a well-established fact for many years, there being many scientific investigations, as well as much popular experience supposed to justify this view. While it is true that certain plants do exceed their normal growth in the absence of light, the fact that the reverse is quite as true, together with other considerations, has led Dr. MacDougal to state as the result of his numerous observations that "light has no invariable and universal relation to increase in length or thickness or to the multiplication or increase in volume of the separate cells." The explanation of the frequently observed fact that plants decrease in growth when brought into the light after even a short period of darkness, is to be found either in the loss of water due to increased transpiration, which might effect a decrease in bulk sufficient to offset the actual growth, or more probably to an irritable response to which the plant gradually accommodates itself when subjected to continuous illumination.

It is hoped that the foregoing brief and inadequate summary of Dr. MacDougal's book may be sufficient to indicate in a general way the scope of the work and that it will lead to a careful examination of such admirable contribution to this aspect of plant physiology. Probably it would have been an assistance to some if there had been a chapter devoted to a general summing up of all the conclusions reached by the author, as certain points are apt to be passed over by any but the most careful reader. However, the most excellent figures in the text, of which there are some 178, practically all of which are original, serve in a graphic way to point out and corroborate the more important principles established.

GEORGE T. MOORE.

Coffee plant in full bloom.

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Extracts from the Note-Book of a Naturalist on the Island of Guam.—V.*

BY WILLIAM E. SAFFORD.

A LITTLE old lady, with a brown, wrinkled face and gray hair, but with a merry twinkle in her eye, stood on the threshold, hesitating to accept my invitation to enter. She introduced herself as Dolores and said that she had come to ask a favor. I invited her to sit down, but she made a quaint curtsey and remained standing. She spoke unusually good Spanish for a native and addressed me as *Vuesamerced* (a contraction for "your honor"). Doña Rufina, the former owner of my house, she said, had permitted her to use the oven in the garden for baking bread and toasting bread-fruit; would the señor have the grace to allow her still to use it. She had no flour for bread, but God in His mercy had given bread-fruit to the poor Chamorros of Guam, and it was now time to lay by a store for future use, when the bread-fruit season should be past. Had the señor ever tasted *biscocho* made of sliced bread-fruit? It was very good either dry or cooked in various ways, and it would last a long time if kept dry. She had heard that the señor was a kind gentleman, and she hoped he would excuse her for making the request. I told her that my oven was at the disposal of any of my neighbors who might wish to use it, and it did not annoy me at all to have them come into my yard either for baking or for water from my well.

* Continued from March issue. Begun in September, 1902.

With "a thousand thanks" the old lady disappeared, and I continued my writing. In about an hour she returned and offered me some of her "*biscocho de rima*," thin, crisp, toasted slices of bread-fruit, which tasted very much like fried sweet potatoes. She said they were very nice to carry in one's pocket and nibble on, and to take with one on a journey, as they did not require re-cooking.

She then told me of a misunderstanding which she and her husband had had with a neighbor over the boundary line of some property situated near Lake Matan-hanom, and that another neighbor in town had asked to have a tree cut down which was growing in her yard, claiming that it was too near the stone wall which separated their property. Now she was a poor woman, and she sometimes made money by selling betel-nuts and betel-pepper leaves. The nuts her husband brought from trees near the *ciénaga;* but the leaves were from her own plants, which climbed all over the tree which her neighbor wished to have cut down. Would the señor have the grace to come and look at the tree and see if it were indeed necessary to sacrifice it; and some day, perhaps, the señor might have leisure to walk to the farm at Matan-hanom, just over the hill from Sinahaña, and settle the question about the boundary line; and might she offer the señor a few cuttings of betel-pepper from her fine plants; she would come and plant them herself. She had noticed the señor working in his garden, and she knew he must love plants. The betel-pepper was a beautiful plant and would look pretty climbing over his stone wall and his lemon tree. She continued talking for some time, saying some very pretty things, which I knew to be arrant flattery but which were very pleasant to hear. Finally, as she seemed to be waiting for me to dismiss her, I rose and said good-night, inviting her to come again. The old lady thanked me, tied her handkerchief over her head, and saying "*con permiso, señor*," * she made a curtsey and backed out of the door.

As I sit writing up my diary I hear a rumpus among the pigs of my neighbor at the rear of my yard. He keeps several of them beneath his house tethered by the fore-leg to the supporting posts. They do not look well fed, and from time to time a disagreeable odor is wafted over to me across the fence. The house is old and dilapidated and needs a new roof. The owner is an old man now living in Merizo, a village at the southern end of the island. I shall make him an offer for his property, but will not insist on buying it if he hesitates to sell. If I do acquire it I shall remove the house and extend my garden through to the next street—*Calle Isabel la Catolica*. In this way I shall have more room for my *sementeras*. I expect to enclose my whole property with a low stone wall and plant some of the palms and other ornamental plants I have brought with me from Honolulu.

* "With your permission, sir."

Wednesday, September 6.—Up early and took coffee with Father Palomo. He is one of the finest characters I have ever known—upright, frugal, and self-denying, but gentle and kind in dealing with the simple people under his charge. I told him of the distress of the poor women whose husbands had been sent away. He said that some of them had besought him to intercede in their behalf, and in two cases, where he thought the men worthy, he had sent them to me; these were the ones whose names I had stricken from the list.

The *Nanshan* left to-day for Manila, taking as passengers besides the Filipino ex-convicts the Curas of Agat and Merizo; the *Medico Titular* Don Francisco Napal and his rebellious half-caste son; and the *Asesor Letrado* Don Vicente Perez, a Spanish official who wished very much to get employment from our Government, but who had incurred the dislike of the citizens of Guam. Fray Francisco Resano returned to Saipan on the *Jan-ho-maru*. He is now the Cura of San Isidro de Gàrapan on that island. These priests are friars of the Augustinian order of *Recoletos*, whose principal convent is in Manila. The Augustinians took the place of the Jesuits on this island in 1769, when the latter were expelled by order of Carlos III.*

I have a little book before me written by a friar in which the principal prayers, the creed, and other articles of the Christian faith are printed in Spanish and the island vernacular in parallel columns: "Devotion to San Francisco de Borja, Patron of the Island of Rota: Explanation of the Holy Sacraments and the manner of receiving them worthily: Devotion to San Dimas the good thief, Patron of Merizo, and the Doctrine explained. By Father Fr. Aniceto Ibañez del Carmen, Augustino Recoleto, and former Cura and Vicar in the Mariana Islands." Manila, 1887.

He dedicates the book to the natives of Guam, "his beloved children," for whom he has written it, begging them to commend him to God, and this will suffice for their old Cura and Vicar. In a historical sketch he traces the history of the island from the time of its discovery by Magellan, describing the martyrdom of Padre Sanvitores, the "Apostle of the Marianas," and lovingly recalls some of the friars of his order who have most endeared themselves to the people. One of those he mentions is Fray Pedro del Carmen, of whom I have heard my friend Father Palomo speak many times. It was Padre Pedro who laid the foundation of Father

*The official report of the Governor relating to the expulsion of the friars created a sensation at the Department. It was forwarded to President McKinley, whose interest was particularly attracted by the disclosure of the fact that the first American Governor of the island has already been obliged to adopt heroic measures in his administration of island affairs, owing to the opposition of the friars, who believed that any disturbance of the order of things which had governed the island for so many years would cause them to lose their hold on the natives. After exhausting all other means to overcome this influence Captain Leary reports that he was obliged to inform half a dozen of the friars that they might have free transportation away from Guam, and he should expect them to avail themselves of the offer. They left only one friar on the island, and he was a man whose character and reputation were such as to convince Captain Leary of his fitness to remain.—*N. Y. Tribune*, October 31, 1899.

Palomo's education before he went to Manila to study for the priesthood. "He was a real and perfect monk," says Father Palomo, "fulfilling the Divine commandments and his vows, and living here as in a cell of his own monastery. Throughout his life he worked as a true missionary, and on his death-bed, before consigning his soul to his Saviour, he asked his confessor to make a priest of me. When that priest, Fray Aniceto Ibañez del Carmen, gave me his help he said that I had no cause to thank *him;* he was only complying with the dying entreaty of my late teacher, his beloved director." It is undoubtedly true that many of the friars who have lived on this island have been noble men, devoted to the welfare of their people. There have been exceptions, it is true; but where is the sect in which there are none?

It was from Fray Aniceto's little book, on our long passage from San Francisco, that I first studied the island vernacular, the "Chamorro" language, as it is called,—beginning with: *Tatan-mame*, our Father; *agon-mame*, our bread; *naan-mo*, thy name; *naan-ña*, his name; *langet*, heaven; *tano*, earth; *mauleg*, good; *minauleg*, goodness; *gasgas*, pure; *guinasgas*, purity; *guma*, house; *i guima*, the house; *ogsô*, hill; *i egsô*, the hill.

Little by little I was able to deduce rules, and found that in this language possessive adjectives are added enclitically to their nouns; that tonic vowels are modified after the definite article *i;* that abstract nouns are formed by inserting the particle *in* before the tonic vowel; and that there are a few words of the same origin as Malayan, Philippine, and Polynesian, but that the bulk of the vocabulary is different from all of these, and many grammatical features are unlike those of any other language with which I am familiar.

* * * * * * * * *

I gave the supercargo of the *Jan-ho-maru* an order to buy for me a number of plants in Japan, including loquats, lily-bulbs, and persimmons. I do not know whether or not they will grow here, but it is worth the trial. I hear that tea was introduced a few years ago; but it grew so rankly that it was useless. Trees of sapodilla (*Achras sapota*) called "chico" here and in the Philippines, are growing on the island, but will not bear fruit. There is a very fine one in San Ramon, near Don José Herrero's house.

Thursday, September 7.—The Gobernadorcillo of Merizo was this day removed from office in consequence of the complaints of the women before referred to. When he appeared before me in obedience to the summons, he declared that the fault was all his; that the man in whose favor the title had been altered had had nothing to do with the matter. "Señor," he said, "this is the first time; I acknowledge that I have done wrong; punish me as you see fit!" The case was referred to the Governor, who

called the Gobernadorcillo's attention to the gravity of the offense, saying that although he merited severe punishment, he would take into consideration the bad examples of those formerly in authority on the island, and would simply dismiss him from office. The land in question was restored to the rightful owner with all the improvements thereon.

Friday, September 8.—Received this day from the *Yosemite* a lot of lumber, paint, linseed oil, canvas, alcohol, shellac, turpentine, japan dryer, varnish, hatchets, hand-saws, files, paint-brushes, nails, bees-wax, sail prickers, and mortise locks for doors. Stored the lumber in rear of the palace and in the court of my old quarters, the tools under A Barracks, and the alcohol, turpentine, etc., in the bodega of Captain Ingate's quarters. The carpenters will soon begin repairs on the palace.

The material has to be transported from the *Yosemite* to the shore a very long distance, over the shallow reef, the boats often grounding on the coral at low water. Then it has to be hauled to Agaña, a distance of about five miles, over a road which is bad in many places, in bullock and buffalo carts. The most enterprising man in the transportation line is a Chinaman, who has a number of carts and animals. He lives in a village not very far from the landing. I see now that there will be great difficulty hauling heavy objects to Agaña, such as engines, boilers, etc., which we shall need for distilling, for the ice-plant, saw-mill, etc., which the Governor expects to put up.

Saturday, September 9.—Made the last payment on my house, receiving a deed from Doña Rufina Quítugua y Pangelinan. The document was drawn up and signed before the acting notary, Don Joaquin de Leon Guerrero, Father Palomo's nephew, the original remaining in his possession and a copy given to me. Am delighted with my house. It is on the plaza almost opposite the palace. The plaza is pretty well overgrown with trees, shrubs, and spider-lilies. The Governor intends to have it cleared and leveled off for a parade ground. The little kiosk is to be removed and the old sun-dial in front of the palace to be demolished. The plaza will look very bare. I suggested planting a line of coconuts around the plaza. The natives shake their heads at the idea, saying they will be dangerous in times of hurricanes.*

In my garden are growing bananas, plantains, lemons, limes, pomegranates, sugar-apples, or "sweet-sop" (*Anona squamosa*), called *atis* by the natives, egg-plants (*berenjenas*) with large purple fruit, bell-shaped and dwarf capsicum peppers, and some small native tomatoes. My yard has a fine thick carpet of Bermuda grass (*Capriola dactylon*), soft as velvet, with here and there tufts of the coarse *Dactyloctenium ægyptiaceum* and *Eleusine indica*, and the feathery *Eragrostis plumosa*. There are also several sedges growing by the path. One of them (*Cype-*

*See plate, March number, showing plaza cleared and coconuts planted.

rus rotundus), called "chaguan Umatag" by the natives, has rhizomes with the aromatic odor of camphor. Another (*Kyllinga monocephala*) has dense heads of spikelets, shaped like miniature bread-fruit, on which account the natives call it "Chaguan lemae," or "Chaguan rima," which signifies "bread-fruit grass." Merely to look upon this fresh green grass is a delight. In many tropical countries the earth is kept bare by leaf-cutting ants. In Guam these pests are happily absent. I remember seeing gardens in the West Indies and in Brazil, where every bed of flowers, every shrub and tree, had to be protected by a surrounding canal of water. Here grass springs up wherever there is room for it.

In a corner near the terrace connecting my kitchen and house are a number of sprouting coconuts—"*haigüe*" they are called by the natives. These are not mine. Doña Rufina reserved them for planting on her property of Matáguak, in the northern part of the island, near Santa Rosa. I have also many coffee plants, which have evidently sprouted wherever the seed have been thrown. I have never before seen such a spontaneous growth of coffee as on this island. The conditions seem to be perfect for it, even at the level of the sea. This beautiful shrub seems to be as common about the houses of the natives as lilacs are with us at home. I hardly know which to admire most—the dark, glossy, green leaves, the white jasmine-like flowers, fragrant as tuberoses, but soon falling to the ground, or the bright scarlet berries. (Plate 13.) I am raising a number of cuttings of scarlet hibiscus for a hedge about my yard. One of the natives thought it very foolish to plant a thing which would yield no return, when I might just as well have planted coffee. The coffee of this island is of excellent quality. I do not think I have ever tasted better than that which Father Palomo gives me at breakfast. His housekeeper, Josefa, is an excellent woman, and knows how to make many good things, which Father Palomo usually offers to his guests, contenting himself with the most simple diet. Josefa's sister, Susana, is said to be the best cook on the island. I hope to go to housekeeping soon, and will try to get Susana to come and take care of me. At present I take my meals with the rest of the officers. My neighbors have taken me at my word and have made use of my oven to-day. (Plate 14, Fig. 2.)

From my side window I look out across my garden at the tribunal and the old school-house. Above it rises the flat-topped mesa, or table-land, evidently an ancient raised coral reef, with an old abandoned fort upon it, and bristling here and there with coconut palms. (Plate 14, Fig. 1.) I shall soon open a night-school in the school-house, to teach English to the natives. I shall give them three nights a week, and on the alternate nights I can work on the language of Guam with Father Palomo and Don Juan de Torres.

[TO BE CONTINUED.]

Fig. 1. Schoolhouse built from the endowment fund of Maria Ana of Austria.

Fig. 2. Oven in Mr. Safford's garden.

Monocotyledons or Dicotyledons.

By J. Arthur Harris.

Every one who has begun his botanical work as an amateur, collecting and identifying the plants of his local flora, has found specimens which at first did not fall clearly into either of the great classes, Monocotyledons or Dicotyledons. But the name of the genus and the family to which the plant belongs was located in the manual, either from a reference to the common name in the index or after various sections in the key had been tried, and there the difficulty ended. The name of the plant was to be found in Ranunculaceae, Berberidaceae, Nympheaceae, Umbelliferae or Liliaceae, and so the position of the plant was fixed beyond doubt and no further thought was given to the matter. But if the confidence in the manual is once shaken and the material is more carefully studied the difficulty is not materially lessened. The venation of the leaf, the arrangement of the bundles in the stem or the structure of the flower may place it in one of the classes, but the disposition thus suggested is not always supported by the evidence offered by the other parts of the plant, and an attempt to solve the problem by the method best fitted to yield the final and correct decision — the examination of the development, structure and behavior of the embryo itself — has shown that the difficulty experienced in referring certain plants to one or the other of two great classes is not one of similarity of external appearance alone but of fundamental structure as well, and presents a most interesting problem for solution.

Excellent illustrations of the point just stated are the lotus (*Nelumbium*), of the Nympheaceae, and the may-apple (*Podophyllum*), and two other interesting forms, Diphylleia and Jeffersonia, referred to the Berberidaceae, while other forms equally interesting and puzzling might be mentioned. While on the most of these forms the careful developmental work which alone can yield a final and satisfactory solution has not yet been done, it is of the greatest interest to know that investigations upon the embryogeny of Nelumbium have shown that its position among Dicotyledons is by no means an unquestionable one, but that it seems to belong quite clearly to the Monocotyledons. The work upon the development of the embryo has shown that primarily there is a single cotyledon which becomes divided, giving rise to the two "cotyledons" which have till recently determined its position in the Dicotyledons, for the structure of the vegetative parts are by no means characteristically dicotyledonous, nor on the other hand are they typically monocotyledonous. In Podophyllum, both our common may-apple and the closely

related Asiatic form, the seedling has been found to be peculiar in that the cotyledons, if they are really two in number, are united into a long tube, through the side of which the plumule finally breaks in germination, and as Professor Campbell has pointed out, the two opposite lobes of the first leaf suggest the possibility that the two cotyledons may be really only one.

Observations of great interest have recently been published by an English botanist, Miss Sargant, who has investigated the anatomy of monocotyledonous seedlings, especially liliaceous forms, and has advanced a theory of the origin of Monocotyledons from Dicotyledons. In studying the arrangement of the vascular system in the seedlings of a large number of Liliaceae, she finally found a type of arrangement which she considered the primitive one, that is to say the type from which the others seem to be derived. This type, best represented in the seedling of Anemorrhena, with which the more modified forms are connected by intermediate stages, was found to be truly symmetrical throughout, two massive bundles occurring in the cotyledon and suggesting its origin by the fusing of two distinct cotyledons, each furnishing one of the bundles, in some remote ancestor.

The significance of this was first clearly seen when a comparison was made with certain plants commonly regarded as Dicotyledons, particularly some Ranunculaceae, and especially Eranthis, which has a seedling which in appearance and internal anatomy, arrangement of the vascular system, is remarkably similar to that of Anemorrhena. The single cotyledon of this member of the dicotyledonous Ranunculaceae is clearly found by the lateral fusion of the two original cotyledons, and the suggestion comes with considerable force that the more characteristic monocotyledonous condition in a representative of the Liliaceae may have been derived from a dicotyledonous ancestor, and the suggestion has a very especial interest when it is remembered that the vascular arrangement in this form is the one from which the others seem to have been derived.

A considerable number of plants regarded as Dicotyledons have seedlings with but one cotyledon, in which case one is considered abortive or the two cotyledons are grown together along one edge. In other cases the fusion occurs along both edges, as is the case in Podophyllum, forming a tube in which the plumule is contained a long time. Nearly all of these forms have certain other characteristics in common and seem to be adapted to life under certain conditions, but the evidence which they offer in support of the theory recently proposed can not be considered here.

The simplicity of structure exhibited by the Monocotyledons as compared with the Dicotyledons is very apparent. There is a quite general

impression among those who may be well acquainted with some phases of botany, but who have never given this question special consideration, that the dicotyledonous plants have originated from monocotyledonous ancestors, and this impression may be due in large measure to the greater degree of differentiation attained by the Dicotyledons as compared with the Monocotyledons as a group, and the assumption that the evolutionary chain is a simple and continuous one with the simpler members of our flora representing the type of plants, although perhaps not the exact species or genera, from which its more highly organized representatives have evolved. But the problem is by no means so simple, for all the groups of plants are not to be regarded as parts of a continuous evolutionary chain, and there are many problems of exceeding complexity to be solved before the relationship of all the groups — whether they be great or small — are understood; and the investigation which clears up these dark points can not be superficial in character, for these cases of extreme specialization and modification are neither few nor simple.

We must not lose sight of these principles in considering the relationship of the two great groups into which the Angiosperms have been divided. While the Monocotyledons are clearly less highly differentiated than the Dicotyledons, the geological evidence does not seem to indicate their greater antiquity. The two groups seem to have arisen almost simultaneously or it has been suggested that the Dicotyledons are the older of the two. In either case the geological evidence for the origin of one group from the other is not great and, in case embryological evidence can be found in favor of it, there is no objection to the formating of the hypothesis that the Monocotyledons have originated from the Dicotyledons, and in case it be shown that the Dicotyledons are really the older it is certainly a point of weight in favor of the new theory.

It would be a serious omission to fail to mention a theory which Mr. Lyon, whose study of the development of the Nelumbium embryo has been a stimulus to a more careful consideration of the relationship of these groups, has recently advanced. Cotyledons are generally regarded as modified leaves. No suggestion to the contrary is to be found in our general text-books of botany and only very rarely in the more exhaustive and technical works. In their behavior during germination many of them resemble in the closest way foliage leaves, though usually quite different from the foliage leaves of the plant upon which they grow; but many are so much modified as to have lost all resemblance to a leaf, as is well illustrated in the absorbing organ of the grasses, palms, and others. The theory proposed by Mr. Lyon is that the cotyledon is not homologous with the leaf, but with the nursing foot of the mosses and ferns. If this theory be the correct one we must regard the cotyledons of the grasses, palms and other Monocotyledons as the primitive

type and the forms which come above the ground, become green and perform the function of foliage leaves during germination, as the most modified type. According to this theory the single cotyledon would be the original type and the Dicotyledons would be supposed to originate from the Monocotyledons by a bifurcation of the cotyledon as has been described in Nelumbium, instead of the Monocotyledons originating from Dicotyledons through a lateral fusion of the two cotyledons into one as Miss Sargant has considered.

The problem is by no means solved, but a beginning has been made which shows what an intensely interesting field of work is open. What the ultimate conclusion will be only time and patient and careful work will tell, but we may well believe that the conceptions which we have till so recently held will be found far from satisfactory in the near future.

From the standpoint of systematic botany the problem is plainly of the greatest importance, for while the most of our species of plants may have been collected and described, and monographed and revised, there is still an immense field for taxonomic work in the determination of the relationship of genera and families as well as of the higher groups.

The Palm Collection at the New York Botanical Garden.*

By George V. Nash.

The palms form a well-marked family, their nearest relative being a small group of plants, the Cyclanthaceae, to which, in foliage and habit, they bear a strong resemblance, but are separated by the more essential characters of flowers and fruit. They are also related, and not very distantly, to the aroid family, to which our own jack-in-the-pulpit and skunk cabbage belong. They are either nearly stemless, bearing their leaves close to the ground; or, as is most frequently the case, the stem is developed into a trunk; this is smooth, or sometimes armed with stout spines; in some it is over 100 feet long, in some creeping on the ground, in other cases slender and vine-like and climbing over tall trees by means of spiny leaf-stalks or special organs of a similar character; but commonly it is stiff and erect.

The flowers individually are quite small, but, occurring as they usually do in large masses, the inflorescence is often an object of much beauty. The flowers are perfect, that is with the staminate and pistillate organs

*Condensed from the *Journal of the New York Botanical Garden.*

in the same flower; monoecious, or with the two in different inflorescences on the same plant, or in different parts of the same inflorescence; or dioecious, with the two borne on different individuals. The sepals and petals are commonly three each, and the stamens usually double that number, or in some few cases as high as fifty. The fruit is dry, berry-like, or a drupe.

The entire family, comprising about 1,100 species and 140 genera, may, in a general sense, be called tropical, for only relatively few species pass beyond the tropics into subtropical or temperate regions. The greatest development has been reached in America, Asia and Australia having relatively but few, and the representation in Africa being even more meager.

Economically the value of the palms can hardly be estimated, for there is scarcely an essential of life in tropical regions which can not be supplied by some member of this royal family of plants. They vie with the grasses in importance to mankind. Articles of food and drink; materials for the manufacture of all kinds of household utensils; fabrics for the making of ropes, lines and clothing; materials for house-building, and other uses too numerous to mention are filled by many of these plants. In civilized lands they take an important place in our decorations, adding much of beauty and grace, and the love of them and their culture has been the cause of the bringing together of many collections.

In the Garden collection, the palm which will first attract attention upon entering the large palm house by the southerly door and bearing to the right will be the large specimen of *Caryota urens*, the wine or toddy palm, standing to the left and towering well above all its neighbors. To the left of the *Caryota* is another noteworthy palm, *Phoenicophorium Sechellarum*, a native of the Seychelles Islands, as its specific name indicates. Immediately in front of this is a specimen some 15 feet tall of *Coccothrinax argentea*, the broom palm, from the Isthmus of Panama, and in the immediate vicinity are smaller plants of a closely-related species from Trinidad, *C. radiata*, which is much more common in cultivation; and also a third species, *C. jucunda*, known only from southern Florida, from whence it was but recently imported, and very rare in cultivation, will be found nearby. The leaves of *C. argentea* are used in the manufacture of brooms and baskets and other kinds of wicker ware. Close at hand is a small plant of a species widely spread throughout India and Malaysia. Its economic importance is the only excuse for alluding to it here, as the plant is as yet too young to show character. This is the betel-nut palm, *Areca Catechu*, which has been in cultivation a very long time, and as a result many varieties have been produced, each having its native and local name. It attains a height of

50–60 feet and bears large bunches of orange fruit about the shape and size of a small hen's egg. The outer covering is thick and fibrous, enclosing a much smaller nut, and it is for this nut that the palm is so extensively cultivated and highly prized by the natives. It is chewed in conjunction with the leaves of some species of the pepper-vine with an admixture of various other ingredients. The constant chewing of this mixture makes the teeth black and gives to the mouth and lips a brick-red color. The nuts are valued for the amount of astringent matter they contain—the more of this element present the more highly are they esteemed. The spathes are frequently used to form drinking and baking utensils.

Just opposite the north entrance is the group of *Phoenix*, containing a number of species and varieties, although most of the plants are as yet small and too young to flower. The most important species is *P. dactylifera*, the true date palm, of which there are many cultivated forms, two or three being represented here in small specimens. This is a native of Africa, although it has been extensively introduced into other tropical countries and into southern Europe. The prepared fruit of this tree is too well known and appreciated to need description here. It is dioecious, that is, it bears the staminate and pistillate flowers on different plants, so that the precaution is usually taken to artificially fertilize the female flowers to insure a good crop of fruit. It attains a height sometimes of 80 feet, terminating in a crown of elegant gray-green leaves. It has many other economic uses in addition to its fruit, which, of course, is its most important product. The leaves are made into brooms and brushes, and the thick fiber which binds the petioles together is manufactured into all kinds of rope and twine. To the inhabitants of northern Africa and the oases of Sahara this palm is of inestimable value, in fact it is the great resource of that region. Their houses are made from its leaves and trunks; the wood is used for fuel; the dates form a large part of the food, both for man and beast; and even the date stones are consumed by the cattle after first being soaked in water to soften them.

The genus *Cocos* occupies a place near the entrance to house No. 2, the aroid house. With the exception of the cocoanut palm, *C. nucifera*, they are natives of South America, largely of Brazil. There are two plants of *C. plumosa*, one on either side of the walk, about 25 feet tall; this is a native of Brazil. In extreme contrast with this is the delicate little *C. Weddelliana*, another inhabitant of Brazil. Its graceful leaves of a rich shining dark green with their narrow drooping segments give this little plant a dainty and well-kept appearance which readily accounts for its popularity as a decorative plant. Of *C. nucifera*, the true cocoanut, there are several specimens, ranging from 2 to 10 feet in height, the smaller ones having been germinated at the Garden. This palm is one

Palms in the New York Botanical Garden: *Roystonea* and *Neowashingtonia* to the right; *Livistona* and *Archontophoenix* to the left. Reproduced from the *Journal of the New York Botanical Garden*, by courtesy of Dr. D. T. MacDougal.

of the stateliest among a family of stately members. Its trunk attains a height sometimes of 100 feet and its leaves a length of 15 to 20 feet.

Here also will be found a small plant of *Calamus ciliaris*, from Malaya. This is one of the climbing palms, referred to earlier, and the long slender spiny organs used by it in climbing will be noted; by means of these the plant pulls itself up by laying hold of surrounding objects, for these organs are provided with downwardly turned spines, well adapting them to this clinging process.

Adjoining the cocoanuts are specimens of the royal palm, *Roystonea regia*, and the West Indian cabbage palm, *R. oleracea*, both natives of the West Indies, the former also occurring in the southern part of Florida and in Panama. The plants are only about 15 feet tall and are just beginning to show the trunks, which make these palms in their tropical home such a striking feature of the landscape. The cabbage palm, sometimes attaining a height of over 100 feet, is of great economic importance. The broad bases of the petioles of the old leaves are used for a number of purposes, and the heart of tender young leaves is made into pickles or used as a vegetable. The trunks are used for making troughs; from the interior tissues is manufactured a sort of sago; and from the nuts is procured a kind of oil.

On the opposite side are the *Howeas*, natives of Lord Howe's Island, lying just east of Australia, *Howea Belmoreana* and *H. Forsteriana*, both much in use for decorative purposes in this country, commonly under the name of *Kentia*.

These are followed by a large group of the genus *Livistona: L. Chinensis*, the Bourbon palm, or, as it is frequently called, *Latania Borbonica*, another of our decorative plants, in several specimens, one of which is about 20 feet high; *L. australis*, at home in Australia; and *L. rotundifolia*, from Java, a neat bright looking species, which is much in favor as a house plant. Another palm much used in decorating is grouped near the south door, *Chrysalidocarpus lutescens*, the yellow-fruited palm, known more commonly as *Areca lutescens*. The base of the trunk soon surrounds itself with offshoots, and these, with the graceful leaves with their bright colored petioles and midribs, make the plant peculiarly attractive for decoration. It is a native of Madagascar, where it attains a height of 30 feet; the taller of our plants are about 20 feet, and one of these fruited the past summer.

Just back of these is *Ptychosperma Macarthurii*, one of the Australian feather-palms, with its tall, slender annulated trunk; this is usually in flower, as it is a free bloomer; it is native to Australia.

In the same house is also a small plant of *Arenga saccharifera*, of great economic use in the East Indies, where it is widely distributed. It grows to about forty feet in height and furnishes many articles necessary to the

inhabitants; among others the coarse fibrous material borne at the base of the petioles is manufactured into ropes, clothing, etc., which are very durable as the fiber has the property of shedding water. This is also one of the toddy and sago palms of that region.

Near by is another of our native palm genera, *Neowashingtonia*, in two species, *N. filifera*, the weeping palm, from southern California and western Arizona, and *N. robusta*, from western Mexico. *N. filifera* grows from 20 to 40 feet tall, the base diameter of the trunk measuring 2 to 3 feet. The old leaves are persistent, hanging down and entirely concealing the upper part of the trunk in old specimens, and giving the palm a very shaggy appearance. *N. robusta* is similar to this, but is stouter and has shorter and more spiny petioles.

Perhaps the rarest plant in the collection is the small one of *Lodoicea Sechellarum*. This was secured from Mr. Falconer, of Pittsburg, and is one of several he succeeded in germinating, a feat, we believe, not before accomplished in this country. Long before the discovery of the tree itself, its fruit was found floating in the Indian Ocean, and from this circumstance it derived its old name of *Coco de Mer*. The unknown origin of these odd fruits gave rise to most astounding tales. One of these was to the effect that the fruit was not a product of the land but of the sea itself, and that it was produced by a tree growing in the ocean and similar to the true cocoanut; this was said to be visible upon the coast of Sumatra, but immediately disappeared did any one dive down to investigate. This mystery of its origin and its scarcity made its fruit appear to the native mind most valuable and to possess wonderful properties of healing, and in one land a royal edict made punishment by death the penalty for its possession by any but the king himself. The discovery in 1743, in the Seychelles Islands, of the palm which bore the fruit, put a stop to all such tales, and its mystery gone the fruit soon lost all its reputed healing properties and became an object of mere curiosity, or a convenient article to be manufactured into necessary apparatus, such as receptacles for carrying water, dishes, plates and other household utensils. The fruit is often 18 inches long and sometimes weighs 40 or 50 pounds, and requires about ten years to reach maturity. The tree attains a height of 80 to 90 feet.

Mr. T. F. Sedgwick, Agriculturist of the Hawaii Experiment Station, has just published a little pamphlet on "The Root Rot of Taro," prepared under the direction of Mr. Jared G. Smith, director of the station. Taro is a plant of the arum family, closely resembling the so-called caladium or "elephant's ear" of our lawns. It is one of the most important of tropical crops, the large fleshy tubers being cooked and eaten by the natives throughout Polynesia. The remedy suggested for the disease by Mr. Sedgwick is to treat the soil with lime and to add fertilizers.

Briefer Articles.

AN INDOOR FERNERY.

One of the pleasures connected with the ferns is that we may study them in our own homes if we take the trouble to construct a suitable dwelling for them. My own fernery is a rather rough affair, twenty-two by seventeen inches, and a foot high, with one side hinged at the top so that it may be opened readily. The base is made of five-eighths inch boards strongly fastened together by cross-pieces with the nails clinched. Upon this are nailed four strips of half-inch pine, forming a box two and one-quarter inches deep that just fits inside of the glass cover. The inside of this was varnished to protect the wood, and then a little mound of limestone and granite was made, and the whole was filled in with the richest earth obtainable in the woods.

When first made the case stood on edge, so to speak, being seventeen inches tall, but in winter the cheerless space between them and the top seemed to discourage the ferns. The present arrangement not only gives more space for planting, but there is less empty space above the ferns. It stands near an eastern window, and even on a winter morning, after an all-night exposure to the cold air coming in, the inside of the fernery keeps warm with only an old woollen cover thrown over it. In summer a piece of thin paper is pasted over the front to keep off the direct rays of the sun, and the side is kept open an inch or two. Every week or two a quart or more of water is poured in, taking care to put plenty in the corners, which are more apt to dry out than the center.

This sounds very rough and crude, but some ferns find it a congenial home. At present sixteen or seventeen species are growing more or less luxuriantly, and it is interesting to note their different behavior. * * * No "management" is necessary except what is stated above, only we are often obliged to cut out handfuls of fronds of some species to keep them from crowding the others out of existence.—*C. E. Waters, in The Fern Bulletin.*

ABNORMAL TRILLIUMS.

A number of observers have given us several papers on various peculiar occurrences in Trillium plants other than the usually published characters for the genus. The purpose of this article, then, is to suggest a grouping of these peculiarities, so that on noting unusual leaves or flowers or their parts, we may have a convenient way to classify them.

It is well known to all that vegetation in general has a tendency and power to replace lost parts or produce new parts to complete the func-

tional activity of the whole plant. Wherever such repairs are made the series of changes in developing parts is approximately the same as that in the development of parts of a seedling of the same species. In the Trilliums the first leaf after the cotyledon is petioled, so to speak, by its sheathing base. Occasionally its blade diverges somewhat from the erect axis of the plant, and when so divergent becomes green and more leaf-like in texture. It would take but a little more development to produce a perfectly typical blade. Such typical blades are developed at this stage in our Jack-in-the-pulpits. Just such leaves as these were developed on a mature plant of *Trillium sessile* which was described and figured in the PLANT WORLD, Vol. 5, p. 92 (May, 1902). Of this plant, Mr. Theodor Holm says: "The little leaves are from 'otherwise' dormant buds, which in your specimen have pushed out. Your specimen is injured, since the terminal bud has been replaced [functionally, the writer would add] by two which have developed into [leaf-] bearing stems." We may consider all such abnormal developments as reparative.

Trillium grandiflorum. Physiologically abnormal, with the peduncle 8 inches long, the petioles 8½ inches long, petals green, with white margins. Drawn by Miss Mausie Cameron after photograph by Mr. J. M. Dickson, Hamilton, Ontario, kindly loaned by Mr. J. M. Macoun of the Canadian Geological Survey.

In contrast to the situation above cited, many plants spring up where the conditions are more or less unsuitable for them. Lack of moisture at the roots or in the air, too much light or too much shade, crowding by too close neighbors, and a score of other conditions affect every species in their normal development. In *Trilliums*, perhaps, as well as in any other group, the results of these conditions are recorded in abnormal development, or in atrophy, or in arrest of development previously begun. These results are physiological.

Abnormal development is shown in the asymmetry of the floral parts in one or more series, irregular and unusual development of pigments, or the unequal growth of leaves otherwise normal. Atrophy, or the arrest of development, may take place in any of these parts. In contrast to

these results may be noted abnormal development, without asymmetry or irregularity, in the enlargement of parts, particularly the lengthening of scapes, of petioles, of peduncles, of claws.

In the accompanying figure is outlined a plant wholly normal except for the long petioles and peduncle, and the coloration of the petals, which were partly green and white. This includes two kinds of abnormality.

It is to be regretted that at the various times these abnormal plants were noted or collected little if any attention was paid to the exact conditions under which they were growing. Accordingly it is impossible definitely to state which results obtain from any set of conditions, as interesting as such facts would be. Reparative abnormalities have been noted by the Macouns, father and son, in *Trillium undulatum* and *cernuum*, and in *Trillium sessile* in this paper. Physiological abnormalities have been noted by Mr. J. M. Macoun in *Trillium grandiflorum* (Canadian Rec. Sci., Oct., 1897, 476, 477); and by Mr. H. W. Britcher in the same species (Maine Agric. Exper. Sta. Bull. 86, Nov., 1902). Two specimens collected by Mr. G. B. Grant, at Moose Head Lake, Maine, in August 1898, have the simple leaves long-petioled from the rootstock, probably developed as suggested by Mr. Holm for *Trillium sessile*. Mr. Grant's specimens probably are *Trillium grandiflorum*. He writes that one botanist has called them "fall leaves," thereby suggesting a likeness to the putty-root and Tipularia. However in these the only foliage leaves are autumnal, while in *Trillium* the usual whorled leaves are foliage leaves. To settle this point, careful observations should be made on *Trillium* beds during the coming season between May and October.

Department of Biology,
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EARLY BLOOMING OF SPRING FLOWERS IN THE VICINITY OF WASHINGTON.

PROF. C. A. WHEELER, of the U. S. Dept. of Agriculture, who for many years has kept a record of the time of blooming of plants, reports that for many species the time of blooming in a given locality may vary through a period of about thirty days. In the vicinity of Washington he has this year observed *Berberis japonica* in bloom since Christmas; *Chimonanthus fragrans* (*Calycanthus praecox* Linn.) since February 1; *Alnus Japonica* February 10, shedding its catkins February 14; *Acer saccharinum*, *Forsythia viridissima* and *Forsythia suspensa* February 13 (the last in sheltered places). At Glen Echo Miss Sipe found *Hepatica triloba* blooming profusely February 8. W. E. S.

The Wild Flower Preservation Society of America.

In the next issue of The Plant World will appear a complete list to date of the Patrons, Fellows, and Members of the Society. April 23 is the first anniversary of its organization, and it may be well again to call attention to the work that it has accomplished. The policy of the Board of Managers has been two-fold: first, to enroll as large a body of members as possible; second, to arouse public interest and sentiment gradually as a preliminary to instituting reforms. In this educational work the dissemination of literature of the right kind is the most important factor; and there have been published in The Plant World and afterwards issued as separates five essays dealing with the subject of plant protection. These may be obtained in any desired quantity without charge; and the demand for them has been so large that new editions must shortly be prepared. In connection with these essays our circular of information has been very generally distributed.

Through the efforts of our press bureau a number of descriptive articles have appeared in various newspapers, and a Philadelphia syndicate prepared, without cost to the Society, a full-page article on the subject, illustrated in colors. Public lectures have been given in Washington, Baltimore and Philadelphia; and many suggestions as to practical methods of work in the schools have been furnished through correspondence with teachers. We shall publish shortly some letters showing what individual effort may accomplish.

With the growth of public interest in the subject, and the experience of the Audubon Societies as a guide, the Society should be able during the coming year to make substantial progress in its work.

Early in May the Secretary will lecture on "Vanishing Wild Flowers" in various cities of the central Western States, and will organize local chapters wherever possible. The itinerary, as far as arranged, is as follows: Columbus, Ohio, May 4; Cincinnati, May 5; Crawfordsville, Indiana, May 6; Lafayette, May 7; Chicago, May 8; Sandusky, May 9; Cleveland, May 11; Syracuse, May 13 (probably). In each of these cities the lectures will be delivered under the auspices of a local scientific society or a University. The Secretary will be glad to meet personally all members resident in the localities visited by him, and to receive advice and suggestions.

Editorial.

THE founding of the Carnegie Institution was a notable event and the publication of the first "Year Book" has been awaited with expectancy, for it was presumed that herein would be outlined the principles and plans along which it would be administered. This book is before us, having been issued some weeks ago, and is on the whole remarkable for what it does not contain rather than for what it does; and we can not help a feeling of some disappointment at the results thus far attained and the apparent indication of lines for future activity. The report of the active officers of the Institution fills only 46 of the 351 pages of the volume, most of this being taken up with the articles of incorporation, by-laws, deed of conveyance, etc., the major portion consisting of reports, often voluminous, of special committees who were requested to submit plans for work in particular fields of research. After setting forth the proposed aims of the Institution the trustees list a number of things that it is not proposed to undertake, such as to "do anything that is being well done by other agencies," "to do what can be better done by other agencies," "to enter the field of existing organizations," "to purchase land or erect buildings for any organization," "or to provide for a general or liberal course of education," etc. It appears that the sum of $185,000 has already been appropriated, but neither the recipients of the grants nor the objects for which they are to be used are specified beyond the bare statement that botany has received $11,700; geology, $12,000; chemistry, $3,000; astronomy, $21,000, and so on through the list of twenty-two subjects. From outside sources it is learned that sums as small as $250 have been granted, the most frequent amount apparently being a thousand dollars, but so far as can at present be determined none of these seem quite up to the standard that it was hoped would be set; in fact our position is almost exactly set forth by Dr. C. Hart Merriam in his letter to the Institution as printed on page 170. He says: "While in accord with much of the report, I find myself more and more opposed to the plan of scattering the work and funds of the Institution. * * * Its strength and influence should not be weakened by diluting and scattering its resources, but husbanded for uses in keeping with the promise and scope of the Institution. It is quite conceivable that its rich endowment might be so distributed as to partake of the nature of charities to individuals and institutions." Of the various proposed explorations and investigations on a large scale, that seem commensurate with the "bigness" of the Institution, the

plan for a biological survey of the Palaearctic region submitted by Dr. L. Stejneger and Mr. Gerrit S. Miller seems to us to be perhaps the most important. Although more elaborately formulated it is quite in line with suggestions made in these columns some months ago, and if carried out could not fail to result in vast and permanent good. Strange as it may seem we do not yet know whether the northern portions of the Old and New Worlds constitute one or two distinct life areas. Although a large amount of work has been accomplished there are neither collections nor data available to settle this and kindred problems for a single biological group. We sincerely hope that the Institution may yet see its way clear to execute this plan. The suggestion of Dr. Merriam for a biological survey of South and Central America is also to be recommended, and both this and the proposition of Stejneger and Miller seem to offer more possibilities for botany than do any of the plans elsewhere submitted.

THE CONNECTICUT BOTANICAL CLUB.

To the Editor of THE PLANT WORLD: Activity among Connecticut botanists has been manifested in the organization of the Connecticut Botanical Society, which was effected under most auspicious circumstances at New Haven, January 24, 1903, thirty-one persons participating. The following officers were elected: President, Prof. Alexander W. Evans; vice-president, Dr. Charles B. Graves; recording secretary, Dr. Edwin H. Eames; corresponding secretary, Mr. E. B. Harger. Among the interesting features of the meeting were papers on "November Wild Flowers" by Mr. Harger, "On the Geographic Distribution of Certain New England Plants" by Mr. M. L. Fernald, and "Notes on the Flora of the North Haven Plains" by Mr. W. E. Britton. As the preparation of a complete flora of the State, founded upon the most accurate information, has been found desirable, the following committees have been appointed: On Phaenogamous and Vascular Cryptogamous plants, Dr. C. B. Graves, New London; Dr. E. H. Eames, Bridgeport; Mr. C. H. Bissell, Southington; Mr. L. Andrews, Southington; Mr. E. B. Harger, Oxford, and Mr. J. N. Bishop, Plainville. On Lower Cryptogams, Prof. A. W. Evans, New Haven; Mr. Isaac Holden, Bridgeport, and Dr. G. P. Clinton, New Haven.

Many botanists not resident in the State can furnish valuable material for this work, and all who are able are invited to correspond with any member of the Committee, who will make proper acknowledgments.

E. H. EAMES, *Secretary.*

The Home Garden and Greenhouse.

CONDUCTED BY F. H. KNOWLTON.

[The editor of this department will be glad to answer questions of a relevant nature, and also to receive short articles on any phase of this subject.]

Necessity for Tillage.—An important point has been made in recent years regarding the necessity of keeping the soil light and loose about growing crops, but the reasons why this is so do not seem to be widely understood. The following succinct statement is taken from Farmers' Bulletin 161 on Practical Suggestions for Fruit Growers, by H. P. Gould, and while primarily applying to care of orchards, is of much wider application. He says:

"The offices of tillage are several. Among the most important are:

1. The setting free of plant food by increasing the activities in the soil.
2. The soil is made finer and hence presents greater surfaces to the roots, thus increasing the area from which the roots can absorb nutriment.
3. The surface of the soil is kept in such condition that it immediately absorbs all the rain that falls during the summer, when it is apt to be dry. Little is lost by surface drainage.
4. Moisture is conserved thereby. When the surface is undisturbed for weeks the soil becomes packed, so that the moisture from below readily passes to the surface and is evaporated, thus being lost to the growing crop. If the surface is kept light and loose by tillage, so that the capillarity is broken, but little of the soil moisture comes to the surface and evaporation is not so great. In this way nearly all the moisture remains in the soil, where it can be used by the plants.
5. Thorough tillage has a tendency to cause deeper rooting by the plants. The surface of the soil is made dryer by tillage during the early part of the season than it would otherwise be; hence the roots go where the soil is moist. The advantage of deep rooting during drought is obvious."

Insect Pests.—The insects that are most likely to make trouble for house plants and plants grown in greenhouses are the aphis or green fly and the so-called red spider, either of which will speedily destroy the plants unless checked. The green fly can easily be kept down with a tobacco preparation, either by burning the leaves or by using a fine powder made of the ground-up leaves and stems. One of the most satisfactory preparations on the market is that known as aphis punk, which comes in the form of rolls of paper impregnated with tobacco. A single piece will kill all the green flies in a house 10 by 20 feet except possibly a few that may be hidden deep in half-opened flowers. The punk should be dampened before use and should not be permitted to blaze, but simply

to smoulder. The red spider is unfortunately not affected by the fumes of tobacco, but readily disappears before a thorough wetting. If the house is so situated that water can be used with force, it is a comparatively easy matter to keep them down; but if not, the plants can be sponged off with warm soap suds or immersed in a tub of water. Care should be taken to thoroughly wet the under sides of the leaves, as this is where the mite takes up its headquarters. They can also be exterminated by the fumes of hydrocyanic gas, but as this is also destructive to delicate plants it can only be used with caution and by persons thoroughly familiar with its effects.

Too Much Water.—A few days ago we were asked as to the probable cause of the dropping of the leaves on a rubber plant. An investigation of the plant disclosed that it was standing in a jardiniere that was half full of water and presumably had been for weeks. Plants undoubtedly need water, some of course more than others, but there are few that can stand having the roots submerged and with no opportunity for the air to reach them. Palms are especially averse to "wet feet" and will very soon show signs of failing if subjected to this treatment. Good drainage is as essential as good soil, and those who would succeed with plants must see to it that they are properly treated in these respects.

Perennial Phloxes from Seed.—Perennial phloxes are raised from seed as easily as any of our most vigorous annuals and are as easily managed. The seed can be sown at any time from February to the first of May, or even later, and with only ordinary care and treatment they will bloom before winter sets in. Sow in pans or flats, not too thickly, and place these in a moderately cool house in a light position. Don't let them get too dry and the seed will germinate inside of three weeks, according to its freshness and the atmospheric conditions. Or they may be sown during March or April in an ordinary hotbed. As soon as the plants are large enough to handle, prick them off about two inches apart in flats or a hotbed and when they are two to three inches high pot them off into 3-inch pots. In two weeks' time the plants will be ready to be planted out in the field or garden. In good rich soil they will grow fast and vigorously and produce strong branching panicles almost as early as the cuttings you take from old plants. They should be left undisturbed for another year, because a second season may develop special characteristics or value in any of the plants. Not until you have seen a second blooming can you determine whether the plants are worth keeping or not.—*Gardening*.

Magnolia stellata.—One of the finest of the early-blooming shrubs is *Magnolia stellata*, or *M. Halliana*, as it is frequently called, having been introduced from Japan by Dr. Hall, of Newport, R. I., about forty years ago. It begins to bloom when only two feet high and increases in beauty

until it attains its maximum size, which in this country seems to be about ten feet. When grown in the open it is of a round, compact shape, and as it flowers before the leaves appear it is a perfect mass of snow-white blooms. The petals are narrow and in several rows, whence the specific name of *stellata*. It remains in bloom for two or three weeks and the flowers are succeeded by the shining green leaves. The fruit is bright red, which adds to its attractiveness in the fall. It is perfectly hardy, at least as far north as Massachusetts. It is now in its perfection in the Washington parks.

Nasturtiums for the Greenhouse.—Although a very familiar plant, amateurs will find the nasturtium a very satisfactory winter plant for a small greenhouse. The tall-growing varieties may be grown in small pots and trained about a pillar, a support in the pot, or permitted to hang down over the edge of a bench or shelf, while the dwarf forms make very pretty subjects for hanging baskets or when grown as specimen plants in pots. All they need is good rich soil and plenty of water and they will bear a profusion of bright-colored flowers for months and may be put out in the border in spring when the weather is mild and will continue blooming all summer. By removing most of the leaves the tall-growing variety may be grown to a length of twenty or thirty feet and trained around the greenhouse.

Streptosolen for the Greenhouse.—A very pretty shrubby evergreen plant for cool greenhouse culture is *Streptosolen Jamesonii*, or *Browallia Jamesonii* as it is sometimes called. It was introduced from Colombia in 1847 and is of the easiest culture, requiring rich rather porous soil and plenty of water. It grows several feet in height and if not pruned makes a bushy growth, but it may be trained against a pillar or other support. The leaves are small, ovate in shape and strongly veined, and the tubular flowers, borne in large terminal panicles, are at first deep lemon-yellow, soon changing to reddish-orange. They remain for six weeks or more, and the little bush fairly glows with the showy blooms. It is readily propagated by cuttings, and blooms the first year.

Management of Greenhouses.—The Agricultural Department of the State of Pennsylvania has recently published, as Bulletin 97, a very valuable pamphlet of forty pages on the management of greenhouses, by Edwin Lonsdale, the well-known and successful grower of Wyndmoor, Pa. After treating of the construction of greenhouses, their heating, watering, and management, he speaks at some length of rose-growing, giving directions for forcing and general growing. There are also short chapters on the ordinary diseases of plants, as roses and carnations, that are grown commercially, and one on insect pests and the means of confronting them.

Book Reviews.

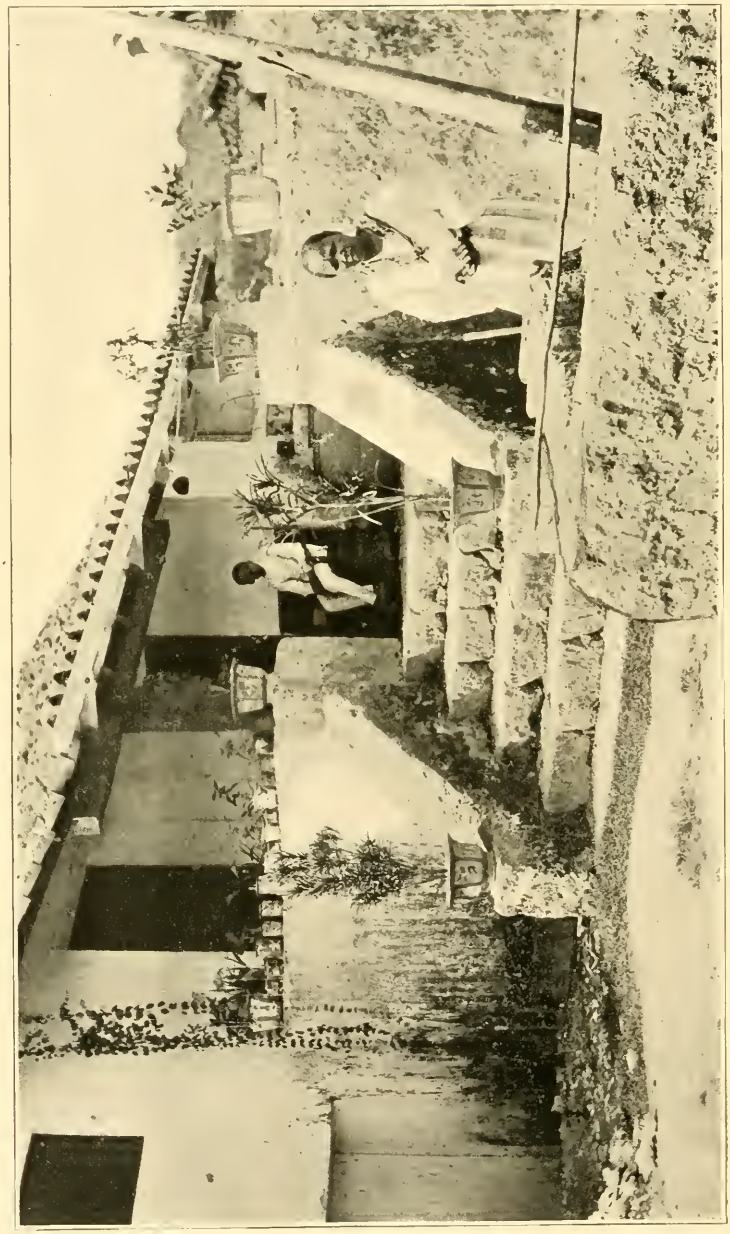
BOTANY ALL THE YEAR ROUND. By *E. F. Andrews*, High School, Washington, Ga. Cloth, 8vo, 302 pages. Price, $1.00. American Book Company, New York, Cincinnati, and Chicago.

This book is admirably adapted for botanical work in the average high school, and requires no expensive equipment. It is based on observation, and in this respect meets the popular demand. The lessons are so arranged that each subject is taken up at just the time of year when the material for it is most abundant. In this way the study can be carried on all the year round, a plan which is much more sensible than crowding the whole course into a few weeks of the spring term. The language of the text is very simple and direct. Botanical terms are introduced only as required. The pupil is led to make accurate observations, and from them to deduce safe conclusions. He is first taught to observe the conditions of plant life, then the essential organs of the plant are taken up, and finally the author treats of plants as they relate to their surroundings—ecology. The book is accurate, and sufficiently full and complete to meet the needs of secondary schools. The work required can easily be done, and will prove thoroughly educative. F. H. K.

A BOOK OF STUDIES IN PLANT FORM. By *A. E. V. Lilley* and *W. Midgley*. Enlarged edition. 8vo, 183 pages. London: Chapman & Hall; New York: Imported by Chas. Scribner's Sons. 1902. $2.00 net.

Those of our readers who are interested in plants as used for decorative and ornamental purposes will find an excellent plain and simple treatment of the subject in this volume. The plan and scope of the book is well stated in the preface as follows: "Now it is seldom that the plant most suitable for a particular design is in season when it is wanted, and it is often so difficult (sometimes impossible) to find a drawing of the ornamental side of many plants that the author ventures to hope that designers of all kinds will welcome a series of more or less decorative drawings and photographs from nature." The photographs and drawings from nature as well as the conventionalized designs form an interesting series of illustrations. C. L. S.

THE Massachusetts Floral Emblem Society has decided that the Mountain Laurel is its choice for a State flower. The 124 branches of the society report that Mountain Laurel secured 25,000 votes; Mayflower and Pond Lily 3,000 each, and Blue Flag 1,000.—*American Gardening*.



Residence of Mr. Safford at Agaña, Guam. Terrace and entrance, rear of house.

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Extracts from the Note-Book of a Naturalist on the Island of Guam.—VI.*

BY WILLIAM E. SAFFORD.

Sunday, September 10.—To-day received a visit from Captain Dunlap of the *Solace*, accompanied by several officers and ladies. The *Solace* arrived yesterday from Manila, having stopped at Iloilo on her way to land and take on passengers. The distance from Cavite to this island by the route usually traveled by steamers is nearly fifteen hundred nautical miles; from Guam to Honolulu it is a little greater than three thousand miles, more than twice as far.

Went with the party to visit the village of the Caroline Islanders, several photographs of which were taken. The natives of Guam say that when visitors come here they do not seem to care to visit the ranches of the natives and see how they live, but they go to this village composed of the huts of a lot of naked savages and take photographs back home, which their friends think are pictures of Chamorros. In this way wrong impressions of the island and its people are scattered abroad. The contrast between the Carolinos and the Chamorros was especially striking to-day. The former, with beautiful physique, but with great skeins of beads depending from their ears, and their half-naked bodies painted with yellow tumeric and red arnotto, looked indeed like savages; while the latter, tastefully clad in their Sunday clothes after the manner of the Fil-

* Continued from April issue. Begun in September, 1902.

ipinos, looked civilized. Many of the Guam girls are quite pretty. Their dress consists of a short jacket of thin muslin, with low-cut neck and flowing sleeves often ornamented with lace edging, a trailing skirt usually of bright-colored gingham of large checked pattern, a fine white handkerchief over the head and often across the breast, and a necklace, usually of coral with gold beads at intervals, around the neck, from which a cross or medal is suspended. A few ladies dress in the European fashion, but most of them say they can not endure the discomfort of lacing. The shoes are made on the island, usually without heels. Stockings are regarded by most of them a useless luxury.

These people are kind, honest, and very hospitable. Indeed, they will not let one pass without an invitation to enter their houses and take some refreshment. To-day, when we declined an invitation of this kind, one good woman disappeared for a moment and brought back some eggs which she begged us to accept, refusing to take money for them. On the other hand, when some of the visitors remarked upon the abundance of chickens about a house, the owner immediately replied: "Yes, señor, I have a few, but I have a large family, and I need them for my use." They do not seem to care for money; indeed, there is little they need to buy. Chickens and pigs thrive; every family has its field of corn, its tobacco patch, and perhaps a plantation of taro and yams. Coffee and cacao thrive, and rice grows in several localities on the island. In the woods grows the wild fertile bread-fruit (*Artocarpus communis*), called *dugdug;* and about nearly every ranch there are trees of the sterile form of the same species.

The seedless bread-fruit, called by the Chamorros *lemae* and by the Filipinos *rima*, must be propagated by cuttings. Usually suckers, or sprouts growing from the roots, are selected for this purpose. I know of no tree which surpasses it in beauty or which impresses one so forcibly with the lavish provision of nature for man and beast. I have already spoken of the custom of the Carolinos and other Pacific islanders of preserving the fruit in pits where it is allowed to ferment, and of that of the Chamorros, who toast slices of it into biscuit. The fruit itself resembles a huge osage-orange (*Toxylon pomiferum*), either round or oval in shape and of the size of a child's head. It is formed from the female flowers, which are very numerous and are grouped in a head upon a spongy receptacle. The male flowers grow in dense, yellow club-shaped catkins. The leaves are very large, leathery and deeply lobed or incised. The fruit is usually eaten green, when the pulp within is pure white. After it ripens the pulp turns yellow and acquires a sweetish taste. It is attached to the smaller branches by a short thick stalk either singly or in clusters of two or three together. It is eaten either baked or boiled, and with gravy or butter is almost equal to bread or potatoes. Cattle and

horses are very fond of the leaves, which are often gathered by the natives for fodder. Young bread-fruit trees must be protected from animals. The seeds of the *dugdug*, or fertile bread-fruit, when roasted, taste very much like chestnuts. The bark is tough, and in some islands is used for making tapa, or bark cloth. When wounded a milky gum exudes from the tree, which, like rubber, soon becomes viscid. In its fresh condition it is used for sizing for whitewash and for a medium in mixing paints. When older it is used for stopping up the seams of canoes, boats, and water troughs.

On our way back from the village we were caught in a heavy shower and had to put up the curtains on the vehicles for protection. The *Solace* leaves to-morrow for home. Captain Dunlap has promised to get me some navel orange-trees in San Francisco. Those I was bringing with me on the *Brutus* died on the way, owing to our long and unexpected stay in Samoa.

The U. S. S. *Nero* arrived here on September 7th, having completed a zigzag survey from Dingala Bay, Island of Luzon, to this island. Commander Belknap has been succeeded by Lieutenant-Commander H. M. Hodges as her commanding officer. She ran a direct line of soundings to the Philippines, with a view to selecting a route for a trans-Pacific telegraph cable, taking observations at the same time for temperature and for characteristics of the bottom. On her return trip she is zigzagging across her former track, measuring depths, taking temperatures, and getting specimens of the bottom at equidistant stations twenty knots (nautical miles) apart and at the turning points of the line. She left here on the 9th for Japan, to discover if possible a practicable route for a branch cable between this island and Yokohama. She goes directly to Yokohama and will zigzag back again to this island. From here she returns to the United States, *via* the Midway Islands and Honolulu, making zigzag soundings all the way.

One of the most interesting results of the *Nero's* survey has been the discovery of a submarine abyss between the Midway Islands and Guam, which is the deepest yet discovered in the world. To avoid this abyss the cable route between the Midway Islands and Guam will have to be deflected. From Honolulu to the Midway Islands there is an almost level plain of soft mud about 2,700 fathoms below the surface. From Midway to Guam for about a thousand miles there is another plain a little more than 3,000 fathoms deep, broken occasionally by submarine reefs and mountain ranges; then suddenly, a short distance to the eastward of the great submarine volcanic range of mountains running nearly north and south, which, rising above the surface, forms the chain of the Ladrones, or Mariannes, and near the latitude of Guam, this plain sinks into the valley known as the Nero Deep, lacking only 66 feet of a depth of six

statute miles. The southern limits of this deep are not yet known. From Guam to Yokohama the route surveyed passes to the westward of the northern islands of this group, and to the eastward of the Bonin Islands.*

With a cable station on this island Guam will be of much greater importance to the United States; and this will be vastly increased by the construction of a canal across the isthmus. Since the establishment of Mexican independence the island has been of no use to Spain whatever, and indeed has only been a source of expense. As long as Spain owned Mexico, and all traffic between the mother country and the Philippines was carried on *via* Mexico, the island was useful as a station for getting water and provisions; when Spain lost Mexico it would have been wise for her to dispose of the whole group of the Mariannes.

Monday, September 11.—Work was this day begun on the water-distilling plant. Hitherto we have been drinking distilled water from the *Yosemite* brought ashore in casks and hauled from Punta Piti in carts. The river is so choked up by vegetable growth that it will have to be cleaned from its mouth to its source.

Company B of the marines were landed from the *Yosemite* to-day and marched to Agaña. They have taken possession of the quarters recently vacated by me. The Major came with them and will be my guest until the Governor takes up his residence in the palace. Then the Major will live with him. The palace roof has been patched up with tiles from the old chapel given us by Father Palomo. The Governor intends to replace the tiles by a roof of corrugated iron, but the natives shake their heads and say: "Look out for *baguios!*" *Baguios*, as hurricanes are called here, seem to be of frequent occurrence. They often blow down all the huts of a village, destroying the bread-fruit and coconut crops, uprooting the trees or stripping them of their leaves, so that it takes them a long time to recover. The inflorescence of the coconut is formed in the axils of the old leaves; and when these are destroyed the nascent flower spathes shrivel up and die, so that considerable time elapses after a hard blow before the coconut is again in good condition for bearing.

Tuesday, September 12.—Doña Susana Perez has consented to be my cook. She is the sister of Josefa, Father Palomo's housekeeper, and of Don Gregorio Perez, one of the most enterprising, thrifty and industrious citizens of the island. During the Spanish occupation Susana lived with the family of the military doctor. Besides Susana I have an orderly and a boy who makes himself generally useful, running errands, making up the beds, and keeping the house in order. Vicente is the son of Don Lorenzo Franquez, the lieutenant of the Insular Artillery Company. Don

* See the Report of the Secretary of the Navy for the year 1900, p. 299, giving a detailed account of the work of the *Nero*, the success of which was largely due to the energy and good judgment of her executive officer, Lieutenant John Hood, U. S. N.

Breadfruit. Photographed by G. N. Collins.

Lorenzo asked me to allow his son to live with me so that he might learn English. He will not accept wages, and even takes his meals at his own home. Susana asked only five pesos a month for wages ($2.50 in our money), but my conscience made me increase her pay to seven pesos; the two pesos extra I call a gratuity, so as not to incur the ill-will of my American neighbors, who do not want the natives "ruined" by being paid too much for their work. I have shown Vicente and my secretary, José de Torres, how to dry plants. While I am at my office Vicente will change the driers and spread them out in the sun. Both he and José know the vernacular names of most of the island plants, and will be very useful to me on my collecting excursions.

Susana has had *carte blanche* to get what cooking utensils she needs; but she says she requires very few things. In the kitchen she has a stone *metate* and *mano* for making tortillas of maize and for grinding coffee and chocolate. The metate is simply an inclined slab of stone supported on three legs; the mano, a stone cylinder, like a small rolling-pin, slightly tapering at each end. The kitchen has neither stove nor chimney. The cooking is done on a broad ledge, covered with sand, on which stones are laid in pairs for supporting stew-pans, griddles, and the chocolate and coffee-pots. The sand is kept in place by a raised border of wood. The smoke finds its way out through a hole in the lee gable. This seems to be very effective, since with the exception of a few short intervals the wind blows from the eastward the greater part of the year. The water of my well is fit for cooking, but I have cautioned Susana not to use anything but distilled water, even for washing dishes, as I want to avoid sickness if possible; and there is now considerable fever among the people. Poor things! I wish we could distil water enough for them all. There is no system of drainage here, and the town is very flat. The Major is starting his men digging a trench from the palace to the sea for a sewer. I have had a wooden gutter made which catches the rain water from the eaves and leads it to a large stone jar on my terrace. In another jar I keep distilled water, of which I get a daily allowance from that brought from the ship. Fortunately I have enough of the latter to supply an American neighbor with drinking water for the use of his family. I do not think the rain water is dangerous, and even the well water may be used if it is first boiled. Above the jar of drinking water I have hung a Samoan 'ava-cup—a half-shell of a coconut. By my kitchen the pretty rose-colored creeper I brought with me from Honolulu (*Antigonon leptopus*) is now growing rapidly, and I have planted a yellow-flowered bignonia by the terrace, which I shall train upon strings.* My little house is beginning to seem like home. I have covered the walls of the living-room with pieces of Samoan tapa-cloth and have hung up a

*See plate.

few spears, war-clubs, and other souvenirs of travel. My days are taken up with my work. At first I thought I would reserve the evenings for myself, but often after night-fall I have visitors who have trudged ten miles or more from their ranches to tell me of some trouble or to ask my advice, and I have n't the heart to turn them away. Even on Sundays they call, especially those living at remote spots on the island who have come to Agaña to mass.

I can not help feeling the responsibility of my situation ; I feel poorly prepared to decide questions involving nice points of law, for, though I am judge, I have had no other legal training than that of sitting on courts-martial. My little codes of Spanish colonial law, civil, commercial, and criminal, are not much larger than prayer-books ; and I can only do my best in deciding cases between the people under my charge. When I am in doubt I go to my dear old friend Father Palomo. The Governor does not like to be bothered ; he tells me to do as I think best.

Friday, September 15.—To-day the Governor issued General Order No. 5 :

"The existing custom of concubinage, rearing families of illegitimate children, is repulsive to ideas of decency, antagonistic to moral advancement, incompatible with the generally recognized customs of civilized society, a violation of the accepted principles of Christianity, and a most degrading injustice to the innocent offspring, who is not responsible for the condition of his unfortunate existence.

"The aforesaid custom is henceforth prohibited, and is declared to be an offense punishable after November 3d, 1899, by fine and imprisonment ; and all persons in this island so living together out of the bonds of wedlock are commanded to procure from the Government the necessary marriage license and to be married by either the civil or church authorities, or by both, in order that their children may become legitimatized.

"Until November 3d, 1899, the license and the civil ceremony will be free."

In the evening I received a visit from a native, apparently in great trouble. He had heard the *banda* of the Señor Gobernador, which had been proclaimed on all the street corners of the town, and he had come to ask my advice. When a young man he had married a woman who proved unfaithful to him, and who had left him to live with another man. He on his part had formed a new alliance with a girl, a good woman, señor, and had several children by her. What was he to do ? The *banda* of the Señor Gobernador ordered him to marry the mother of his children, but he was already married to another woman. Would the American laws permit him to have two wives, or must he be separated from the mother of his children ? I told him that in America it was possible to obtain a divorce for certain causes, and that when this had been granted a new marriage could be performed. "Ah, Señor," he said,

"God grant that there be some way to arrange it, for we are sorely troubled!"

Saturday, September 16.—The Governor visited Agaña to-day, and I reported to him the result of his last general order. "It is a very simple matter," he said; "we will grant them divorces." "Who will grant them, sir," I asked. "Why, you," he said; "if you do not wish to assume the responsibility, just add to the decree, '*by order of the Governor.*'"

[TO BE CONTINUED.]

Plants that Keep a Body-Guard.

BY FREDERICK LE ROY SARGENT.

ONE of the most serious difficulties encountered by those who cultivate plants in the tropics comes from the depredations of leaf-cutting ants. These little creatures march in armies, thousands strong, and on coming to a plant that suits them, they ascend it and spread to every leaf. Each ant now snips off with his sharp jaws a piece of leaf bigger than himself, and swinging it over his head, joins a procession of his fellows similarly laden and bound for the nest. New ones come to take their place, and in a short time not a leaf remains.

It is found that native plants suffer much less than those introduced from other regions, and this is because the indigenous sorts are mostly provided with some means of keeping off the leaf-cutters. Thus the stems are sometimes slippery, or sticky, or covered with hairs over which the ants can not climb, but the most efficient means is the keeping of a standing army to resist the invaders.

One of the best examples of this remarkable method of defense is afforded by a species of acacia, known as the "bull's-horn thorn-tree," which is a native of Nicaragua. The name is descriptive of a pair of horn-like thorns situated at the base of each compound leaf. All but the youngest thorns are found to be hollow and inhabited by colonies of ants. These are smaller than the leaf-cutters, but better fighters, and fiercely resist any encroachments on their domains. They sting severely, so that even the higher animals have much to fear from them.

As fast as the thorns become large enough for occupancy, the ants bore into one of a pair and proceed to hollow it out by eating the sweetish pulp within, leaving the hardened wall. They bore through the partition which separates the thorns at the base and so continue the cavity into the other thorn. In this way one entrance is made to answer for

both rooms of their house. Once established in their new quarters they raise their young and make it their home.

It is obviously of great importance to the plant to have its little warriors always on guard, and this is accomplished by so completely supplying them with attractive food and drink that they have no desire to leave the plant. On each leafstalk, a little way from the base, there is a good sized gland that secretes abundantly a sweet liquid which the ants delight in. One or more ants are almost always to be seen near a gland, either sucking the nectar or waiting for more to appear. But of course they can not live on all sweets any more than we can, and some solid, nutritious food is necessary. This the plant provides in the form of pear-shaped food bodies, which are produced at the extremities of certain leaflets, in such a position that to get at them the ants must travel over a considerable portion of the leaf. The food-bodies ripen a few at a time, and thus keep the ants traveling over the leaf, day after day, for some little while. When ready to pick they are of a rich golden color, and filled with material like the meat of a nut. Upon finding one in this condition, an ant bites through its slender point of attachment and bears it in triumph to the nest.

The acacia just described has in some respects the most perfect provision for keeping a body-guard of any known plant, but there are others in which very efficient though different means of keeping an ant-garrison have been observed. This is true of the "imbauba" or trumpet-tree of tropical America, which lodges colonies of ants in its hollow stem. Their entrance is made easy by thin places in the stem-wall, through which they can easily bore, and once inside, they cut a small hole through the thin partitions which extend across the stem-cavity at the joints and thus get the run of the whole interior. The chambers into which the partitions divide their dwelling are used for different purposes. One is the queen's apartment; in some, grubs of different ages are kept; while in others are confined numerous small "scale-insects," somewhat like plant-lice. These suck the juices of the plant and exude from the back a sweet liquid of which the ants are very fond. These scale insects are tended with great care and have been aptly compared to cows in their relations to the colony. They render unnecessary any secretion of nectar by the plant, and we find only food-bodies. These are produced as outgrowths from a rather large cushion situated on the leafstalks near the base, and while they resemble the food bodies of the bull's-horn acacia in form and nutritious contents, the crop from a single leaf is not so soon exhausted, and as long as the leaf is vigorous the ants find every day fresh tid-bits awaiting them on the same cushion. This keeps the ants traveling back and forth over the plant a good deal. If a leaf be touched they immediately assume the

defensive, while shaking a branch will cause a good part of the garrison to turn out prepared to fight.

In the two plants we have been considering, it will be noticed that it is near the young and tender organs that the ant-guard is mostly kept, and these are of course the parts needing most protection. When leaf-cutting ants are absent, the principal enemies to be feared are caterpillars and herbivorous mammalia, and these also much prefer to eat the younger parts. Although the danger from these animals is not so grave as from the leaf-cutters, it is of enough importance to make some means of defense of decided advantage even to plants of our climate. We have no plants that give permanent lodgings to a body-guard, but not a few of our common trees and flowers have on their most vulnerable parts well developed nectar glands which attract considerable numbers of ants, wasps, beetles and other insects that would soon kill a caterpillar or effectually deter any browsing animal from eating much of the plant on which they were.

Our poplars, for example, have a pair of glands on the first few leaves of a shoot. A sweetish liquid is secreted in abundance from them, and almost any time of the day ants or other insects may be seen at the glands sucking the nectar greedily. Peach-trees have several glands on the edges of the leaf-blade, and cherry-trees have, as a rule, two pairs of glands on the leafstalks. In all of these cases the insect-guard is much more numerous on saplings or on the lower branches of young trees than upon the higher portions of old trees, where there is less need of their presence. Numerous ants are attracted to the flower-buds of the trumpet-creeper by the sweet exudations of glands clustered on the under side where the rain and dew would be least likely to wash away the nectar. The common peony is also provided with nectar-glands on the flower-buds, and many other cultivated plants could be mentioned which offer nectar to attract a body-guard.

Dr. C. E. Waters, of Johns Hopkins University, well known to fern students in this country through his numerous papers in The Plant World and *The Fern Bulletin* and for his "Analytical Key," based on cross-sections of fern stems, will shortly publish through Henry Holt and Company a book entitled "Ferns," which is likely to prove the leading popular work on this group. It will contain over 200 illustrations, the majority original photographs; and with respect to this feature it can be confidently asserted that no finer examples of fern photography have ever been produced. Dr. Waters brings to his work fifteen years of experience in field and herbarium study, and the book may be expected to prove of permanent scientific value, as well as to satisfy a want which existing popular treatises have but imperfectly filled.

Juvenile and Adult Forms of Bloodroot.

By John W. Harshberger.

A plant in its development from youth to old age passes through a series of marked changes, chemically and structurally considered. The first stages may be called the juvenile stages, and when the climax of development is reached the adult stage begins. The difference between the juvenile stages and the adult form may be more or less great. These two stages naturally include series of developmental processes which pass one into the other without distinct limitation. Thus, for example, the primary leaves of the broad bean, *Vicia faba*, differ greatly in configuration from the succeeding ones; they are reduced to small three-toothed leaflets, the middle tooth representing the leaf-blade, the lateral ones the stipules. The primordium of the leaf has remained stationary here at a very early stage, and in subsequent leaves experiences only an increase in size and no further morphologic differentiation takes place. We can prove this experimentally. The axillary shoots which spring from the base of the plant all possess the same form of leaf. If the chief shoot be removed above the primordium of a lateral shoot, this will be forced to grow out at an early period, and instead of the primary leaves there will be found upon it, according to the degree of development to which it had attained, the most varied intermediate forms between the primary leaves and the foliage leaves, or the typical foliage leaves.*

A somewhat similar case is found in the bloodroot (*Sanguinaria canadensis* L.). This plant is met with commonly in our eastern woods and forests and displays, as the botanists of our country have no doubt frequently noted, great differences in the form and lobing of its leaves. These forms may be reconciled with each other and arranged in a series if the above-mentioned facts with reference to the juvenile and adult stages are taken into consideration in making a comparison of the various kinds of leaves of the bloodroot. After the seed has germinated and the two cotyledons have unfolded and while one of them still remains attached to the seed coats, the hypocotyl of the embryo plant begins to swell to form a fusiform enlargement. Coincident with this, the first leaf makes its appearance. This juvenile leaf is somewhat reniform with an undulate margin and in most cases (figs. A and C) with a rounded tooth at the apex. Stages of about the same age are represented in figures A, B, and C. As the fusiform hypocotyl enlarges and as new secondary roots appear growing out from it, the first leaves are replaced by other juvenile forms much larger in size and usually with three dis-

* Goebel, *Organography of Plants*, Eng. transl., Part I, General Organography, p. 156.

tinct lobes, the middle one of which is the most striking feature of the leaves at this stage of development (figs. E and F). Figure F shows the two leaves of different ages upon the short rhizome, which now begins to differentiate. The plant represented in figure G is a still more advanced juvenile form. This form of juvenile leaf is frequently arrested, and protects the flower bud which subsequently grows up within its rolled edges. The appearance of this leaf is followed by a more evolved form (fig. H), in most cases associated with the formation of flowers and fruit. This

form of leaf may be said to represent the first adult stage of development of the bloodroot and it is followed by other leaves which are larger, more prominently veined, and which show seven well-marked lobes separated from each other by rounded sinuses. Coincident with this enlargement of the leaves, the rhizome, which arises from the fusiform hypocotyl, grows in length and thickness, until, in the older plants, it may be several inches long and fully one-half to three-quarters of an inch thick. The amount of orange-colored latex also increases with the age of the rootstock. Elsewhere the writer * has presented measurements of these

* HARSHBERGER, *The Limits of Variation in Plants*, Proc. Acad. Nat. Sci. Phila., 1901, pp. 306-308.

various forms of juvenile and adult leaves in a statistical study of variations in plants, and the reader is referred to the paper mentioned in the foot note for the detailed measurements of bloodroot leaves. The most highly evolved adult leaf is one represented in outline in figure M. This leaf was eight inches wide, four inches long, with a petiole ten and one-half inches long. It had nine three-lobed divisions separated by narrow rounded sinuses.

Occasionally reverted forms of leaves are found on old plants. These usually appear as lateral outgrowths of the fleshy underground rhizome. It is known that reversion to a juvenile form chiefly takes place when the conditions of vegetation are unfavorably influenced. That this is the case with the appearance of juvenile leaves on adult plants of the bloodroot seems to be indicated by the stimulation of the dormant lateral buds on the rhizome which give rise to the aforementioned juvenile leaves. Leaf *a* in figure L is such a reverted juvenile form and may be compared with the juvenile leaves illustrated in figures A, B, and C.

The bloodroot, therefore, in the development of its leaf forms, ranging from the simple, undulate reniform juvenile type to the nine-lobed evolved type, is another exemplification of the principle that in the development of plants from the germ there appear frequently relationships of configuration which are different from those exhibited by the adult plant, and this is chiefly the case when the seedling is adapted, as in the Australian acacias, to other conditions than those which surround the subsequent stages of development.

It may be stated in closing that with the exception of figure M, which was much reduced, the leaves and rhizomes illustrated in the figures were drawn life size, and are all equally reduced.

University of Pennsylvania.

Mr. William R. Maxon, of the U. S. National Museum, has gone to Jamaica for the purpose of making a collection of the flora of the island, and more especially to study tropical ferns, in company with Dr. L. M. Underwood.

An attractive little guide has been published to the Hope Gardens at Kingston, Jamaica, under the authority of the colonial government. It is prepared by the director, Mr. William Fawcett, with the assistance of Mr. Walter Jekyll, and contains descriptions of the more attractive features in the gardens, with several good illustrations. The annual report of the Department of Public Gardens of Jamaica has also been received.

Briefer Articles.

A HYBRID RUDBECKIA.

HYBRIDS among our wild flowers sometimes occur, yet to find one is not a common occurrence, and when a collector meets one of undoubted character face to face he feels that his find may be worthy of note.

In the summer of 1902, while collecting along the Eagle River on the western slope of the Colorado Rocky Mountains, I chanced on a hybrid Rudbeckia. It was growing among *Rudbeckia laciniata* L. and *Rudbeckia montana* Gray, and partook so much of the characters of each that its true origin could not be mistaken.

Rudbeckia laciniata—what has for a long time passed for that—is a beautiful plant with a wealth of flowers in July and August. It is tall and graceful with ample glaucous foliage. The flowers on long peduncles have long yellow rays and the cone is yellow. It is found both on the eastern and western slope of the Rocky Mountains growing in the moist ravines and along the banks of streams.

Rudbeckia montana is about the same in height and of similar foliage but has fewer flowers. It is a peculiar and striking plant when in blossom, on account of the heads of flowers. These, on peduncles a foot long or more, are black cones one and one-half inches in height by three-quarters of an inch in diameter and without rays. The black cone standing at the top of the long naked peduncle gives the strange appearance. It grows in situations similar to those of *Rudbeckia laciniata*, but is a much rarer plant and I have found it only on the western slope of the mountains.

Along a little springy run, in the location I have indicated, both of these plants were growing and among them was the hybrid. It was of about the same height and the foliage was not different from that of *Rudbeckia laciniata*, but the difference was in the heads of flowers. Unlike *Rudbeckia montana* these had yellow rays, quite like *Rudbeckia laciniata;* but unlike it the cone was dark purple—not quite so dark as those of *Rudbeckia montana*.

Had one found it growing by itself at a distance from other plants it would have seemed to be an undescribed species, but appearing as it did among the two species it is unquestionably a hybrid.

New Windsor, Col. GEO. E. OSTERHOUT.

SLEEPY GRASS.

IN A recent number of *Science* Mr. Vernon Bailey, chief field naturalist of the U. S. Biological Survey, relates his experience with the so-called sleepy grass (*Stipa Vaseyi*) in the Sacramento Mountains, New Mexico.

After going into camp one evening in a beautiful park, bordered with spruce and fir, along the crest of the mountain, he was warned by a passing ranchman that the horses were getting sleepy grass, and adding that if they got a good feed of it it might be a week before they could get out of there. Not wishing to remain that long but wishing to test the effect, Mr. Bailey permitted the horses to feed for half an hour, then they were picketed out of reach of the grass. The next morning all of the horses showed more or less drowsiness, but one, Old Joe, seemed to have secured more than the others and "was standing on the side hill asleep, his feet braced wide apart, head high in air, both ears and under lip dropped, a most ridiculous picture of profound slumber. At breakfast time the others woke up to a keen interest in their oats, but Old Joe, after being dragged to camp, much against his will, preferred to sleep rather than eat, and after pulling back on his rope all the way down to the spring refused to drink or even lower his head." Although the horses were gotten under way they manifested evidences of stupor and could only be induced to move by repeated urging with whip and spur. "The stupor lasted about three days, and was too evident and unusual to be attributed to weariness or natural indisposition. We were making easy trips and the horses were in good condition. After it wore off they showed their usual spirit and energy, as well as appetite. The only after-effect was a gaunt appearance, apparently resulting from lack of energy to get their usual amount of grass."

It appears from Mr. Bailey's inquiries that horses coming up from the valley will always eat freely of this grass, and the resulting stupor may last for a week or ten days, but they will never touch the grass a second time. Horses and cattle familiar with the range carefully avoid this grass, perhaps having learned from experience of its somnolent effects. The sleep-inducing properties appear to reside in the leaves, but just what it is is not known, although it has been suggested that it is allied to opium.

WEEDS.

It is difficult to define a weed. The dictionaries tell us it is a useless plant, but the utility of any species depends on its special environments. A plant which in one country may be of extreme value, is in another a pest and nuisance.

We may characterize as a weed any plant whatsoever that grows where it is not wanted. Thus, the white-weed or ox-eye daisy is, in the Eastern States, a most unquestioned weed. But a thing of such beauty is sure to have admirers, and every one does admire the daisy, so that in regions where it is not so prolific we find it cherished as a garden flower. Again, what can be said of the *Rudbeckia*, or cone-flower, that glorious

star of richest orange yellow? The farmer ranks it as a weed; the flower-lover as something very precious. He could ill spare it from the meadows, where it reminds one of Persephone and Enna. Then, can anything be prettier in its combination of colors than that well-recognized weed, the common "butter-and-eggs"?

The very best and choicest flowers, then, become weeds when out of place and troublesome. The reverse of this proposition, however, is not true. We have a poor rule here that does *not* work both ways. The apotheosis of some weeds must be impossible. Who could exalt into garden flowers our wretched pig-weed, or amaranths or cockleburs; our purslanes and carpet-weeds? Yet even here we see how narrow is the dividing line; how much a matter of opinion it is when we place any particular species in this purely arbitrary classification. Our showy garden portulacas are nothing but purslanes glorified. In the hothouses we find Abutilons prized as ornamental shrubs; on our ash-heaps there is an abutilon despised as a weed. It is then purely a question of situation.

The very meanest fleck of a flower has beauty incomparable after nature has touched our poor blind eyes and bid us see. City authorities are severely criticised for unsightly ash-heaps and waste lands. We smile serenely, for these are our real parks, our botanical gardens, free to everybody. In the municipal inclosures authority has carefully eradicated all the native or curious growths. It is only on these elysian ash-heaps you will find them. Here thrive, side by side, the escaped exotic and the native herb. And how they do grow! If in your unsuspecting heart you endeavor to reproduce the conditions in your own garden you will fail. It is only accident that can mix the heterogeneous elements—tin-cans, wash-boilers, stove-pipes, broken crockery, cast-off bottles, tomato-cases, ashes, lime, and broken bricks—into a fertilizing compost. A curious laboratory is here, in which are mystifying chemical affinities. At any rate, here the sunflower uplifts its glorious disk, the morning glory pitches its silken tents, and the hemp entices the wandering yellow bird. And all the tangle of weeds and flowers, creeping, ascending, erect, are as vigorous again as if he had tried to grow them.

The truth will out; we love weeds! There is no abnormal doubling, no fancy distortion about them. They grow as they were designed to, with an occasional sport, perhaps, but if so, one which is vigorously held to an account. For in plant nature conservatism is the rule. Innovations are looked upon with disfavor. Dangerous doctrines are examined, and the law is made, not to benefit an individual or a class, but to advance the race. We pity any weak brother who enters this field of competition. He must grow as do others; elbow his way; assert his quality; perhaps claim and prove his superiority, or go to the wall. It is *vae victis*—step on the fallen; exorcise the puny.

And so, as a moral must be tacked to every preachment, there is here our ash-heap; a living parable. Here is an epitome of life wherefrom we can extract a deal of information. We see certain weeds making broad their phylacteries, and others in sheep's clothing doing the work of Samaritans. Strange if we do not note, too, in some humble corner, the violet, simple, modest, pure, wafting abroad its fragrance, "a good deed in a naughty world." W. W. BAILEY.

Brown University, Providence, R. I.

IN THE February issue of *Torreya* Mr. A. B. Seymour publishes a record of a Georgia station for the little filmy-fern *Trichomanes Petersii*, known hitherto only from Alabama. In the same number Dr. Underwood records it from Mississippi, where it was recently collected by Professor S. M. Tracy. Thus the distribution is much wider than has been supposed.

AMONG the dangers to which shade-trees in cities are exposed one of the chief is illuminating-gas, escaping from mains and dealing death to the trees in its vicinity. The gas escapes in small quantities, so small as to attract no attention, and finally so permeates the soil as to cause gas-poisoning. There is absolutely no remedy for a tree in the advanced stage of gas-poisoning, and nothing of any practical value for incipient cases. Soil charged with gas is likely to remain in that condition for some time and to constitute an unwholesome environment for trees. Practically the only remedy is the prevention of gas leaks. How that is to be accomplished is a hard question to answer.

The danger from electric wires and currents Prof. Stone, of Amherst, considers less serious, but he thinks that the ever-increasing mass of wires on streets and highways is responsible for the mutilation and disfigurement of our trees and streets. The best possible place for overhead wires is in the rear of buildings on private property as much as possible. The alternating current is less disastrous to plant life than the direct current, and when either is utilized at a certain strength it accelerates growth and strength. All the injurious electrical currents as a rule are local; i. e., the current causes an injury at or near the point of contact of the wire with the tree. There is a great range in the current which is required to injure a plant, and it is impossible to state, except in particular cases, what a current of a certain strength is capable of doing; but with the very high electrical resistance of trees and plants in general it is evident that under ordinary circumstances there is little likelihood of their being killed by electricity with present current employed for commercial purposes.—*American Gardening*.

The Wild Flower Preservation Society of America.

The subjoined list shows the membership of the Society at the end of its first year. If each one of our present members would address himself or herself seriously to the task of securing ten additional names within the next two months, it would be the best service that could be performed for the Society.

Members are requested to report to the Secretary any errors or omissions that may occur in this list.

The publishers of THE PLANT WORLD desire it to be made known to the Society that the journal can not be furnished to members in arrears for dues. If you fail, therefore, to receive the journal, please consult the treasurer as to your standing. The latter officer desires members to note that her name is *Mrs.* Carolyn W. Harris, and not "Mr." or "Miss."

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*Stokes, Dr. H. N., Washington, D. C.
Sumner, Miss Mary E., Rochester, N. Y.

*Taylor, Miss Katherine A., Baltimore, Md. *Baltimore Chapter.*
*Taylor Miss Mabel L., Washington, D. C.
Teuteberg, Mr. L. W., St. Louis, Mo.
Towle, Miss E. L., Washington, D. C.
*Trelease, Dr. William, St. Louis, Mo.
Turner, Dr. M. H., Ticonderoga, N. Y.
Tyler, Prof. A. A., Bellevue, Neb.

*Underwood, Prof. L. M., New York, N. Y.

*Vail, Miss Anna Murray, New York, N. Y.
Van Sant, Miss Belle, George School, Pa.,
Von Schrenck, Dr. Hermann, St. Louis, Mo.
Vroom, Mr. J., St. Stephen, N. B.

Wall, Mr. J. L., New York, N. Y.
Waller, Mr. Elwyn, Morristown, N. J.
*Ward, Prof. Lester F., Washington, D. C.
Warwick, Mrs. Charles, Baltimore, Md. *Baltimore Chapter.*
*Waters, Dr. C. E., Baltimore, Md. *Baltimore Chapter.*
Watson, Mr. J. Henry, New York, N. Y.
Wheeler, Prof. C. F., Washington, D. C.
Wheelock, Mr. William E., Morristown, N. J.
*White, Mr. David, Washington, D. C.
White, Dr. James C., Boston, Mass.
White, Miss V. S., New York, N. Y.
*Wight, Mr. William F., Washington, D. C.
*Wilkins, Miss Lewanna, Washington, D. C.
Williams, Miss Carrie H., Baltimore, Md. *Baltimore Chapter.*
Williamson, Prof. C. S., Philadelphia, Pa.
*Wilson, Miss Louise, Ensenada, Lower California.
Wilson, Miss Maude D., Dayton, Ohio.
*Wood, Mr. Geo. McLane, Washington, D. C.
Wright, Miss Miriam S., Brooklyn, N. Y.
Wright, Mrs. J., Brooklyn, N. Y.

Editorial.

FEW people perhaps realize the enormous annual loss from forest fires in this country, but when confronted with the figures it is seen to be a serious matter. Thus, within two weeks last year over $12,000,000 worth of timber and other property was destroyed by forest fires in Oregon and Washington alone, and the estimated yearly loss throughout the country is from $25,000,000 to $50,000,000. So prevalent are fires that they have come to be regarded as almost inevitable and few systematic attempts have been made to prevent or control them. With the view to securing valuable data on the subject the U. S. Department of Agriculture, through the Bureau of Forestry, has a number of agents in the field charged with the duty of visiting the various areas while the fires are burning and ascertaining, when possible, the manner in which fires ordinarily originate, the rapidity with which they burn, and the extent of the damage to soil and tree-growth. Ultimately it is hoped that means may be devised for an effective system of protection.

IT SEEMS hardly necessary at this stage to call attention to the planting of shrubbery as a means of beautifying the home grounds, but it is so often neglected it appears that it must be reiterated. And it is not enough to plant shrubs and trees at random without considering the size that each will attain at maturity, for the chances are that the disfigurement will be nearly or quite as great as when the lawn was simply a "piece of ground in front of the house." In a recent number of *Country Life* is given the experience of a suburban resident in beautifying (!) his grounds, the various stages in the evolution being shown in well executed views. The first and last seem hardly the same place, so great has been the transformation. At one time the owner was possessed with the desire to have a gigantic rockery in the middle of the lawn, and, as he expresses it, the thing was so hideous that the birds avoided it in flying over. Unless one is familiar with the possibilities of the various plants it is wise to make haste slowly, lest the result be unsatisfactory. First of all there should be a clean sweep of open lawn in front. About the foundation of the house, especially if it be low, there should be planted some large-growing shrubs, as wygelia, spiraea, or the like. The remainder of the planting should be carefully thought out and each individual or cluster of individuals should be placed for the final, not the immediate, effect.

The Home Garden and Greenhouse.

CONDUCTED BY F. H. KNOWLTON.

[The editor of this department will be glad to answer questions of a relevant nature, and also to receive short articles on any phase of this subject.]

Plants from the Philippines.—The editor has received from a friend and correspondent in the Philippines—Mr. D. LeRoy Topping, formerly of Washington—a package of seeds and bulbs, among them the so-called "Bouquet Lily," which is said to be much superior to the Bermuda Lily. These will be tried in our greenhouses, and if we succeed in flowering them the results will be presented in these columns.

Chrysanthemums.—By the time this number is in the hands of our readers the chrysanthemums intended for next fall's flowers should be rooted and well under way. When taken from the cutting-box they should be potted off in 3- or 4-inch pots and should be shifted from time to time as they demand until they reach the size in which they are to be flowered. The growth of the plants should not be checked, for this hardens the wood and lessens their capacity for blooming. As stated in an earlier number they may be planted out in the ground, on the benches in the greenhouse, or in pots, as the convenience of the grower dictates. If it is desired to grow them to single stems all side branches should be pinched off as soon as they appear, but if a bushy plant is to be produced the terminal bud should be pinched out before the plant is six inches in height. This will start the lateral branches at once, and of these from three to six or eight may be permitted to grow. The disbudding comes later.

Amorphophallus Simlense.—Last year we secured from a well-known florist a small bulb or tuber of what is called *Amorphophallus Simlense*, an aroid from the Eastern tropics. It did not flower, but sent up a number of handsome palm-like leaves a foot or more in diameter and on petioles two feet long. At the close of summer the leaves died down and the bulb, together with a number of small offshoots, was placed under the greenhouse bench, where they were overlooked until April. When discovered the large bulb had sent out a flower-bud that was then six or eight inches long. It was immediately potted and moderately watered, and at the present writing the spathe has nearly doubled in length, but is not mature. Bailey is of the opinion that this is not a true *Amorphophallus* but is probably an *Arisæma*. Its development will be watched with interest, and if anomalous features are presented they will be presented in our next issue. The genus *Amorphophallus* contains a number of marvelous plants, among them *A. Titanum*, of Sumatra, which produces a tuber 5 feet in circumference, a leaf-stalk 10 feet long bearing a blade often

45 feet in circumference, a spathe 3 feet in diameter, and a spadix 6 feet high. This botanical marvel was flowered in the Kew Gardens, England, in 1890.

Farm Crops.—The enormous value of farm crops in the United States is shown by the following table which has been compiled from Census Reports. The year covered is 1899:

Crops.	Acres.	Quantity.				Value.
		Bushels.	Tons.	Bales.	Pounds.	
Corn	94,913,673	2,666,324,370	.....	.....	.....	$828,192,388
Wheat	52,588,574	658,534,252	.....	.....	.....	369,945,320
Oats	29,539,698	943,389,375	.....	.....	.....	217,098,584
Barley	4,470,196	119,634,877	.....	.....	.....	41,631,762
Rye	2,054,292	25,568,625	.....	.....	.....	12,290,540
Buckwheat	807,060	11,233,515	.....	.....	.....	5,747,853
Broom corn	178,584	.....	.....	.....	90,947,370	3,588,414
Rice	342,214	.....	.....	.....	250,280,227	6,329,562
Kafir corn	266,513	5,169,113	.....	.....	.....	1,367,040
Flaxseed	2,110,517	19,979,492	.....	.....	.....	19,624,901
Clover seed	.....	1,349,209	.....	.....	.....	5,359,578
Grass seed	.....	3,515,869	.....	.....	.....	2,868,839
Hay and forage	61,691,069	.....	84,010,915	.....	.....	484,254,703
Cotton seed	.....	.....	4,566,100	.....	.....	46,950,575
Cotton	24,275,101	.....	.....	9,534,707	.....	323,758,171
Tobacco	1,101,460	.....	.....	.....	868,112,865	56,987,902
Hemp	16,042	.....	.....	.....	11,750,630	546,338
Hops	55,613	.....	.....	.....	49,209,704	4,081,929
Peanuts	516,654	11,964,109	.....	.....	.....	7,270,515
Peppermint	8,591	.....	.....	.....	187,427	143,618
Dry beans	453,841	5,064,490	.....	.....	.....	7,633,636
Castor beans	25,738	143,388	.....	.....	.....	134,084
Dry peas	968,370	9,440,210	.....	.....	.....	7,908,966
Sugar cane	386,986	.....	4,202,202	.....	.....	.....
Sorghum cane	293,152	.....	291,703	.....	.....	815,019
Sugar beets	110,170	.....	793,353	.....	.....	3,323,240

Pollination of Apple Blossoms.—Certain varieties of apples have long been known as "shy bearers," but the causes for this condition have not been well understood. In investigating this subject Mr. G. O. Greene has ascertained quite definitely what was before supposed, namely, that the pollen in certain varieties is not potent in its own pistils, some being almost sterile when fertilized with their own pollen. And further it was noted that even when a self-pollinated variety set fruits they were of inferior size and exhibited a greater tendency to fall early than when crossed. All goes to show that in setting orchards it may be necessary to select varieties that experience has shown will mutually cross-pollinate.

Date Palms.—While it will not be possible for many people in this country to raise their own dates, it may interest some to learn that there is a date palm orchard in Arizona, comprising about 600 trees, which were obtained from the Sahara, Egypt, Arabia, and Beluchistan. A few of these trees fruited during the past year.

The Tree Peony.—The so-called tree peony (*Pæonia Moutan*) is in reality only a much-branched shrub growing from three to six feet in height, and bearing a profusion of single or very double and variously-colored flowers. It is a native of China, where it has been in cultivation for centuries, and as a consequence its varieties are numbered by hundreds.

Easter Lily Bulbs.—It is perhaps well known that the supply of *Lilium Harrisii* bulbs is grown in the Bermudas, and in the haste to market the crop the bulbs are often gathered before they are fully mature. In order to compare the value of mature and immature bulbs Mr. A. F. Woods, of the Department of Agriculture, selected fifty healthy plants growing in one of the best bulb fields of Bermuda. Twenty-five of these plants were dug about the middle of May and the bulbs shipped to the United States, where they were stored in a cool place. The remaining 25 plants were dug and shipped the latter part of July. At this time the tops of the plants were dead. Both lots of bulbs were planted in pots in August in the usual manner. The following winter the immature bulbs produced 64 per cent of badly diseased and worthless plants and 36 per cent of poor plants, averaging but 4⅓ flowers each. The mature bulbs produced 68 per cent of good strong plants, averaging 7 flowers each, and 32 per cent showing some disease of the leaves, but even with these most of the flowers were all right. The plants were ⅓ taller than those from immature bulbs.

Dutchman's Pipe for a Porch Vine.—One of the handsomest of the quick-growing perennials for a porch is the dutchman's pipe (*Aristolochia macrophylla*), a native of the Eastern United States. It is a very tall-growing vine and in a few years will cover the entire front of a house, if not controlled, with its tangle of branches and great heart-shaped leaves. It makes a dense and impenetrable shade, and not the least of its attractions are the curious U-shaped, three-lobed flowers which are borne in great profusion in early spring before the leaves are fully mature.

Oranges in California.—According to a recent paper in a publication by the U. S. Geological Survey on the water supply in the orange-growing region of California, it costs in the neighborhood of $900 an acre to get a citrus orchard in bearing condition, including land, water, and interest on the investment. Under favorable conditions a ten-year-old orchard should produce $200 gross and $100 net per acre. When all conditions are satisfactory it takes five or more years of hard, patient, and intelligent work to place an orchard on a paying basis.

Professor L. M. Underwood, in pursuing further his studies on our North American ferns, has reached the conclusion put forth by the German botanist Willdenow, nearly a century ago, that the royal ferns of America and Europe, hitherto known as the same species (*Osmunda regalis*), are really entirely distinct. Our royal fern is henceforth to be known as *Osmunda spectabilis* Willd. The chain-ferns, which we have hitherto called *Woodwardia*, are placed by Professor Underwood in two distinct genera, though the specific names remain the same. They will be called *Anchistea Virginica* and *Lorinseria areolata*.

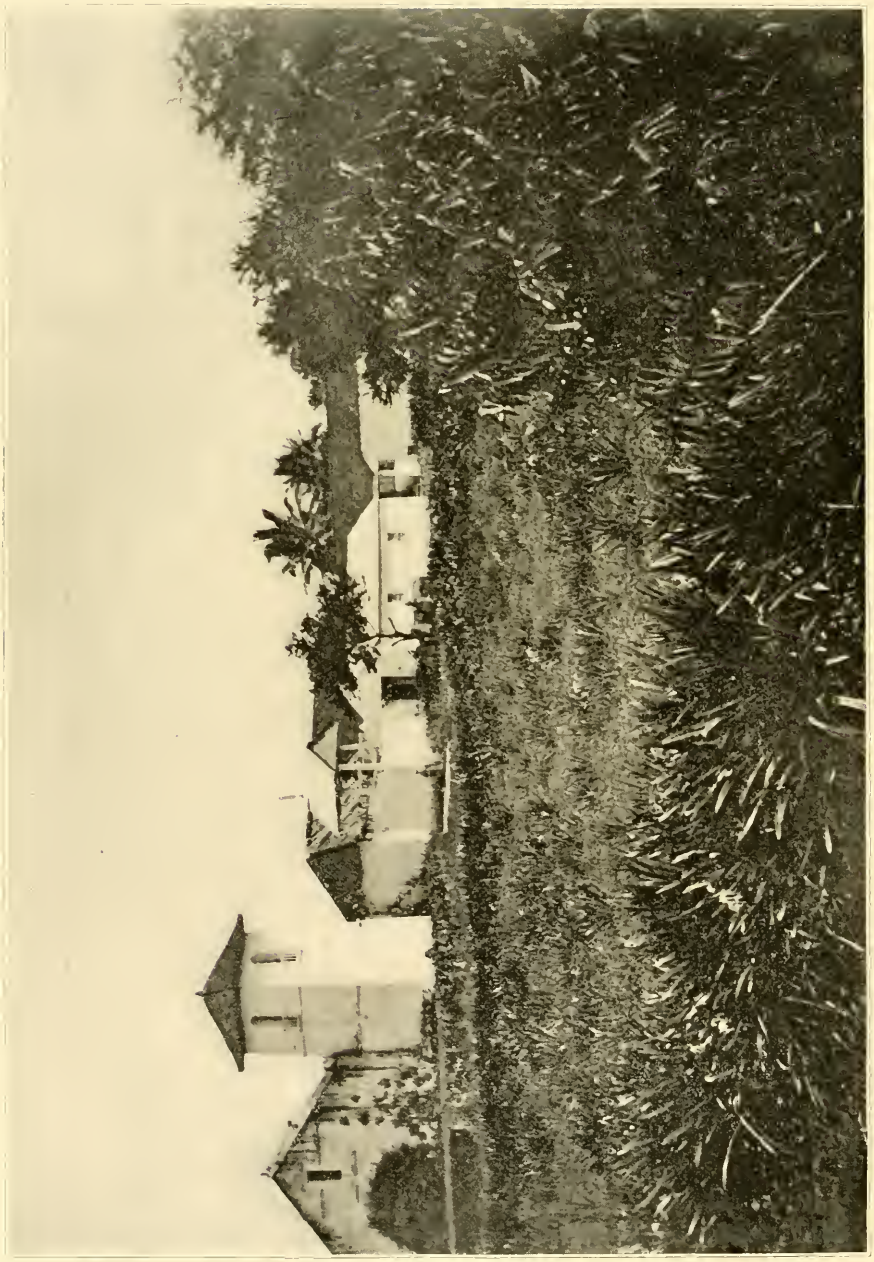
Book Reviews.

NATURE STUDY AND LIFE. By *Clifton F. Hodge*. Boston, Ginn & Co., 1902. $1.50.

Of nature study books there seems almost no end, yet of really good books there are very few and in the superlative class, to which the present book belongs, it stands almost alone. Professor Hodge is himself a naturalist and a trained observer, and as a result he speaks with authority on the numerous topics treated. This book is not arranged to especially suit the school year, for as the author well says, "nature's changes were not arranged according to our school courses, and the predominant importance of subject-matter precludes such cramped and formal treatment." It is prepared to interest and instruct the young mind all the year round, taking up, for instance, such subjects as children's animals and pets, insect study, insects of the household and garden, elementary botany, garden fruits, propagation of plants, insectivorous animals, common birds, domestication of our wild birds, elementary forestry, flowerless plants, etc. As stated in the introduction, which is written by Dr. G. Stanley Hall, instead of elaborate methods applied to a few species, it presents the essential and salient points about many, and this avoids the current of over-elaborate and over-methodic treatment, prolonged until interest turns to ennui, and another important feature is the practical turn given to much of the information. The book is beautifully printed and well illustrated, and we confidently recommend it as the best of its kind that has appeared. F. H. K.

THE NEW ONION CULTURE. By *T. Greiner*. Rewritten. Illustrated, 5x7 ins., about 150 pp., cloth. Orange Judd Co., N. Y. 50c.

A complete guide in growing onions with the greatest profit, explaining the whys and wherefores. Minute directions are given of how the plants are grown; the cold frame; seed bed; planting; fire hotbed, hotbeds heated by steam; cheap greenhouse for market gardeners; greenhouse heated by hot water; quantity of seed required; time of sowing; varieties; what soil to select; how to manure and prepare it; onions on muck soil; clean soil essential; how the plants are set in the ground; tillage as moisture preserver and weed killer; tools of tillage; when and how to harvest the crop; danger in delay; signs of maturity; curing the crop; curing sheds; weight of crop; wintering onions; advantages and profits of the new way; estimation of cost and returns. Prizetaker and Gibraltar onions, when well grown by this method, cannot be distinguished from imported onions, and there is no reason why American farmers should not raise all that our markets require. X.



Old church at Agaña. *Anona reticulata* and *Hymenocallis littoralis* in the foreground, *Cestrum nocturnum* at the church door.

THE PLANT WORLD

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Extracts from the Note-Book of a Naturalist on the Island of Guam.—VII.*

BY WILLIAM E. SAFFORD.

Sunday, September 17.—Awakened this morning before daylight by the sound of voices. Went to the window and saw scores of natives flocking to the old church across the plaza, on my left. Dressed hurriedly and followed them. Bright starlight; the morning air fresh, and laden with the fragrance of night-blooming Cestrum, two bushes of which grow on either side of the church door—vanilla-like odor, agreeable at a distance, but too rank at close range. The natives call the plant *dama de noche*, or the "lady of the night," the same name, I think, which it bears in other Spanish-speaking countries.

On entering the church I was impressed with the beauty and good taste of the interior. Roof supported by two rows of columns, straight trunks of "ifil" trees (*Intsia bijuga*), said to have been cut near by. The altar of white and gold, after the Spanish style, but not so overloaded with ornament as many of the Spanish churches of America. Along the walls the stations marked by simple crosses of wood. Everything sweet and clean; the church overflowing with worshippers, men, women and children, some of whom were obliged to kneel outside the door; organ of good tone and played with taste; choir of men and boys in the loft above the entrance. As the women reached their places, most of them took off

*Continued from May issue. Begun in September, 1902.

their slippers and knelt upon them, each person carefully covering the bare feet of her neighbor in front with her train; this is a use to which I have never before seen trains put. Church without pews; I was led to a chair of crimson and gold on the left of the aisle near the altar; everybody had a kindly look as I passed. The services were most impressive and solemn. Father Palomo's voice was well suited to his office. A feeling of reverence and awe came over me as the ceremony advanced, and I envied the worshippers their faith. Two hundred and thirty-one years ago this site was given to the Jesuit missionaries for a church by Kipuha, the high chief of Hagadña, as the principal town of the island was then called. Under the floor of this church still rest the bones of this chief, an account of whose conversion and baptism and of the impressive ceremonies attending his burial is given in the narratives of the early missionaries.

Yesterday Father Palomo lent me a history in manuscript which my secretary, José de Torres, is to copy for me: "Historia de las islas Marianas desde la llegada de los Españoles hasta hoy, 15 de Mayo de 1870." Late last night I read how the islands were dicovered by Magellan after a passage of three months and a half across the vast Pacific Ocean. I then turned to a map of the world and opened my Navarrete's history of Columbus's voyages, and I was impressed with the fact that, compared to Magellan's undertaking and the hardships which he and his men endured on their long voyage over an unknown sea, Columbus's passage of one month and three days from the Canary Islands until he sighted land was merely a trip across a mill-pond. Pigafetta, the narrator of the voyage, which Magellan himself did not live to complete, has told of the terrible suffering of the crew—how they ate the leather off the rigging used as chafing gear; how they bought rats from those skilful enough to catch them, which brought the price of half-a-crown each, and moreover "enough of them could not be got"; how they even resorted to sawdust of wood for food; how the water they had to drink became yellow and stinking; and the gums of nearly all were swollen with scurvy, and nineteen died, and twenty-five or thirty others fell ill "of divers sicknesses, both in the arms and legs and other places, in such manner that very few remained healthy."

Then I read of the arrival of Magellan at this group of islands; of his cruel vengeance upon the natives, who were accused of having stolen one of the boats riding astern of his ship; how he went ashore at the head of a landing party, burned their houses, killed women and men and brought back the missing boat; how his ships were followed by the natives in their wonderful flying "praos"; how the women wailed and tore their hair, "surely for their husbands killed by us," and how the men in reply to the shots of the arquebuses of the Spaniards showered back at them

a hail of stones from their slings and of lances pointed with barbs of bone. It was like a passage from the Odyssey.

Then, in contrast with this, I read of the subsequent kindness of the natives to ship-wrecked sailors; of the reception of Sanvitores, a Jesuit priest who came to establish a mission among them; how they vied with each other in offering him the hospitality of their villages; how they provided the priests with homes and built for them a church; how all wished to be baptised, though the missionaries could at first only baptise the infants and dying persons, it being necessary that adults in good health should be first instructed in the Christian doctrine. Nothing could be more interesting than the story of Sanvitore's life, the details of which I have gotten from an old vellum-covered book published in Madrid only fifteen years after the arrival of the missionaries at Guam.* In it many miraculous occurrences are related; but it must not be forgotten that this was an age of marvels.

In Scotland, nine years before the arrival of Sanvitores at Guam, the puritans had convicted and burned seventeen persons for the crime of witchcraft; and it was seventeen years afterwards that Cotton Mather, in our own New England, wrote his "Memorable Providences relating to Witchcraft and Possessions," a work which was responsible for the shedding of much innocent blood and for most horrible cruelties and persecutions. The Devil's influence in affairs of every-day life was recognized in many countries; and it is not surprising that it found its way to Guam. It was to the power of the Evil One over the elements that the early missionaries attributed the adverse trade-winds, which blew constantly to the westward, and prevented ships from sailing directly to Guam from the Philippines; and he did many things to thwart the missionaries in their work of saving souls.

Diego Luis de Sanvitores was born in the city of Burgos, in northern Spain, November 12, 1627. The history of his life tells of his miraculous vocation to the Company of Jesus; of his ordination to the priesthood at the age of twenty-four; his entrance into the college of Alcalá; his work among the poor; his call to the Indies and the supernatural occurrences in which God manifested his will; his departure from Cadiz for Mexico; the work which he accomplished in the city of Mexico; his departure from Acapulco April 5, 1662, for Manila; the interest and pity inspired in his heart by the sight of the natives of Guam, where the ship touched on her way to the Philippines, and of his desire to return to the Marianne Islands as a missionary; the refusal of his superiors at Manila to allow him to do so; the royal decree of the King of Spain ordering the Governor of the Philippines to furnish him with a vessel and the means of reaching

* *Vida y Martyrio de el venerable padre Diego Luis de Sanvitores de la Compañia de Jesus, primer apostol de las islas Marianas, etc.*, por el padre Francisco Garcia, de la misma Compañia de Jesus. Madrid, 1583.

the Mariannes; the building of the ship *San Diego* at Cavite and his sailing therein, first crossing the ocean to Acapulco, as was then the custom, owing to adverse winds and currents in the latitude of Guam; his appeal for aid to the Viceroy of Mexico and the wonderful earthquake which caused it to be granted; his arrival at Guam and his emotions on seeing the islanders coming out to meet him in their canoes; the establishment of himself and his fellow missionaries on the island of Guam, together with a few secular assistants; his zeal in the work of teaching the natives; the hardships which he endured and his final martyrdom.

In order that he might instruct the natives so that they could be baptised he applied himself to the study of the language, receiving assistance from certain shipwrecked sailors who had been cast ashore thirty years before on one of the islands of the group. These, together with some of the Filipinos who accompanied him as secular assistants, and who soon learned the language of the natives, helped him in his teaching of the catechism and the explanation of the doctrine. The natives were a merry set of people, fond of singing and dancing, working only sufficiently to construct their canoes and to provide food and dwellings for their families (they needed little clothing); proud and arrogant, yet warm-hearted and hospitable; believing in caste distinctions, and recounting in chants the deeds of their ancestors and their myths and legends, vying with one another in spear-throwing, stone-slinging, and in feats of wrestling, jumping and diving; wailing for their dead with passionate grief and placing upon the tumuli over their graves paddles and spears after the manner of the ancient Greeks; monogamists, as a rule, yet permitting certain license between the sexes before marriage.

When the interest of the natives in his lessons could not be maintained by other means, Sanvitores, seeing a number of them congregated in a group would sometimes throw himself into their midst, dancing and singing:

> "Alegria, alegria, alegria, buena, buena, Jesus Maria!
> Nuesta alegria, Jesus, y Maria! Amen, Amen. Jesus, Maria, y Joseph."

And repeating these words to the sound of clapping hands, he would continue singing and dancing a long time, the natives joining in with him, and he, as the good historian says, dancing like David before the Ark of the Covenant.*

The first serious stumbling block in the way of the missionaries was a Chinaman named Choco, living at the southern end of the island. This man had been shipwrecked about twenty years before their arrival while going in a sampan from Manila to Ternate. He called the attention of the natives to the fact that many of the children and old people died after

*GARCIA, "Vida y Martyrio de el venerable padre Diego Luis de Sanvitores," p. 216.

having been baptised. He told them that the padres were people despised and looked down upon by the Spanish, who had sent them into exile for that reason to this island; and he said that surely the water was poisonous, though some of the more robust might resist its effects. As many of those baptised had indeed died shortly afterwards, and as the missionaries taught that they were sure of salvation, it looked to the natives as though the padres really wished them to die. Henceforward, instead of receiving them joyfully in their villages and retaining them there as guests almost against their will, the natives greeted the missionaries with scowling faces, and calling them murderers threatened them with their spears. They no longer offered them bread-fruit, and at their approach mothers would catch up their babes and fly with them to the woods for safety, or, if the little ones were sick or dying, they would conceal them in their houses as best they could. In their zeal the padres would often baptise the children in spite of the threats of the fathers and the tears and prayers of the mothers. It was under circumstances of this nature that Padre Sanvitores lost his life. While baptising a child at Tumhun, the bay in which the leper settlement is now established, he was killed by the child's father, a chief named Matapang, aided by one of his retainers.

* * * * * * * * *

Tuesday, September 19.—Took a walk to-day along the beach where, among other things, I saw growing *Scaevola koenigii*, a shrub with fleshy leaves and white flowers shaped somewhat like those of the genus Lobelia; *Tournefortia argentea*, a shrub with silky-hairy leaves and scorpioid branching inflorescence belonging to the Boraginaceae; the common "goats-foot convolvulus" (*Ipomœa biloba*), with glossy leaves notched at the apex and purple trumpet-shaped flowers; *Paritium tiliaceum*, from the inner bark of which the natives make ropes; *Thespesia populnea*, with flowers very much like those of the Paritium (both like yellow hollyhocks); and *Erythrina indica*, a tree with trifoliate leaves, not now in bloom.

At the the town of Aníguag I noticed a fine specimen of the "cabo negro" palm, *Arenga saccharifera*, and a tree which the natives called "lumbang," which at first I did not recognize, but which proved to be the candle-nut (*Aleurites moluccana*), the well-known "kukui" of Hawaii. Of this species there are very few trees on the island of Guam. It is evidently of recent introduction and its name is of Philippine origin. In a thicket I came across several undershrubs, including a malvaceous plant with lobed leaves (*Urena sinuata*) and a species of Sida.

After carrying my specimens home it occurred to me to examine the Urena to see if the leaves had glands like those of the closely allied *Urena lobata* of Samoa, a plant which once excited my interest in the subject of extrafloral nectaries. There they were, a distinct vaginate gland in each

midrib near its base on the under side of the leaf. Then I thought I would examine my other malvaceous plants to see if they had corresponding glands. In the Sida I found no indication of a gland, but in the Paritium leaves there was a long clean-cut slit in each of the midribs beneath, corresponding to the gland in the Urena. On some of the leaves of *Thespesia populnea* there was not a vestige of a gland, on others there was a glandular pore between the bases of the veins beneath. Turning to the leguminous plants I found on the leaves of the Erythrina distinct cup-shaped glands on the rachis at the base of the two lower leaflets and in-

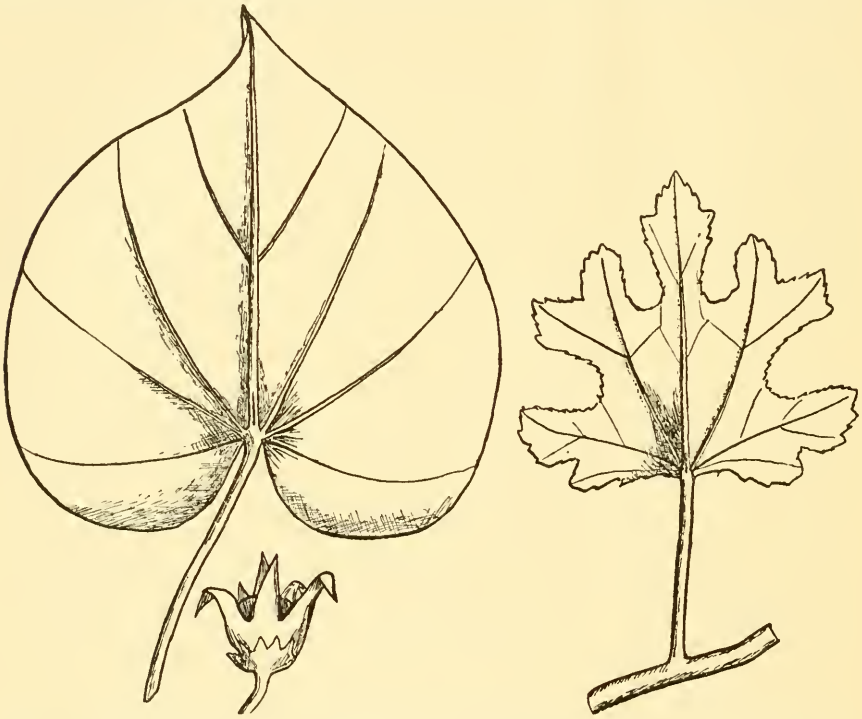


Fig. 1. Leaf of *Paritium tiliaceum* (on the left) showing slit-like gland near base of midrib. Fig. 2. Leaf of *Urena sinuata* (on the right) showing similar gland in same position. Original.

dications of glands on each side of the termination of the rachis just below the articulation of the terminal leaflet. I had often before noticed the glands on the various species of Cassia and I longed for literature on the subject. Here in Guam I have only Darwin's "Cross and Self Fertilisation in the Vegetable Kingdom," and to this I turn. Darwin speaks of plants bearing glands on their leaves, petioles, phyllodia, stipules, bracteae, or flower peduncles, and sometimes on the outside of the calyx, and these glands secrete minute drops of a sweet fluid which attracts sugar-loving insects, such as ants, hive-bees, and wasps. The question is

whether this sweet matter is merely a waste product secreted by the gland or whether the power of secreting it has been specially gained by the plant for the sake of attracting ants and wasps which will serve to protect it from caterpillars, leaf-cutting insects, or other enemies.* It seems strange that the glands are of such little structural importance that they may be present in one plant and absent in a closely-allied species, or, as in the case of the Thespesia, that they may be found on some leaves and not on others of the same plant. I was so fortunate while in Central America as to find a gland-bearing Acacia similar to *Acacia sphaerocephala* described by Belt, if not identical with that species, in the large stipulary thorns of which small ants had taken up their abode. When I broke off a branch I was stung very severely by the tiny insects, which in this case served as a very efficient body-guard.

In the Euphorbiaceae of Guam there are at least two plants with glands at the base of the leaf-blade — the common "palma-christi," or castor-oil plant, and the candle-nut tree I saw this afternoon. It seems to me that very little has thus far been done in investigating the subject, and there is a chance for somebody to do some good work. I wish my duties would allow me more time. One thing I have noticed: ants seem plentiful on cotton plants, which also have glandular leaves and sepals; but I saw none to-day on the Urena, the leaves of which were much eaten by caterpillars. It may be that this species, which has burs with hooked barbs, has been brought to this island by human agency or on the feathers of birds, and that the ants which are its natural protectors have never reached here. It is not surprising that certain insects which lay their eggs in grain, such as the corn and rice weevils, should have gotten here, or that there are plant lice in abundance on some of the introduced foliage plants, which must have been brought here in a growing condition; but I have thought it very curious and interesting to find on this island a tobacco worm very much like those in America, the larva of a sphinx moth which infests the tobacco plants and keeps the natives busy until the leaves are ready for gathering; and accompanying the milk-weed, *Asclepias curassavica*, the same tawny butterfly (*Anosia plexippus*) which feeds on it in tropical America. Both the tobacco and the milk-weed must have gotten here in the form of seed. Eggs of the sphinx moth may have reached here on dry tobacco leaves; but how did the tawny butterfly get here? I have also noticed the same insect in Samoa, where the same Asclepias has established itself.

Friday, September 22.—Action was brought this day by an old woman named Margarita de la Cruz against Bruno del Rosario to recover damages awarded her during the Spanish administration of this island. The wife of Bruno, it seems, assaulted the old lady and set her house on fire.

DARWIN, "Cross and Self Fertilisation in the Vegetable Kingdom," p. 402–4. New York, 1877.

Don Pedro Duarte has gone security for the payment of the damages, and Bruno will continue to work on Don Pedro's ranch until the debt is cancelled.

Saturday, September 23.—To-day I granted the first divorce, in accordance with the Governor's recent order. Of course it will not be recognized by the church authorities, and the divorced couple when they remarry can only go through a civil ceremony before the justice of the peace.

A complaint having been made by a citizen of Agaña that one of the crew of the *Yosemite* while ashore on liberty last Sunday had come to his house in a state of intoxication and had grossly insulted his wife, a warrant was this day issued for the arrest of the said man, a seaman of foreign birth named Hans Hansen. He will be tried by a military commission of which I shall be president.

Thus far our men have gotten along very well with the residents of the island. The only thing which can possibly endanger the public peace is drunkenness. Men who have been cooped up on board ship for months naturally seek recreation on coming ashore, and it is not surprising that some of them will drink more than is good for them after a long period of forced abstinence. I am sorry about Hansen. In his normal condition he is peaceful and law-abiding, and he is very penitent. He must be punished, however, as an example for the rest and as an indication to the natives that their rights are to be respected as strictly as though they were citizens of one of our own communities.

The presence of our ships in the harbor with large crews on board of them, and of the two companies of marines now in this city, is making itself felt. Eggs and chickens are becoming scarce, difficulty is sometimes experienced in getting sufficient meat, and as there is nothing resembling a market, we have to depend upon the good will of the natives for our vegetables. Forunately for me, Susana is a good provider. Not a beef is killed or a deer brought to town by a hunter but Susana hears of it and secures a piece for me. The other day she asked me why I did not buy some chickens and start a ranch of my own, so that I need not depend upon others for fresh eggs and fowls. She has already planted a peculiar kind of string bean along my garden fence (*Psophocarpus tetragonolobus*), with tender green pods having four longitudinal ruffled wings. These the people here call "seguidillas."

[TO BE CONTINUED.]

C. G. LLOYD'S Mycological Notes Nos. 12 and 13 have recently appeared. No. 12 contains an account of the species of *Bovista* and *Mycenastrum*, No. 13 contains Catastoma and *Mitremyces* (Calostoma), besides some miscellaneous notes. The accompanying plates are issued separately.

Indian Hemp as an Ornamental.

By William R. Beattie.

In connection with planting around the rural home it is often difficult to select some rapidly growing plant that may be used to form a screen to conceal something beyond, or to form a clump to make a break in an extended open space. In many instances it may be desirable to plant something that will remain but a single season, and which will form a hedge to separate two distinct parts of the lawn or garden. It is essential to secure a plant of rapid growth, of sufficient size, compact and close growing, of sufficient strength to withstand the force of the wind or any ordinary injury, and one that will be attractive. All these requirements are met with in the Indian Hemp, *Cannabis indica.*

The hemp plant is a native of India and Persia. It is of well-known commercial importance for its fiber and its alkaloid properties. The dried leaves and flowers are used both alone and mixed with tobacco for smoking purposes. When grown in warm countries there exudes from the stems a resinous compound which is highly narcotic, and in great demand for use as an intoxicant. The commercial importance of Indian Hemp need not be considered in this connection, for the plant is worthy of cultivation for its ornamental value alone.

The species of hemp usually grown for fiber, *Cannabis sativa*, should not be selected for growing as an ornamental, as the leaves are too coarse and rough and the plant has not the proper shape either to form a screen or present an attractive appearance, except when grown in large quantities. The plant of the Indian Hemp grows to a height of from four to six feet, is closely branched, compact, and spreading, with numerous finely-divided leaves. The leaflets have a drooping habit which adds very materially to the graceful appearance of the plant. A perfectly developed plant of Indian Hemp, when viewed from a distance, has the appearance and general outline of the young trees of Red Cedar, *Juniperus virginiana.*

Plant the seed in the open ground as soon as the soil can be worked in the spring, or start in flower pots in the house and transplant to the open ground later. If the seed is planted in the open ground, two or three seeds should be placed together in order to secure a good stand, all but one of which should be removed as soon as the plants are well established, or the surplus plants may be transplanted to some other place. The plants should be placed about two feet apart, and a double, alternately planted, row will form a perfect screen. After the seedlings become established they grow very rapidly and attain good size before midsummer.

The seeds are not produced until very late in the season, and unless planting be done early, no seeds will ripen. The foliage is not injured by the first frosts, remaining green until hard freezing weather begins. During the season of 1902 it was noted that specimens growing on the Potomac Flats withstood, without apparent injury, a temperature of 28° F., at which time the ground was slightly frozen. The plants were not actually killed until after the thermometer had gone as low as 22°.

The color of the entire plant is of deep green, sometimes with a bronze tinting on the stems. When the foliage is disturbed by the wind it has a silvery or frosty appearance due to the presence of innumerable small plant hairs on the under side of the leaves. On a warm day and with a light wind blowing there are few things more pleasing to the eye than a field of growing hemp.

Indian Hemp is not well known to the American seed trade, and when ordering seed it should be clearly stated that it is this species that is wanted. The seed is also very scarce and the price correspondingly high, but as a rule a few seeds are all that will be required.

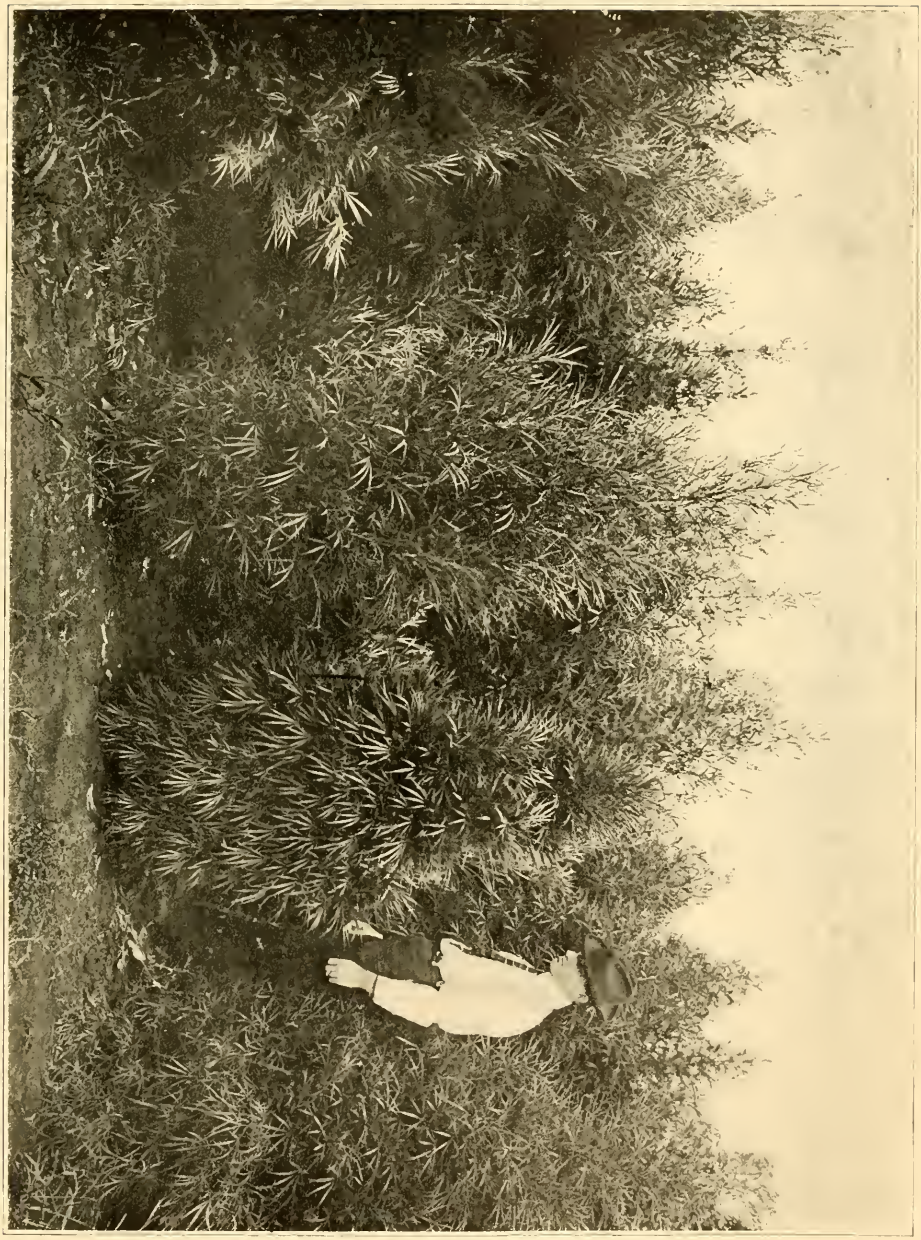
A Collecting Trip to Bolivia.*

By R. S. Williams.

Leaving New York July 9, 1901, I took a through steamer to Colon, crossed the isthmus to Panama, where I met the other three members of our party, and proceeded down the South American coast to Mollendo, the chief port by which one enters Bolivia, landing at that place August 4, twenty-six days out from the city.

From Mollendo an excellent railway to Lake Titicaca carries one in eight or ten hours to Arequipa, at an elevation of 7,500 feet. The first part of the route and up over the first hills to an elevation of between 3,000 and 4,000 feet has considerable vegetation, small trees or bushes growing along the few streams and various shrubby plants, grasses, etc., on the hillsides and in the ravines. After ascending this first range the road passes through a comparatively level tract that seems to be an absolute desert, extending over many hundreds of square miles. From the train there was nothing living to be seen, either plant or animal, as far as the eye could reach in all directions, except along the track at the stations. It is in this desert that the curious moving sandhills occur. Apparently the higher winds all blow from one direction, sift out the light colored sand, lighter also in weight, from the darker sand and

* Condensed from the *Journal of the New York Botanical Garden.*



Indian Hemp in the Trial Grounds of the U. S. Department of Agriculture.

rocks that compose most of the surface, and pile this light sand into more or less crescent-shaped hills up to perhaps six or eight feet in height and fifty feet or more in length; these advance slowly with the wind as it blows the sand on the exposed side over the crest to the sheltered side. These hills, moreover, not only stand out clearly defined over the darker surface, but they are covered all over the windward side by the most delicate tracery of little waves, closely imitating those produced on water by a slight breeze, and they are so numerous that at a little distance the outline of one hill becomes merged into that of its neighbors on either side.

As one rises and approaches Arequipa vegetation gradually appears again to some extent. Various tall, more or less branching cacti are conspicuous, shrubby composites are common, and various small bushes and grasses appear on the gravelly hillsides and ravines. Even a few ferns and mosses are found, but everywhere the country is too dry for any extensive cultivation without artificial irrigation, and this is carried on quite extensively, both in Arequipa and neighboring valleys. The railway on leaving Arequipa rises rapidly, winding in and out among the bare hills till near the summit of the continental divide, when the grade becomes more gradual and one scarcely realizes that he is at the highest point at a station called Crucero Alto, 14,666 feet above the sea. Let one attempt the slightest exertion, however, and at once the great difference in the air is perceptible by the difficulty of breathing, often accompanied by headache and even nausea. Vegetation is not uncommon at this altitude, some of the best and most abundant grasses thriving at from 12,000 to 14,000 feet; various cacti also occur, although what may be termed the cactus belt is somewhat lower, from about 6,000 to 10,000 feet. Rather above the grasses and near the summit of the divide a resinous composite a foot or two high is abundant, large quantities of which are pulled out by the roots, made into bales and sold for fuel. At about the same height also are several odd cespitose plants. One is perhaps umbelliferous. It grows in hard, dense masses, that when dug out are nearly the size of a bushel basket and furnish an excellent fuel. Another species forms more or less complete yellow-brown rings over the surface of the ground. This last evidently continues to grow about the outside of the dense tuft it first forms. Finally the center, composed of the older branches, dies away and becomes replaced by sand, thus leaving a very perfect ring, often several feet across and of a peculiar yellowish color, in strong contrast with the dark sand around and within it.

As one approaches Lake Titicaca the low flats bordering the lake are observed to be extensively cultivated. The principal crop raised is barley, next perhaps comes kenoa, then potatoes. The barley is mostly

cut before maturity and used for fodder, and the potatoes are small and poor in quality. The kenoa, a species of *Chenopodium*, varies from a small plant without branches and only ten or twelve inches high to a great branching weed-like thing three or four feet tall. It becomes bright red at maturity and a large specimen doubtless produces half a pint or more of seed. The seed is cooked and eaten much the same as rice, but requires more care, as the first water in which it is boiled should be drained off. When thoroughly cooked the spirally coiled embryo becomes separated from the endosperm and gives the dish an odd appearance. At best it is quite inferior to any of the cereals as a food.

No native trees or bushes of any size were observed about the shores, and wood for building purposes and fuel is very scarce. In the shallower parts of the lake a tall rush much like *Scirpus lacustris* is abundant and out of this the Indians make a very neat, boat-shaped raft called balsa, with sail also of rushes, which they use in navigating the smaller arms and bays, rarely going more than three or four miles from shore however. They also use this boat in netting and spearing fish and in pulling up from the lake bottom water plants which they feed to cattle picketed out along the shore. This rather unusual fodder consists largely of a species of *Myriophyllum* and a somewhat grass-like plant, possibly a *Potamogeton*, mixed with *Chara* and a green filamentous alga. The cattle eat these things doubtless from necessity rather than choice, but the rush above mentioned they will wade far out into the water to obtain, so that when feeding little more than their backs and heads are visible.

The city of La Paz is in a great gulch some 1,000 feet lower than Lake Titicaca and about twice that distance below the surrounding plateau. The *Eucalyptus* is the commonest tree in cultivation, several fine groves standing out conspicuously as one looks down upon the town. Another much smaller tree in some of the gardens, with handsome purplish flowers, is a *Cantua*, apparently of the species *laxifolia*. Tall, branching, cylindrical jointed cactuses are common as a hedge plant along various lanes, and in the lower part of the town a weeping willow grows finely.

From La Paz we went with mules to Sorata, the trail passing around the northwest base of the Sorata range, over a pass some 14,000 feet elevation and down quite rapidly 6,500 feet to the town of Sorata, which, being 4,000 feet lower than La Paz, has a most agreeable climate the year around. Here, as in the latter town, *Eucalyptus* trees were the most conspicuous of any, but various other species were quite common, especially a black walnut, the fruit of which furnishes the Indians one of their dyes. The mountain sides near town are well cultivated for probably a distance of 2,000 feet up, and when we were there, in early June, thousands of acres of fine fields of Indian corn and bearded wheat were

just maturing. Potatoes are common and they seem to grow best at 8,000 or 9,000 feet. In the plaza and gardens about town a good many peach trees seem to thrive, but the fruit is of little or no value, I was informed; also a few grape vines occur, but these evidently do better at a somewhat lower level. Among the numerous native bushes on the hillsides near by were two species of *Rubus*, but although they were fruiting abundantly and looked quite tempting, the berries proved to be rather dry and tasteless. Fine strawberries are cultivated and a few scarcely ripened ones were coming into the market just as I left early in October.

Uses of Cacti.

By C. R. Orcutt.

These curious plants are prized in Eastern and European greenhouses because of the great diversity of forms presented, and not a few because of their brilliant flowers. Several species native to the Rocky Mountain region are hardy in the Eastern States, and useful for rockeries and out-of-doors landscape effects.

In portions of the Southwest, particularly in Texas and parts of Mexico, the prickly pear forms an important forage plant, and other varieties of cacti are also eaten freely by cattle and other animals. The stock raiser cuts the fleshy joints and roasts them slightly that the barbed spines may not injure the cattle; but the wild cattle are not at all fastidious or tender-mouthed, and eat them greedily, spines and all. The beautiful velvet cactus (*Cereus Emoryi*) in Lower California is eagerly browsed upon by goats and sheep, the young growth with flexuous spines being especially sought after.

The cord-wood cactus, or *pitalla agria* (*Cereus gummosus*), besides a luscious fruit slightly resembling a strawberry in quality, yields a gummy substance which has been used to caulk boats.

The famed night-blooming cereus (*Cereus grandiflorus*) is valued in medicine, as are also many other species of cacti. Among them I may mention the hikoi of Mexico, used in sacred rites by the Indians, and producing when eaten some of the effects of opium; a species of Mammillaria new to science, credited among the Indians as a cure for consumption; *Opuntia tuna*, now extensively used; *Anhalonium lewinii* for the drug anhalonin, and others not yet well demonstrated.

In Texas a curious notion prevails with some that eating the fruit of the tuna is productive of chills and fever. The tunas exist in Mexico in countless varieties and form one of the most important articles of food

among the lower classes, who, during the season, subsist almost entirely upon this fruit.

The hecho in Sonora (*Cereus pecten-aboriginum*) produces a curious spiny fruit like a giant chestnut-bur. This is utilized by the Indians in the manufacture of a comb or brush for the hair.

In many arid regions the cactus furnishes a most important portion of the fuel supply, and often enters into the construction of fences, corrals, and even of houses. In Tehuacan the ligneous pith is used for poles in the vineyards. Many varieties are planted regularly for living fences.

In Mexico the cactus is by far the most valuable among the fruit-producing plants, and tons of tunas, pitallas and numberless other varieties annually find their way to the market places. It is a curious sight in some of these markets to see scores of men, women, and children, each with a plate, or a basket, or a burro pack train loaded with some variety of cactus fruit. In San Luis Potosi probably forty or fifty varieties of these fruits may be counted. The sweet globose fruits of *Cereus geometrizans* are dried in large quantities and later eaten like raisins or currants, which they slightly resemble. Other varieties are made into pleasant summer drinks, or fermented and made into wine or other intoxicating beverage. The national drink of the Mexican Republic—pulque—is made from the maguey or mescal plant (species of Agave), commonly but erroneously called a cactus. The history of the industries connected with this group of plants alone has formed the subject of many volumes.

The Indians are credited with using the spines of some cacti for fish-hooks, of others for needles, and in the craze for novelties they are being gathered in quantities for toothpicks by enterprising curio dealers. The manufacture of furniture, napkin rings, canes, and countless other curious and useful objects has assumed considerable proportions.

Carloads of one variety are gathered in Mexico and shipped to the cities and manufactured into dulces or confectionery. In some localities a single plant may be found to yield $20 worth of dulces.

The cochineal insect was formerly an important product from the cactus, and plantations were maintained for the production of this dye.

Sometimes a giant cactus in the desert will save the life of a traveler by supplying him with water in his hour of need. A large plant may yield a wash-tub full of sweet, if somewhat insipid, water, and has won the gratitude of the parched prospector.

In Utah one variety occurs that the Indians gather and peel as we would cucumbers before eating. The pioneer will often find a few planted around a patch of ground to be the best kind of a fence for protection against chickens or wild animals.

Doubtless many other and diverse uses for some of these plants could

be named. One kind is bruised by fishermen and cast into small arms of the sea, the juice stupefying the fishes so that they can be easily picked up. But I will close this hasty memorandum with mention of the use made of the prickly pear by the roadrunner, a bird peculiar to California. When this sagacious bird finds a rattlesnake asleep it will gather joints of the cactus and carefully surround his snakeship, and then rudely awake him by dropping a joint upon him. When he finds no escape he is said to commit suicide. This story has been told by many who claimed to have been eyewitnesses in early days, but not, I believe, by any naturalist of undoubted veracity. There is little reason to doubt its truth.

Editor, THE PLANT WORLD:

In your issue of THE PLANT WORLD for May, page 121, you quote Prof. Underwood as having reached the conclusion that the royal ferns of America and Europe, hitherto known as the same species (*Osmunda regalis*) are really distinct. For many years I made, with Prof. Leo Lesquereux, comparisons of American with European species, and have continued comparisons during later years, and am fully satisfied there are no distinctions to separate these ferns from the two continents. While the distinct rounded auricle on the lower side of base is not so common with our American *Osmunda*, these forms occur in all parts of Beaver County, and the pinnules bear the rounded lobes as in the European varieties. IRA F. MANSFIELD.

Beaver, Pa.

REV. J. M. BATES, of Callaway, Nebraska, calls attention to a statement made in "The Families of Flowering Plants"* that Gerardias and their allies turn black in drying. He says: "In our dry climate I am able with care to dry *G. aspera* and *G. Besseyana* without much loss of green." Mr. Pollard's statement of the general fact was true, but there are undoubted exceptions to the rule, as not only the species mentioned by Mr. Bates, but several Southern species, can be preserved with the colors unchanged.

With regard to the distribution of *Martynia*, the unicorn plant, Mr. Bates writes: "You state the range of *Martynia* as 'tropical American.' Britton and Brown say: 'Native of Mississippi Valley from Iowa and Illinois southward.' I have heard several observers say that it grew wild in southern South Dakota, Nebraska, and Kansas." Here, again, the statement of fact was meant to be general rather than specific, as in a work devoted to plant families it would be impossible to give the generic distributions with exactness.

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*THE PLANT WORLD, Vol. 5, No. 8, Suppl., 236.

Briefer Articles.

PLANT PHYSIOLOGY FOR THE HIGH SCHOOL.

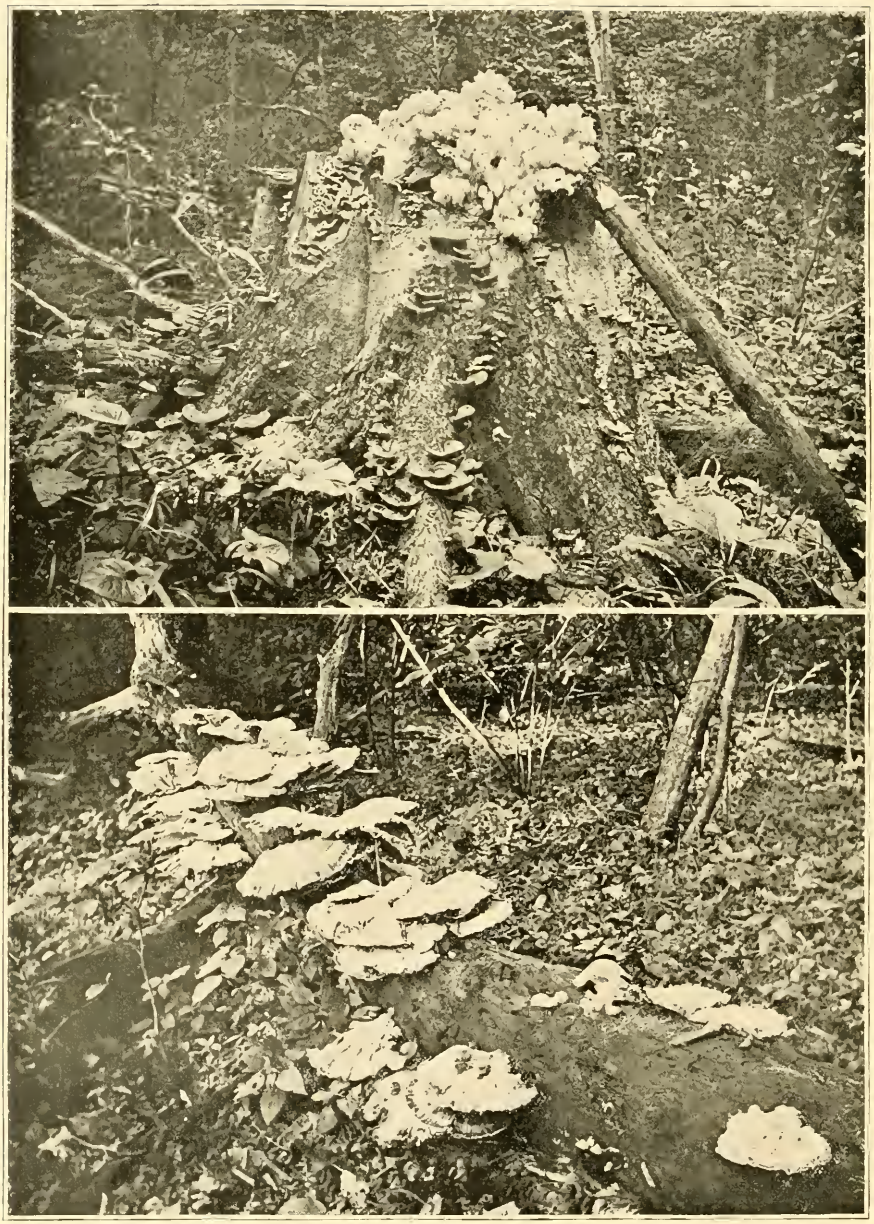
[The proper method of teaching botany in our high schools is a subject that is now being widely discussed by prominent educators. We recommend teachers to secure and read all of Dr. Ganong's valuable article, of which we have space for only a small portion.—EDS.]

THERE are many differences between the older and the newer botanical instruction, but the greatest of these is the presence in the newer of much plant physiology. Whether one views the modern textbooks, or the courses in the more advanced institutions, or recent educational discussions—it is everywhere the same, a strong emphasis upon plant physiology as an integral part of every truly scientific elementary course in botany.

That the emphasis upon this phase of the science is no passing whim but a permanent addition to scientific education, there is every evidence. Its growth has been gradual and sound, and it has won recognition as an indispensable foundation for an understanding not only of plant structure and adaptations, but also of the simpler processes of animal physiology, as illuminating and pleasing knowledge, and as a peculiarly valuable intellectual discipline, one going far toward aiding to elevate botany to as high an educational rank as any subject possesses. It is now safe to say that every progressive and well-informed high school teacher either already has introduced a fair proportion of the subject into his instruction or else is preparing to do so.

To secure its full educational value, however, there is one great prerequisite, namely, that it shall be taught in the truly scientific inductive spirit from actual personal observation and logical experiment. * * * By far the best way is to have all experiments performed by each student individually, but as that is generally impossible in high schools, a fair substitute consists in making each student a participant in the experimenting, holding him responsible for as full an understanding and exposition of each experiment as if it were actually carried out by himself individually. * * *

The understanding of plant physiology is by no means easy, but this is precisely one of its chief educational values. Moreover, the teacher should by no means attempt to select its easiest, but its most important parts. It is far better that the pupil should attack those questions which the nature of the subject points out as most fundamental and illuminating, and do the best he can with them, than that he should concern himself with matters of lesser importance even though these are easier to study and more open to simple experiment.—PROFESSOR W. F. GANONG in *School Science*.



Shear on Fungus Flora; upper figure, *Hydnum coralloides*; lower figure, *Polyporus* sp.

FUNGI ON OLD LOGS AND STUMPS.

THE fungus flora of an old log or stump might be made the subject of a special study, which would prove both interesting and profitable, especially if it were continued through a whole year or series of years.

There is considerable variety in the succession of forms appearing during the seasons. In the summer the fleshy wood-loving mushrooms appear. A beautiful example of one of these is shown in the upper figure. The snow-white mass at the top of the stump is the coral hydnum (*Hydnum coralloides*), a striking and beautiful fungus, as pleasant to the taste as to the eye. It usually grows in large masses and when once seen and tasted it will always be remembered. The tougher species of pore and gill fungi persist throughout the year and many of them can be found as well in winter as in summer. About the sides and base of the stump in the illustration is one of these forms. It has not yet received a common name so far as we know. It is known to the mycologist as *Lenzites betulina*. The upper surface is densely and coarsely pubescent and zoned, the under surface is covered with tough pale yellowish gills. It occurs very frequently on old beech logs and stumps, but is also found on various other deciduous trees.

The lower figure shows some beautiful specimens of a pore fungus (*Polyporus* sp.). These plants flourish most abundantly in late summer and autumn. The species are very numerous and varied in size, shape, and color.

These large conspicuous forms are but a few of a multitude of species of fungi which may be found on a decaying log or stump. Examine them more carefully, even in the dead of winter, and you will find numerous smaller forms whose beauty and diversity can only be discovered by means of a hand lens or compound microscope. Nature always has something interesting and beautiful to reveal to those who care to look, and in no part of her great realm are these things more numerous than among the winter forms of fungi, which are kept constantly at work in myriads tearing to pieces the dead and decaying monarchs of the forest in order that others more noble perhaps may be reared therefrom.

C. L. SHEAR.

"OHIO Mycological Bulletin" is the title of a series of leaflets being published by Dr. W. A. Kellerman of the Ohio State University. No. 4 has just been distributed. Notes and reproductions of photographs of the fleshy fungi are published. It is intended especially for beginners and amateurs. By mailing the small sum of ten cents any one may become a member of the Ohio Mycological Club and receive the bulletins as issued.

The Wild Flower Preservation Society of America.

The Society has received a large accession of members during the past month, the enrollments being the result chiefly of the lectures given by the Secretary in various cities of New York, Ohio, Indiana and Illinois. A full report of this lecture tour has been submitted to the New York Botanical Garden, under whose auspices it was made. Later the report will be published in The Plant World.

The Secretary desires to take this opportunity of expressing his gratitude and personal obligation to the various officers of universities and societies who by their active efforts and careful advance arrangements contributed greatly to the success of the lectures. The social side of the trip was one of its greatest pleasures, and the opportunity of personally meeting those whom the Secretary had known only by reputation was one which he greatly appreciated.

THE SYRACUSE CHAPTER.

At the close of Mr. Pollard's lecture in Syracuse on the evening of May 13, a preliminary organization of the Syracuse Chapter was effected with a membership of twelve persons. Mrs. L. L. Goodrich was elected president and Miss Ellen Beauchamp secretary. The permanent organization was entrusted to an executive committee of seven members. A more detailed report will be published later, when the chapter has completed its membership and adopted plans for work.

On the following day the members of the Syracuse Botany Club entertained Mr. Pollard on an excursion to the home of the hart's-tongue fern (*Phyllitis scolopendrium*) at Jamesville. This is one of the plants deserving of the most careful protection, as also the peculiar green trilliums which are abundant at one station in that vicinity.

CORRECTIONS.

In the list of members of the Society published in last month's issue of The Plant World the name of Miss V. S. White, of New York City, a Fellow, should have been printed in capitals. The following names were accidentally omitted :

Eccles, Dr. R. G., Brooklyn, N. Y.
Kaufman, Miss Pauline, New York, N. Y.

NEW MEMBERS ENROLLED DURING MAY.

Please notify the Secretary of corrections or omissions in this list.

Agan, Mrs. Anna E., Syracuse, N. Y. *Syracuse Chapter.*

Baldwin, Mrs. Kate Poole, Syracuse, N. Y. *Syracuse Chapter.*
Barker, Mrs. J. W., Syracuse, N. Y. *Syracuse Chapter.*
Barnes, Mrs. Kate S., Syracuse, N. Y. *Syracuse, Chapter.*
Barroeta, Dr. G., San Luis Potosi, Mexico.
Beauchamp, Rev. Dr., Syracuse, N. Y. *Syracuse Chapter.*
Brickenstein, Miss M. R., Washington, D. C.
Brown, Mr. Walter L., Buffalo, N. Y.

Cary, Mrs. Elizabeth M. L., Buffalo, N. Y.
Cloyd, Miss Anna, La Fayette, Ind.
Crane, Mr. A. M., Cincinnati, Ohio.

Dorner, Mr. H. B., La Fayette, Ind.
Drude, Miss, Cincinnati, Ohio.

Fenton, Mr. Benjamin W., Buffalo, N. Y.
Forbes, Miss H. E., Brooklyn, N. Y.
Foster, Mr. Orion L., La Fayette, Ind.

Gemmel, Miss Marion, Buffalo, N. Y.
Groneweg, Mr. Victor, Cincinnati, Ohio.

Hambleton, Mr. J. C., Sandusky, Ohio.
Haynes, Miss Frances, Baltimore, Md. *Baltimore Chapter.*
Henderson, Miss Emily, Brooklyn, N. Y.
Hill, Miss Mary E., Syracuse, N. Y. *Syracuse Chapter.*

James, Mr. Davis L., Cincinnati, Ohio.

Kerens, Mrs. R. C., St. Louis, Mo.

Latimer, Miss M., Brooklyn, N. Y.
Letchworth, Mr. Josiah, Buffalo, N. Y.
Lindahl, Dr. Josua, Cincinnati, Ohio.

MacDougall, Mrs. Thomas, Cincinnati, Ohio.
Martin, Mrs. Geo. W., Bond Hill, Ohio.
Maxwell, Dr. F. B., River Forest, Ill.
McGuire, Mrs. L. A., Cincinnati, Ohio.
McLeod, Mr. W. C., Sandusky, Ohio.
Motts, Miss Sarah F., Brooklyn, N. Y.

Page, Miss Louise I., Syracuse, N. Y. *Syracuse Chapter.*
Pepoon, Mr. H. S., Chicago, Ill.

Ransom, Dr. D. L. C., Sandusky, Ohio.
Raynor, Miss Julia Adele, Syracuse, N. Y. *Syracuse Chapter.*
Rice, Miss Elizabeth L., Syracuse, N. Y. *Syracuse Chapter.*
Riddle, Miss Lumina C., Columbus, Ohio.
Roberts, Miss Louise W., Syracuse, N. Y. *Syracuse Chapter.*

Scott, Prof. William, Toronto, Canada.
Smith, Mrs. Carroll E., Syracuse, N. Y. *Syracuse Chapter.*
Smith, Miss Harriet V., Chicago, Ill.
Smith, Dr. Lee H., Buffalo, N. Y.
Smith, Mr. T. Guilford, Buffalo, N. Y.

Vogt, Mr. Frederick A., Buffalo, N. Y.

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The dues of new members are now payable, and should be forwarded to the Treasurer, Mrs. Carolyn W. Harris, whose summer address is Chilson Lake, Essex Co., N. Y. Membership dates from the time of enrollment.

Editorial.

In a recent issue our contemporary, *The American Botanist*, calls attention to an important matter that may very well be taken up by the plant-protection societies, namely, the securing of legislation that will protect certain conspicuous plants, such as arbutus, azalea, columbine, trillium, lupine, various ferns, etc., unless the consent of the owner of the land is secured. As Dr. Knowlton shows in his Phelps-Stokes prize essay, the idea that the plants of woods and fields are common property — to be plucked at will — is of very ancient origin and has accumulated through many centuries of license. The laws against trespass are doubtless sufficient to protect these plants if the owners of property were sufficiently interested to enforce their rights; but too often they are negligent in this respect, and the devastation goes merrily on. We would like to urge upon those interested in plant protection the necessity of interesting property-owners in establishing their rights in this matter, and to this end the various State legislatures might be induced to pass laws making it necessary to secure the consent of owners before flowers and plants may be gathered. It is true, too, as our contemporary says, that only those plants in great need of protection should be included in such bills, as otherwise they would probably be defeated. As a step in this direction it may be stated that the legislature of New York is to be memorialized by the Syracuse Chapter of the Wild Flower Preservation Society to establish a public park for the protection of the local hart's-tongue fern. When these matters are more thoroughly understood it will probably not be difficult to secure such legislation, but the effort must not be sporadic. As an example of what may be accomplished along similar lines we may mention the agreement recently entered into between the members of the Millinery Merchants' Protective Association of New York and the Audubon Society of the State of New York, whereby the former agrees to "abstain from the importation, manufacture, purchase, or sale of gulls, terns, grebes, humming-birds, and song birds" for three years, and the latter to "prevent all illegal interference on the part of game wardens with the millinery trade; to refrain from aiding the passage of any legislation that has for its object restrictions against the importation, manufacture or sale of fancy feathers obtained from domesticated fowls, etc." This was a hard battle, and we congratulate our kindred organization, the Audubon Society, on its signal victory. When our plant-protection organizations are as old as the Audubon societies we hope we may point to a similar line of successes in staying the destruction of our plants. In the meantime let us hope that every one will carry on active missionary work among his neighbors and friends.

The Home Garden and Greenhouse.

CONDUCTED BY F. H. KNOWLTON.

[The editor of this department will be glad to answer questions of a relevant nature, and also to receive short articles on any phase of this subject.]

The Japanese Snowball.—One of the handsomest shrubs for lawn decoration is the Japanese Snowball (*Viburnum plicatum*), a native, as its name implies, of Japan. When grown alone it forms a very compact bush, five to eight feet in height and nearly as much in diameter. In May it is covered with a great mass of globular flower clusters so as to almost obscure the branches. The fine leaves are apparently plaited, hence its specific name. It may be trained in tree form, but is perhaps best when allowed to form a globular shape.

Pink-flowered Locust.—The pink locust (*Robinia rosea*), a native of the southern mountains, is a very showy bush from two to four feet in height, covered in spring with a profusion of racemes of clear pink flowers. It makes a very pretty addition to the hardy hedgerow and is of the easiest culture, requiring simply to be planted in any good soil. It propagates by underground suckers and in a few years will form a dense thicket unless restrained. It is also readily grown from seeds.

Easter Lilies.—A correspondent requests information as to the disposition of Easter lilies after they have been forced. Ordinarily they are discarded, for few people have facilities for caring for them, and they are not especially successful when forced a second time. Perhaps the best disposition to make is to plant them out in the ground, when according to some they will continue for years showing each season a fair proportion of bloom. They are very closely allied to the *longiflorum* lily, which is so conspicuous a feature in out-of-door planting, and when protected during the winter may live for many years. They may also be kept in a greenhouse and forced into flower the next season, but, as stated, the second forcing is not as satisfactory. Perhaps some of our readers can give other and more specific means for utilizing them.

Raising Cucumbers.—A great many plans for utilizing a small space of ground for cucumbers have been suggested, but one of the best we have observed is as follows: Cut a flour or sugar barrel in half and bury the larger end an inch or two in the ground. Fill the bottom to the depth of eight inches with loose stones, broken crocks, etc., and the remainder to within two inches of the top with very rich earth. The seed may be planted and induced to germinate, even before danger of frost is passed, by covering the top of the barrel with glass. If too cold the glass may be left in position at night until safe to remove it. It is an easy matter to water plants grown in this way and the drainage

material at the bottom will prevent an excess of moisture. Four hills prepared in this manner will not occupy more than 25 square feet and will supply a small family with an abundance of fruit.

Strawberries.—While there is some difference of opinion as to the relative merits of the hill or solid-row system of growing strawberries, it seems probable that for a small area the hill system offers advantages. It is easier to cultivate the plants properly and to be certain that the fertilizer comes in direct contact with each individual. Strawberries should not be cropped more than twice, and some growers advocate but a single full crop. If a new bed is to be set, a good stand may be secured by rooting the young plants in small pots during June and July and transferring them as soon as possible. In late fall they should be lightly covered with straw, leaves, or other light material.

Hellebore for Currant Worms.—Currant and gooseberry bushes are likely to be infested with the destructive currant worm, the bushes often being completely denuded in a few days. This pest may be destroyed by an application of powdered white hellebore, applying it early in the morning when the leaves are wet with dew, or after dampening the bushes with a watering-pot. No fear need be entertained as to poisoning the fruit, for although a poison, it is easily washed from the bushes by the slightest rain, and a washing of the fruit is sure to remove any slight trace that may remain.

Bedding Begonias.—Bedding begonias are usually of the so-called Vernon type, and are easily raised from seed, which should be sown in flats in March. The plants will be ready to put out by the middle or latter part of May, and if supplied with sufficient water and not too much strong sun will grow rapidly and be in bloom by July. There are various shades, ranging from pure white through pink to red. A few plants removed before frost in the fall can be kept in an ordinary living-room, and may continue blooming through the entire winter. The flowering is very profuse and the light green succulent foliage and the pure waxy flowers are often very attractive.

Failure of Narcissus to Bloom.—A correspondent in New York City, Miss Pauline Kaufman, writes to the editor as follows: "During the twenty-two years that we have been living in this house, several clumps of Narcissus, in various situations, have each year shown their willingness to bloom, but the buds never fully matured. This spring, for the first time, we have had a flower, and a fine one at that. Is it owing to the heat and rain in the latter part of March and the beginning of April? During that warm spell I watered the plants when there was no rain, but have never before watered them so early in the season. Next year I will start the watering in March, and judge by results whether they require excessive wet."

Miscellany.

"THE School Garden" is the title of Normal School Bulletin No. 5 published by the Eastern Illinois State Normal School. This should be helpful to all primary and secondary teachers interested in the subject. The author, Dr. O. W. Caldwell, gives an account of the work done in this direction in European schools, which shows how far they are in advance of us. He also discusses plans, methods, and purposes of the work in a concise and practical manner. A number of reproductions of photographs add to the attractiveness as well as usefulness of the paper.

THE curious and interesting "puff-ball" known as *Cauloglossum transversarium* (Bosc) Fr. is the subject of contributions from the Cryptogamic Laboratory of Harvard University No. LI. Mr. John R. Johnson is its author. No. L of the same series contains preliminary diagnoses of new species of Laboulbeniaceae by Dr. Roland Thaxter. This interesting and curious group of fungi occurs on various insects. They are very minute and inconspicuous and until recently only few were known. Dr. Thaxter's thorough investigations have brought to light a large number of new genera and species.

THE May number of *School Science* contains an article by John E. Cameron, Cedar Rapids (Iowa) High School, on the value of making an herbarium. The necessity of more field work, more direct contact and familiarity with plants is very properly emphasized, and it is suggested that the preparation of an herbarium will help to remedy the matter. The preparation of an herbarium is undoubtedly of value as a means to an end. The mistake is sometimes made in making it an end. Properly coordinated with other work it is very desirable.

IT HAS been found from experimental plantings made at Winter Park, Florida, and extending over five or six years, that camphor trees will grow in the southern part of the peninsula. Considerable groves of cuttings are now being set out. In camphor-producing regions of the east the camphor is obtained chiefly from the trunk and larger limbs of the tree, the wood being reduced to fineness by means of an axe or scraper. Trees less than fifty years old are not regarded as sufficiently rich in the gum to yield enough to pay for working them.

In Florida it is proposed to distill only the leaves and small branches. From various analyses that have been made of this material, it has been found that seventy-seven pounds of leaves and a greater weight of twigs are required to yield one pound of camphor.—*Paint, Oil and Drug Review.*

Book Reviews.

THE NATURE-STUDY IDEA. By *L. H. Bailey*. 8vo, 159 pp. Doubleday, Page & Co., New York, 1903. $1.00.

Professor Bailey has presented here, in his interesting and enthusiastic manner, some of his views regarding nature-study. Not only the teacher but the parent should find the book pleasant and profitable reading. The teacher need not look here, however, for any set examples of the dry-as-dust method of presenting nature to children, accompanied by a set of questions and answers regarding the number of pedal extremities of a dog or other equally edifying matters. The author repeatedly insists that this sort of thing is not nature-study. The first part of the book is devoted to an explanation and definition of nature-study. It is suggested that nature-sympathy would be a more expressive and appropriate term. Prof. Bailey maintains very correctly, we believe, that nature-study and science-study are quite different matters. To attempt to teach the abstruse facts of science by a prolonged microscopic study of the plant-cell or a thorough dissection of the cat is to make impossible the attainment of the true end and aim of nature-study. The prime requisite is that the child become interested in the thing itself and be brought into sympathetic relations with it. It is not important what the object is so long as it is common and easily obtained.

A few quotations will make the matter clearer than any remarks of ours: "We must define nature-study in terms of its purpose, not in terms of its methods. It is not doing this or that. It is putting the child into intimate and sympathetic contact with the things of the external world." "Again, nature-study is studying things and the reason of things, not about things."

What result should follow proper method of nature-study? "By their fruits ye shall know them." Let us quote again: "Its legitimate result is education — the development of mental power, the opening of the eyes and the mind, the civilizing of the individual. As with all education, its central purpose is to make the individual happy, for happiness is nothing more nor less than pleasant and efficient thinking."

Nature-study should interest all, for, as the author remarks, "we are all children of nature"; and besides we are all obliged, either directly or indirectly, to wrest from her the means of supplying our physical wants. Might she not supply them much less grudgingly if we approached her in a more sympathetic attitude, and might we not at the same time derive some of the joy and happiness which she is ever ready to bestow upon all who will accept?

C. L. S.

Fruit of the Mango. After photograph by G. N. Collins, courtesy of the U. S. Department of Agriculture.

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Extracts from the Note-Book of a Naturalist on the Island of Guam.—VIII.*

BY WILLIAM E. SAFFORD.

Sunday, September 24.—Went for a walk this morning across the Agaña River in an easterly direction, and then turned south parallel to the river. As I passed through the *barrio* called San Antonio, noticed many coffee bushes above the houses laden with bright red berries; yards separated by fences of physic nut (*Jatropha curcas*) called "tubatuba" by the natives, the stakes of which had taken root. By the road-sides, as I ascended a slope leading to the plateau, or "mesa," a number of plants of the curious *Bryophyllum calycinum*, the leaves of which when broken off or lying on the ground send forth tiny plants at every notch in their coarsely crenated margin. The natives here call it *siempre-viva*, or "live-forever"; in Cuba it is called *hoja de bruja*, or "witch's leaf." Many bananas, coconuts, lemons, papayas (smaller fruit here than in Samoa), silk cotton trees (*Ceiba pentandra*), and two shrubs called *dadangsi*, or "bur-weeds." The first of these is the *Urena sinuata*, called in Porto Rico "dogs-foot weed," on account of its deeply lobed leaves, the malvaceous plant before described with the gland in the mid-rib of the leaf. The second is a species of Triumfetta, a member of the Tiliaceae. The first has rose-purple flowers, which soon wither after opening. The second has small yellow flowers. Both have bur-like

*Continued from June issue. Begun in September, 1902.

fruit with hooked spines, which stick to the clothing of the passer-by—which accounts for their distribution along the paths and road-sides. They could very easily have been brought here on the feathers of birds.

Among the common weeds: *Asclepias curassavica*, a coarse, ill-smelling, hispid labiate called "múmutu," with blue flowers and rough cordate leaves, growing to a height of 9 or 10 feet; a trifoliate bean-like plant called "chochomeko," with small, inconspicuous flowers and flat pods containing seeds like small Lima beans; bushes of the introduced Cestrum, which bears the dark-colored berries eaten by fruit-pigeons; thickets of "lemoncito," evidently formed from old hedges; large areas of guava-bushes growing breast high. Climbing along the bushes blue-flowered morning-glories called "fofgu," wild yams (*Dioscorea spinosa*), with sharp branching, wiry spines at the base of the stem, protecting the roots; and a trifoliate twining vine with the habit of a clematis, called "akankan lalátun." In an open place *Cassia tora*, called by the natives "múmutun palaoan," or "female múmutu"; high bushes of sapan wood (*Caesalpinia sappan*), here called "sibukao," the heart, wood, and roots of which yield a fine dye—plants evidently spread from ancient boundary-hedges; flowers growing in racemes, yellow, with woolly stamens, followed by short, broad, flat pods; leaves compound-pinnate, with spines on rachis at the base of the leaflets, also stipulary spines; trees thorny, one with a rat's nest in its branches.

On top of mesa, not far from the river, is an open place which had once been cultivated. Earth red, colored from oxide of iron in disintegrate coral; substratum hard coral, scarcely different from that on the reef; large patches of indigo growing wild, *Cassia occidentalis*, called "múmutun sable," or "sword-weed," by the natives, from the shape of its pods; escaped cypress morning-glory (*Quamoclit quamoclit*), covered with intense bright red star-like flowers. In places where there was no grass the ground covered with a carpet of a small creeping trifoliate plant, *Meibomia triflora*, incorrectly called "agsom" or "apson" by the natives (sour) from its resemblance to the trifoliate *Oxalis corniculata*.

Approaching the edge of the plateau I found myself on the edge of the great swamp or "cienaga" on the side opposite Agaña. Through this swamp the river, rising in the great spring called Matan-hanom, makes its way to the sea through a dense growth of reeds and other marsh plants. Fine view across the swamp; reeds like a canefield, with here and there groups of coconuts rising like islands or projecting like capes. One or two Areca palms, from which the natives get their betel nuts, growing on the edge, with slender, ringed trunks, plumy pinnate leaves forming a rank-looking crest, below which the fruit hangs in clusters. Among the reeds tufts of the coarse swamp-fern *Chrysodium aureum*, with pinnated fronds fertile at the tips; a grass called "achugau,"

so coarse that only water-buffaloes will eat it; a poplar-like shrub called "pápago sesonyan," or "chaguan sesonyan" (swamp-weed), with palmate veined leaves of a yellow-green color; near by a tree called "alom" (probably a species of Mallotus), with heart-shaped leaves, monoecious flowers in racemes, the male having five sepals and many stamens and the female having fruit like two or three small globes attached to each other; leaves used here medicinally.

Suddenly I came upon a small bamboo hut, or *rancho*, thatched with coconut leaves, where I found a young man and a boy. Accepting a cordial invitation to enter, I took a seat upon the elastic platform of split bamboo, about 2½ feet from the ground, which occupied half of the hut. As I sit here writing my notes a number of little chickens fly up on the platform by my side and look at me curiously and fearlessly, The young man climbs a coconut tree near the door and brings me a refreshing drink of coconut sap just beginning to ferment, very much like cider. He pours off the scum and puts into the mouth of the bamboo vessel a wad of coconut fibre to strain the "tuba" as I drink it. The boy breaks a coconut and calls "rrrrrrrrru, rrrrrrrrru." Chickens come to him, flying and running from all directions—fifty or sixty about our feet. He chews the meat of the coconut and throws it to them. They seem very fond of it, but he says that they will lay much better if fed on maize. Among the chickens there is a small pig; the rest of the pigs in a pen. He says he lets one or two out each day; they will not desert the others which are kept in confinement. In this way each has its turn of freedom and the pigs are kept healthy, get exercise and a variety of food, and will not wander away. He feeds them bread-fruit when it is in season. No well or spring on the mesa, owing to the porous nature of the coral. It is evidently an ancient reef. In the rainy season the boy collects rain-water by leaning a bamboo against a coconut palm, so that the water running down the trunk drains into it. He also gets water from a well down the hill on the edge of the swamp. Near the house he has cleared a patch of land for maize and sweet-potatoes. The sweet-potatoes he will plant in October or the first part of November. He has also small patches of arrow-root (*Maranta arundinacea*); *Tacca pinnatifida*, which is often called "Polynesian arrow-root"; and the cassava plant, *Manihot utilissima*, here called "yuka," or "mandiuka." All of these plants appear to grow in Guam with little care.

Soursop tree now in bloom (*Anona muricata*); flowers have three heart-shaped sepals. Flowers of the beach-plum (*Ximenia elliptica*) small greenish. In a stubble-field much Sida, Asclepias, and several species of Cassia. Thicket of Guavas near by; not now the season for the fruit, but plenty of it ripe enough to eat; flowers pretty, white, with large tuft of stamens. Flowers of Tacca very peculiar, spider-like; fruit

like a polygonal cone. From the many abandoned hedges, this locality shows evidence of having once been widely cultivated. Most of the land now said by the natives to be *cansada*, or "tired."

Near the hut a handsome, large, dome-shaped mango tree, with its trunk covered with scars. The young man said he had hacked it with his machete in order to make it bear. The mango tree (*Mangifera indica*) is not so well established in Guam as in Samoa or the Philippines. Comparatively few trees are found on the island; but these are highly prized by the natives, who esteem their fruit above all others. Guam mangos are large, sweet, fleshy, juicy, and are free from the tow-like fibre and the peculiar turpentine flavor which so often characterize the fruit in other countries. In shape they resemble the "Manila" variety, which has found its way to Mexico.*

The trees grow to a good size and appear to thrive, but the majority of them on the island have been blown down by hurricanes, continuing to grow, as though propping themselves up by their elbows. Most of those which remain standing are in places protected from the wind. The great esteem in which the fruit is held is shown by the fact that the price of a farm is always enhanced by the presence of a mango tree upon it. There are some years in which no fruit is produced, owing, perhaps, to too great moisture, or heavy rains at the time of flowering interfering with the pollination. Not only do the natives try to force the tree by cutting gashes in the trunk, but they build fires beneath the branches, with the idea that the smoke will cause them to bring forth flowers and fruit. Sometimes one part of the tree will bloom or send out tender fresh foliage while the rest remains dormant; and the fruit may be ripe on one limb and green on all the rest. In Guam the trees are propagated entirely by seed. In other countries inarching, layering, and budding are practiced. Grafting is more difficult. The mangos of Guam are of such good quality that I think it would be unwise to introduce other varieties. They come true to seed. The reason that the tree does not thrive better is probably owing to the fact that in Guam there is no very well defined dry season like that of the countries best suited for its cultivation.

In taking leave of my host I asked him to whom the hut and the fine mango tree belonged. "To me," he said; "to my brother and myself; we are soldiers in the native artillery company, señor. Nearly all the soldiers have ranchos. Indeed the school-teachers, the Gobernadorcillo, the justice of the peace—all the officials must have ranchos, for the pay they receive from the government is not enough to support their families. For this reason we have certain days free, so that we are able to come

* See G. N. Collins, U. S. Department of Agriculture, Bureau of Plant Industry—Bulletin No. 28; plates III and XIV, from the former of which the accompanying illustration (Plate 21) is taken, with the permission of the author.

and work in our fields. If it were not for this none of us could live." He also said that he had been having trouble on account of chicken thieves. Since the Americans have come chickens are becoming scarce, and the prices have risen. Men sent to buy them can not always find enough to satisfy the demand, and they do not fear discovery very much, since the chickens are killed at once and can not be identified. If things keep on in this way there will soon be a dearth of chickens on the island. Pigs are also becoming scarcer, and it looks as though it is only a question of time when all the cattle will be killed off.

Monday, September 25.—Doña Ana Pangelinan called on me to-day, accompanied by her sister, Doña Rosa, the wife of Juan Martinez, the silversmith. These ladies are daughters of the late Don Vicente Pangelinan, a most talented man, to whose many good qualities and remarkable versatility Don Francisco Olive y Garcia pays a high tribute.* Doña Ana stated that she wished to bring action against Don Joaquin de Leon Guerrero y Espinosa, who is in unlawful possession of a tract of land belonging to her, she having inherited it from her father. I sent for Don Joaquin, who is the official armorer of the native artillery company, an excellent blacksmith, and a very thrifty, industrious man. He stated that the land in question had originally been granted to an agricultural syndicate, called "La Sociedad Agrícola de la Concepcion," for cultivation. The company had failed and the usufruct of it, not the ownership, had afterwards been granted to Don Vicente Pangelinan. Don Vicente did nothing whatever to improve the property, which consisted principally of an overgrown swamp. With his knowledge and consent Don Joaquin went to work, cleared the land, and prepared it for the cultivation of rice, often for days at a time standing waist deep in the mire cutting down trees and shrubs and clearing away thickets of cane and ferns. The remainder of the land had continued without improvement; and now the young lady wished to deprive him of the fruit of his work, to drive him away from the fine plantation which he had created from an unkempt marsh. He also stated that the Spanish authorities had already taken action in the case and refused to deprive him of the fruits of his toil. On consulting the records I found that the case had indeed been decided by the courts of the island, and I refused to reconsider it.

The young lady has a good deal of land lying idle; and like everybody else on the island she can not get any one to work for her. The only incentive to labor here is self-interest; and where each person has a plot of land of his own, it is not strange that he should prefer to reap all the profits of his labor rather than to share them with another. Several citizens of the island own vast tracts of land for which they pay

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* *Islas Marianas;* por Francisco Olive y Garcia, Teniente Coronel, ex-Gobernador P. M. Manila, 1887. P. 83.

no taxes. They keep out deserving young men who wish to utilize a spot here and there for growing maize, cacao, coconuts, or tobacco. If a tax were levied on the land it would not be held unless it could be made to pay. It seems wrong that it should lie idle, and that young men eager to work it should be prevented from doing so.

This is not the first serious question that has arisen among the people here. Doña Rosa Pangelinan has been to see me before. About a month ago she complained that a farmer named Telisforo Basa had killed three cows belonging to her, one in the month of June and two on the 15th of August, the said cows being at the time in a pasture in the locality called Tehaka. Of the two killed in August one was with calf. Witnesses: the Gobernadorcillo, Don Benancio Roberto; Juan de los Santos, Jesus de los Santos. The said Telisforo Basa, after having killed the animals, went in person to the Gobernadorcillo, informing him that he had killed them, and stating that he found them eating his corn. Now, the site of the cornfield planted by Basa is in the midst of the pasture belonging to Andres Roberto and rented by him to Juan Martinez, husband of Doña Rosa, and it is not enclosed by fence nor hedge. The corn was, moreover, planted in the midst of the pasture without permission of the owner of the land. She declared that Basa had been charged with similar offenses before; that he was a bad man, and had often defied the law. He had gone to Francisco Portusach the day before, telling him of the damages he had suffered from the cattle, and asked him what he should do. Portusach told him to kill the cattle, as he had the right to do so according to the law of America. Moreover, the said Basa had no license to carry the gun with which he killed the cattle, and the penalty for having arms in one's possession without a license is a certain fine and the confiscation of the said arms.

When Basa appeared before me he had a proud, dignified air. He seemed to me to be more nearly pure-blooded than any native I had before seen. He told me that he had long been in possession of the land in question, and that if some one else claimed it he did not know by what right they did so; that there were several people who claimed vast tracts as "pastures" who had a few cattle. They allowed the cattle to roam over the country uncared for, and that, as every one knew, there are no fences in Guam about the corn-fields, and in one day two or three cattle could destroy the result of months of hard work. He said that if he had done wrong he was willing to be punished; but that he thought something ought to be done to protect the rights of planters and to inquire into the titles which the owners of these large tracts claimed to possess. I refused to take action on the matter and ordered that the justice of the peace decide upon the merits of the case. There is one thing I shall do, however—I shall try to find some way in which to

prevent good, fertile land from lying idle; and I shall carefully examine the registers of property in the recorder's office to see if the entries there made have been in accordance with law.

Friday, September 29.—The first civil marriage was this day celebrated; the ceremony was performed by the justice of the peace; the contracting parties, Ramon Pangelinan y Guerrero and Dolores Manibusan y Santos.

The military commission found the seaman Hans Hansen guilty of the charge of drunkenness and disorderly conduct in the streets of Agaña and of grossly insulting citizens of Guam, and sentenced him to five days' imprisonment and the payment of twenty pesos fine.

Saturday, September 30.—Don Benancio Roberto this day sent in his resignation as Gobernadorcillo of the city of Agaña, and Don Gregorio Perez was appointed Gobernadorcillo in his stead. Don Luis Dueñas also resigned and was replaced by Don Antonio Perez. The reason given for the resignation of the two officials was that their duties, for which they received practically no compensation under the existing laws, have occupied so much of their time and attention that they have been obliged to neglect their personal affairs and have been unable to look out for their farms and plantations.

To-day an anonymous communication was left in my yard denouncing the justice of the peace and his secretary, both of whom are Filipinos by birth. They were accused of having cried "Viva Aguinaldo!" on the 4th of July, when there was a procession in honor of the Independence of the United States, and the Chamorros cried "Viva Hamerika!" The note declared that as Tagalos they should not be permitted to remain in office; that they had shown favor to a certain man who was a great rogue and thief, because he had given them presents. I paid no attention to the communication, feeling sure that it had been written by one who felt himself aggrieved over some decision the justice of the peace had made.

[TO BE CONTINUED.]

THOUGH the average weight of some of the Mexican Agaves may exceed that of the Porto Rican "maguey," it is unquestionably true that the longest peduncle known is that of *Furcroea foetida*, the "Mauritious Hemp." A specimen was recently photographed at the Porto Rico Experiment Station which showed a height of over 50 feet, some 6 feet of stem included. There is another specimen in the vicinity which would probably weigh considerably over a ton and has about 200 leaves of from 6½ to 8 feet in length.—O. W. BARRETT, Mayaguez, Porto Rico.

The Resting Period of Plants.

By C. E. Waters.

Many persons who go to the woods are often impelled by a strong desire to carry home some of the treasures that they see growing in one of Nature's gardens, and to plant them around their own homes. Such attempts are usually successful with the majority of our wild flowers, although there are a few that will not bear transplanting. It has been found that many species of plants have a "symbiotic" relationship with certain kinds of fungi. That is, the threads, or *hyphae*, of the fungus attach themselves to the roots of the higher plant, to which they bring certain food materials, while at the same time reaping some benefit from the host. In general, it may be said that all species devoid of root hairs, such as the orchids, the adder's tongue family, and saprophytes, possess such root-fungi (*mycorrhiza*). But the pines, and heaths, and very many others are more or less dependent on these fungi. It is obvious that unless such plants are very carefully dug up, so as to disturb the roots as little as possible, they will not live in their new home. Besides this, the change of conditions, to which so many species are so sensitive, is also unfavorable to their being transplanted. Other plants will thrive even better in the home garden, where they are taken care of, than in the woods. This is especially true of the wild columbine, which grows to a very large size when planted in any good soil. The leaves are much larger and the flowers more numerous, but the plants we have had under observation die out in about four years, apparently from some sort of decay of the roots. Fresh plants brought in from the woods do not thrive in the spot from which the decayed ones were taken, the soil being inoculated with the disease germs.

When we try to grow wild flowers indoors, disappointment results if we expect them to do well in winter. It almost invariably happens that the leaves drop off and the plant dies down, just as they do in the woods. The disgusted gardener is then apt to throw them away. The trouble is that we are trying unconsciously to overthrow one of Nature's firmly established laws, that plants need a period of rest during the year. This is certainly true of the plants in temperate regions, and we believe also of the tropics, even where there is no dry season during which they are compelled to stop growing from lack of moisture.

Even among the lowest plants there are formed so-called "resting spores" that remain inactive for a certain length of time before starting to grow. They are most often formed at the end of the season of growth or on the approach of unfavorable conditions, and can in most cases endure

great extremes of heat and cold as well as drought without injury. When the plants are taken indoors the necessity of a resting period on account of unfavorable conditions no longer exists, but the habit has become firmly fixed and can not easily be overcome. Nature makes extensive preparations for this time, as we shall see. The seeds of plants are also like "resting spores" in a way, and they rarely grow if planted as soon as they are ripe, but must be kept for some time. When the spring returns the conditions of growth are usually so favorable that it takes place with great rapidity, the result being a struggle for existence between the different species and individuals as well. Anything that will give it the slightest advantage over its fellows may decide whether a plant will survive or not. It is obvious that a good start at the beginning of the growing season is of importance. At that time there are no green leaves, unless the plant is an evergreen, to manufacture food material from the carbon dioxide of the air and the substances taken in through the roots; and unless the plant has some reserve food left over from the previous summer it is not easy to see just how it would get along. Accordingly, we find that most plants spend a large part of the growing season in laying up a supply of starch in the stems or roots, just as a similar food supply is found in nearly all seeds. Sugar, starch, cellulose, and gums are closely related chemically, and they are all composed of the three elements—carbon, hydrogen, and oxygen. It is a comparatively easy matter for the chemist to transform the more complex of these compounds into the simpler ones, though no one has succeeded in bringing about the opposite change. The plant takes these simpler compounds and from them manufactures the more complex ones, such as cane sugar, gums, starch, and cellulose, which is the ground work of all plants. The most the chemist can do is to break these down into relatively simple substances. Thus, by boiling starch or cotton, which is nearly pure cellulose, with acids we get glucose, etc. So that it is literally true that "sugar can be made from old rags." What we get is not simply something that is sweet like sugar, but it is true sugar.

The carbon which is contained in starch is obtained from the carbon dioxide ("carbonic acid") of the air. The hydrogen and oxygen come from the water taken up by the roots. By very roundabout methods the chemist has been able to take these elements and from them has made different sugars, an operation that is carried on by nearly all plants whenever the sun is shining. In the plants the simple sugars are transformed into the more complex substance, starch, which is deposited in certain parts of the organism. In some plants it is stored up in the roots or tubers, or it may be packed away in the stems or elsewhere. In this form the reserve food is useless to the plant, for starch is insoluble and can not be carried to those parts of the plant where it is needed. It must be changed

into some soluble substance—generally sugar. The change which we can bring about by boiling with acids is effected in the plant by means of the so-called "ferments." These are complex chemical compounds that occur in all plants. Perhaps the most familiar one is "diastase," the ferment that is found in malt, and can change starch into malt sugar, glucose, and dextrin, a kind of gum. Another familiar ferment which occurs in the animal body is "pepsin." As the season of growth approaches, the reserve of starch is acted on by these ferments, and the sugar which is formed is carried in the sap to all parts of the plant.

Nearly every one has noticed that when a vine clings closely to a brick or stone wall the parts near the chimneys often send out leaves before the buds on the rest of the vine have begun to grow. It is probably due to the action of the ferments on the starch in the stems, under the influence of the greater warmth of the wall near the chimney.

In another way preparation is made for the resting season, for the young wood of perennials is "ripened." The tissues become harder and less watery, so as to withstand cold weather better. It is not so much the cold that injures plants as it is the harm done by their freezing, which tears apart the tissues by the expanding ice. The less water there is in the tissues, or, in other words, the more concentrated the sap, the less danger there is of freezing, just as the freezing-point of water is lowered by dissolving salt, or sugar, or something else in it.

Preparations are also made for the fall of the leaves by the formation of a layer of cells across the stem. Certain of the cell walls are destroyed and the leaf then falls off. Sometimes a layer of corky cells is formed across the end and the tubes in the fibrovascular bundles are closed by a sort of gum that prevents bleeding.

Is it not evident that any attempt of ours to make the plants grow actively through the winter must meet with failure? All the arrangements and habits of the plant are interfered with. The best we can hope for is that the resting period will be shorter than usual, and this is found to be the case. Our own observations have been made chiefly on ferns grown in a glass case indoors. The evergreen species and a few of those that die down in the fall remain green, while the others wither away. This year the new growth of most of them began late in February, nearly or quite two months before the time outdoors. At the time of writing the maidenhair, walking fern, and *Cystopteris* (two species) are still dormant, while the ebony spleenwort, Bradley's spleenwort, Christmas fern, lip fern (*Cheilanthes*), and others are sending up new fronds. A large hart's tongue is also showing signs of activity, for its fronds are slowly starting to uncoil. In a near-by aquarium some plants of bladderwort that appeared to be dead have recently started to grow rapidly, vying with the *Chara* around them.

The Cross-bearing Bignonia or Cross Vine.

By Dr. J. Schneck.

This bignoniaceous vine is one of the most individually characteristic plants found in the Wabash Valley. Linnaeus made two species of our plant, naming one of them the Forked Bignonia (*B. capreolata*), the other the Cross-bearing Bignonia (*B. crucigera*). Later investigations appear to have shown that there is but one species; and as *Bignonia crucigera* L. is the older name, it is to be adopted.

This plant has long been in cultivation in Europe as an ornamental vine in conservatories, and in the warmer parts of the Old World in the open. It is highly prized and admired at some places on the continent for its characteristic beauty and habits. Among the Germans it is known as the *Kreitztragende Bignonie* (Cross-bearing Bignonia), from the peculiar cross-wise arrangement of the leaflets of the two compound leaves (Figs. 1 and 2), as well as for the Greek cross-shaped marking shown when the stem is cut across. When twisted in the hands it splits along the line of these markings into four equal parts; hence it is generally known as "Quarter Vine" in this vicinity by our bottom farmers and timbermen. Many of the farmers and woodmen believe that this plant possesses poisonous properties, and that a pernicious or mephitic influence is given off from it into the surrounding atmosphere which will affect persons unfavorably who may remain near the vine for some time.

After many years of familiarity with the plant in its native haunts, and also in cultivation, where it has grown in my door-yard and been frequently handled by many persons at all seasons and in all stages of growth, I have not learned of an instance of any unpleasant or untoward results. I do not believe the plant has any poisonous qualities. It has been well tested as to its medicinal virtues, some parties claiming for it alterative, sudorific, and diuretic properties; other authors think they have seen beneficial results from its use in the treatment of chronic rheumatism and specific diseases, but it has not proven itself of any clearly marked value in these conditions to the medical profession generally so far as I have been able to learn. It grows to greatest perfection in the rich woods of river bottoms, preferring alluvial soil, but away from those lower places where the water stands for some time during the summer season. It is a true climber. One may often see one or more vines ascending the body of a tree in a straight line for sixty or more feet

(see plate), holding on to its support by the trichotomous decompound tendrils alone. The tendril arises from the top of the common petiole, which is from one-half to one and one-half inches long, and bears at its top the petiolules of the two compound leaves and one tendril. The latter divides trichotomously several times, the ultimate tendrils finally ending in minute disks, by means of which they anchor themselves to any object with which they come in contact. The tendrils throughout their length are capable of forming contracting spirals or of twisting about anything they touch ; the vine is thus firmly attached whenever it comes into contact with a tree, shrub, or underbrush. The tendril always arises at the top of the common petiole on a level with the leaves, but always on the lower or centripetal side. The two secondary petioles, or petiolules, are about one inch long, and bear each two leaflets which hang downwards and outwards and are arranged crosswise with the vine, one pair of leaflets on the two sides of the ascending stem producing a peculiar effect, which makes it look like a succession of crosses standing above one another and gives this vine its peculiar characteristic appearance when growing straight up the body of a tall tree. When tall trees are absent or not in reach it will scramble over lower forms and underbrush, but it prefers to go straight up to the sunlight. The tendril, or one or both leaves, is often absent from the common petiole.

The flowers are borne in the axils of the common petioles and are arranged in short cymes of one to five flowers. The flowers are about two inches long, of a deep orange color outside and a bright yellow within. The time of flowering is from May 3d to May 30th in this latitude. The fruit is a flat pod from eight to fifteen inches long and about one inch broad.

Although this is a very free bloomer, it seldom bears fruit in the Wabash Valley. Its principal means of increase is by an extensive system of underground stems which are sent out from the main root into the rich sandy soil and loam in all directions. These side branches take root at frequent intervals and send up shoots from buds, which develop into new plants that eventually sever their connection with the parent plant by the decay of the old underground stem, so that one plant may become the parent of an extensive group of plants covering an acre or more of ground. The first leaves that form from the underground stems are usually in twos only, one leaflet to each leaf, are more heart-shaped, and are not accompanied by tendrils, as is the case when the plant is older. Its habitat extends from Virginia south to Florida and Louisiana and northward to Ohio, southern Indiana and Illinois.

Its leaves are a dark shining green color in summer and remain fresh, even in the northern extension of its range, during the greater portion

The Cross Vine (*Bignonia crucigera*).

of the winter. After maturity they become dark purple, at first along the veins, but as winter comes on and cold weather increases the whole leaf becomes an iridescent purple, especially so on the under side; finally, as spring approaches and the sap ascends and new leaves and flowers begin to develop the old leaves become sere and fall off. The plant is said to be an evergreen in its more southern home. The dark-green foliage of this plant is one of the most characteristic and beautiful objects in our winter woods in bottom lands, being one of the first objects seen in the distant gloom and thickets. It is a free bloomer and is a magnificent plant when in its prime. Although the rich river-bottom lands are its preference, yet it does well in almost any kind of soil and surroundings when planted out and given a support to climb on, producing a great profusion of flowers during the month of May. With all these qualifications it is surprising it is so seldom seen in cultivation in this country and that so little has been said about it in our literature.

Mt. Carmel, Ill.

The Preservation of Native Plants.*

By David S. George.

In the progress of civilization a point has been reached where we begin to realize that the rare, the beautiful, and the harmless all have a place in the economy of nature and a right to their existence; that the wholesale destruction of harmless wild creatures for the mere sake of killing, or of ornamenting somebody's person, and the indiscriminate gathering of rare wild flowers, are barbarisms, prompted generally by selfish motives; that the nature of every animal, the true beauty of every bird, butterfly, or flower is seen and studied to advantage only when under natural conditions.

Many charming native plants, once common, are fast disappearing at the hands of those who, often thoughtlessly no doubt, continue to gather in quantity our wild orchids, fringed gentians, arbutus, azaleas, rare ferns, ground pine, mountain laurel, and the cardinal flower.

In some States there are laws for the protection of certain plants whose fast-approaching doom has awakened the public to a sense of duty.

The following is a verbatim copy from the Connecticut State Laws Protecting Wild Flowers, Trees, etc.:

"Section 1463. Every person who shall wilfully injure any tree or shrub standing upon the land of another, or on the public highway in front of said land, or injure or throw down any fence, trellis, frame-

* Published by courtesy of the New York Botanical Garden.

work, or structure, on the land of another, or shall wilfully cut, destroy, or take away from the land of another, any creeping fern, crops, shrub, fruit or vegetable production, shall be fined not more than one hundred dollars or imprisoned not more than twelve months, or both."

"Wilfully injure any tree," etc., is directed especially toward those who denude white birches of their bark; for if the whole thickness of bark is removed it frequently results in killing the tree.

The lines regarding the destruction of "any creeping fern" were intended to protect particularly the Hartford fern, the walking-fern, and maiden-hair.

"SEC. 1. Every person who shall wilfully pull up, tear up, dig up, or destroy any trailing arbutus from the land of another, or who shall sell, expose for sale, purchase, or have in his possession, any arbutus with the roots or underground stems attached, shall be fined not more than twenty dollars; provided, however, that any person may take such arbutus on land owned or leased by him, or with the permission of the owner or lessee.

"SEC. 2. This act shall take effect from its passage.

"Approved May 11, 1899."

While the thoughtless tearing up of plants works great havoc, fire is perhaps the worst agent for their destruction. In mountainous districts these fires are very often started by the old berry-pickers; for tracts thus cleared will in two or three years yield a rich harvest of blueberries. To prevent these fires the following law was passed:

"SECTION 1344. Every person who shall set fire on any land, that shall run upon the land of any other person, shall pay to the owner all damages done by such fire."

Legal procedure is, however, of little permanent avail — indeed it often serves only to bring to the attention of the public the fact that such and such things are rare or beautiful, with the natural consequence that conditions are made rather worse than better by those whose chief delight is in breaking such laws. What then can be done to preserve and protect those treasures of field and woodland which so delight the heart of every child of man?

The love of flowers is common to all, and the true appreciation of them we wish rather to promote than to discourage. There can be little doubt that one of the primary uses of flowers is to delight the eye of mankind. We often hear people say of this or that flower, "I just love them." We surely hope so; but how deep and genuine is that love which allows us to root up every flower in sight, when we have come suddenly upon a clump of rare orchids or fringed gentians. Certainly our love for them (if such it can be called) has got the better of our

good judgment. We have not stopped to consider where next year's flowers are coming from, or whether we did not owe it to others to let them have the same pleasure of seeing them which we ourselves have had. Love for flowers, like love for other things, must be trained. "Still waters run deep," and, as a rule, those whose love for rare flowers is deepest have the least to say regarding their whereabouts. If they know where some rare fern or delicate orchid grows, they do not fill their vases with the treasures, but jealously guard the secret, for they know that if its haunts were made public extermination would soon follow.

True love for plants and their flowers will come only when we have learned to know them in their native haunts and with their natural surroundings. Under such conditions only do they manifest their greatest charms.

A bunch of arbutus denuded of all but two or three leaves, crowded into a vase, or even spread out in a shallow dish, can never give the pleasure that the same pink buds afford peeping from their cover of moss and brown leaves, adding fragrance to the freshness of the spring air.

Maidenhair ferns give as shortlived pleasure as any plant which people persist in tearing from its native wood. The slender black stems and pale green crescent resent being torn from the cool damp shade of rocky wood and ravine to be placed in a hot dry room.

We often see people coming from the woods or meadows with whole armfuls of azaleas, laurel, ferns, lilies or even the showy lady's-slipper. They have picked every one in sight, and having overcome and subdued all the visible floral world, are sighing for more to conquer. These same people returning the following season remark with astonishment, "Strange, there were lots of them here last year." Nothing however could be more reasonable. Little they think that, while delighting a few, they are often robbing many of the greater pleasure which these same flowers would have afforded in their natural conditions. True there are many who are unable to go where some of our most beautiful flowers grow; but two or three blossoms would give them as much pleasure as an armful, especially if they were accompanied with a description of the spot where they were found.

It is safe to say that the wholesale gatherer would as a rule be unable to accurately describe the surroundings or even the flower itself. He would probably say, "O, there were lots of them; it was just white with them and I picked all I could find." He would not have noticed the delicate pink buds unfolding from the sheathing leaves of pale green; nor would he have thought of the wonderful construction of that inflated lip, into which the busy bees were diving, performing for the plant a task which this youth has rendered fruitless.

"If I do not pick them some one else will," says one. This is quite possible; but by refraining yourself and teaching others to do the same you at least give the plant a chance to escape destruction and to mature seed. If it does not it is no fault of yours. It is this destructive spirit in "friendly enemies" which must be weeded out. Surely those who already know better should take the lead by trying to teach their friends the superior beauty of plants in their wild nooks, where they have those suitable surroundings, which they have through many plant generations become best adapted to.

Those who make a point of observing plants where they grow also soon acquire that keenness of vision which enables them to see far more than they ever otherwise could.

Certainly many of our rare beauties are a sorry sight in the vases and jardinieres of our homes. They are about as natural as a gentle fawn in a box menagerie — never at home, always unhappy. Most flowers which are in danger of extermination are also unsuitable for house decoration, because they are so delicate that they fade quickly; while butter-cups, daisies, black-eyed Susans, blue flag, clovers, meadow rue, queen Ann's lace, asters, goldenrods, and many grasses are by no means all that remain for the beautifying of our homes.

Measures should be taken for the preservation of the trees and shrubs along our roadsides. The use of growing trees as supports for fences, whether of boards or of wire, is injurious to them and should not be permitted. In the State of Connecticut it is forbidden any one to cut the branches of or otherwise injure any tree for the sake of passing electric wires along the streets. This State offers to pay one dollar for every tree planted along its public highways. Planting of native trees should be encouraged, for there are no trees so well suited to our climate as those which grow naturally in our region, and surely none more beautiful as street trees. The elm-arched streets of our New England villages are proverbially beautiful.

Every effort, public or private, to awaken the interest of the public for the protection of our native plants and to teach people the true beauty and nature of them is worthy of the encouragement and support of all who, in the best sense of the word, love flowers.

New York Botanical Garden.

A REPRESENTATIVE of the German Government has been sent to Canada to ascertain what trees can be profitably transplanted into Germany. He has already decided that white pine, cherry, spruce, and black walnut would flourish on German soil, and experiments are to be made with those trees.—*The American Inventor.*

Briefer Articles.

PLANTS OF UNIVERSAL APPLICATION.

In certain portions of the world there exist plants which are used by the natives in so many ways that we are led to doubt whether mankind could dispense with them. Naturally these useful plants are mainly indigenous to the tropics. In the North there is no one tree or shrub which will supply man with all his needs, food, raiment, and the very home which shelters him. Under the equator, however, where vegetation is so rank and the people, as a rule, so indolent, it is natural enough that there should be those vegetable wonders. Indeed, the very luxuriance of life and the ease with which the fruits of the earth may be obtained without exertion engenders that indolence which is so characteristic of these countries.

We of the temperate zones have our oak-trees, pines, and spruces, used in many important ways, it is true; yet it is conceivable that we might survive without them. Not so with some of the Oriental and South American nations, dependent solely for every want upon the growth of one plant. Even cotton, to whom we pay such loyal homage, is but a tributary prince in comparison to many of the tropical plants.

One of the most remarkable instances of universal application is afforded by the bamboo, which, in the countries where it occurs, is indispensable to the inhabitants. Of it they construct their dwellings, weave their garments, build their rafts and boats, and even make the sails which waft them. Musical instruments are manufactured from the hollow tubes, and pipes for smoking, or for the transmission of water. It is formed into all kinds of domestic utensils, as chairs, tables, and bedsteads. Even the carts used in the field are constructed of bamboo. It is beaten into a pulp for paper, and is twisted into mats or cordage. Sometimes it is used for a candle-wick; sometimes a life-preserver is made of it. When young and tender it is used as an article of food, and preserved in sugar is exported to less favored nations. Plantations are fenced in with it, and the dignitary uses it as a baton of office, or as a whip to scourge the offender.

Not unlike the bamboo in its manifold applications is the banana. This plant has been so long cultivated, or, we might more properly say, has been allowed to grow for his use, by man that all traces of seed are obliterated. Besides its more obvious use as an article of diet, the leaves are employed to thatch houses or to clothe the body, and the stems are used in as many ways nearly as the bamboo itself. Viewed simply as an

ornament, it is important. In Central and South America the huts of the natives are almost always surrounded by a growth of bananas, the broad ribbons of which droop and flutter in the wind.

Like the camel among animals is the date tree among plants. The inhabitants of the desert regions of Africa and Arabia depend upon both alike. Besides the fruit, which makes a large part of the food of these people, there is hardly any part of the tree that is useless. Wine is made from the fruit, and the fibrous parts are employed for the manufacture of baskets, cords, mats, etc. The heart of the tree contains a substance not unlike sago, very nutritious and palatable. Even the leaves are employed as fans, brooms, and mats, and the stem of the leaf is made into many articles of furniture.

Next in interest, probably, are the rattan baskets, canes, couches, chairs, carriages, mats, and hats which are made of it. It is largely employed, too, in the manufacture of cables and ropes for marine service. In mountainous districts bridges are made of it, as are also houses. One species yields the dye called dragon's-blood. In New Zealand the so-called flax, *Phormium tenax*, is applied to almost as many purposes; nor should we forget the thousand applications of the cactus in Mexico.

The cocoanut tree, in the countries where it grows, is employed in as many ways as either of the classes of plants before mentioned. Its fibre enters largely into fabrics; its oil is of vast importance; the butter is used in many ways. In some regions it furnishes all the necessaries of life. Every part of the tree is put to some useful purpose. Clothes-brushes, brooms, mats, hats, cushion-stuffings, and mattresses are made of its yarn, called *coir*. Its food products are numerous, and it yields a liquor called toddy. Garments, thatch, ornamental work-boxes, and medicines are all derived from the cocoanut.

We are often told of the intimate relations that exist between insects and certain plants. Is it not possible that the annihilation of those plants here mentioned would necessitate the decadence of many peoples?

W. WHITMAN BAILEY.

Brown University, Providence, R. I.

THE WATER-HYACINTH IN GEORGIA.

THE introduction and rapid spread of the water-hyacinth (*Piaropus crassipes*) in some of the rivers of Florida, and the consequent injury to navigation, fishing, lumbering, and other industries, attracted considerable attention a few years ago, but since that time the plants are said to have so decreased in numbers as to be no longer troublesome.

This species does not seem to have been reported as growing spontaneously in this country outside of Florida, however, so I was somewhat

surprised to find a luxuriant growth of it near Valdosta, Georgia, on September 1, 1902. The plants were growing in profusion in a pool by the railroad, about a mile north of the city, some floating in deep water and others rooting on the muddy shores. The rooting plants were much the taller, some of them reaching a height of three feet, and their petioles were not at all inflated, thus resembling very much those of the related native species *Pontederia cordata*. Being at that time in flower, the plants presented a very handsome appearance.

I made some inquiries in Valdosta about this colony of water-hyacinth, but found no one who was even aware of its presence, so I could learn nothing concerning the date or manner of its introduction. Fortunately there seems to be little chance for the plant to escape from this pool and obstruct navigation, and there is no navigable river anywhere in the vicinity. The drainage from this point is into the Withlacoochee River, a tributary of the Suwannee.

Associated with the water-hyacinth in a peculiar way was another interesting plant, *Habenaria repens*. All the specimens of this orchid that I saw were supported on the floating masses of the water-hyacinth, in water about six feet deep. Where it grew before the advent of the water-hyacinth is a mystery, unless it was introduced at the same time. *Habenaria repens* was originally described from the vicinity of Savannah by Nuttall in 1818, and its status as a native of North America has apparently never been questioned. But it is also reported from the West Indies and South America (in which regions *Piaropus crassipes* is native), and the manner of its occurrence near Valdosta suggests that it may not be indigenous in the United States at all, or at least in the northern portions of its range. ROLAND M. HARPER.

THE crane-fly orchid (*Tipularia*) is said to be "very scarce," and the only ones I have seen in fourteen years were come across this summer—seven in one woods and a solitary one nine miles away. The small purplish-green flowers on the slender brownish, leafless scape are quite inconspicuous in the woods when the ground is covered with dead leaves from the trees. The first plant had only buds on it, but it was easy after that to see the others. A thorough search would probably have brought to light several dozen of them. Are not many of our "rare and local" plants simply inconspicuous—hiding in full view until we can not help seeing them? *Schweinitzia* is another brownish plant that has been found in many places near Baltimore, though few of the local botanists have ever seen it.—C. E. WATERS, Baltimore, Md.

The Wild Flower Preservation Society of America.

MANY of our members are now enjoying their vacations at mountain or seashore, and it should be the season of active effort and missionary work. The blossoming plants afford the best object-lessons for talks on the beauty and utility of plant life. Not that they should be picked and placed around the lecture hall or parlor, but they can be made to serve equally well for illustrative purposes if an excursion is made to the woods and a little practical talk given on the subject on the very ground where it is needed. Our Chapters should be perfecting plans for the winter. It will not do to lose what we have gained in popular interest and support.

DURING the last month two excellent articles on plant preservation have been published, one by Miss Frances Zirngiebel in *Popular Science Monthly*, one by Herbert Bolce in the *Saturday Evening Post*. Both writers speak highly of this Society.

FOR the benefit of some of our members, we wish to point out that there is no connection between the Wild Flower Preservation Society and THE PLANT WORLD other than an agreement to furnish the journal at special rates. Those who send in subscriptions to THE PLANT WORLD are *not* enrolled as members unless they express a desire to that effect. And after three or four months have elapsed it is equally impossible to enroll unless an additional fee is sent to the Secretary of the Society. The reason for this is that the term of membership must coincide with the term of subscription in order to prevent mistakes and complication. If you wish to be enrolled as a member, state your wishes clearly in advance.

THE name of Mrs. H. E. Warner, of Washington, D. C., a charter member, should be added to the list printed in the May issue. We regret also to record the death of one of the members, Mr. Charles A. Hoyt, of Brooklyn, N. Y.

NEW MEMBERS ENROLLED DURING JUNE.

Brenckle, Dr. J. F., Kulm, North Dakota.
Cannon, Mr. Geo. L., Denver, Colorado.
Cass, Mrs. M. M., Jr., Watkins, N. Y.
Coyle, Miss Alice Kearny, Washington, D. C.
Free Library, Center Sandwich, N. H.
Kato, Mr. Frederick, Jersey City, N. J.
Richards, Prof. Herbert M., New York, N. Y.

Editorial.

As we enter upon the second half-year of the current volume we wish to indulge in some retrospective observations and to have at the same time what Mr. Bok would call "a heart-to-heart talk" with our subscribers.

The improvement in The Plant World since it has been printed in Washington is so marked that it has been everywhere the subject of favorable comment. We feel also that the illustrations have been of a high standard, and we have spared no expense to obtain just the right picture for the right place. As for the subject-matter, it must be admitted that it compares favorably with the contents of the larger magazines, and in literary value is far above what is published in many so-called popular periodicals. There may be some readers who do not find the whole contents of any given issue of interest. But it must be remembered that we have on our subscription list many different classes of people. The largest group consists of those who receive The Plant World by virtue of their membership in the Wild Flower Preservation Society.

Many of these, perhaps, care little for a journal of this type, their membership merely evidencing a desire to aid the cause of plant preservation. To these we believe the articles written by Mr. Safford will especially appeal, as the series is of general as well as historical interest, and it is the only full account yet published of the early days of American occupation in Guam.

There is also a group of subscribers who are taking the journal as an experiment, and many of them change their periodicals annually. Then there are those whose interest is limited to some particular feature, such as the Guam articles or the "Home Garden and Greenhouse" department, and we endeavor to please this class of readers by adding new features from time to time. Finally there are the old permanent subscribers who have stood by us through adversity and prosperity since the founding of The Plant World, and who constitute the foundation-stone of our endeavor. To these we turn for advice and support, and to them particularly this editorial is addressed.

The increase in size, the improvement in typography and printing, and the enlarged edition have all combined to add materially to the cost of the journal, the subscription price of which has, however, remained unchanged since the beginning. We venture the assertion that few publications can point to a record of progress such as ours without a corresponding increase in the price; and even those that seem to give the most for the money usually consist of one-third reading matter and two-

thirds advertisements. Under ordinary conditions the rapid growth of our circulation during the last three years would cover the increased cost. But it must be understood that under agreement with the Wild Flower Preservation Society THE PLANT WORLD is furnished to members at a special rate; and the price paid by the Society allows us a profit of only two cents on each annual subscription. As many of our old supporters joined the Society, there has resulted a deficiency which even the increased circulation has not overcome. In plain language, we are giving more than we can afford; and since we do not wish to be obliged to raise the subscription price, we appeal to those interested in the welfare of the journal to help us by securing new subscribers. Canvassing, with a copy of the magazine at hand as an argument, is very little trouble, and in most cases no soliciting would be required. Simply invite the attention of your friends to what you consider the merits of the publication, and let them examine it. We feel sure that every reader of this article could gain at least one new subscriber by these means.

We are going to back up this appeal with the following inducements: Every person who sends us in one new subscriber will receive a two months' subscription to THE PLANT WORLD; for two new subscribers we will give a four months' subscription; for three, a six months' subscription; for four, an eight months'; and for five, a year's subscription and a copy of "The Families of Flowering Plants" ready for binding. Present subscribers will have their terms lengthened for the corresponding period, and are entitled to the same book. Those who send more than five will receive our regular agents' rates of 20 per cent. on each subscription. In all cases the cash must accompany the club.

Finally, in order to add zest to the canvass, we will give to the first club-raiser of five subscribers a special premium of two beautiful unpublished plant photographs, of which we own the exclusive rights.

We hope that this appeal will be carefully read and considered. The publishers of THE PLANT WORLD are not seeking profit. The editors are busy professional men, who give their time and services freely to help the cause of plant protection and spread the knowledge of nature. But it is unreasonable to expect the supporters of the journal to maintain it at a loss when the deficiency could be so easily remedied by a little active endeavor on the part of our friends.

The picture published in connection with Mr. Shear's article on "Fungi on Old Logs and Stumps" in the last issue of THE PLANT WORLD was made from a photograph by Mr. Carl Krebs, of Cleveland, Ohio, who furnished, it will be remembered, many of the excellent illustrations for Mr. Pollard's "Families of Flowering Plants." Credit was accidentally omitted from the legend of the picture in question.

The Home Garden and Greenhouse.

CONDUCTED BY F. H. KNOWLTON.

[The editor of this department will be glad to answer questions of a relevant nature, and also to receive short articles on any phase of this subject.]

Protection Against Cut-worms.—It is a well-known experience that young plants, such as tomatoes, egg-plants, cabbages, etc., are frequently injured or ruined by the depredations of cut-worms. This danger may be entirely obviated by wrapping the stem of each plant loosely with a piece of old newspaper. The paper should extend for an inch or more below the surface and for two or three inches above, and can be held in position by the earth as it is firmed about the plant. The injury of the cut-worm occurs just at the surface of the ground and so slight a barrier as a thickness of newspaper is sufficient to keep them away. The growth of the plant is not impeded by the loosely-wrapped piece of paper and by the time the plant is able to take care of itself the paper has disappeared.

Tuberous-rooted Begonias.—"Some years ago I was very much impressed by a display of superb single- and double-flowered Tuberous-rooted Begonias in the Golden Gate Park, San Francisco, and resolved on my return to the East to attempt their culture. I was informed that they could be rather easily grown from seed, so I secured a package of the best seed obtainable; but before planting them I consulted with one of the experts at the Department of Agriculture as to the best method of sowing and handling them. He told me that the best thing to do was to throw the seed away, as it was impossible to succeed with them in Washington. This was discouraging indeed, and I followed his advice and did not sow them. This spring, however, I determined to make an attempt, which could only fail, and if it succeeded I knew would be ample reward. I purchased half a dozen bulbs of Henderson and potted them, using rather fibrous, sandy loam with a liberal mixture of artificial fertilizers. These pots were set in larger ones of half their height and the intervening space packed with earth. They were placed in an eastern window and kept well watered, and they have had a mass of blossoms, all averaging two inches or more in diameter. The colors are superior to those of the finest geraniums."—J. R. THOMPSON.

The Easter Lily from Seed.—It has always been supposed that the length of time necessary to grow Easter Lilies from seed was so great as to put it outside the limits of practicability; in fact it was stated at the lily conference in London in 1901 that it would require about five years to raise flowering plants from seed. The lily industry has grown to be of much importance in this country, not less than 5,000,000 bulbs

being annually forced into flower during the spring months; but coincident with the demand has grown the loss from diseased bulbs, which often amounts to from 20 to 60 per cent. In Japan and Bermuda, where the bulbs are mainly grown for the American trade, the ground is used year after year, and it is said to be hard to find a field that is free from disease. It becomes, therefore, of the greatest importance to devise methods either for reducing the percentage of disease or growing them in some other way. Mr. George W. Oliver, an expert in the Bureau of Plant Industry, has been turning his attention to the subject of late and with surprising results. He has succeeded in growing flowering plants from seed in six months, and has produced bulbs six inches in circumference inside of ten months, each of which produced three flowers above the average size. On this point he says: "So easy is it to raise flowering plants from seed that the writer is inclined to believe that should the time come when the disease is more rampant than at present, growers will, when the subject is better understood, be able to raise their own bulbs by a system of greenhouse treatment, and have the plants from seed flowering in pots, ready to be sold within a year."

In his paper just issued (Bulletin No. 39, Bureau of Plant Industry, Dept. of Agric.) he gives careful directions for pollinating the flowers of desirable plants, gathering the seeds, and caring for them until the time of sowing. Then follows directions for sowing and germinating the seed and pricking off and caring for the seedlings. A great field is opened in all parts of the United States for experimentation with Easter Lilies from seed, and we would like to urge upon our readers that they take up this subject, for while its practicability is assured, much remains to be ascertained as to the methods that will be effective in different sections of the country.

Works on Landscape Gardening.—One of our subscribers has requested that we give a list of works of moderate cost on landscape gardening. At our request, Prof. B. T. Galloway, Chief of the Bureau of Plant Industry, Department of Agriculture, has suggested the following as being likely to meet all reasonable requirements: "Garden Making," Bailey; "Art out of Doors," Van Ransselaer; "Ornamental Shrubs," Davis; "Landscape Gardening as applied to Home Decoration," Maynard; "Landscape Gardening," Waugh; "Landscape Gardening," Downing; "How to lay out a Garden," Kemp; "Landscape Gardening," Parsons; "How to plant the Home Grounds," Parsons; "Ornamental Gardening for Americans," Long.

Don't Shear Your Shrubs!—"The beauty and interest of a shrub surely lie in its natural habit and form," says Prof. L. H. Bailey in *Country Life in America*. "When shrubs are sheared into formal shapes the shrub no longer exists for itself, but is only a means of expressing some

queer conceit of the shearer. Of course, shrubs should be pruned to make them healthy and vigorous, to keep them within bounds, to increase the size of bloom, to check mere waywardness; but all this leaves the shrub a shrub, with the hand of the pruner unseen, and does not make it to counterfeit a bottle or a barrel or a parachute. If the forsythia has superlative merit, it is for the wealth of early spring bloom. Yet I know a yard in which the forsythias are annually sheared into shapeless shapes, and this is done when they are in bloom. Last year two-thirds of the bloom was cut from these bushes when it was just opening, and the reply of the Irishman who barbered them, when I remonstrated, was, 'Indade, they hev no shape.'"

Miscellany.

PROF. L. M. UNDERWOOD, of Columbia University, and Mr. William R. Maxon, of the National Museum, have returned from Jamaica with a large and valuable collection of ferns, which will be determined by them jointly.

IN HIS report on a trip to Honduras, published in the *Journal of the New York Botanical Garden*, Mr. Percy Wilson gives some interesting facts about a number of tropical plants. Referring to the cohune palm (*Attalea Cohune*), he says that it "is frequently met with in the forest or in the open fields, and is utilized by the natives for building houses, or a single leaf is sometimes used as a sail. The fruit is produced in large bunches and is about the size of a hen's egg. The kernel has a flavor much like that of a cocoanut, but is more oily. The trunk of this palm contains a large supply of a watery fluid, which is obtained by cutting the palm down and making a hole near the top, and by raising the basal end the liquor flows into the cavity, and is readily obtained with the aid of a small vessel, thus supplying a cooling drink."

WE ARE in receipt of a neatly-bound little volume by Ira F. Mansfield, entitled "Contributions to the Flora of Beaver County, from the Mansfield Herbarium, 1865–1903," if one follows the title-page. But the cover bears the imprint "Wild Flowers, Beaver County," and on the back we find "Mansfield Herbarium." This multiplicity of titles is unfortunate, but as the book is merely a local list of the plants of Beaver County, Pennsylvania, it will not require frequent citation. It is neatly, even elegantly, printed, though the pages are marred by some atrocious typographical errors. A number of colored plates from Neltje Blanchan's "Nature's Garden," from *Birds and Nature*, and other sources are included. Descriptive notes are frequently inserted in the text. The nomenclature, we regret to say, follows antique usage.—C. L. P.

Book Reviews.

On the Physics and Physiology of Protoplasmic Streaming in Plants. By *Alfred J. Ewart, D. L. C.* Royal 8vo, 131 pp., 17 illustrations. $2.90. The Clarendon Press, Henry Frowde. London, Edinburg, and New York, 1903.

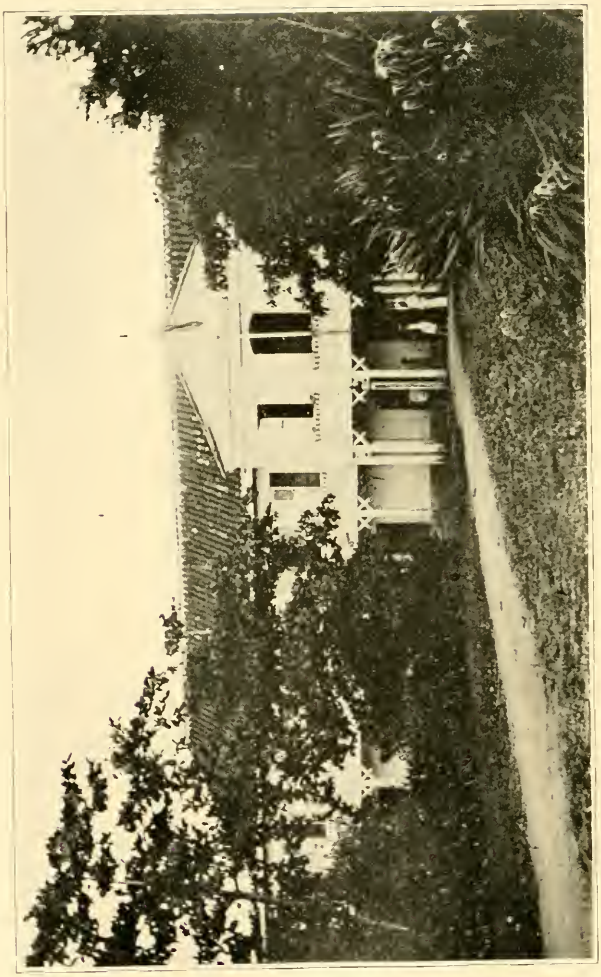
The present volume not only contains a summary of what has already been learned about protoplasmic streaming, but also the results of many experiments and observations made by the author. The matter is divided into four chapters and an appendix, as follows: I. Introduction; II. Physics and Chemistry; III. Physiology; IV. Theoretical and General. The appendix discusses the electrical conductivity of egg-albumen.

As early as 1774 the streaming movement of protoplasm in plants was observed and described by Corti, an Italian botanist. It has been a subject of much interest to investigators as well as amateurs ever since. Under the head of physics and chemistry phenomena are considered which may be attributed to physical and chemical causes, such as osmotic pressure, viscosity, electrical and magnetic influences, and the chemical changes occurring. Under physiology, what may be called vital phenomena, such as can not in the present state of our knowledge be referred to chemical or physical causes, are treated. The work is comprehensive and will be indispenable to all physiological botanists. C. L. S.

Economic Plants of Porto Rico. By *O. F. Cook* and *G. N. Collins*. Illustrated. Smithsonian Institution, Contributions from the United States National Herbarium, Vol. VIII, Part 2.

This is one of the most valuable works yet issued in the series to which it belongs. It is in the form of an annotated alphabetical list, and might well be called a dictionary of the economic plants of the West Indies. The Spanish names are fully defined and explained, while important products, like the banana and cocoanut, are made the subjects of elaborate essays, dealing with methods of cultivation, the value and distribution of different varieties, etc. The book is rendered more valuable by the fact that the authors have incorporated practically all the information contained in the works of Bello, Stahl, Hansard and Grosourdy.

C. L. P.



The Palace at Agaña, Guam.

THE PLANT WORLD

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Extracts from the Note-Book of a Naturalist on the Island of Guam.—IX.*

BY WILLIAM E. SAFFORD.

Sunday, October 1.—As I sat this morning after breakfast looking across the plaza at the tangled mass of vegetation near the door of the palace, Susana came in to clear off the table. "Susana," said I, "do you know when the palace was built?" "Surely, señor; it has not been very long. It seems only yesterday. Don Enrique was Governor; † everybody liked him; and as for his wife, she was an angel—a lovely Cuban lady. I don't know why it is, señor, but we have all noticed one thing—if a Governor brings his wife to Guam it 's a sure sign that he is a good man and that he will be kind to us. Perhaps it is because he is good that his wife would be willing to come here with him. If he were bad and ill-natured she would rather stay in Spain. We have been having a terrible time with the governors. Don Angel de Pazos, a cruel, disagreeable, overbearing man, was assassinated by one of the palace orderlies. Don Francisco Olive, who came next, was a hard worker, but he did not seem to think much of the Chamorros and he did nothing to make us better. Then came Don Enrique; he brought his dear lady. I can not tell you, señor, how good and kind she was. She treated us all as though we

* Continued from July issue. Begun in September, 1902.

† Don Enrique Solano, Colonel of Infantry, Governor of the Mariannes from 1887 to 1890. He and his wife are highly spoken of by J. Cumming Dewar, who visited the island in 1889, while the palace was in process of construction. See his "Voyage of the *Nyanza*," London, 1892.

were her own people. We would do anything for her. When Don Enrique began the palace everybody wanted to help,—men, women, and children,—carrying stones, getting sand for mortar, and helping at the kilns to burn lime from the coral rock. And while they worked they kept singing all the time, just as though they were on their own ranches. Some of the governors have written books about Guam, I have heard, and have called the Chamorros *ingratos;* but, señor, they only received what they gave—it is the nature of the Chamorros to love those who treat them with affection. But here I stand talking, and not a bit of meat in the house for the señor's dinner!''

As food is becoming scarcer every day it is apparent that something must be done to regulate the consumption of island products and to encourage the natives to cultivate larger crops and to rear more fowls and pigs. The island has never produced more corn, rice, and sweet potatoes than are sufficient for the natives, and chickens and eggs have doubled in price, and at the present rate of killing cattle there will soon be none left. Although we have a good stock of tinned meats and vegetables for our two ships in the harbor and the two companies of Marines at Agaña, yet they must have fresh provisions at intervals. In the basement of the palace, among the archives of the island, there are a number of letter-books containing copies of orders of many of the Spanish governors. Perhaps I can find what measures they took in similar cases and we may profit by their experience. So I cross the palace to look over the old books, telling Susana where I may be found if my presence should be needed at home.

For some time I turn over page after page—the writing is beautiful—and find nothing but reports of proper observance of saints' days, royal birthdays, and fiestas. At last, however, I come to an order restricting the exportation of food and another one relating to the propagation of pigs and chickens and the cultivation of certain food staples. Good! I shall draw up orders somewhat similar and submit them to the Governor for his approval. We may be accused of paternalism, but these people are like children in some respects and need a father's care and love and guidance. In an island like this, where food can be produced in such abundance, there is no reason why anybody should go hungry. What we want to do is to induce the natives to produce not only what they require for their own needs, but a little more. If each family will do this, there will be quite enough to supply the ships and battalion. I am sure they will do this if they realize that it is for their own interests and for that of their little ones. In other words, each family should have a little capital. As it is they usually exchange what surplus food they may have for articles brought by the traders, often for things of which they really have no need. They say that their corn and rice will become

mouldy or will be infested by weevils if kept a long time, and that all their labor of cultivating and harvesting it will be wasted. This has made me realize more than anything else the need of capital, and capital not in the form of rice and corn, which moth and mould may corrupt, but in good indestructible and divisible money. In this way surplus food could be converted into money at the end of good harvests and reconverted into food (imported rice or flour) in times of scarcity. As it is, the people find themselves without resources during the seasons of famine which on this island always follow hurricanes, and the traders will not give them food for the superfluous ribbons and rosaries they got in barter for their copra or surplus food. We ought to take some step to restrict or abolish the present system of barter by which the natives are induced to take all sorts of things of which they have no need at all. If they had a little stock of money on hand they would not have to depend, as they now do, upon charity from abroad in times of scarcity. To-day I came across a record of one governor's efforts to induce the natives to make provision for a "rainy day."

Don Felipe de la Corte, who became governor in 1855, discusses the causes of the stationary condition of the population of the Marianne Islands in a report to the Captain-General of the Philippines. He attributes it to the poverty or lack of accumulated capital on the part of the natives. "To ameliorate the condition of these islanders," writes Don Felipe, "my predecessors, with laudable zeal, have reproduced without ceasing exhortations, orders, and decrees that they should plant and harvest wholesome and abundant crops. But who would believe it! With bountiful harvests, of which the grain has at times even been burned for lack of consumers, poverty has continued; because no steps were taken to store the wealth, then superfluous, so that it might meet the demands in later seasons of scarcity, everything going to waste without accomplishing any good. And what is still worse, it has created in these natives in years good as well as bad, of large crops as well as of small, the idea that the conditions can not be improved, and they logically reason that though they have produced such great crops that they had to be burned they did not thereby escape privations when times of scarcity came, and it was better for them to work little than to work in vain. In consequence of this they are accused of laziness, which they are far from manifesting when they clearly see the good accomplished by their labor. To dispel a prejudice so harmful, I have taken the first step toward the accumulation of wealth, by providing for the storing of the article most important for the subsistence of these natives. This is maize, or Indian corn, which is cultivated with the greatest ease and may be planted so as to yield three crops a year, and in such a way that it may yield at each harvest three times as much as

necessary for the actual consumption of the people, if sufficient be planted, and leaving out accidents."

To provide for the storing of this reserve supply of grain, Don Felipe proposed "to put into practice the ancient system of Spain and of other countries of preserving cereals in subterranean granaries, and combining this idea with the beneficent institution of the public granaries of Spain and some places in the Indies." He published an order for which he begged the approval of the Captain-General, assuring him that in taking such a step he had been prompted by a fervent wish to benefit the natives.

Monday, October 2.— Made a draft of two general orders, which I sent to the Governor, who is still on the *Yosemite* awaiting the completion of the work on the palace. The tiled roof has been patched and the carpenters are putting gutters under the eaves, in order to catch all the rain water possible. The doctor disapproves of the wells, which he considers the source of the sickness among the natives and our men.

This day Don Vicente Herrero y Roberto tendered his resignation as Administrador, or Treasurer, the duties of his office not allowing him sufficient time to devote to his personal affairs. With the consent of the Governor I promoted Don Juan de Torres, the Interventor, or Auditor, to fill the vacancy. I do not think it necessary to fill Don Juan's place, as I myself will audit the accounts each month. This leaves me a fund of 62.50 pesos a month.

The roads and streets are in bad condition, and it seems absolutely necessary that there should be some official whose duty it would be to inspect the roads, streets, and the sanitary condition of the town. This official could act also as coroner and under the doctor's direction grant burial permits. At present there is no attempt at drainage. During the recent rains many acres of ground in the heart of the city remained flooded for more than twenty-four hours. Don Pedro Duarte, late Captain in the Spanish Army, the military aid of the last Spanish Governor, possesses all the necessary qualifications for these duties. He is a practical civil engineer, has a transit instrument, and can make any surveys or plans that we may need. He has, moreover, a good knowledge of medicine and sanitation. He accompanied me all over the city, pointing out the position of ancient sewers and drainage lines, and seems anxious to render us any assistance in his power. In order that we may not unduly increase the expenses of the island government, however, it will not be possible to offer him more at present than the salary the late auditor has been receiving. I no sooner asked Don Pedro if he would be willing to accept such a position, than he proceeded to show his willingness by taking his transit instrument out into the street and adjusting it, as though he meant business.

Wednesday, October 4.—This day the Governor issued the following orders:

"GENERAL ORDER NO. 6.—Until otherwise ordered, the exportation of cattle, hogs, fowls, eggs, rice, corn, and sweet potatoes from this island is hereby forbidden.

"Articles of food may be delivered to vessels only in sufficient quantities for the subsistence of those on board during their stay in port and their passage to the next port of their destination.

"The delivery of such articles of food to ships is prohibited without a Government permit.

"GENERAL ORDER NO. 7.—Every inhabitant who is without a trade or habitual occupation, by means of which he is able to provide for the necessities of himself and his family, must plant a quantity of corn, rice, coffee, cacao, sweet potatoes, or other fruits and vegetables sufficient for that purpose.

"He must also have twelve hens, one cock, and one sow.

"The land necessary for the provision of article 1 is understood to mean that which produces with good results a single article; if it be suitable for two or more articles he must plant as great a quantity as possible consistent with the means at his disposal, taking into consideration what is most necessary for the maintenance of life.

"Citizens who possess no land for planting may solicit from the Government that which they may require for this object.

"When land is once granted it must be cleared, cleaned, and planted within such a time as the Government may deem necessary, the period being indicated when the grant is made, the means of the petitioner being taken into consideration.

"If the land be not cleaned at the expiration of the time fixed when the grant was made, the person receiving the grant will be considered vagrant, unless he prove that he was prevented from accomplishing the work by some good cause.

"Every part of the island may be utilized for cultivation, even though the sites selected be adjacent to cattle ranches. In the latter case it will be obligatory for the planter to inclose his garden patch with fences to protect it from damage by cattle.

"Those who, by virtue of this provision, have their plantation near cattle ranches can not claim damages for injuries caused by cattle if it can be proved that the plantations were not properly protected by inclosures.

"Henceforth land granted for pastures or plantations may be utilized by their possessors for stock farming or for agriculture, according to the nature of the soil, with the condition that they may be properly fenced in, so that he who wishes to start a stock farm will be obliged, before taking his cattle thither, to fence in the territory where they are to graze, being responsible for the damage that they may cause to the crops of neighbors for lack of fences or of proper care.

"Captains of towns and inspectors of crops will report monthly in writing concerning the progress of plantations and other matters referred to in this order."

* * * * * * * * *

The publication of the above orders in the United States caused no

little amusement. Many of the newspapers stated incorrectly that the orders were issued for the benefit of the Governor and of the barracks, as will be seen in the following extract: "Interesting disclosures in regard to the social conditions prevailing among the natives of the island of Guam, which has recently come into the possession of the United States, are made in a report made by the Governor of the island. The report shows that the natives are inordinately lazy and raise only enough crops to keep body and soul together. They have no idea of the value of money and make no attempt to add to their material possessions, being satisfied with a minimum exertion, just sufficient to keep them alive and happy. * * * It appears from his report that he has set to bring the poor benighted natives of that distant island to a better realization of the natural wealth of their territory and to make it as productive and prosperous as possible. * * * He forwards copies of two orders recently issued by him and distributed broadcast over the island. They are printed in English and were struck off from the first printing-press ever seen in Guam. The first of these is calculated to compel each adult native *to contribute to the support of the Government* by engaging in food production. This order was dated October 4 and directs all who have no trade to plant cereals, vegetables, etc., under more or less severe penalties. It is stipulated that each citizen shall have at least twelve hens and one sow, and continue in possession of them indefinitely. *They must bring eggs, chickens, and vegetables to sell to the Governor's house and to the barracks at stated intervals*, and they must pay their taxes and discharge their other indebtedness." [The italics are those of the author.]

It is needless to say that the orders issued were not for the benefit of the Government officials, but for that of the natives themselves, and at no time were the natives required to bring provisions either to the Governor's house or to the barracks. Equally untrue was another statement, that the Governor "commanded immediate wedlock for the whole adult population of the island, and as a result the officers in charge of licenses and marriages were worked half to death."

* * * * * * * * *

I have set apart Mondays to hear divorce cases and grant marriage licenses. On Tuesdays I listen to cases involving the ownership of land. I am glad to have all the registration books intact. Some of them show that large tracts, including small farms of natives, have come into the possession of persons declaring themselves the owners of these tracts, which were granted to them as pastures for their stock. There is no adequate provision for the education of the natives. In Samoa nearly every native more than eight years of age knows how to read and write. Here a great proportion of the people are illiterate. On the other hand, the habit of begging, which is so prevalent in Samoa, is here unknown.

Indeed the natives go to the opposite extreme and insist upon your accepting their hospitality. Some of the school-teachers get only $3.00 Mexican a month, equal to $1.50 of our money. I shall double their wages, but even then it will be a miserable pittance. No wonder they have to suspend their teaching frequently to work in their garden-patches and corn-fields. The only trouble is, we have not income enough from the island to pay higher salaries; and we want the island government to be self-supporting. I myself have started a night-school for teaching English three nights a week. I have about fifty pupils, ranging from the age of five to fifty years. Among them, besides the natives, are a number of bands-men (Italians) and Chinese servants of the officers' mess. I usually begin by pointing to various objects and pronouncing the corresponding English names. My pupils repeat the words after me; then I teach them a few adjectives, such as *long*, *short; thin*, *thick; hard*, *soft;* illustrating the meaning by objects having these attributes; then a few verbs, such as *walk*, *sit*, *stand*, *fall*, *catch*, *see*, *hear*, *speak*. Most of my pupils do pretty well, but the youngest do best. While walking the other day with the Governor he asked me how my pupils were progressing. I told him that the little boys were learning readily. Just then we came upon a group of two or three youngsters, and one of them saluted the Governor, saying, "Hello, bub!"—a greeting which, I assured the Governor, he had learned not at school but evidently from the Marines. The Governor was not a little amused at what he called the forwardness of my pupils. To meet the increased expense of the schools we are to have a custom-house. The Governor has asked me to prepare a tariff. This I am trying to do in such a way as not only to bring in a revenue but to encourage the cultivation of rice, coffee, sugar, and to discriminate in favor of American goods, which will come in free.

[TO BE CONTINUED.]

MR. DAVID G. FAIRCHILD has published an interesting paper on Japanese bamboos (Bull. 43, Bureau of Plant Industry, U. S. Dept. of Agric.). He is convinced that a number of species can be successfully grown in Southern California and the Gulf States, and that they may be adapted to a wide range of uses. In England the more hardy kinds have withstood a temperature of 6 degrees Fahrenheit.

THE following method for the treatment of borers and running sores in shade trees is recommended by the Wyoming Experiment Station: Carefully remove all grubs and other larvæ; dig out the decayed tissue. Then, if the wound is one that will conduct water to the interior of the stem, fill it with grafting-wax and putty, and make it waterproof with paint or tar.—*Country Life in America.*

Ferns of Smugglers' and Nebraska Notches.

By Carrie E. Straw.

W. W. Eggleston, of the Vermont Botanical Club, wrote an article for volume 20 of the *Botanical Gazette*, which was afterwards published in pamphlet form, entitled "The Flora of Mt. Mansfield." It is a very interesting article and contains a most fascinating list of the rare plants to be found on the two peaks of Mt. Mansfield and in Smugglers' Notch at the base of the mountain.

The casual tourist may find many of the rare plants of the mountain, since they grow on the rocks and in the sphagnum bogs all along the crest of the mountain from the nose to the chin, but one must climb perhaps a thousand feet in the Notch to reach the alpine gardens. Before beginning the ascent we may find in the rich soil in the base of the Notch *Aspidium aculeatum Braunii* (Braun's holly fern). It formerly grew here in great abundance, but a florist from the southern part of the State, we are told, has been here several years and has carried away barrels of fern roots for sale, and this fern seems to have suffered much from his ravages. It is a beautiful fern, with chaffy stalks and with fronds from one to two or more feet long. It was first discovered in the United States by Frederick Pursh in 1807, in this Notch. It is found in the Catskills, Adirondacks, in northern Maine, in Michigan, and by mountain brooks in northern New England.

On shaded banks grows the graceful *Cystoperis*, or bladder fern, which shares with the maidenhair the honor of being first to be sent to the Old World by botanical explorers. *Aspidium acrostichoides*, the Christmas fern, is common here, and one may sometimes find its variety *incisum*.

Aspidium spinulosum grows here, and some of its varieties; also *A. marginale* and others of the commoner sorts. In the summer of 1901 there was a quantity of *A. Goldieana* growing here, but we could not find a plant of it in 1902, and think that must have gone with the *aculeatum Braunii*.

It is an experience long to be remembered to climb to the cliffs, there to find under dripping, overhanging rocks some of the treasures of the botanical world. It is not so great an undertaking as it might seem, even for ladies. The wonderful views to be obtained of mountain fastness and distant valley repay one for the toil, while a botanist is many times repaid by a glimpse of one of the rarest of ferns in its own natural setting. Some of the rare plants which grow here are the saxifrages (*Saxifraga aizoides*, *Aizoon*, and *oppositifolia*), while on the

Mount Mansfield and Smugglers' Notch, Vermont.

way one may find *Astragalus Blakei*, *Castilleja pallida septentrionalis*, *Erigeron hyssopifolius*, and *Artemisia Canadensis*. On the wet cliffs the little plant that one thinks at first is a belated violet is *Pinguicula vulgaris*, or button-root. On the dry cliffs, they tell us *Draba incana* grows. We found only the variety *arabisans*, which is rather common. There, too, we found *Arenaria verna hirta*. We found beautiful specimens of our rarest fern, the green spleenwort (*Asplenium viride*), which was discovered here for the United States by Mr. Pringle. It has been found on Camel's Hump, and these are the only stations known in eastern United States. It is found in British America and in the mountains of Oregon, Wyoming, and Washington, as well as in Greenland.

Pellæ gracilis grows here, and *Woodsia ilvensis*. The rarer Woodsias, too, grow here. *W. glabella* is quite common. We did not find *W. hyperborea*. These are alpine ferns, and are found only here and at Willoughby and Inuchee Gulf in Vermont and at a few stations in the mountains of Maine and New Hampshire.

Aspidium fragrans formerly grew on Mt. Mansfield, but it has practically been exterminated there except in some almost inaccessible places. Mr. Eggleston mentions in his Flora that in a pass south of Mansfield, called Underhill Notch, but which we on our side of the mountains call Nebraska Notch, he found *Aspidium fragrans*, *Woodsia glabella*, *Pellæa gracilis*, and other rare plants. With a small party, with Mrs. E. B. Davenport, of Brattleboro, for our inspiring genius, we visited that Notch in the summer of 1902. We found the growth of ferns, orchids, and other plants very rich in the base of the Notch. Splendid specimens of *Aspidium aculeatum Braunii* grew here in undisturbed profusion. There are many cliffs in view, and we knew not which to select for exploration ; but the nearest ones we finally reached. The ascent was a tiresome one. There were many pitfalls among the rocks, and no mountain-sides convenient for a road were here. Mr. Straw, climbing above the cliffs, was the first to find *Aspidium fragrans*, the object of our search. But soon we began to find it on the lower side of the cliffs too. It grew all about and of large size. Its brown stipes made it easily discerned from a distance. It seems safe to survive among these cliffs, as pleasure-seekers do not come here, and if the man who sells ferns should find this place it would take him a long time to get it all. This is a beautiful fern, with dark green fronds, with an odor often compared to raspberries. It is a rare fern, growing here and on Mt. Mansfield, and on Mt. Zion in Hubbardton in Vermont. It was discovered for Vermont by Mr. Pringle. It grows in a few elevated stations in New Hampshire, New York, Wisconsin, and Minnesota. These cliffs are much drier than those of Smugglers' and not so high, and have no such wealth of rare plants, but the finding of the *fragrans* repaid us for our journey.

The Relations of Insects to Fungi.

By Perley Spaulding.

It has been known for a long time that there is a more or less intimate relation between some of the insects and various forms of the fungi. The really great importance of this relationship has not been realized until recently, but within a few years it has been discovered that the relation is of great importance, not only to the insects and fungi, but also to the lower animals and even to man himself. The more familiar we become with the life histories of the fungi the clearer it becomes that we should know the exact relations existing between these two great groups of organisms. And the more dangerous a fungus is to vegetable or animal life, the more imperative it is for us to realize to its fullest extent the possible influence of our common and omnipresent insects upon the status of the trouble. It is somewhat similar to Darwin's famous example of the cats and the clover, in which he showed that the presence of a large number of cats in a certain neighborhood may have a very decisive, although indirect, effect upon the production of clover in that locality. In the same way we see that, although at first thought there seems to be little or no connection between such widely differing forms, there really is a direct influence of the one over the other and vice versa.

Many insects are appropriated by fungi as a base upon which to grow and reproduce. Although insects have an external chitinous covering which is, to a certain extent, impervious to the action of fungi, there are certain weak places in this protective armor which make the entrance of fungi a comparatively easy matter. These are the breathing pores and the joints. A spore lodges upon the insect and finds there suitable conditions for germination. The germ tube is sent out and makes an opening into the interior of the body, where it branches and soon spreads throughout the body. Fruiting threads are sent to the outside of the body again so that the spores will be freely distributed as soon as ripe. In any case the life of the insect is soon doomed, for the fungus finds its best feeding ground in the vital organs and soon affects them so that they can no longer carry on their proper functions. One class of fungi grows on the outside of the insect's body and fruits while it is alive, their attack upon the host seeming not to have such serious results. Cicadas, ants, locusts, chinchbuds, flies, bees, wasps, beetles, moths, and butterflies are some of the best known of the insects which are affected by these diseases. Spiders, although not insects, may also be mentioned as hosts for fungi. The fact that insects have fungus diseases is the most obvious connection between the two, and consequently it has been longest known, and more work has been done on this phase

than on any other. There are several books treating almost exclusively of insect diseases caused by fungi. Among these are Thaxter's "Monograph of the Laboulbeniaceae" and Cook's "Vegetable Wasps and Plant Worms," the latter being a more popular work than the other. Besides the books which are devoted to this subject there are numerous articles scattered throughout botanical literature, making an aggregate which is quite voluminous. The Muscardine disease of silkworms is probably of as great economic importance as any of the fungus diseases of insects, although in this country the foul-brood of honey-bees causes more loss than any other one disease of this character. It is very well known that house-flies are very subject to a fungus disease, as are also locusts and chinchbugs. In the latter two cases it has been proposed to destroy the insects in large numbers by means of artificially-raised fungus. This is procured from some of the diseased insects early in the season and pure cultures are made upon artificial media. When the insects get troublesome by their numbers a few are caught and thoroughly covered with the spores of the fungus. They are then turned loose among the rest in the field, where they scatter the spores and inoculate many others with them. In this way their numbers can be materially reduced when the conditions are right for the rapid development of the fungus. The experiments as a rule have not been very successful.

That insects very often carry fungus spores from one place to another has in many cases been actually proven. The peculiar adaptations of some fungi for this method of distribution are very interesting. The Phalloideae, commonly called "stinkhorns," exhibit such adaptations to a marked degree. They are of the most fantastic and beautiful shapes, and for this reason have been called "fungus-flowers" by one author. When mature they have quite a tall stem, the spore-bearing portion degenerates into a slimy, sticky mass, and their best-known characteristic becomes very evident. This is one of the vilest odors, if not *the* worst one, known in the plant kingdom. It very closely resembles the odor of decaying animal matter at its worst. Flies are attracted from far and near by it, and after walking over the sticky, spore-containing mass, they carry away large numbers of the spores to be left everywhere the flies may chance to alight. A curious adaptation of another kind is that of the ergot (*Claviceps purpurea*). At the time of the formation of the spores large drops of a sweet liquid are produced and many spores float in the drops. The liquid is eagerly sought by insects and they carry away many spores after getting the fluid. Still another curious case is that of certain fungi which have an agreeable odor by which insects are attracted. *Sclerotinia vaccinii*, which has a strong, characteristic odor of almonds, is a good example of this class of fungi. Many fungi have spores that are sticky or that have spines such as will catch on the legs

and bodies of visiting insects. Of the plant diseases which are known to be carried by insects we may mention the following: ergot of grain and grasses, smuts of grains, brownrot of stone-fruits caused by *Sclerotinia fructigena*, bitterrot of apples; and some of the rusts are known to be carried by aphids, snails, and caterpillars. Several of the bacterial diseases are also known to be thus distributed and it is more than likely that all of them may be. Texas fever is carried by cattle ticks, malaria and yellow fever by mosquitoes, typhoid fever by flies, and anthrax, pink-eye, and bubonic plague are known to be carried by various insects. Although these diseases are not all bacterial ones, they are so similar that they are governed by practically the same factors as are bacterial diseases, and for this reason are mentioned here. An instance is known where a fungus grew only along the slimy trail of a snail or worm on a leaf. Still others are known to grow only in the honey-dew secreted by certain insects. The sooty mold of the orange is a good example of this class. The honey-dew is secreted by aphids, white flies, and scale insects, and the fungi grow on the leaves, branches, and fruit wherever the liquid falls. The fungi are dark colored and make a sooty covering on the parts where they grow. In the leaves this causes less food material to be manufactured for the plant, while on the fruit the dark sooty appearance hurts the sale very much. The damage caused in this way is estimated to be $50,000 in the State of Florida alone. Still other fungi are known which grow in a similar way upon forest trees.

The spores of certain fungi, called Ambrosia fungi, are a staple article of food with some wood-boring beetles. Little has yet been done along this line, but it promises to be very closely connected with some of the diseases of wood. Honey-bees have been observed to collect the spores of blackberry rust (*Caeoma nitens*), and to use them just as they would pollen grains. This is not as bad a mistake as one would at first think, since the fungus spores are very much like pollen grain in every way. The bees may be depended upon to know what they are doing, and it may be that they are thoroughly American in inventing a new method of making wax. Certain ants are known to cultivate a fungus for food. They cut pieces of leaves and plant the fungus among them so that later they live on the fungus thus raised. Insects are the scavengers of the fleshy fungus world. As soon as the fungi are a little past their prime, one will find numbers of larvae tunneling through the tissues.

In very many fungus diseases the fungi could not gain entrance to the uninjured tissues of the affected plant. Insects, by reason of the numerous bites and punctures which they make, aid the fungi by giving them an easy entrance to the tissues which they later destroy. In various ways, therefore, it will be seen that insects are very important factors in the spread of fungus diseases.

The Birthplace of Agriculture.

By O. W. Barrett.

In a recent article on "The American Origin of Agriculture," Mr. O. F. Cook brings forward the strongest evidences, if not proofs, which show that the idea of cultivating plants for food originated with the inhabitants of the old Caribbean region. Archeologists and geologists have been preparing us for this startling announcement; we have been taught that the cities of Central America were in need of reforms before the Sphinx was blocked out, and it has been proved that Central America and the West Indies are the remains of an Atlantic-like continent which was alternately raised and sunken during the Tertiary epoch. But it seems a still higher honor that the middle America should have been the cradle of the most important of all the sciences.

The aboriginal inhabitants of Polynesia and the Orient were primarily fruit-eaters, while the remote ancestors of the Incas, Aztecs, and Arawaks subsisted largely upon roots. It is obvious that savage tribes would not attempt the cultivation of fruits; whereas the quick-growing roots and grains could be easily managed by semi-nomadic races like the prehistoric Indian tribes of Tropical America. Furthermore, "the origin of the agricultures and civilizations of the valleys of the Nile and Euphrates is no longer sought by ethnologists among Semitic shepherds or more northern peoples, but among a seafaring race which has been traced to southern Arabia, and whose language has been found to have analogies with the ancient Polynesian tongue of Madagascar." Now, "the most important food-plants of the Polynesians were seven in number — the taro, yam, sweet potato, sugar-cane, banana, breadfruit, and cocoanut, of which six, or all except the breadfruit, existed in pre-Spanish America, and of these, five, or all except the cocoanut, were propagated only from cuttings."

In a special bulletin issued by the U. S. Dept. of Agriculture, Mr. Cook has shown us that the cocoanut, a cosmopolitan plant in Columbus's time, originated in northern Colombia. Proofs are numerous of the prehistoric intercourse between the Orient and Central America via Polynesia. Therefore it is easy to understand how the food-plants of the old Caribbean country were gradually disseminated throughout the Pacific Islands and southern Arabia.

There is one apparent glaring exception to this "American export" idea — the banana. It is highly probable, however, that the native East Indian banana was first cultivated for the starch of its large bulb-like rootstock, in harmony with the imported American idea of root crops; in fact, this old custom is still practised in Abyssinia and New Caledonia;

moreover, a banana-like plant, *Heliconia bihai*, was cultivated by the natives of the West Indies when Columbus came on the scene, and is now found in a wild state in Polynesia.

It seems that Old Caribbea (if we may coin a name for the region) gave far more than it received agriculturally; the main fruit of Polynesia, the breadfruit, did not reach the "New" World until brought over by Captain Bligh in 1793; but it is doubtful that any important plant was introduced in the pre-Columbian era. The trend of the Pacific equatorial currents may in part account for this—westwardness. The hand of man must have been the instrument of this food-plant introduction into Polynesia, for no root-cutting could withstand contact with salt water. The cocoanut alone might have drifted with the currents.

Native plant names are more numerous and are used with more precision in Porto Rico than elsewhere in the West Indies; this indicates a strong agricultural proclivity; indeed, the aboriginal name of the Island, "Borinquen," signified "strong man of the soil," and the piratic cannibal Caribs contemptuously called the inhabitants "Arawaks," or "eaters of meal."

Settlements of savages were necessary before civilization could begin; *i. e.*, the tribe must needs have time and place to rest and think in order to progress. A permanent food supply from cultivated, or at least protected, crops was necessary to settlements. From the great number of food-plants which Old Caribbea gave the world, and from many other signs which come to us out of those misty and most ancient times, it is more than probable that that region was the birthplace of the most important science in the history of the world.

But I wonder what the citizens of the lower layers of old Nippur thought about it?

Moles in the Lawn.—It not infrequently happens that a fine lawn is more or less disfigured by the work of moles. Many devices have been proposed to rid the land of these pests, some of which work fairly well while others are complete failures. One of the best and most effective means of getting rid of them is to arm one's self with a pitchfork and watch for a movement of the surface of the ground, when it is no trouble to kill the mole with a few quick thrusts of the fork. Moles appear to be most active during the middle of the day, and if a person be stationed on an infected lawn about noon, preferably of a bright day, they will soon be seen disturbing the surface and can be dispatched without otherwise opening the ground. It will rarely be found that more than three or four individuals are working in a single lawn, although the amount of depredation may seem to imply the presence of a large number. F. H. K.

Briefer Articles.

A FASCIATED TULIP.

An unusual abnormality was presented in the spring of last year by numerous specimens of tulips, *Tulipa gesneriana* L. var. *alba*, *fl. pl.*, in a flower-bed at the home of Mr. Gustav F. Hammer, in Cincinnati. The bulbs had been preserved from the growth of 1901 in the same bed, when none of them had shown any unusual development, and now, in the spring of 1903, the bulbs from last year have produced only normal flowers. But in 1902 a large number of them came out with many flowers, sometimes, as in the specimen figured, as many as six from each bulb. The treatment of bulbs and of soil had been the same in all three years, and there were no peculiarities in the climatic conditions of 1902 which can be regarded as the cause of the sportive development of the tulips in that year. No similar case appears to have occurred anywhere else in this region.

The specimen figured had just been taken up with its bulb and transplanted into a pot when received, and it was photographed at once. Besides the leaf and flower-bearing stem, it had a large cornucopia-shaped ground-leaf and two small ones, mere scales sticking out of the ground. The large ground-leaf had two ribs, and was undoubtedly formed out of two leaves, standing face to face with their laminas transversely curved and the opposing margins connected on one side along their entire length about six inches and so completely that there was no trace of a suture on the other side, only along the proximal two inches, and here a suture was plainly marked. My main reason for considering this leaf composite was, besides its large size, the existence of two mid-ribs. The stem was terete and without any grooves in its proximal three inches up to the first stem-leaf. A transverse section of this portion showed no structure differing from that of the ordinary one-flowered stems. The first stem-leaf was very large and clasped the stem completely. The following internode was two and one-quarter inches long, and showed some traces of longitudinal grooves. The next internode was contracted to a fraction of an inch, and the leaves borne at its extremities were coalescent from their bases, the line of insertion running slantingly along and almost around the reduced internode. The union of these leaves continued without a visible suture, along the proximal two-thirds of the entire length ; then they parted by a slit, one-quarter of an inch long, and again became connected with a distinct keel-shaped suture, as though the adjoining margins were cemented face to face ; but distally they parted again, each having a free apex, and that of the side whose base commenced lower down

reached ⅓ inch beyond the free apex of the other side. From the proximal end of the said contracted internode up the stem revealed unmistakably its fasciated nature by deepening grooves, showing the stem to be a bundle of peduncles, one after the other of which detached itself from the bundle and carried each, bracts and a large white double flower. These, too, showed a tendency to form multiple parts, more or less completely coalescent.

As far as I have been able to ascertain, this is the first instance of fasciation in tulips hitherto recorded. It is not unusual in many other plants. Professor Schübeler in his "Viridarium Norvegicum" (Christiania, 1886), Vol. I, page 413, enumerates forty-five species of wild or cultivated plants in Norway in which he had observed banded habits either in stem or root, and he quotes Olaus Borrich as the original author (in 1673) of the term *fasciatio* for such phenomena observed by him in four plants, which he named *Geranium columbinum fasciatum*, *Corona imperialis fasciata*, *Hyssopus fasciata*, and *Martagon fasciatum*. To this list I can add *Ipomœa batatas*, which grew in my garden in Rock Island, Ill., some years ago, with conspicuously banded vines.

Cincinnati, Ohio. JOSUA LINDAHL.

SOME SUMMER OBSERVATIONS.

LATE in the winter a severe ice storm damaged the woods for miles around Baltimore, and in the early summer two or three severe wind storms broke off hundreds of branches in addition, and uprooted many trees. As a result the undergrowth received more than its usual supply of light and many spots in the woods changed their botanical aspect to a surprising degree. In the low woods the touch-me-nots (*Impatiens*) and nettles (*Urtica* spp.), richweed (*Collinsonia*), and all those things have been taller and more numerous than ever before within my memory. The nettles are shoulder-high, and in one river-bottom the *Impatiens pallida* is at least seven feet tall — nearly twice as large as usual. Near the latter is a dense thicket of ragweed (*Ambrosia trifida*) with many stalks over an inch in diameter, and the slender, closely-packed stems reaching, in at least one instance, the height of fifteen feet nine inches, and others may have been taller. No estimate was made at the time, but there must be, on the average, ten or twelve plants to the square foot. It is only fair to say that this bottom was flooded three times when the ice was breaking up, and this, combined with the effect of the storms, caused the unusual growth. The dry spring, which was very hard on corn and other crops, must have been a drawback to these weeds.

The perusal of Warming's "Pflanzengeographie" prepared me for the thick-leaved plants on the shore of Kent Island in the Chesapeake.

A Fasciated Tulip.

Without naming species, it may be said that nearly all the plants had succulent, fleshy leaves — golden-rods, asters, and other composites were especially noticed. The most curious plant was the samphire (*Salicornia*), which had no leaves, but only thick, succulent stems, in the joints of which the flowers were imbedded. It was quite a surprise to find the common white melilot in bloom on the thirteenth of September. On closer examination it was found that the leaves were about twice as thick as usual on account of the salt in the ground water. C. E. WATERS.

Miscellany.

WE LEARN from *Science* that Dr. Augustin Gattinger, the well-known botanist of Tennessee, died on July 15 at the age of 77 years.

PROFESSOR HENRY GRISWOLD JESUP, of Dartmouth College, a subscriber to this journal from its inception, and author of many papers on the local flora, died recently.

MR. FREDERICK V. COVILLE, Botanist of the U. S. Department of Agriculture, has sailed for Europe, where he will visit the leading botanical gardens and museums.

DR. F. H. KNOWLTON, Editor-in-chief of THE PLANT WORLD, has gone to southwestern Colorado for the purpose of collecting fossil plants. He expects also to secure a number of photographs of the Colorado flora, some of which may appear in our pages later.

A YOUNG floral friend, as she calls herself, in sending me a little plant of the white asclepia, *A. verticillata*, writes, besides other interesting items: "I found a showy orchis and a friend of mine a beautiful yellow lady's slipper. I was not so fortunate as she. The showy orchis, of which I sent you a little blossom last summer, is perfectly beautiful this year. I wish you could see it. It is very large, but only one plant, and it stands in such a dreadful place. In order to get at it one must be waterproof. It grows behind a rock in a swamp surrounded by pokeweed and wild azalea. I have waded out to it twice." (She has not torn it up, as the general rule is, for many flower collectors, and ought to have a medal as a silent member of the society for the preservation of our rare native flowers.) She further says, "our meadows, some of them, are fairly red with painted cups (*Castilleia coccinea*) and the mountain laurel has been beautiful." Thoreau did not like the name of "painted cup" for this glowing red beauty. He wished it might be better called "flame of flower, or scarlet tip," as the tips of the leaves seem to be dipped into some scarlet tincture.—*Wilhelmine Seliger, in the Hartford Times.*

The Wild Flower Preservation Society of America.

THE following letter, recently received from one of our members in Ohio, contains an excellent suggestion, and one that is worthy of adoption at many similar resorts. The Secretary has written to the General Manager of the Louisville and Nashville Railroad calling attention to the fact that the wild native vegetation enhances the beauty of every region, and requesting permission to post notices to the public at conspicuous points along the line.

"CINCINNATI, OHIO, *August 1, 1903.*

"MR. C. L. POLLARD, *Secretary Wild Flower Preservation Society.*

"DEAR SIR: The Cumberland mountain spur that is crowned with the Natural Bridge, this gloriously beautiful and interesting wonder of Nature, is annually visited by large numbers of excursionists. These persons should be taught to look upon the ferns, the orchids, the trees that fringe the mountain paths and clothe the great rocks, as treasures, to be held in trust for future generations, and not to be uprooted and thus exterminated.

"May I suggest that an appeal to excursionists be sent and posted in a conspicuous place? I think the railroad company would gladly cooperate with our Society in order to preserve the natural beauty of this mountain region and give it added value in time to come.

"Yours truly, LOUISE DRUDE."

The idea of placing posters where they will be widely observed and read has been carried out by the Society for the Protection of Native Plants in Boston. The poster issued by them reads as follows:

"PROTECT THE NATIVE PLANTS.

"Many attractive flowering plants, ferns, etc., in the neighborhood of towns and summer resorts, are in serious danger of local extermination or reduction to relative rarity. This condition already exists in many places, and is much to be deplored, as it takes away one of the great charms of wood and field.

"How may this danger be averted? Pick only a few flowers instead of a large quantity, thus giving an opportunity for seeds to develop and perpetuate the species. A few flowers skilfully arranged are much more attractive and decorative than masses bunched together. In picking flowers do not pull up the roots of plants. Avoid purchasing wild flowers in the streets and elsewhere, thus checking the incentive to collecting for sale, which in some cases has assumed very large proportions. * * *"

The remainder of the poster is occupied with a statement of the Society's officers and organization.

Editorial.

Owing to the absence of Dr. Knowlton, our Home Garden and Greenhouse department is limited this month to a few notes, thus giving space for reviews of two important books. In the next issue will appear an article on landscape gardening for a small home, illustrated by diagrams. We are always glad to receive horticultural notes from our readers for publication in this department.

The study of practical forestry in New York State has received a severe setback on account of the veto by Governor Odell of the appropriation for the State College of Forestry at Cornell, and the consequent retirement of its able director, Dr. B. E. Fernow. It is probable that the malice and private grudges of landholders in the extensive timber lands of the Adirondacks, where the experimental forestry operations were conducted, have contributed to this deplorable outcome. In striking contrast, and, as it were, in rebuke to her sister State, Maine has just voted $2,500 for the establishment of a professorship of forestry in the State College.

In the death of Dr. Augustin Gattinger, of Tennessee, another prominent contemporary of the late Dr. Asa Gray has passed away, and we are reminded more forcibly of the fact that the botany of to-day is in the hands of a new school of iconoclastic tendencies. Dr. Gattinger was an untiring student of the flora of his State, and published several works, besides contributing large numbers of specimens to his correspondents by gift and exchange. His name is commemorated in many species of flowering plants.

As many of the manuscripts submitted to us for publication are accompanied by photographs, it may not be amiss to give a word of advice to those intending to favor us with their contributions. As a general rule it may be said that photographs are only thoroughly satisfactory for illustrative purposes when they are limited to scenery or to plants and flowers at close range. A photograph of a bush or a group of herbs even six feet away usually appears as a dark mass of varying intensity, and the half-tone plate does not do justice to the subject. It would be far better if our contributors would furnish drawings, and of these we could insert many more as text cuts than would be possible with the photographs, each of which must occupy a full-page plate.

Photographs for reproduction are preferably unmounted, and should be printed rather strongly on glossy paper, but should not be deeply toned. Line drawings should always be larger than they are to appear in the figure; and photographs also are in general the better for slight reduction, though sometimes they stand enlargement well.

The Home Garden and Greenhouse.

CONDUCTED BY F. H. KNOWLTON.

[The editor of this department will be glad to answer questions of a relevant nature, and also to receive short articles on any phase of this subject.]

A Good Hardy Perennial.—The new double Rudbeckia, Golden Glow, proves to be one of the best tall perennials for the hardy herbaceous border. It should be planted at the back of the bed, near the wall or fence, as it reaches a height of from 5 to 6 feet. The foliage is handsome and the blossoms, which appear about the first of August, are of a fine yellow color and perfectly double. It needs no especial care other than occasional sprinkling, and it seems very free from insect pests.

Moving Conifers in Summer.—It was formerly supposed that the proper season to transplant conifers was spring, before the new growth was started; but it has now been found that better results can be secured by moving them in summer, or at least when growth is active. The ground should be carefully prepared where they are to go and the holes made ready a few hours in advance of setting, and the transfer should be made as quickly as possible. It is perhaps needless to say that under no circumstances should the fine roots be permitted to become dry, for if they do failure will almost certainly result.

Book Reviews.

FLORA OF THE SOUTHEASTERN UNITED STATES. By *John Kunkel Small.* 8vo, pp. I–XII, 1–1370. New York, published by the author.

Every one interested in the plant life of the South has awaited with eager interest and expectancy the publication of Dr. Small's long-promised Flora. Now that it has appeared, the ponderous volume of over one thousand pages is likely to impress its readers and reviewers both favorably and unfavorably.

To mention first the purely mechanical features of the work, it is attractively and very strongly bound in plain cloth, the back being sufficiently flexible to permit it to lie open at any page, a most important consideration in a reference book. The choice of type is excellent, and the presswork leaves nothing to be desired. The paper, also, is of good quality, but unfortunately it has not been matched in a few of the signatures.

In arrangement and presentation of text the work conforms to the

usage of most modern manuals, keys to the species, genera and families being placed at the head of each group, while at the beginning of the work there is an elaborate and carefully prepared key to the orders. Measurements are given in the metric system; and the descriptions are well drawn, though they are in some cases, as for example in Xyris, too concise for easy discrimination. Synonymy is inserted only when the accepted name differs from that used by Chapman or other standard authorities. We are pleased to observe that the author has not considered it necessary to coin book-names for each species, and the only vernacular designations admitted are those in actual use; hence we find no such literary absurdities as "Smith's Contorted Pipewort" to mar the pages of this work.

It is, however, in the nomenclature and systematic treatment that interest naturally centers, and while we approach the discussion of this phase of the subject with an earnest desire to recognize the justness of Dr. Small's view-point wherever possible, there are several respects in which we can not altogether commend the stand he has taken.

In discussing the third edition of Chapman's Flora of the Southern States, on its appearance six years ago, the present reviewer remarked: "It is to be deplored that Dr. Chapman did not make some effort to obtain material for examination at least in those genera in which he himself contemplated the establishment of new species. The omission of these well-marked forms is less of an injustice to the botanists who have devoted time and careful study to the plans than it is to the field student who constantly discovers specimens which he can not match with any of those described." Dr. Small can not be credited thus with the sin of omission, for as far as can be judged from a general examination, he has included in his work every species of plant that once grew, is now found, or is ever likely to appear within the limits covered.

Genus	*Chapman*	*Small*	*Genus*	*Chapman*	*Small*
Erianthus	2	9	Euphorbia	35	83*
Andropogon	16	39*	Viola	17	36
Paspalum	24	60*	Verbena	10	23
Panicum	46	144*	Scutellaria	14	25
Sporobolus	8	17	Pentstemon	3	20
Tradescantia	4	16	Houstonia	6	18
Trillium	9	20	Asarum	3	10*
Sisyrinchium	2	53	Eupatorium	27	45*
Quercus	25	43	Lacinaria	11	35
Celtis	1	7	Chrysopsis	8	23
Crataegus	15	185	Solidago	47	81*
Prunus	10	25*	Aster	50	109*
Baptisia	14	25	Silphium	10	26
Amorpha	3	12	Rudbeckia	15	38
Petalostemon	10	24*			
Oxalis	5	22*	Total	450	1273

* Includes Small's generic segregates from the genus as originally treated by Chapman.

The above table gives a few comparisons between the number of species included in a given genus by Chapman and by Small. It should be explained that the names are taken in a random survey of the book, and many of them represent the work of specialists other than Dr. Small, their names being mentioned in the text. The table is presented, not in a spirit of hostile criticism, but merely for the purpose of giving an idea of the enormous number of species described in this work. And no matter what may be our views on the subject of species limitations, we must give credit to Dr. Small for the almost herculean labor he has performed in studying, describing, and classifying this immense amount of material from all parts of the South.

In extenuation of this increase, the ratio in the above table being about three to one, it should be remembered that within the last few years many parts of the South have been explored thoroughly, with the result of bringing to light, not only species new to science, but others of extra-territorial distribution. Careful monographic study, moreover, has demonstrated that many species maintained by the older writers are really divisible into several distinct types, while the modern liberal ideas of taxonomy admit to this rank many that would have been classed by Dr. Chapman and his contemporaries as mere forms or varieties. Whether these reasons are sufficient to justify the increase it is not the intention of the present reviewer to decide.

In nomenclature of genera and species Dr. Small follows the principles of the Rochester code, and it will be found very convenient to students of the Southern flora to have at hand a reference work in which the oldest specific names and the proper citations are available. The treatment of the higher groups calls for serious consideration. The book represents almost the extreme limit of radicalism in generic segregation. New or little-known names stare one in the face on almost every page, and it is a distinct shock to find old friends like the various species of Oxalis wandering around amid the ponderous generic precincts of Ionoxalis, Monoxalis, Lotoxalis, and Xanthoxalis. The genus Oxalis is restricted to the *O. Acetosella* type, and the segregations give a good idea of the extremely slight characters which the author regards as sufficient for his purpose. Even if we grant that the caulescent species should be separated from the acaulescent, the wisdom of which is by no means certain, we have left a group which Dr. Small splits into three genera on such characters as the mode of division of the leaf-blade, the shape of the stigma, and the degree of adnation of the stipules. On this basis nearly all of the familiar natural genera, such as Pinus, Prunus, Cypripedium, and many others are split asunder and new generic names given to them. We can not apply to this process the explanations or the excuses that are valid in the case of the species; for generic delimi-

tation is purely artificial, even though idealists may insist that a genus is a *res naturae distincta* and not a concept.

In family nomenclature Dr. Small has adhered to strict priority, taking up the oldest name based on an accepted genus. Of course, on this basis not only names already superseded in recent manuals, like Cruciferae and Labiatae disappear, but many of those still in general use, such as Loganiaceae and Onagraceae, which are displaced for Spigeliaceae and Epilobiaceae respectively. We believe that the time is coming soon when it will be admitted that family names should be lifted outside the rules of priority which govern genera and species and that an arbitrary list will be adopted, the names to have the uniform termination *-aceae*, and to be based on familiar or important economic genera wherever possible.

We do not wish to criticise Dr. Small for following the dictates of his own judgment, and he is certainly entitled to credit for the fearless and thoroughly consistent manner in which he has worked out his ideas. It is a pleasure to find that the types of every new species described in the work are listed separately at the end, so that there need be no doubt about the determinations. In view of the fact that the work, on account of its importance and completeness, is destined to take its place as our standard Southern manual, we can only express the vain wish that Dr. Small had been guided, to a certain extent at least, by conservative principles in the treatment of genera. C. L. P.

VARIATION IN ANIMALS AND PLANTS. By *H. M. Vernon*. 8vo, pp. 415. New York: Henry Holt & Co., 1903.

The numerous data accumulated during recent years by the different students of variation have long been in need of general treatment and correlation. The study of variation in animals and plants has become so broad and diverse and the literature so great and scattered that a single student, even though he be a Darwin, can scarce encompass it.

The present work does not pretend to treat the subject in an exhaustive manner but to give a general account of our present knowledge and theories. The author, being a zoologist, is naturally more familiar with that part of the subject, and since he frankly admits the possibility of having omitted important botanical matter we can scarcely find fault with him, though there are matters which we should like to have seen discussed. It is to be hoped that the zoological and botanical data may be compiled by thoroughly competent specialists in each subject, then the coordination and generalization may be done with greater ease and satisfaction.

But to return to the book in hand. The subject is treated in three parts: Part I. The facts of variation; Part II. The causes of variation; Part III. Variation in its relation to evolution. The three chapters of Part I treat of the measurement of variation, Dimorphism, and discontinuous variation and Correlated variation. In treating of Bateson's discontinuous variation De Vries's somewhat similar mutation theory is discussed. The author evidently thinks neither of great importance in the evolution of species. In the seven chapters on the causes of variation much attention is given to Weismann's theory of the germ-plasm and his classification of blastogenic and somatogenic variations is adopted, though some of the difficulties in attempting such a division are evidently recognized. The author finds himself unable to accept Weismann's views entirely. Later on, in discussing the inheritance of acquired or somatogenic characters, a modification of the germ-plasm theory is proposed which accounts for the transmission of variations in various organs on the supposition that these organs produce a secretion which transmits to the determinants of the germ-plasm the necessary stimulus. Even with this important modification we can scarce accept the theory.

The several so-called laws of variation which have been promulgated from time to time are discussed. To us it seems a misuse of the term "law" to apply it to general statements based upon so few data. The two chapters of Part III treat of the action of natural selection on variations and Adaptive variations. Notwithstanding the great plausibility and apparent truth of the theory of natural selection, its experimental demonstration remains yet to be accomplished. The so-called proofs given are scarce of a convincing nature. The question of adaptive variations is also one far from settled. The author, in common with most other writers on the subject, seems to take for granted the entirely passive nature of animate organisms. In view of the known facts of variation it seems to us more probable that protoplasm possesses an inherent tendency or force which may produce variations in organisms, especially when the equilibrium between such organisms and their environment is disturbed. We perhaps rarely appreciate how numerous and delicate are the influences which effect this equilibrium.

The author's calm and dispassionate treatment of the whole subject is certainly commendable. His own important investigations form no insignificant part of the work. The book is a valuable addition to the literature of evolution and will be read with profit by all interested in the subject. C. L. S.

Breadfruit Tree; Livingston, Guatemala. After photograph by G. N. Collins.

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The Breadfruit.

BY HENRY E. BAUM.

THE breadfruit tree has for over a century occupied a unique position in the vegetable kingdom. Its farinaceous fruit serves the Pacific Islanders in lieu of the wheaten loaf of the western hemisphere, and along with the taro, yam, and banana furnishes the daily food of Oceanica. When the pioneer Europeans in the Pacific began to find cluster after cluster of tropical islands full of new things of ethnological and biological interest, nothing more worthy of mention was seen than this new fruit, or rather vegetable, which was produced in abundance practically all the year with no cultural effort on the part of the native beyond the original planting. From the time of its earliest authenticated mention it became an object of curiosity and inquiry, until as an indirect result of Captain Cook's splendid efforts between 1769 and 1777 in charting the unknown ocean an expedition was sent out by the English crown to obtain this valuable food-staple for his majesty's most loyal West Indian subjects. The mutiny of the *Bounty*, with the subsequent founding of the Utopian community on Pitcairn's Island by the reformed mutineer Adams, was the result of this first attempt at introduction into the American tropics; but success was spelled a few years later when Bligh, who also commanded the former expedition, made the trip safely from Tahiti in the Society Islands to St. Vincent and Jamaica in the West Indies, with a cargo of the precious trees. The existence of a record of a still earlier, but half-forgotten, introduction of the seeded fruit into the West Indies through a

captured French vessel, and a knowledge of the fact that the fruit failed completely to meet expectations as a source of food supply in its new home, renders its history fascinating; and this interest is still further strengthened when we reflect that it has not yet reached its decline, but has a potential future as a food plant in our newly-acquired tropical islands, in which it has never been properly exploited or appreciated.

BOTANICAL DESCRIPTION.

The breadfruit tree (*Artocarpus communis*) is botanically a member of the mulberry family (*Moraceae*), and is related to the Central American rubber tree (*Castilla elastica*) and to the common osage orange (*Toxylon pomiferum*) of temperate regions. The large tropical genus Ficus, which includes the fig of commerce, is also not far removed from it in botanical relationship. The tree attains a height of from 30 to 60 feet according to soil and climate, having a diameter ranging from one to three feet. The straight trunk with its rough yellowish or grayish bark rises clear from the ground for 10 or 15 feet before the first wide-spreading horizontal branches are met with; the top of the tree is spreading, in general outline roughly cone-shaped, the lower branches being the longest. The tree furnishes a good shade, which is sometimes utilized in coffee and cacao plantations as well as in gardens and about houses. The limbs are, however, too easily broken by the wind to make it a good plantation shade tree.

The leaves are large, alternate, and vary in size and shape on the same as well as on different trees. The size ranges from a foot to 2 or even 3 feet in length, and from 10 to 18 or more inches in width; in outline they are ovate, cuneate and entire at base, but with the upper part pinnately cleft into 6–12 more or less deep, rounded incisions.

The fruits are borne on solitary peduncles produced from the axils of the leaves near the ends of the branches. The buds are included within the same enveloping leaf. The male flowers are densely packed on a cylindrical or club-shaped fleshy catkin from 8 to 16 inches in length, yellowish in color, while the female flowers are grouped around a globular, fleshy receptacle, developing into a fruit morphologically analogous to the mulberry or strawberry and resembling in some varieties a greatly magnified sycamore seed-ball; two or three sometimes grow closely bunched (see plate). The shape, size, and markings of the fruits differ greatly, some weighing but one or two pounds, others as much as eight or ten pounds, and varying from 6 to 18 inches in diameter. In some of the seeded varieties portions of the stigmas remain attached to the mature ovaries, the fruit consequently presenting a muricate appearance, while in the seedless sorts the surface is almost smooth, being marked with

hexagonal areolae. The peduncles, petioles, and fleshy parts of the branches are all covered with very short, fine hair, harsh to the touch.

VARIETIES.

All breadfruits fall under one of two great varietal heads according as they do or do not mature seeds. Through long-continued cultivation a portion of the trees began to produce abortive seeds and to depend more and more upon human agency for the perpetuation of their kind, until the seedless sort was evolved. This variety is propagated by suckers from the roots, which are not especially hardy and require average care in transplanting, but with the usual agricultural skill displayed by the Polynesians were taken from group to group in the Pacific until the whole oceanic archipelago was occupied. In their new home the differentiation went on, until in some of the islands there are as many as twenty-five recognized local varieties.* While there can be no doubt but that some of these are identical with varieties in other groups, there is, nevertheless, no way of getting a tentative descriptive list until they are grown together or a general survey made.

The seeded breadfruit is almost entirely propagated by means of seeds, while the seedless or abortive sort is perpetuated by suckers from the roots, by branch and root cuttings, by various modifications of the process of layering, and by grafting.

RUBBER-PRODUCING QUALITIES.

The whitish viscid juice in which this tree, like all its relatives, abounds, is not the least important of its products, meeting with ready and constant use in the islands of the Pacific as a pitch and bird lime. The natives of Brazil, to whom the tree was unknown a hundred and fifty years ago, use its latex as a bird lime and a substitute for glue, it being entered in fact in Pearson's work on rubber substances under the name of "Brazilian bird lime." It is, however, in the South Seas that it becomes of actual economic importance, being about the only available gum for caulking the seams of canoes, which are in most cases not mere dugouts, but boats cunningly constructed from pieces of wood 18 inches to 5 feet in length and usually sewn together with the fiber prepared from the husk of the coconut.

In most lists of rubber-producing plants one member, at least, of the genus Artocarpus is generally given, and the breadfruit itself has been placed in this category. While it is certainly true that every part of the tree, even including the fruit until complete maturity is reached, abounds in a viscid milk easily obtainable by tapping, it is, however, extremely

* Christian records twenty-five varieties of the sterile breadfruit from Ponape in the Caroline Islands (Christian, F. W. "The Caroline Islands." London, 1899).

doubtful whether rubber of requisite quality and in quantities needed for commercial exploitation can be extracted. Like our milkweed and osage-orange, this tree no doubt contains a rubber-like principle which will appear after a reasonable amount of coaxing and a considerable expenditure of time, but after all scarcely worth the search. Mr. R. H. Biffin, who has examined the phenomena of coagulation in the latices of a number of plants, obtained the following results with that of the breadfruit:

"When diluted and centrifugalized it separates readily, giving a creamy white layer which dries to a resinous mass somewhat resembling gutta-percha. At the ordinary temperature this is quite hard and brittle, but if the temperature is raised slightly it becomes plastic, and at the temperature of boiling water it is soft and excessively sticky. The substance is soluble in carbon bisulphide, and insoluble in water and alcohol." *

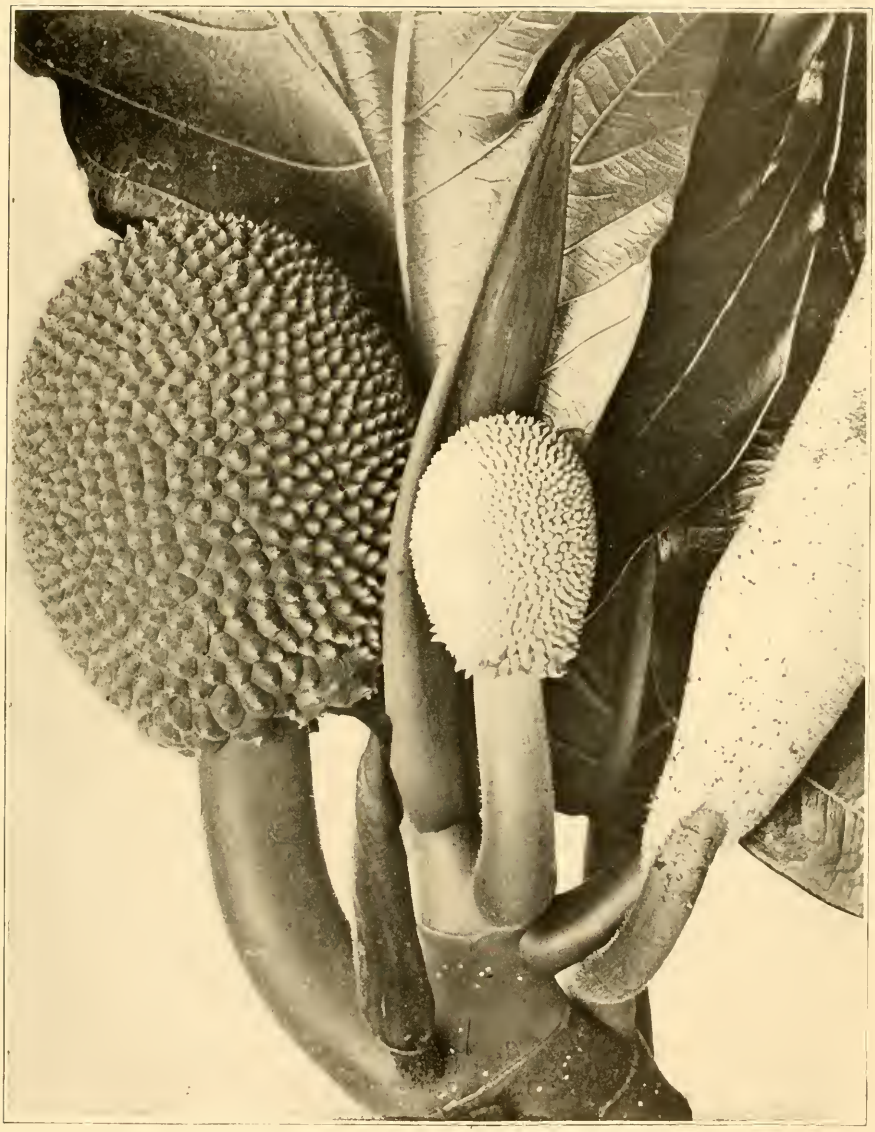
From this it becomes apparent that unless superior methods of extraction and treatment for its gum are found, the breadfruit will scarcely enter into competition with any of the commercial rubbers. Experiments recorded by Watt with the milk of the jak (*A. integrifolia*) were, however, more promising in that the rubber prepared from its gum was leathery, waterproof, and capable of removing pencil marks, thus fulfilling at least the requirement which gave rubber its name.

The breadfruit trees throughout Porto Rico are scarred with machete marks made by the natives for the purpose of obtaining milk, which they boil with coconut oil to obtain the thick, gummy substance used in caulking canoes and rendering bottles water-tight; this is also used as a bird lime before it hardens. The milk is used as a medium for paint in the Pacific islands, serving its purpose well, although for interiors it does not give as smooth a finish as paint prepared with oil.

NUTRITION.

When obliged to compete with the banana as a food staple the breadfruit has taken second rank on account of its comparatively inferior yield and slower growth; in the West Indies the banana played an important part in the cuisine of the explorers from the time of discovery, while the aborigines had, in all probability, previously developed an extensive acquaintance with that fruit, and accumulated traditions which were passed on to their Spanish conquerors. Therefore when King George III caused the breadfruit to be introduced into his West Indian islands in 1793, the banana had an overwhelming advantage in being already firmly fixed in the list of traditional food-plants and the usual conservatism of man in changing his food-materials prevented an extensive use of the fruit in those islands. Except in a few of the Pacific Islands where the successive ripening of different varieties of breadfruit keep it in season

* Kew Bull. 140, pp. 177–181. August, 1898.



Male and Female Inflorescence and Young Fruit of Breadfruit (reduced).
After photograph by G. N. Collins.

practically all the year, the banana, yam, and taro are the plants chiefly relied upon by the natives. That the breadfruit will not succeed as a food staple when obliged to compete with well-established cereals and root crops is generally acknowledged, but nevertheless, its utility as a farinaceous food of considerable nutritive value is generally underestimated.

From an analysis given in the Experiment Station Record of the Department of Agriculture (Vol. 12, p. 1076), it would seem that breadfruit contains more starch (25 per cent) and less water (25–30 per cent) than either the yam or sweet potato, but the presence of over 4 per cent of fibrous matter is a great handicap upon its attaining wide use as a vegetable, a disadvantage not shared by either of the plants mentioned. The amount of nitrogenous matter varies a great deal in the different analyses, but the presence of protein enough to justify the following statement is assured:

"The result of the determination of nitrogen in a portion of the pulp of the wasted fruit shows that this esculent must be classed with taro, yams, potatoes, and rice as essentially farinaceous in character." *

The chief obstacle to the commercial exploitation of the fruit is its lack of transportable qualities while in a fresh condition, owing to the fact that it ripens quickly and soon loses quality after complete maturity has been reached. The following quotation gives an idea of the Hawaiian fruit at maturity:

"When just ripe the fruit contains but little sugar. If baked in this stage, the bulk has a delicately fibrous texture, with a suggestion of 'lightness' that recalls that of a loaf of wheaten bread. The flavor is agreeable and characteristic, reminding one, however, a little of wasted chestnuts." †

Before ripeness is attained the fruit is dry and rather tasteless, but with complete maturity comes a sudden change of the starch content into sugar, accompanied by a rich peach-like aroma, but with no corresponding change in flavor; even this odor is lost in the process of cooking. According to Mr. Lyon the fruit in this over ripe condition is soft and gummy, but is preferred by many on account of its pronounced sweetness.

Captain Cook, while on his first voyage round the world, made the acquaintance of this vegetable-tree and has left the following rather extravagant record in his monumental folios of travel:

"Of the many vegetables that have been mentioned already as serving them for food, the principal is the bread-fruit, to procure which costs them no trouble or labour but climbing a tree. The tree which produces it does not indeed shoot up spontaneously, but if a man plants ten of them in his life time, which he may do in about an hour, he will as com-

* *Hawaiian Planters' Monthly*, 13 : 316. July, 1894. † *Ibid.*, p. 315.

pletely fulfil his duty to his own and future generations as the native of our less temperate climate can do by ploughing in the cold of winter and reaping in the summer's heat, as often as these seasons return ; even if, after he has procured bread for his present household, he should convert a surplus into money and lay it up for his children."

It was through such indiscriminately bestowed praise that the English were led to send expeditions into the Pacific to obtain the plant for the West Indian colonists, with the resulting reward of disappointment in its qualities.

CULTURE.

The tree grows best in hot countries having a considerable amount of atmospheric moisture and reaches its highest development in the tropical islands of the Pacific and in the Malay Archipelago, the original home of the fruit. Hawaii is the northern limit of cultivation in the Pacific, the tree growing there in abundance, but with little of the luxuriance attained in the southern islands, while on nearly the same level of latitude in the Presidency of Bengal in India, all efforts at cultivating it have been defeated by the stunting of the summer growth by the frosts of winter. Even in Madras, about a hundred miles farther south, the tree has not become thoroughly acclimated after years of cultivation. The West Indian climate is also not considered ideal for its culture, although it is likely that portions of the moist northern slope of Porto Rico are well adapted to the commercial growth of the breadfruit. The islands of the lesser Antilles and the shores of Central and South America bordering on the Caribbean Sea seem to afford congenial localities, but it is in Brazil that its highest development in the New World is attained. It is not out of the range of possibility that the fruit was brought by the Portuguese to their South American dependencies before the French and English supplied their West Indian colonies by importations from the east, as in Brazil a longer series of uses was developed than in any other part of America, and mention has already been made of its entry by Pearson under the name of "Brazilian bird lime." The mango was also brought to Brazil some years before it reached the West Indies. The cultivation of the tree in these regions, however, does not extend much beyond the coast, being restricted to the warm, moist coastal plains or inland places with similar climatic conditions.

The tree grows sparsely in our own country in Florida, where the fruit can scarcely be had in sufficient quantities to justify its culture for commercial purposes, although a few cases of successful wintering in the open air have been reported as far north as Manatee.

[TO BE CONCLUDED.]

Lianes.

By William Whitman Bailey.

By the beautiful, euphonious name "Liane," the peoples of Spanish origin in South America and elsewhere designate certain plants of peculiar habit. They may belong to different families; what unites them under a common designation is their manner of growth.

To understand this one must bear in mind the tremendous competition that takes place in a tropical forest. Every plant is put on its mettle to accomplish its utmost. It is met on every hand by opposition — unceasing, relentless.

Now, one prime object of every plant is to obtain for itself the requisite amount of light, air, and moisture. To do this it exerts every effort and resorts to every artifice. Sometimes the struggle, even on one of our own temperate waste-places, reminds one of a football tangle. Each individual attempts to emerge from the crowd at the most favorable place. Some wriggle around the ends, some push through by main force, while others twine around their fellows or even climb upon their shoulders. Woe to the individual that falls; it is crowded to death in the contest!

The lianes or twiners are, by botanists, distinguished from climbers. The latter are plants that possess tendrils or other prehensile organs by means of which they lay hold of a support. Good instances are the grape-vine, climbing by shoot tendrils; the clematis, by means of its petioles; the pea, by leaf tendrils; the green-brier, by its stipules, and the poison ivy and English ivy, by clinging roots. It would be interesting to know what determined evolution along these varying lines.

The Roxbury wax-work (*Celastrus scandens*), the Lima bean, and the hop and morning-glory, are all twiners. It has been observed of these that they all twine in a direction definite for each kind of plant. The morning-glory and the hop, say, reverse their direction, one moving with the hands of a clock, the other oppositely. Force will not, for any length of time, prevent this purpose.

The continuous heat and steaming moisture of the tropics stimulate the most vigorous and emulous growth. While the liane habit is comparatively infrequent with us,—for we do not include twining herbs in the term,—there it becomes extremely common and bestows upon the jungles a characteristic and striking appearance.

Kerner von Marilaun, one of the most graphic of recent botanical writers, and whose noble work has done so much to enrich our science, thus writes. His picture is too fine to be retouched by any lesser artist:

"When the beautiful word 'liane' is sounded, a whole series of splendid pictures stand out in strong relief from the twilight of youthful recollections. I see a dense, leafy canopy, lit by a stray sunbeam here and there, rise up like the columns of a spacious hall. On the forest floor the scanty green of shade-loving ferns covers the remains of fallen trees. Farther on a confused brown mass of tangled roots renders progress almost impossible. In contrast to these gloomy depths, how brilliant is the picture in the glades and on the margin of the primeval forest! Plant forms in indescribable confusion piled up into the thickest of hedges rise higher and higher to the very crowns of the giant trees, so that it is impossible to obtain even a glimpse into the pillared hall of the interior of the forest. This is the true and proper home of the liane. Everything climbs, winds, twines with everything else, and the eye in vain attempts to ascertain which stems, which foliage, which flowers and fruits belong to which. Here the lianes weave and work green draperies and carpets in front of the stems of the forest border, there they appear as swaying garlands, or hanging down as ample curtains from the branches of the trees. In other places they stretch in luxuriant festoons from bough to bough and from tree to tree, forming suspension bridges, even actual arcades with pointed and rounded arches. Isolated tree-trunks are transformed into emerald pillars by the covering of woven lianes, or more frequently become the centers of green pyramids over the summit of which the crown spreads out in verdant plumes. Where the lianes have grown old with the trees on which they cling, and the older portions of their stems have been long stripped of foliage, they resemble ropes stretched between the ground and the tree summits, and often assume peculiar and characteristic forms. Sometimes drawn out tightly, sometimes limp and swaying, they rise up from the undergrowth of the forest ground and become entangled and lost far above among the boughs. Many are twisted like the strands of a cable, others are wound like a cork-screw; and others again are flattened like ribbons, hollowed in pits, or shaped into elegant steps—the celebrated monkey ladders."

It must be remembered, too, that these plants, assuming so many and varied positions, are frequently gay with flowers, among which float the glorious, iridescent butterflies, or dart the gem-like humming-birds of the tropics. Many of the plants are of the bignonia or trumpet-creeper type, and present the gorgeous yellow or orange tubes of that brilliant alliance. Plants of the pipe-vine order, too, are apt to assume this habit, and offer to the observer their curiously shaped and colored flowers. But a liane may be of almost any seed-bearing family of plants, the name denoting a habit and not a blood relation.

The word had its origin in the French Antilles, but from its beauty and designation has found its way into most languages. Spier & Su-

The Cross-leaved Calabash Tree (*Crescentia alata*).

renne's French Dictionary translates the word "convolvulus," but, as we have seen, its application is oftener to woody twiners of other families. It has even been recommended in this broad use as a desirable scientific term. One reason that it has not been generally adopted arises from the fact of its general application—especially to woolly plants of peculiar habit. Any one will recall, however, many herbaceous twiners and climbers. To these, as we understand it, the term is no longer applicable. Thus to the morning-glory and scarlet runner we should never apply the name "liane."

Brown University.

Extracts from the Note-Book of a Naturalist on the Island of Guam.—X.*

By William E. Safford.

Monday, October 16.—Walked to the hill above San Ramon, behind Agaña. Fine view of the town, the harbor, and the ocean; made up my mind to buy the hill-top and erect a little rancho or summer-house upon it. Site stony and overgrown with a thicket of Triphasia bushes matted together with thorny wild yam vines; *Abrus precatorius*, which bears scarlet black-eyed seeds; and a leafless parasitic plant like dodder, called "maiagas" by the natives. Collected specimens of a species of Cestrum called "tintan China" (Chinese ink) with small white flowers and dark purple berries; *Clerodendron inermis*, a spreading shrub with pretty honeysuckle-like flowers, called "lodugao" by the natives; *Anona reticulata*, "the bullocks-heart," or custard apple, called "anonas" by the natives, with fruit not yet ripe; *Ximenia americana*, which bears a small yellow plum-like fruit, tasting like a crab-apple flavored with bitter almond; a weed-like plant (*Desmodium gangeticum*), called "atis aniti" (Devil's sweet-sop), from the resemblance of its leaves to those of *Anona squamosa;* and *Crescentia alata*, the calabash tree of the Pacific coast of Mexico.

The calabash trees were of the same general shape as those of *Crescentia cujete* of the West Indies, with dense long curved spreading leafy branches like that species, but with the gourd-like fruit much smaller, almost like an orange in shape and size, and with trifoliate leaves having long winged petioles. The common name in Guam for the tree is "híkara," a word of American origin, and in the Philippines it is sometimes called "hoja-cruz," from the resemblance of the shape of the leaf

* Continued from August issue. Begun in September, 1902.

to a cross. Picked up a number of old fruits lying on the ground ; their shell hard and brittle, containing a number of seed. In the allied West Indian species the shell is thicker and more woody, and the calabashes, which are often colored and engraved, serve as basins, cups, water-bottles, and even kettles in which water may be boiled several times before the calabash is destroyed. The fruits I picked up to-day could not possibly be used for anything else than cups for coffee or tea. When fresh they contain a bitter pulp which in Mexico is boiled with sugar and is used internally for diseases of the lungs. In the Philippines a decoction of the leaves is used as a remedy for blood-spitting.* The tree is interesting from the fact that it is *cauliflorial;* that is, its flowers are produced by adventitious buds in the thin greenish bark of the trunk and larger branches, as in the allied candle-tree of Panama (*Parmentiera cerifera*),† cacao (*Theobroma cacao*) from the seeds of which chocolate is made, and *Averrhoa carambola*, erroneously called "bilimbines" on this island. The flowers of the Crescentia are very much like those of Parmentiera and other trumpet-shaped Bignoniaceae. They are thick and fleshy, and in this species of a mottled brownish or purplish color, and have a disagreeable odor.

The wild yam of Guam (*Dioscorea spinosa*), called "gado," or "nika cimarron," is very abundant in the thickets of this island. It is often confused with *Dioscorea aculeata*, the cultivated prickly yam, here called "nika," which it resembles in the form of its broad heart-shaped leaves, with deep basal sinus, and its prickly stem. It is very distinct however in having its fleshy tuberous root-stock protected by a growth of hard, wiry, sharp, branching thorns around the base of the stem, which would undoubtedly save it from wild hogs and other root-eating animals. These branching spines, which have very much the appearance of compound fish-hooks, are in reality lateral roots which differ from typical monocotyledonous roots in their hard woody structure and the absence of root-caps.‡ The "nika" was cultivated on this island before the discovery. The "nika cimarron" is probably an introduction from the Caroline Islands.

The dodder-like "maiagas" proved to be the widely spread *Cassytha filiformis*, a wiry, leafless, twining, parasitic plant very common in many tropical countries, belonging to the Lauraceae. The leaves are replaced by small scales from the axils of which grow spikes of small six-parted

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* Padre Blanco. "Flora de Filipinas." Manila, 1837 : 491.

† See Schimper. "Pflanzen-Geographie auf physiologischer Grundlage." Jena, 1898 : 360. An excellent figure of the candle-tree is given to illustrate what the author calls "cauliflorie."

‡ See Hill, T. G., and Mrs. W. G. Freeman. "Annals of Botany," 17 : 413, on the root-structure of the allied African species, *Dioscorea prehensilis*, which is armed with similar spines. "The lateral roots form the actual spines. They only exhibit normal root-structures at the extreme apex ; elsewhere the phloem strands travel irregularly throughout the whole area of the stele, while the xylem is more or less restricted to the central region. The hardness both of the main roots and the spines is due to the thickening and lignification of the conjunctive tissue of the stele."

flowers. The plant takes root in the soil, but on coming in contact with another plant, it twines closely about it, sending forth root-like processes from the stem through which it thenceforth derives its nourishment from the plant to which it has attached itself, after which the original root dies, as in the case of the dodders.

Desmodium gangeticum, or rather *Meibomia gangetica*, as I suppose I must now call it, is a widely-spread tropical weed which I have collected before. This is the first time, I think, that it has been found in Guam. It is highly esteemed as a medicinal plant in India, where it forms one of the chief ingredients of the Hindu preparation *dasamula koatha*, so frequently alluded to in Sanscrit works. It is regarded as a febrifuge and anti-catarrhal.

Wednesday, October 18.—This day the Hospital Ship *Relief* came to anchor in the harbor of Apra, bringing as a passenger Mr. Stimpson, a civilian, who represents the Western Commercial Company of San Francisco. Mr. Stimpson has come to Guam with the view of establishing a commercial house, to buy lands, if it seems practicable, and to engage in any business enterprise which may seem profitable. At present most of the goods brought to this island come from Japan, whence they are brought in trading schooners. There is no reason why American goods should not find a market here and that the copra produced by this island should not find its way to the United States. This product—the dried meat of ripe coconuts—is the only article of export produced on the island. From it a valuable oil is extracted much used for making soaps and also entering into the manufacture of candles. Soaps made from coconut oil are especially valuable for use on board sea-going ships, as they produce a profuse lather in salt water. In Germany an excellent food product resembling butter is now made from it; but the secret of its manufacture is not known. The greatest difficulty is to neutralize the fatty acids and rancid properties of the oil. American flour and tinned meats would always be in demand on this island; kerosene would find a ready market; and the natives would be sure to buy quantities of cod-fish, which they esteem as a great luxury. It is doubtful, however, whether our rice could compete with that from Japan.

Saturday, October 21.—All the officers of the *Brutus* except the doctor and chief engineer were this day detached and ordered to take passage in the *Relief* for Manila. Lieutenant Robert E. Carmody of the Marine Corps, who has been stationed at Agaña, also leaves on account of ill-health. Several of the officers have been indisposed lately. Nearly all of them find the life here irksome and long for detachment. Carmody has been very home-sick and said this morning that he could hardly realize he was going; he couldn't believe he would get away from this island alive. He has been very efficient as recorder of our military court, and is well

liked by the men of his company; but unless a youngster is interested in some such specialty as botany or zoology, or finds pleasure in associating with the natives, or sets out to learn the vernacular, life on this island must seem very uneventful and dreary. During Carmody's illness Father Palomo has been very kind and attentive to him. This morning, after helping to pack his trunks, I went on board the *Relief* with him. We were overtaken by a shower when half way out to the ship and were drenched to the skin. After seeing that he put on dry clothing I asked the captain in charge of the ship to look out for his comfort and then went on board the *Yosemite*, where the Governor gave me a full outfit of underclothing and a suit of his white uniform to replace my own wet garments. When I left the *Relief* Carmody seemed to be in fine spirits at the idea of getting away from the island.*

This day I bought the lot back of my own, which faces on the Calle de Isabel la Catolica in the district of San Nicolas. Paid the money to Doña Dolores Flores in the presence of my secretary José de Torres, Don Felix Roberto, late Gobernadorcillo of Agaña, and Don Lorenzo Franquez, commanding officer of the Insular Artillery. The house on the lot I have just bought is very old and dilapidated. I shall remove it and extend my garden through to the next street. This will give me a fine plot for my nursery and I can plant some more of the seeds given me by Mr. Haughs of the Honolulu garden.

Sunday, October 22.—Took a walk along the beach to the eastward of Agaña with Don Gregorio Perez's son Manuel for a guide. My object was to find a good place for bathing, so that I might put up a bath-house and if possible buy a little spot on the edge of the beach for a seaside ranch. Inside the reef the water is very shallow for a great distance from the shore. Near the village of the Caroline Islanders the coral sand is very smooth and almost as fine and white as flour. A little farther on we reached the coconut plantation of Don Justo Dungca, the justice of the peace, where we found several houses cleverly constructed of bamboo, the work of one of the Filipino ex-convicts recently sent to Manila. This man when not drinking was a fine workman, and Dungca seemed to regret his loss. He says it is almost impossible to carry on work extensively owing to lack of labor. Magnificent coconut grove; trees thrifty and laden with fruit; many young trees recently planted. Don Justo is one of the most thrifty citizens of the island; he was the first man in Guam to send copra to Manila. He had seen prices of copra quoted in Manila papers, and realized that coconut planting would be profitable. I asked Don Justo to sell me enough land for a small ranch. He said he would be glad to let me put up a bath-house or summer-house on his

* We were very much shocked on the arrival of our next mail to hear that poor Carmody had been lost overboard when the ship on which he had taken passage was half way between Guam and the Philippines.

land, but he did not wish to sell one foot of it. He even put one of his pretty bamboo houses at my disposal. The beach is very good here for swimming, though the water is shallow. Took a bath. While in the water a rain-squall passed over. When I came out I renewed my proposal, but Don Justo declined to sell any of the land in this vicinity. In all my dealings with the natives I have asked them to treat me as though I were one of their own people, and never to feel obliged to grant me a favor because I am an official of the Government. Am glad that Don Justo took me at my word. This island has a peculiar charm for me. I feel that I must possess at least one grove of real coconut trees and a high point from which I can see the ocean and the palm-fringed beach. A little beyond Don Justo's ranch, saw several fresh water springs, called "bobos" by the Chamorros, spurting forth from beneath the salt water near the shore. The land of this region (Apurgan) is highly valued by the natives on account of the magnificent coconut groves upon it, which are four times as productive as those of the high land.

On our way back, climbed up on the mesa, or table-land, which forms the northern portion of the island, by means of a steep path up the face of the escarpment. This locality, called Haláguak, not well adapted for coconut planting, but pretty fair for growing corn, sweet potatoes and tobacco. Most of it, however, is pretty well exhausted, as the natives never attempt to fertilize it. The plateau bordered throughout nearly its whole extent by a steep, inaccessible cliff. Soil not deep, of a red color. Subsoil of disintegrated coral, below which is solid hard coral rock — an ancient reef which has been raised bodily to about a hundred feet or more above the sea-level. On the edge of the cliff many banyan trees and "ifils" (*Afzelia bijuga*). The long rope-like aerial roots of the banyans hung over the edge and served us as life-lines to climb up on the plateau.

This is the first time I have ever been on the mesa. Here and there patches of corn, a small rancho, clumps of old coconut trees, breadfruit groves, thickets of cycas, and in places whole fields of scrubby guava bushes, as great a nuisance here as in Hawaii. Am glad to find that there are no Lantanas or sensitive plant on the island. From time to time our way obstructed by impassable thickets of Triphasia and wild yams. Finding it impossible to make our way along the edge of the cliff, we took to the road which leads Agaña-ward, going out from time to time to the edge of the mesa in search of some good point from which to get a view of sea and headlands. Near most of the small ranchos we visited there were a few "kasoe" trees (*Anacardium occidentale*) and clumps of "daok" (*Calophyllum inophyllum*), which furnishes the natives with good tough wood for their cart-wheels and an aromatic resin which exudes from the trunk and branches when wounded. Under some large mango trees, which showed no signs of fruit, the natives had as usual

built fires, hoping to induce the trees to put forth blossoms. Sometimes the mangos fail to bear on this island for several years in succession. The trees are hard to propagate in Guam. If the seed is not planted when fresh from the fruit it will die. Seedlings do not bear transplanting well, and the natives have no idea of grafting or in-arching.

As we repeatedly made our way from the road to the edge of the cliff and back we were much annoyed by a coarse, hispid, ill-smelling mint which grows to a height of six feet or more and by a plant called "batunes" by the natives (*Hyptis capitata*), also a labiate, with heads of small flowers. At places there were thickets which had spread from old boundary hedges of sappan wood (*Caesalpinia sappan*), here called "sibukao"; "lemoncito" (*Triphasia trifoliata*); "tubatuba," or physic nut (*Jatropha curcas*); and a shrub like an acacia, with odorless heads of whitish flowers (*Leucaena glauca*). On the edge of the cliffs we saw many "dug-dug" trees (*Artocarpus communis*), as the fertile bread-fruit is here called, and a hard-wood tree called Ahgao (*Premna integrifolia*), belonging to the Verbenaceae, which yields a valuable hard durable wood used for construction. In open plains—abandoned fields—saw scrubby growth of cassias, crotalarias, and indigo. It occurred to me that these Leguminosae must be of benefit to the soil as nitrogen storers. No clover grows on the island, but there is a tiny Meibomia (*M. triflora*) which makes pretty patches of turf.

Made our way gradually toward Agaña, and at last came to a point where the land begins to slope down toward the district called San Antonio. Here we had a fine view of the city, the Government House, and the mountains to the southward and westward beyond Agaña. Found a little clearing in which corn had been planted and a small hut of bamboo thatched with coconut leaves. From this point there was a path going down the escarpment of the mesa, like a ladder over a ship's side, having life-lines of living banyan roots. Below was a luxuriant growth of young coconuts. This point struck me as a fine site, and I made up my mind to buy it if the owner is willing to sell it. His name, I was told, is Ramon Quítugua. He has another ranch on lower land, which is much more productive. This place is of very little use except for raising chickens, which are said to thrive especially on account of the abundance of grasshoppers and other insects in the weeds.

On my way back descended the steep path to the road below. Home and dined. After dinner the Major went with me to see the land. He seemed to be very much pleased with it and expressed his admiration of the view from it. The locality is called "Maite." In the evening I sent for the owner, who said he had no objection to selling it. It is a good place for chickens, but he said he has been unable to raise a garden, as they ate up the young corn as fast as it came up. This high land is

only good for corn, sweet potatoes and tobacco in the rainy season. There is no water nearer than the river. It might prove suitable for peanuts, which grow very well on this island, and appear to like a limestone soil. These would be a useful crop to alternate with corn.

Tuesday, October 24.—To-day the S. S. *Uranus* from Ponape and Saipan, with the Spanish commissioners on board, dropped anchor in the harbor. They have come to collect the remaining property belonging to the military branch of the Spanish government, in accordance with the treaty of peace. The president of the commission, Lieutenant-Colonel Cristóbal Aguilar, called at my office and explained to me his mission. Offered him every facility to carry on his work. Among the property are a number of old guns near the palace, mounted on decaying carriages, and old spherical projectiles which I do not think it will pay to carry away from the island. Our blacksmiths might utilize the tires of the gun-carriages for various purposes and convert some of the old muskets into machetes and plow-shares.

Received a communication from Fray Francisco Resano, formerly the *vicario* of the Mariana Islands, whom the Governor recently sent away from this island. He has been living on Saipan, one of the northern islands of this group, which the Germans have recently bought from Spain. Fray Francisco says in his letter that he has received orders from the Superior of his order at Manila to proceed to Guam on the departure of the Spanish authorities from Saipan, and that the padres stationed on that island are to remain there until other missionaries shall arrive. After their arrival he is to hand over the mission to them and then proceed to Spain. This, he says, is in compliance with the instructions of the bishop. He requests me to ask the Governor's permission for him to come to Guam, and if it be refused, to inform him by letter; so that if he be obliged to go to Manila it will be his excuse to the authorities. He says that the Chamorros have been very good and are all Christians, so that the bishop does not wish that they be abandoned spiritually, and it would not be pleasing to Rome to leave so many Christians without priests."

[TO BE CONTINUED.]

THE widespread character of the interest which has been awakened in forestry within the last three years is strikingly illustrated by the fact that Brazil, with her hundreds of thousands of square miles of forests, is becoming alarmed at the unscientific methods in use in that country; and in a recent issue of the "Sao Paulo Boletim da Agricultura" there is given a resumé of the past, present, and future aspects of the case, with a warning note ringing through it all. O. W. BARRETT.

Briefer Articles.

THE LEUCOCRINUM.

THIS plant, as its name signifies, is a little white lily, sometimes called sand lily. The Colorado child calls it a crocus and it certainly resembles this European wild flower, but it is daintier and is rich in perfume. It lies on the grey alkali plain like patches of freshly-fallen snow, but the sun does not wither it like the primroses, for it lasts the entire day. To press one and keep its white sheen, dip quickly into boiling water and then carefully lay between sheets of blotting paper. Treated otherwise it blackens in drying.

At blossom time the ovary lies just above the ground, the long tube of the calyx extending several inches above. When in June I sought it to gather seeds, no flower-stalk could be seen, only the grass-like leaves. By digging down several inches below the surface the ovaries were found well perfected as large as garden peas, but in nine-tenths of these something had bored a round hole and eaten or taken away the three morning-glory shaped seeds. Had ant been fed or had an egg been laid in the blossom to hatch and eat its way out?

The few seeds I gathered required much digging for, and none of them germinated, though tested in Colorado, North Carolina and Wisconsin climates. MRS. A. E. GOETTING.

Cincinnati, Ohio.

ORCHIDS IN THE TROPICS.

BEYOND the marshes lie a region of quintas (small farms), which are chiefly devoted to the raising of orchids for the European trade. What an easy and pleasant employment, and how profitable, remembering the "fancy" prices that are paid for the rarer varieties. We stopped at one of the orchid ranches, whose English proprietor, a "younger son," who came here practically penniless, is recouping the family fortunes in England and enabling the titled brother to keep up an estate which his ancestors loaded with mortgages. His methods seem very simple, but with true British uncommunicativeness he did not tell us much about them. He showed us his nursery, where were several thousand small wooden boxes, in each of which is nailed a stick, the latter wrapped with sphagnum moss, among which an orchid plant was tied. The lovely epiphytes grow wild all over Colombia, in an infinite variety of form and coloring. The growers send natives out into the woods and hills to collect

them, paying from 1 cent to 30 cents for each plant, and selling the same in Europe at prices ranging between $50 and $500 per plant — sometimes even thousands of pounds sterling for a particularly scarce and long-sought species. Like opals, these curious freaks of the floral kingdom seem to have no set price, but are valued according to the passing craze of wealthy collectors. There are other quintas in the vicinity of Bogota where fruits and vegetables are raised for the markets of the capital; and small farms, green with wheat, corn, alfalfa, and clover. Nothing tells more truly of the even temperature of the locality than the various stages of the corn fields, proving that seed time and harvest are entirely in the hands of the cultivator. One field is being plowed and planted; another by its side has a fine crop of full-grown corn on stalks higher than the head of a man on horse-back; while perhaps the next field shows the green blades just shooting out of the ground. It is the same way with wheat. Here are newly-sprouted fields, like emerald velvet; close by are others in full head. Some are being cut by women, with short sickles. In many places the primitive threshing floor is in operation.—*Fannie E. Ward in the Philadelphia Record.*

THREE ECOLOGICAL PROBLEMS.

How is it that the Taro (*Colocasia antiquorum*, var. *esculenta*, Schott.), which probably originated in Tropical America, has but one (or possibly three) varieties in that region while it has about forty horticultural forms in Hawaii and other Polynesian islands? Is it because, being one of only a few food plants in the latter region, it received much more attention and was purposely or otherwise bred into numerous forms, while in its old home, in the presence of superior rivals, it was neglected or at least not highly appreciated?

How does it happen that the cocoanut, in all probability a native of northern South America, as shown by Mr. O. F. Cook, has only two or three varieties in the Western Hemisphere, while in the Orient, where it is the sole representative of the large genus, the species is broken up into upwards of thirty varieties and forms?

Why have the eight or ten cultivated kinds of Yautia or Tanier (*Xanthosoma* spp.) never left the land of their birth, the Caribbean region, during the two hundred or three hundred years of their domestication, notwithstanding the fact that they are propagated more readily than the Taro and are also more easily grown, more prolific, and more delightfully edible?

O. W. Barrett.

Mayagüez, Porto Rico.

The Wild Flower Preservation Society of America.

SOME PLAIN TRUTHS.

THE rage for golf has done a good deal to exterminate wild flowers in the environs of New York and other eastern cities. In a number of haunts of the bird-foot violet on Staten Island this most exquisite of the native violets has been exterminated by the greens and by the players trampling to and fro. This violet is still abundant, however, around Hempstead Plains and near Garden City, whence the bicyclers come in with great bunches of it in springtime.

The building of fine country places by wealthy people is, unfortunately, the means of exterminating many wild flowers in spots where, of all others, they should be preserved. A certain wealthy New Yorker bought one of the loveliest sites on Long Island — lovely not only for its view in all directions, but for the woodland beauty of the land, slowly matured through generations. There were beautiful masses of Virginia creeper, draping the trees with a tropical luxuriance of foliage. The dogwoods made spots of snow through the woods in May. There were red cedars and sweet-woods and masses of viburnum, clumps of sumac to crimson in the fall, and little natural ponds full of water lilies and pickerel weed. He razed that site, combed it with a fine-tooth comb, drained the ponds, cut down native trees and vines, uprooted the flowers that lived among them — destroyed what it would take two hundred years to put back. To him it was only a mess of weeds, to be removed to make room for his fine lawns and formal hedges.

In happy contrast to this is another place near the Meadow Brook Hunt Club. This estate has been developed according to its owner's individual taste, and while laid out in formal fashion close to the house, the grounds are full of delightful woodland nooks. She has kept the scarlet cardinal flowers standing like points of flame in the darkest woods, the American holly, masses of native ferns and shrubs, the red maples that grew wild on the place, and the water lilies and pickerel weed.

At Lakewood there are many beautiful places in which bits of the wild lake shore have been preserved in all their native loveliness. Private schools and boarding houses have displayed admirable wisdom in this respect. In the Vanderbilt mausoleum, on Staten Island, on the contrary, the opposite taste was displayed. A strip of natural hillside, thickly sewn with wild flowers, was destroyed, and the grounds laid out in formal style.

One very well-known New York man, who has a country place not far from the city, out of pure love of beauty and a desire to afford pleasure to the public, has planted the roadside with wild and cultivated flowers, and lets masses of trailing flowers and vines from his own private grounds fall over the wall that edges his place upon the public side. The sightseers have appreciated his kindness by rifling plant and shrub of every blossom. And it is not the vulgar masses who do this, but people driving in their own carriages. He has frequently met them, driving away with their carriages heaped high with his flowers, planted for the benefit of the whole public, but not for that of any particular person, particularly when the person is able to buy his own flowers. The last remark applies to those women who go up to Bronx Park, and seeking some obscure corner where they are safe from observation, deliberately dig up ferns for their jardinieres. Any person who is able to have a jardiniere is able to buy a fern for it. And a fern transplanted from the woods to an apartment house in this brutal fashion will not live anyway. Ferns that will live should be secured from the greenhouse, where the proper varieties for the purpose have been acclimated, and where the salesman will give proper information as to the care of the plant. If women are the offenders as to ferns, men destroy a great many more plants by starting fires with their castaway matches. Many fires are started in the Botanical Garden, and many plants destroyed, by the carelessness of smokers who walk there when the ground is covered with dry leaves.—*Minnie J. Reynolds in the New York Times.*

ANNOUNCEMENTS.

As noted in the editorial column of this issue of THE PLANT WORLD, Mr. Pollard, the Secretary of the Society, will soon leave the U. S. National Museum, to take up his new duties in Springfield. His address will remain as heretofore, 1854 Fifth Street, Washington, D. C.

Next month, in accordance with the requirements of our Constitution, the list of official nominations for members of the Board of Managers will be published. Members will then have the privilege of suggesting additional names, which, if endorsed by a sufficient number, will be added to the official ballot. Full details will be given when the list is published.

A number of our members are still several months in arrears for dues. The publishers of THE PLANT WORLD have been lenient in this matter during the first year of the Society's existence, but they now positively announce that the journal will not be sent to these members until the arrearages are paid in full.

Editorial.

THE discomforts of an annual attack of hay-fever, which seizes one of the occupants of our editoral sanctum with relentless regularity, moves us to make a few remarks anent the subject of weeds in city vacant lots. "Weed," like "dirt," is an elusive word to define. If dirt is matter out of place we may ask why a weed is not a plant out of place. The obvious answer to this is that there are some plants, such as the ragweed (*Ambrosia*) for which it is hard to conceive a useful place in the economy of nature. Besides being a pest of cultivated fields, the ragweed takes possession of the roadside and all out-of-the-way corners; and when its yellow pollen begins to float in the hot, dog-day atmosphere of late August it brings terror to the heart and coryza to the nose of the luckless victim of hay-fever.

Almost all the weeds of vacant lots resemble ragweed in being tall and coarse in habit, so that when growing in a mass they form a shelter for dirt of all kinds, besides harboring insects. Many of them are unpleasantly scented, and none are of any possible value; so that it would seem a simple matter to insure their extermination by municipal ordinance requiring the owners of these lots to have them mowed at fixed intervals during the summer.

MR. CHARLES L. POLLARD, of our editorial staff, and the executive officer of THE PLANT WORLD COMPANY, has accepted a position on the scientific staff of the G. and C. Merriam Company, a publishing house of Springfield, Mass. There will be no change in the management or place of publication of THE PLANT WORLD. Mr. Pollard's business address in connection with this magazine will be, as at present, in Washington, though he will be in residence in Springfield for the next few years. He leaves the U. S. National Museum October 1.

DURING the past month two more persons prominent in nature study work have passed away. With the death of Miss Sadie F. Price, of Bowling Green, Ky., the botanists of the country have lost a good friend and a faithful correspondent. Miss Price was always quick to notice interesting features of plant life, and her zeal in furnishing material to professional workers is attested by the species that have been dedicated to her in grateful recognition of her services. Among these discoveries may be mentioned *Apios Priceana* Robinson; *Oxalis Priceae* Small; and an unpublished violet.

Through the courtesy of Miss Price's sister we have received a manuscript entitled "Kentucky Oaks," with numerous drawings, probably

one of her latest works; this we shall publish in an early issue of THE PLANT WORLD.

DR. CARROLL E. SMITH, of Syracuse, N. Y., one of the regents of the State University, and prominent as a journalist, also died within the past month. Dr. Smith was greatly interested in plant life, and was well known and beloved among the Syracuse botanists. On the occasion of Mr. Pollard's lecture last May under the auspices of the Wild Flower Preservation Society, Dr. Smith presided, and aided the work in every possible way. His death is a distinct loss to his city and to the State.

Miscellany.

YARROW or milfoil, here a common roadside weed, is sown in Germany purposely for sheep pastures. Its aromatic leaves, resembling wild carrot, are very enduring and nearly evergreen. In the large principal cities small bunches of yarrow are sold, as we use here fennel and such like.—*Hartford Times.*

WITH the intention of fixing upon a proper forest policy, California has undertaken this year, with the help of the Bureau of Forestry, a comprehensive and detailed study of its forests. The State legislature recently appropriated $15,000 for the study, the condition being that it should be carried out by the Bureau of Forestry, and that the Bureau should bear half the expense. The task of securing all the information necessary for a forest policy for California the Bureau of Forestry has begun this summer. The work is of such magnitude that several years will be required to complete it, but valuable and suggestive results will be secured each year.

MR. G. W. OLIVER, expert in the U. S. Department of Agriculture, has just published a bulletin (Bureau of Plant Industry, No. 46) on the propagation of tropical plants. He discusses in successive chapters the mango, the loquat, the fig, the tea plant, and Manila hemp, giving full directions in each case. It is apparent that there are many localities in the Southern States where the cultivation of these crops may be profitably undertaken.

WE ARE in receipt of an announcement of the publication of a new "Standard" Dictionary, thoroughly revised and enlarged by about 17,000 words. The subject of botany is given much prominence, as it is recognized as one of the most progressive of the natural sciences. The new definitions in botany were prepared by Dr. W. Nevin Geddes, who assisted Dr. F. H. Knowlton in this work for the original edition.

The Home Garden and Greenhouse.

ELEMENTARY LANDSCAPE GARDENING.

By Charles Louis Pollard.

One of the first questions that arises to harass the suburban householder after the masons and carpenters have finished their work is how to lay out his grounds so that they may afford him the best satisfaction. So much depends on the situation, the size of the plot, the natural surroundings, the architecture of the house and the tastes of its owner that the science of landscape gardening usually aims to deal with individual cases according to their own special requirements. Still there are certain broad principles which may be very generally applied, and the object of this paper is to show how they may be followed in laying out a small homestead. The elaborate and extensive country-seat will not require these hints, for it should be intrusted to the professional landscape architect.

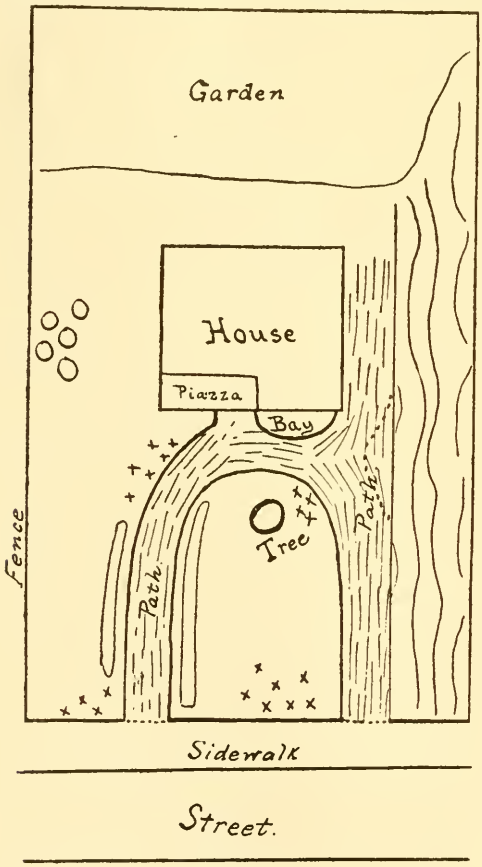

Figure 1.

If a house is to be built, it is well to study the conditions of the place beforehand. By a judicious location of the building it is often possible to improve greatly the appearance of a certain slope or grade. The position of the standing timber, moreover, is of great importance; for unless the lot is located in the midst of a woodland it is unwise to remove many trees. As a general rule it may be stated that a house should occupy the central portion of a rectangle if the ground is level and open, but should be placed at one side, on a knoll or ridge, if the area presents great diversity of elevation or is heavily timbered.

The site having been selected, little more can be accomplished except in draining and grading, until after the completion of the house. It is useless to set out plants until proper attention can be given to the soil; and the accumulation of scraps and rubbish of all sorts, refuse from sand and mortar beds, etc., usually renders it impossible to do work of this kind. The top soil should always be removed from the area on which the house is to be built, and carefully carted to one side; every pound of it will be needed later.

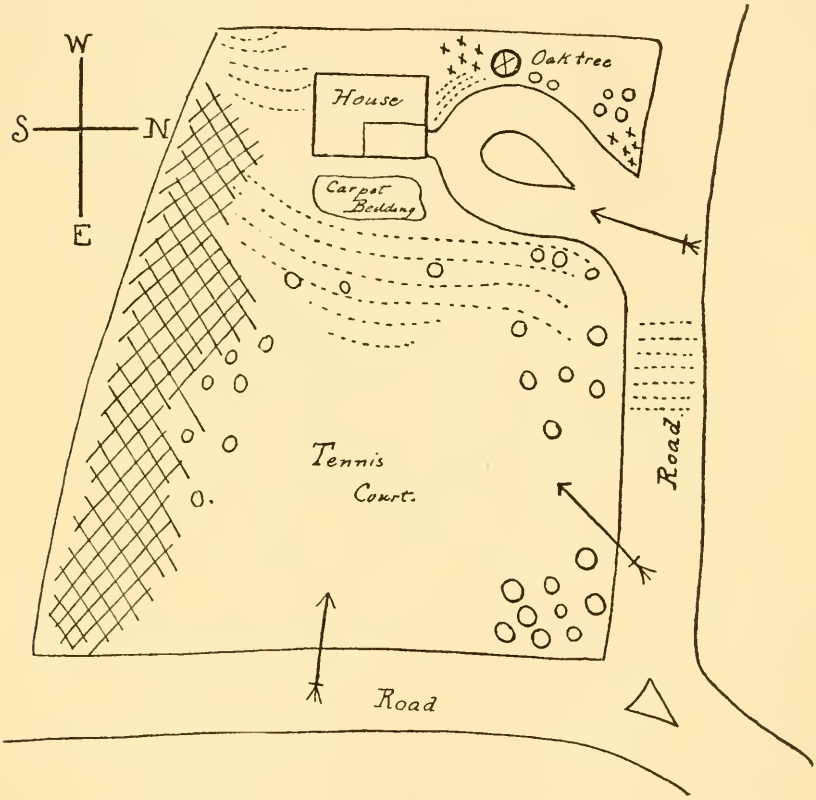

Figure 2.

After the house is practically completed and the ground cleared of all litter, consideration should be given to the necessary walks and driveways. In a small place these should be limited to what are absolutely necessary to reach the house from the street; and the principle laid down in most works on landscape gardening, that the walk should follow the most direct course from street to house is a sound one. Nothing makes a place look more grotesque than a series of tortuous footpaths extending in every direction.

In a rectangular piece of ground, where the house occupies the center

of the plot, the footpath should lead from the center of the front line direct to the door of the house, bisecting the grounds evenly. Where a driveway is needed, the best arrangement is that shown in Fig. 1. Here there is no separate footpath, and the driveway describes a simple ellipse, one arm having an extension to the rear of the house. This diagram also illustrates the location of the main building in the center of a rectangle. In Fig. 2 we have a tract of land that is not only heavily wooded but heavily graded, as shown by the dotted contour lines. To have placed the house in the level open space at the south side of the lot would have ruined all artistic effects, and would have subjected the house to dampness on account of the steep hill behind it. Therefore the slope near the west line was graded, and a long sweeping terrace formed, giving space not only for the building itself, but for a display of carpet bedding along the edge of the terrace and a driveway loop on the north side.

In a heavily wooded lot great care should be taken to thin the trees with a definite purpose in view. The tendency is often to swing the axe almost indiscriminately, and some of the finest shade trees are thus wantonly sacrificed. In Figure 2 the ground was originally almost a forest. The first operation was to remove all dead or dying and a number of badly shaped trees; and thinning out was continued until there were three distinct vistas through which the house could be seen, indicated by arrows in the diagram. On the terrace only enough trees were left to give shade to the house, while the forest on the south side was left almost unbroken.

Where the ground is open, it is of course necessary to plant trees and shrubs. In Figure 1 the cross-marks indicate the most desirable situations for low growing trees or groups of shrubs such as Forsythia, Weigelia, Hydrangea, Viburnum and others. Shrubs should almost always form groups, and the principle of compensation, so important in artistic photography, must be considered in this connection. In a picture a deep shadow or prominent object at one side must be balanced by something of equal value on the other. So if we wish to secure decorative effects around our houses, we must not burden one side of the yard with a mass of shrubbery while the other contains merely a few low-growing plants. A study of the diagram, noting the position of these groups with respect to the large tree in the center, the pathway, and the house itself, will serve to make this point clear.

Along the fence, marked by wavy lines, is intended to be what is technically known as the hardy border. This contains exclusively perennials, which take care of themselves, and the bed requires only surface digging and an annual mulch of manure. The main thing to remember in laying out a border of this kind is to place the tall and stiff-growing plants at the back, the lower and more bushy ones in front of these, and the dwarf edging or border plants in front. Consult a reliable catalogue, and con-

sider carefully the periods of bloom and the combination of colors. You may set a purple larkspur next to a bright blue campanula, if—and it is a very big if—you are sure that the two will bloom at different seasons. Group each kind by itself, and have enough so that the eye may readily differentiate the various types of flower. A bed containing a hundred varieties, one plant of each, would not possess half the attractiveness of one containing only fifteen varieties, each represented by half a dozen good plants. Remember also that in this bed you do not care for formal effects but for masses of color and graceful foliage. But if you lay out a bed in the center of the lawn, such as that occupying the center of the driveway loop in Fig. 2, it is essential to bear in mind the formed surroundings, and to select plants of rather stiff habit and neat appearance. Nothing is better for such a bed than the various hothouse foliage plants, with the addition of a few orchid-flowering cannas in the center and a row or two of coleus near the margin.

There are some plants, like the sweet pea, which, although noted for the beauty and delicacy of their flowers, are sadly lacking in attractiveness so far as their stems and herbage is concerned. This applies also to blossoms of hideous coloration, like the zinnia. The proper place for all of these is in the garden at the rear of the house. In fact, if cut flowers rather than ornamental effects are desired, all flowers should be grown in a corner of the vegetable garden, where they will thrive usually much better than in the particular nooks and corners provided for them. But that course would prevent the application of the principles of landscape gardening, which depends fully as much on flowering herbs as on shrubs and trees for its best effects.

A Floral Wonder.—As an example of the reliability of newspaper information on botanical subjects, we reprint the following without further comment:

A CHAMELEON ROSE BUSH.

Out in Greendale there is a rose bush that is related to a chameleon, and this year blooms forth in a new tint. For two years past the bush in question has produced bright yellow roses, but yesterday, apparently without reason, the bush wore a number of bright pink roses. The bush is the property of Mrs. L. E. Johnson, 3 Wildey avenue.

While Greendale is known to be the home of freaks of many kinds, this is the limit. No explanation can be thought of to cover the case. Last fall a peony was set out about two feet from the rose bush. This peony bore red flowers, but the theory of hybridizing is done away with, as the rose bush had ceased blooming when the peony was set out. Mrs. Johnson and all the neighbors have viewed the bush with interest, and are at a loss to explain the change.

As far as is known, there has been no pollen from other plants exchanged with that of the roses of last year, and at that it is strange that there is no trace of the original yellow in the roses borne by the bush.—*Worcester (Mass.) Telegram.*

Book Reviews.

OUR NORTHERN SHRUBS. By *Harriet L. Keeler*. New York: Charles Scribner's Sons. Crown 8vo, pp. xxx, 521, with 205 plates from photographs and 35 illustrations from drawings. $2.00 net.

This book is a companion volume to Miss Keeler's "Our Native Trees," which, as we have heretofore stated in these columns, is the best work of its class. The present volume has been prepared with the same care, and the discussions of each species show that the author has more than a passing acquaintance with the various species listed. It is a pleasure to note that in her technical descriptions Miss Keeler is thoroughly accurate, and never sacrifices scientific truth to the demands of so-called popular language. Yet the descriptions, with the aid of the glossary, can be understood by any one.

We regret that the photographic plates are not quite equal to the standard set by those in the companion volume "Our Native Trees." This is the more unfortunate because the photographs themselves are in general excellent, and by the use of a heavy coated paper they would have been much more effective. C. L. P.

PLANT PHYSIOLOGY. By *George James Peirce, Ph. D.* New York: Henry Holt & Co. 8vo, pp. vi, 291, figs. 22. $2.00.

As Professor Barnes has pointed out, no student of plant physiology ought to get all his information from one source, and the fact that Professor Peirce, of Stanford University, has added another to the excellent text-books of plant physiology now in the field will in no way interfere with the wide circulation it deserves to have. The book is based on lectures given by the author, and it is obviously intended more as a work for contemporaneous reading and reference rather than as a laboratory manual. All laboratory directions are omitted, and the author states in the preface that the manual and text-book are suited to entirely different needs.

The work is comprised in seven chapters, the first being devoted to introductory discussion, and the remainder to the following topics: II, Respiration; III, Nutrition; IV, Absorption and Movement of Water, Food Distribution; V, Growth; VI, Irritability; VII, Reproduction. In treatment Professor Peirce follows Pfeffer rather closely, to whom he makes ample acknowledgment in the preface. Aside from some minor inaccuracies pointed out by other reviewers, our only adverse criticism would be that the book is somewhat discursive, and that the subject-matter might be more clearly arranged. But this is the natural result of basing

the text on lectures, which are necessarily more general in scope. We judge that the student of plant physiology will find in it many new suggestions and much practical information. C. L. P.

MOSSES WITH HAND LENS AND MICROSCOPE. A Non-technical Handbook of the More Common Mosses of the Northeastern United States. By *A. J. Grout, Ph. D.* Part I, 4to, paper, pp. 1–86, with many illustrations. Published by the author. $1.00.

Dr. Grout is to be congratulated upon the appearance of the initial portion of this superbly printed work. It is intended as a manual of the most popular type, by means of which any one can learn to recognize the more common of our mosses; and it contains in convenient form practically all the information that the young student is apt to require. Among the excellent features of the book we notice particularly the glossary of bryological terms, with numerous text-figures to emphasize the definitions; also the pages dealing with the life history and structure of the moss plant. The plates, of which there are a profusion, are beautifully printed. Many of them are from the famous "Bryologia Europea."

Interest in the forthcoming parts of this work will not be confined to bryologists, and we trust it will take its place as one of the standard books to which the adjective "popular" can be truthfully applied. C. L. P.

SPRAYING CROPS—WHY, WHEN AND HOW. By *Clarence M. Weed, D. Sc.* New York: Orange Judd Company. Illustrated, 150 pages, cloth. Postpaid, 50 cents.

The practice of spraying is now recognized as an essential part of the work of the successful fruit-grower. Professor Weed's little manual on "Spraying Crops" has been generally recognized, for the last ten years, as a most useful guide to spraying operations, the book having had an extraordinary sale in its three previous editions. The present fourth edition has been rewritten and reset throughout to bring it thoroughly up to date, so that it embodies the latest practical information gleaned by our fruit growers and experiment station workers.

After an introduction which discusses the general principles involved in spraying, the book is divided into four parts, the first dealing with spraying the larger fruits; the second with spraying small fruits and nursery stock; the third with spraying shade trees, ornamental plants and flowers; and the fourth with spraying vegetables, field crops, and domestic animals. In each part the principal insect and fungous enemies of the various crops are discussed, and the best methods of combating them are clearly described. J. R. T.

THE ROLE OF DIFFUSION AND OSMOTIC PRESSURE IN PLANTS. By *Burton Edward Livingston*. Decennial Publications of the University of Chicago, 2 Ser., Vol. III, pp. 149. Chicago, 1903.

In the work before us Dr. Livingston has given an excellent and much-needed general treatment of the diffusion and osmotic pressure in plants. The work is divided into two parts: the first treats of the physical phenomena bearing on the subject, such as matter and its states, diffusion, liquid solutions, ionization, and osmotic phenomena. Part second discusses the physiological aspects of the subject, as turpidity, absorption and transmission of water, absorption and transmission of solutes, and the influence of the osmotic pressure of the surrounding medium. This part of the work contains also the results of the author's own investigations.

The treatment of the whole subject is clear and concise and forms an admirable addition to the literature of physiological botany. It will be found indispensable to all students along these lines. C. L. S.

NOTICE.

Hereafter, if *The Plant World* comes to you in a red wrapper, it is an indication that your subscription has expired, and that you must renew promptly if you wish to keep your files complete.

Breadfruit (*Artocarpus incisa*), from "Cook's First Voyage," Vol. II, 1773, plate 11.

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The Breadfruit.—II

BY HENRY E. BAUM.

THE breadfruit is a common tree in the Malay Archipelago, having its original home, according to De Candolle, in the Sunda Islands, the group having Sumatra at its western end and Timor at its eastern, or in the Moluccas, which lie to the northeast of this group. The sterile variety is to be found side by side with the seeded in this labyrinth of islands, and the tree has been reported by Rumphius as growing wild on some of the Sunda Islands. The seedless variety was, however, carried to the Pacific islands at an early date, and when the first Europeans made their way into the South Sea it was found under cultivation on all the islands from the Malay Archipelago to the Marquesas group and from the Low Archipelago in the southern hemisphere to the Hawaiian Islands in the northern. The open-boat journeys of the Polynesians in their peopling of the Pacific islands are marvelous from the point of view of seamanship alone, but become even more wonderful when the record of their agricultural introductions is considered. Probably a hundred species of plants were introduced into Hawaii by the Polynesians, and as a majority of their principal food-producing plants were propagated by cuttings alone, the difficulty in successfully carrying them across a wide expanse of ocean in open boats is obvious.

The tree has at present, however, a cosmopolitan distribution in the tropics as the result of the introductions and care of civilized man,

although it does not flourish equally in all parts of the warm portions of the earth.

As an indication of the distribution of the breadfruit in former times may be mentioned the records of its occurrence in the geological formations of Greenland and of its discovery near Denver, Colorado, while a third instance has been reported from California.

HISTORY.

While the home of the breadfruit in the Asiatic islands has never been seriously questioned, and the fact of its extensive pre-Magellanic distribution among the islands of the Pacific is undoubted, nevertheless it seems pardonable to briefly trace the growth of knowledge regarding this vegetable curiosity among Europeans.

The breadfruit was in all probability seen by the Portuguese and Dutch pioneers in the East Indies in the early years of the 16th century. But as it was obliged to compete with the spices and other marketable tropical products of the Moluccas, it did not attract sufficient attention to be noticed in the published accounts of their voyages. Although the fruit is supposed to be native in the Sunda Islands and the Moluccas, points reached by Europeans at an early date,* nevertheless it does not obtain there any semblance of the importance assumed in the oceanic islands to the east, where it forms one of the principal articles of diet of thousands of natives. In the East Indies, on the other hand, it is overshadowed by a long series of quicker growing and better tasting food products.

Turning to the Spanish and English voyages from the east it is interesting to note the absence of mention of the breadfruit in the journal of the Chevalier Pigafetta,† who accompanied Magellan during the first circumnavigation of the world. Guam, in the Marianne Islands, was visited during this voyage. They observed in the canoes of the natives various products, such as coconuts, bananas, etc., common to the Pacific, but no breadfruit. Drake, the second circumnavigator, visited the same group but did not touch at Guam. He likewise failed to report seeing the fruit, as did also Cavendish, the next to essay circling the globe. From a study of the various accounts of these voyages, however, it may be ascertained that in all three cases the visit was made during the months in which the fruit is not in season in that group.

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* Between 1505–9 an Italian traveler, Varthema, is supposed to have reached the Moluccas and to have told, while on his way back to Europe, the great Indian Viceroy of Portugal, D'Albuerque, of the riches of Ternate and Tidor. In consequence of this information Antonio d'Abreu was dispatched in 1511 to reduce these islands to the commercial domination of the Portuguese trader. This expedition was not immediately followed up and the Spaniards and Dutch found their way to the Spice Islands in time to enter rival claims for possession. The Dutch, however, by persistence and good management got the upper hand, and by the end of the 17th century were the undisputed masters of these fruitful islands.

† "The First Voyage Around the World by Magellan" (Hakluyt Soc. Ed.). London, 1874.

The records of the early voyages of the Spaniards across the Pacific from New Spain to Asia are largely traditional, although fairly well authenticated by circumstantial evidence. It is not, however, until 1567, with Mendana's discovery of the Solomon Islands, that we can begin to trace with any accuracy the voyages into that mysterious waste of waters. A full account of this first attempt to discover lands in the Pacific would mean a review of Peruvian folk-lore in which the natives had kept alive traditions of inhabited islands to the west,* and also follow the adventurers on their sail of 3,000 miles to the Solomons. No notice of the breadfruit was made there, but on their way home a low coral island, probably an outlying northern member of the Marshall group, was visited, the Spaniards finding "some of the natives' food, which was very different from those of the islands [Solomons], and of a bad taste and smell." That this native food was the breadfruit is extremely likely, judging from negative evidence; but on the other hand it is just as probable that it was the fruit of the screw-pine (Pandanus) fermented in underground pits. The Pandanus tree is extremely common on the low coral islands of the western Pacific, where it apparently grows without human aid, and which, together with the coconut, forms the chief source of food supply of the coral islanders.

Ferdinand de Quiros, who sailed as chief pilot with Mendana in 1595, when that adventurer attempted to colonize his islands of Solomon which he had discovered over a quarter of a century before, noted the breadfruit growing on the island of Santa Christina or Tauta in the Marquesas group. This group of islands was first made known to Europeans through this expedition, and in the harbor of Madre de Dios, Quiros observed the natives and made notes on their food supplies, the following being the first account of the fruit which can be identified with certainty:

"A fruit growing on large trees, each fruit about the size of a large pineapple. It is a very good fruit. I have eaten much of it green, roasted and boiled, and ripe. It is so sweet and good a fruit that, in my opinion, there is none superior, having nothing to throw away but a little shell." †

A letter from Quiros to Don Antonio de Morga, Lt.-General of the Philippines, is the principal source of information regarding this voyage upon which the Spanish chroniclers draw for their leading facts. Figueroa, however, seems to have talked with companions of Quiros and Mendana, as on particular points he is considerably more detailed, but unfortunately for the history of this voyage only a fragment of his work is to be found. His version is as follows:

"The trees, mentioned to be in the square, yield a certain fruit which

* "The Discovery of the Solomon Islands by Alvaro de Mendana in 1568" (Hakluyt Soc. Ed.). Introd., pp. iv, v. London, 1901.

† A. Dalrymple, "Historical Collection of Voyages and Discoveries in the South Pacific Ocean," Vol. I, p. 70. London, 1770.

comes to be like the head of a boy, whose colour, when ripe, is a clear green, and extremely green when unripe; the outside appears with cross rays, like the pineapple; the figure is not quite round, it is somewhat narrower at the point than at the foot; * from hence grows a core, which reaches to the middle, and from this core a web. It has no stone or kernel, not anything useless, except the outside, and it is thin, the rest is one mass, with little juice when ripe, and less when green. Much were eaten in every way. It is so delicious that they called it *blanc manger*. It was found to be wholesome and very nourishing. The leaves of its trees are large and very jagged, in the manner of papays."

A search through the later literature of Spanish travel would no doubt bring to light many interesting historical references, but with the beginnings of English naval supremacy in the Elizabethan era her navigators began to play a more important part in the work of exploring the Pacific, and to them the later developments in the history of the breadfruit can largely be traced. The first Englishman to report the fruit was Captain Wm. Dampier, who in 1686 visited Guam during the fruiting season. Dampier describes the fruit and the native methods of preparing it for food and remarks that it is about the size of "a penny loaf when wheat is at five shillings the bushel." Nearly fifty years later Lord Anson visited the same island and reported that the fruit was about the size of a two-penny loaf, from which statement Hooker reasons that wheat had risen considerably in price since Dampier's time. Both of these explorers were highly pleased with its quality and commented upon its usefulness as a food staple to the islanders.

Geographical knowledge made great strides during the 17th and 18th centuries through the work of the explorers who were looking for gold, spices, and other marketable tropical products, and who incidentally made known to the world many an unknown group of islands.

The work of Captain James Cook in charting the then "Unknown Ocean" between 1768 and 1779, the last the date of his untimely death on the Sandwich Islands, is phenomenal when viewed merely from a geographical point of view, but his services become even more valuable when his influence on subsequent voyages and general work in the Pacific is considered. Cook fully appreciated the possibilities inherent in the breadfruit and lost no time in advertising its virtues to the English nation and in suggesting its introduction into the West Indies. During his second voyage (1772-1775) the two Forsters, father and son, accompanied the expedition as naturalists, and as a result of their collections gave the scientific name *Artocarpus communis* to the breadfruit. The published

* This peculiar ob-pyriform fruit is figured by Captain David Porter, of naval fame, who visited these islands in 1814, during our war with England, in the ship *Essex*, afterwards lost in Valparaiso Harbor. The coincidence of resemblance in form is striking and goes far toward proving the accuracy of the old chronicler.

accounts of these three trips met with great popular demand, and principally through his glowing accounts, together with the praises of the other Pacific navigators, a desire for the introduction of the fruit into the West Indies was built up, a demand which it was attempted to gratify in 1787, when Captain Wm. Bligh was dispatched to bring plants from Tahiti to the British West Indies.

In 1769, however, the French authorities had sent out from the Isle de France, the modern Mauritius, an expedition for the purpose of obtaining valuable foods and fruits for the French insular colonies. This expedition, which carried Sonnerat as naturalist, visited New Guinea and the Philippines, and from the island of Luzon he shipped breadfruits which were taken back to the "Isle de France." That these plants were of the seeded variety would seem to be well indicated by the description which he gives of them in his book as well as by the figure engraved in the same work.*

The presence of the seeded breadfruit in Mauritius might be questioned, however, owing to the fact that Baker and other modern botanical writers do not mention it. That it was carried there by this expedition is hardly to be doubted, and its presence in 1789 at least is assured by an entry in a manuscript catalogue of the Royal Gardens at Port Louis, referred to in Larmarck's "Encyclopédie Methodique" (3 : 208). Moreover, in the Transactions of the Society of Arts (20 : 313. 1802), there is a record of an introduction of the seeded fruit from Martinique into Tobago, and the statement is further made that the seeded fruits in the possession of the French were the result of an importation from the Isle of France in 1792.

Beginning with the year of Captain Cook's death (1779) the "Society instituted at London for the Encouragement of Arts, Manufactures, and Commerce," offered a yearly prize for the successful introduction of the breadfruit "into the islands of the West Indies, subject to the Crown of Great Britain." This premium repeated year after year sustained the popular interest first aroused by the writings of the Pacific navigators, and this, together with the demand for the fruit among the West Indian planters themselves, caused the English Crown in 1787 to dispatch Captain Wm. Bligh in the *Bounty* to attempt the introduction of the fruit into the Western world. The interesting history of this voyage is known to most every one; the delightful stay at Tahiti in the land of summer and plenty proved to be too tempting for Bligh's crew, a mutiny resulting shortly after their departure from the romantic island. Bligh with eighteen companions was cast adrift in an open boat, poorly provisioned and equipped, near the island of Tofoa in the Tonga group. Meeting with a hostile reception from the natives of that island, they were obliged to steer for the distant East Indies, fearing to land on the Oceanic islands

* Sonnerat, "Voyage a la Nouvelle Guinee," p. 100. Paris, 1776.

on account of their defenseless condition. After one of the most remarkable open-boat voyages in the history of navigation they reached Timor, and as Bligh remarks—

"It appeared scarcely credible to ourselves that, in an open boat and so poorly provided, we should have been able to reach the coast of Timor in forty-one days after leaving Tofoa, having in that time run, by our log, a distance of 3,618 miles; and that, notwithstanding our extreme distress, no one should have perished in the voyage."

The mutineers sailed back to Tahiti and from thence some of the Englishmen, accompanied by Tahitian natives, migrated to Pitcairn's Island, where, after the death of all but one of the Europeans, under the leadership of the reformed mutineer one of the most ideal communities in the world was developed.

Nothing daunted by the misfortune of their first attempt, the English Government, stimulated by Sir Joseph Banks, President of the Royal Academy, and one of the naturalists of Captain Cook's first voyage, sent Bligh in 1792 to make another attempt. This time all went well, and in 1793 approximately 700 plants were divided among the islands of St. Helena, St. Vincent, and Jamaica, the two last mentioned receiving the lion's share, while a number were taken to the Kew Gardens for hot-house growth.

The estimate put upon the fruit by those concerned in its introduction is well shown by the following quotation:

"At length their wishes have been happily gratified by the persevering attention of Captain William Bligh, assisted by those ingenious botanists Mr. William Viles and Mr. Christopher Smith, whose names on this occasion ought also to be recorded, and the Western world put in possession of what will hereafter secure to that part of the globe an inexhaustible fund of good, palatable, and wholesome food." *

Bryan Edwards, the historian of the West Indies, had remarkable ideas of its utility, very interesting in the light of its subsequent history in those islands: "The cultivation of these valuable exotics will, without doubt, in a course of years, lessen the dependence of the sugar islands on North America for food and necessaries; and not only supply subsistence for future generations, but probably furnish fresh incitements to industry, new improvements in the arts, and new subjects of commerce."

As an illustration of carelessness in the treatment of the history of the breadfruit the records of its introduction into the West Indies may be cited. In practically all the available literature discussing this point, the first introduction has been assigned to Captain Bligh with the date 1793. As this navigator brought an overwhelming majority of seedless plants, the existence of the seeded variety in the West Indies has been somewhat

* Preface, Vol. 12, Trans. Soc. Arts, p. xiii.

of a mystery, some even going so far as to suggest a reversion to the primitive type by the sterile fruits, with the consequent formation of seeds. The reversion theory is hardly tenable, however, when we find printed records of the seeded variety antedating 1793. Bligh, moreover, in claiming the reward of the Society of Arts for his feat made an affidavit stating that but one seeded plant (from Timor) was secured by him. The proportion is thus so small, one to seven hundred, that it is obviously inadequate to populate the West Indies even if the records of the seeded sort before 1793 had not been found.

Tussac, however, in his monumental "Flora des Antilles," buried nearly a hundred years ago the fact that Lord Rodney in 1782 * was instrumental in introducing the seeded breadfruit into Jamaica. The fortunes of war had that year thrown into his hands a French vessel laden with useful plants of the East Indies destined for the French West Indian colonies. In a list of the plants growing in the gardens of Hinton East in Jamaica, Bryan Edwards gives the Jak alone as being introduced by Lord Rodney, while Tussac credits the same sailor with the introduction of both the Jak and breadfruit. The famous No. 11 mango was also one of the horticultural spoils of this ship, which was captured while en route between Mauritius and Santo Domingo. These vegetable aristocrats were intended for the French colonists in Santo Domingo, but were strangely enough enjoyed by her greatest rival, England. Before 1792, however, according to a record in the Transactions of the Society of Arts, the French successfully introduced the seeded variety into Martinique, as in that year Mr. Robley, the governor of Tobago, imported from the French island plants which he grew with the understanding that they were of the seedless variety, but was greatly disappointed when they turned out to be full of seeds and consequently worthless, according to his light. These introductions, however, occasioned but little notice, and when Captain Bligh in 1793 successfully brought the Tahiti fruit he was universally given the credit for the first introduction. It may be that the presence of the inferior seeded kind was the cause of the English in those islands petitioning for the importation of the true or seedless breadfruit, whose utility they were just beginning to appreciate through contact with the writings of Dampier, Anson, Byron, and Cook.

[TO BE CONCLUDED.]

THE New York Botanical Garden has recently acquired land and buildings at Cinchona, Jamaica, where it will establish shortly a subtropical laboratory.

* Sagot (*Journ. Cent. d'Hort. de France*, 2 ser. 6: 38. 1872) also records this introduction of the seeded fruit, presumbly after Tussac.

Extracts from the Note-Book of a Naturalist on the Island of Guam.—XI.*

By William E. Safford.

Wednesday, October 25.—Many people have come to register their land. I have tried to impress upon the natives the necessity of having their titles clearly established and properly registered in the office of the Recorder before the arrival of more foreigners in this island. This must be done according to the Spanish law, which is still in force. By so doing, they and their children can not be disturbed in the possession of their homes and their ranchos. Several foreigners who have already visited this island declared before their arrival that they were "going to buy up the whole d——d island," in the evident expectation of a boom in real estate. Thus far very little land has been sold by the natives; and that which has been sold is not very desirable. The other day an American complained of the laziness of the natives, saying that they will not work for a white man. One of the natives replied: "It seems to me that it is the white man who is lazy, not the Chamorros. Who is it that builds our houses? Who clears our land, plants our fields, and gathers our crops? Every Chamorro provides for his family, and if he has time to stop his work occasionally to breathe and enjoy life, why shouldn't he? The white man comes here and will not even work for himself. He wants to sit still and have some one else clear and chop and plant and build for him; but he thinks the Chamorros should be kept at work for their own good." This indeed seems to be the attitude of many settlers in new countries. One of my American neighbors asked me the other day what scheme I could suggest for utilizing the natives. I told him that I had been trying to find the best way to be of use to them. It seems to me that in taking this island we have assumed a responsibility; and I sincerely hope it is for the real and lasting good of those who are under our care and protection. The conditions of life here are very simple. Nearly every individual in Guam is the owner of one or more "ranchos." There are no regular shoemakers, tailors, carpenters, bakers, blacksmiths, etc., who depend upon their trades for their living. A man may consent to make a pair of shoes for you; but it may take him several weeks to do so, he being obliged to visit his ranch at intervals to attend to clearing, weeding, planting, etc. Most of this he does himself. The blacksmith may be weeks without work owing to the fact that the charcoal burner has made no charcoal, he having found it more profitable

* Continued from September issue. Begun in September, 1902.

to raise vegetables for the ships in the harbor. The carpenter may wait for months for wood for a table or wardrobe, the people who usually bring logs to the town having use for their cattle and carts on their ranches. The shoemaker may be without leather for a long time, the tanner being engaged planting rice, or being without tan-bark, or busy sawing boards for a new house. It is impossible to go to a man with money in your hand and say: "I wish to put up a house of certain dimensions. What will you charge me for the work? How soon can you do it for me?" The man will answer: "Have you posts? Have you beams and joists? Have you boards for the sides and flooring? Get them, and then we will talk about it. I am too busy on my ranch to bother with looking for them." If a mason comes to build a wall for you he expects to find ready for his use lime, sand, and stone, and even utensils for working; and when he or a carpenter comes to do a piece of work, ten to one no square or level is brought. If they could level or make a right angle with the eye alone it would be all right, but unfortunately they may have a piece of work half finished when you discover that it is inaccurate; and then for the first time you learn that the mason or carpenter has no square or level, and he asks you to borrow one for him. In constructing a house or shed it may never occur to them to see that the holes for the posts are dug at right angles with one another. They are likely first to dig holes, then fill them up again and dig others when they find they are not at right angles. It is the same way in putting on a roof—it may not occur to them to find out whether the posts are all of the same height until the architrave is nailed or lashed to them. As the boards are sawn by hand, many of them do not have their sides parallel, and the boards composing the side of a house, which should be vertical, may have their edges at almost any angle. There are exceptions to this rule, and some carpenters show evidence of doing good work as joiners. The best are Filipinos, but even they do not let their trade interfere with work on their ranches.

Thursday, October 26.—This day Don Antonio Martinez, in the presence of the President of the Spanish Commission, paid to Shebata, the Japanese merchant, $150 damages for not fulfilling a contract to deliver to him copra. This copra was gathered by Don Antonio's employés on the island of Alamagan, and was taken away from the island by Captain Harrison of the schooner *Esmeralda*, who claimed that his brother-in-law, Don José Portusach, had received this island as a grant from the Spanish Government, and that his title to it was registered in the archives of the Government. It is true that negotiations were opened by the Spanish Government for the leasing of the island in question, and bids were offered by several people. The lease was awarded to José Portusach on the condition, among other things, that he should maintain communication among the islands of the group by means of a vessel flying

the Spanish flag, and that he pay a certain sum quarterly to the government for the support of the hospital for lepers. It is claimed that Don José did not comply with these conditions. Don Antonio had sent employés to Alamagan with the permission of Governor Marina, in July, 1897, for the purpose of planting and gathering coconuts. On the 2d of April, 1898, the conditional grant was made to Don José Portusach of the usufruct of Agrigan, Pagan, and Alamagan, small islands lying near the northern end of the Marianne chain. On June 27, 1898, five days after the seizure of Guam by the United States, Captain Harrison paid Don José Martinez for copra he had taken from Alamagan. Martinez still kept his men on the island and paid their taxes for them into the the public treasury at Agaña. On the 12th of the following December, Captain Harrison took copra from the island without paying for it, whereupon Martinez obtained a possessory title to the island from the *Asesor Letrado*, and Portusach one week later received a grant of the same island by the self-appointed Governor Sisto, in consideration of a certain sum of money. When, in the following March, Captain Harrison again took copra without paying for it, Martinez brought action against him. Captain Harrison refused to obey the summons of the court, and the matter was reported to the senior army officer in command of the United States forces in the Philippines. As Guam is under the jurisdiction of the Navy, the matter was referred to the admiral commanding the Philippine squadron, and he in turn referred the matter to the Governor of Guam. The Governor has ordered me to decide upon the merits of the case; and I have taken evidence to determine, if possible, who is right and who is wrong. Verily, some have greatness thrust upon them. I am afraid I was not intended for a judge.

As Shebata bought the copra from Martinez and sent for it in good faith, it seems only just that Martinez should reimburse him for the expense of sending a schooner to the island for copra which failed to materialize. Later I will try to solve the problem of the ownership of the copra. There is one thing which seems evident—if the Spanish governor decided that Don José Portusach had not fulfilled the conditions of the contract by which he was to have the usufruct of the islands in question, I do not see by what right Sisto could grant him the title.

Friday, October 27.—During my walks after office hours I have been adding little by little to my herbarium. José and Vicente have learned to change driers, and Susana seems to take great interest in the proceeding, keeping an eye on the weather so as to get the driers indoors in time to avoid rain-showers. *Urena sinuata*, the malvaceous plant with the glands on the midrib of the leaves, is now in bloom. The small, rose-colored flowers, like many others of the family, wither soon after blooming. The silk-cotton tree, called "Algodon de Manila" (Manila cotton),

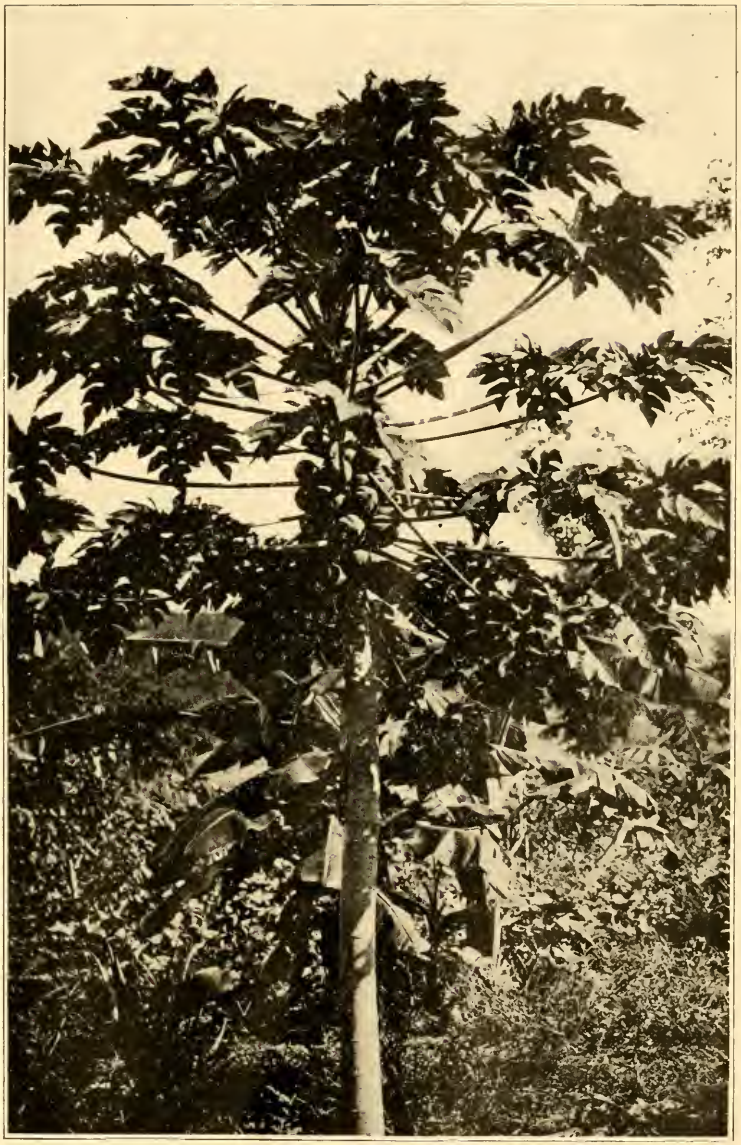
is apparently the same species as the common Ceiba of the West Indies (*Ceiba pentandra*). Here the trunks are very straight and the branches in regular horizontal whorls. The trees are sometimes planted along boundary lines between estates. When we get our telephone line established, I think it will be well to follow the example of some of the East Indian islands and plant these trees along the roadside between Agaña and the port for live telephone posts. Among the weeds common about my yard are *Euphorbia pilulifera*, called "Golondrina," and *Acalypha indica*, which grows in crevices in the stone wall. Climbing on the wall there is also a fern with leathery lobed leaves (*Polypodium phymatodes*), which the natives call "Kahlao." Among other ferns, I have collected the delicate *Lygodium scandens*, which climbs among the reeds in the marshes and reappears on the treeless patches of the uplands called "sabanas." The great coarse marsh fern is *Chrysodium aureum*, a species very common in Polynesia and distributed nearly all over the warmer regions of the globe. The natives of this island call it "Lagñga-yao." Another common Polynesian fern with simple, small, linear fronds is *Polypodium adnascens*. It climbs tree trunks and seems to prefer coconut palms. The most beautiful of all the climbing ferns is a species of Davallia very much like *Davallia solida*, which I have collected in Samoa. It has glossy green divided fronds, and is probably the species called *D. lucidula* by Presl. I have not yet found it in fruit. On the sabanas of Makahna Mountain I found *Lindsaya retusa* and *Lindsaya ensifolia* accompanying patches of *Gleichenia dichotoma*, which reminds me of the common bracken (*Pteris aquilina*). The high, sharp-edged "neti," or sword-grass, covering stretches of sabana, is often burned by hunters to drive out the deer. This burns the fronds of the Gleichenia, but leaves the stipes sticking up like sharp-pointed wires, which are very dangerous for bare-footed pedestrians. Few things have pleased me more than finding a pretty little yellow-flowered Hypoxis (*H. aurea*) on the sabana—it was like meeting a little friend from home. Among the strand plants the "Hunik" (*Tournefortia argentea*) and "Nanaso" (*Scaevola koenigii*) are hard to dry on account of their fleshy leaves. There seem to be a number of plants growing along the beach which do not dry readily. I suppose that if there were not some provision for checking their transpiration, or regulating it, their tissues would soon be filled with crystals of salt from the sea-water.

I collected a plant to-day with small flowers having discs like our "Jersey tea" (*Ceanothus americanus*). It proved to be *Colubrina asiatica*, which is used in Samoa for washing the white shaggy rugs made of nettle fibre. The fresh leaves make a lather with water, which gives it a name in Fiji signifying "much foam." José says its Chamorro name is "Gasôsô." Collected specimens of leaves and flowers of the "horse-

radish tree" (*Moringa pterygosperma*), here called "Marunggai." In the East Indies its tender young leaves and young pods are eaten like greens or string beans. Its ripe seeds yield the ben-oil of commerce. The first time I ever saw this tree was during a cruise on the Central American coast. At Corinto, Nicaragua, there was a row of the trees along the water front, which the natives kept trimmed pretty closely, feeding the branches to horses and cattle, which seem to be very fond of them. The roots are often used for horse-radish, but they are inferior to the genuine horse-radish in flavor.

Another introduced tree is the "Papaya" (*Carica papaya*). The fruit of the Guam tree is not so large as that grown in Samoa. It has always seemed strange to me that it was introduced into Samoa under an assumed name. The natives there call it "Mummy-apple," a name intended for "Mammee-apple," which is correctly applied to the fruit of *Mammea americana*, a tree belonging to the Guttiferae, and allied to the genus Calophyllum to which the "Palo Maria" of this island belongs. The Papaya is a graceful tree, with the habit of growth of a palm. Its straight, slender, fleshy trunk bears a crown of large palmately-lobed leaves with long petioles. (See plate.) The staminate and pistillate flowers are borne on separate trees, though occasionally trees are found with hermaphrodite flowers. These bear fruit on long pedicels, while the ordinary fruit of the female flowers is sessile. The fruit is melon-shaped. A remarkable feature of this tree is that if the milky juice of the unripe fruit or of the leaves be rubbed on meat it will make it tender. By experiment it has been found that this juice is more efficacious than pepsin in dissolving albumen and muscular fibre; and from the half-ripe fruits a proteolytic ferment has been derived called "papain," which differs from pepsin in that its action on proteids goes on in neutral or alkaline solutions as well as in acid solutions. The natives recognize the difference in the staminate and pistillate trees, calling the former "macho" and the latter "hembra."

Complaints having been recently made that certain natives were trespassing upon pasture lands belonging to Don Vicente Herrero and Don Justo Dungca, I examined into the matter and found that both Don Vicente and Don Justo have large tracts granted for grazing purposes. Don Vicente has an area of sixteen square miles, and I do not know how large Don Justo's tract is. I have been informed that their herds of cattle are very small. It seems a pity that they should refuse to sell a hectare or two to men anxious to utilize it for agricultural purposes. Some of the natives have complained that when declarations were made with a view of obtaining possessory titles to property, ranchos have been included, in some cases, which have been occupied for many years by the families now living upon them. It seems to me that if a tax be



Carica papaya. Female tree. After photograph by G. N. Collins.

levied upon all land, those having large areas, which they hold for purposes of speculation, will turn it into the Government rather than pay taxes on what yields them no income. If they do this small grants can be made in the regular manner to thrifty young men anxious to provide for their families, and in this way much idle land may become productive. Whatever action we may take, however, we do not wish to be unjust; nor is it to the interest of the island to discourage stock-raising or the breeding of carabaos, several herds of which, I am told, are to be found in the interior of the island.

This afternoon there was an auction of Spanish army property. Don Gregorio Perez bought some of the old field carriages, for the sake of the iron tires of the wheels, I suppose. I bought one or two cane-bottom bed-frames and a large ammunition chest with sloping lids. I can keep my plants in this and there will be no danger from rain, hurricanes, nor earth-quakes.

Began building a stone wall between my property and that of Atanasio Táitano, the neighbor on my west. He is going to let me have a small piece of land, so as to make my wall run straight to the street back of my property. Don José Herrero and Don Pedro Duarte walked with me to the place which I have picked out for my chicken ranch on the other side of the river. The site is beautiful, overlooking the broad marsh, with its islands of coconut trees on the west, and the great ocean on the north. Susana says she does not see why I have to climb a hill to look at the ocean, when I can see it by walking down to the beach. She highly approves of the chicken-ranch project. There are about forty coconut trees on the place, the area of which is about two and a half hectares. They are old and spindling, and are not very productive. The land is said to be pretty well "*cansado*," or "tired," and not fit for cultivation.

[TO BE CONTINUED.]

Planting Bulbs in the Fall.—The time to prepare for the spring feast of flowers is in the fall, says *Country Life in America*. Too often people forget all about it until they see the tulips in the parks or in their neighbors' gardens, and then they hie to the bulb-seller in a quest for bulbs. Generally speaking, from the middle of October until the ground is closed with frost, the bulbs for spring flowering may be planted. Some of the species are late in ripening,—lily-of-the-valley, for instance,—and so the planting stock is not available until November. In our northern climate frost and snow may have made their appearance before these are procurable, so the expedient of covering the ground where they are to be planted must be adopted. Coarse bagging spread over the ground and a covering of three or four inches of leaves, hay, or litter of any kind will answer.

Our National Flower.*

By W. E. Wolcott.

There has never been a presidential contest in the history of this country when the struggle for supremacy between the rival candidates has been more spirited in a way than is that which has arisen over the question of selecting a national flower, and certainly none in which such a long time has been required to reach a decision. Ordinarily in a presidential campaign there are but two men who stand much of a chance of winning, no matter how many may be in the field; but in the contest over the national floral emblem there are numerous candidates for public favor, and just at present it can not be said that any one of them seems to have a better prospect of being chosen than another. Among the numerous flowers which have been suggested as appropriate are the golden rod, columbine, rose, violet, daisy, pansy, arbutus, anemone, and more recently the sunflower, tobacco, and Indian paint-brush. All of them have enthusiastic supporters and eloquent arguments have been advanced in favor of each.

In behalf of the solidago or golden rod it has been argued that it is a plant which abounds in this country, and nowhere in the world thrives so luxuriantly or is so widely distributed. About 80 species of golden rod are native to the United States, and of these 42 species can be found in our northeastern States. In early autumn its bright flower heads of golden yellow gleam in every field and meadow, fringe every country highway, and make glad the waste places everywhere. Ours is more truly the land of gold than any other beneath the skies; the land where gold is mined, where gold is coined, where gold is earned and freely expended; the land of golden sunshine, golden hours, golden opportunities and golden dreams, some of which are realized and others of which are not. Further than this it is set forth that the golden rod, growing as it does so freely throughout the land, is typical of the liberty and freedom which our people enjoy. It is a beautiful, conspicuous flower and one which would certainly form a very pretty emblem. Thus argue the friends of solidago. The chief argument against selecting it as the national flower is the fact that it blooms so late in the season and is not available for decorative purposes when most wanted. The generic name is from two Greek words which signify "to make whole," and refer to the healing properties which have been attributed to the genus.

The aquilegia or columbine has a great many friends, and they are so enthusiastic in its behalf that a Columbine Association was formed in

* We reprint herewith in part from *The Utica* (N. Y.) *Journal* a paper read before the Asa Gray Botanical Club of that city, and communicated to us by Dr. Geo. V. Haberer.—Ed.

Cambridge, Mass., in 1896, and the idea of having the flower as the national emblem has met with the approval of many representative people, including artists, writers, horticulturists, and botanists in various parts of the country. The claims of the columbine to the honor sought are numerous and suggestive. In the first place its name comes from the same root as Columbia, the name which is so dear to the American heart. Its other name, "Aquilegia," is, of course, another form of the word for eagle, and was given it because its petals end in spurs, very like the talons of the American bird of freedom. Its petals are five, which, it has been pointed out, correspond to the five points in the star on the United States ensign. These points are grouped around a central shaft, which might be compared to the dependency of the States upon the National Government. It is indigenous to the North American Continent and grows wild in every State in the Union. There are in the United States nine species, two varieties, and one introduced species. For use in floral decorations it is claimed the columbine is particularly well suited to our needs, as there are a wonderful variety of colors: brilliant red, pure white, exquisite cerulean blue occurring among the strictly American sorts, and besides these national colors there is pale and golden yellow, orange, scarlet, and purple. The wild forms are for the most part in bloom by Memorial Day, and here not all disappear by July 4.

No reasonable objection could be raised to the adoption of the rose as a national flower if it were not for the fact that it is commonly thought of in connection with England. Red and white roses were in the badges of the Lancastrians and Yorkists during the civil war known as the War of the Roses. Many have favored it as our national flower, as we have a number of wild species which are exquisite, and strong pleas have been made for the sweet brier. As to the violet, we have a large number of native species, and perhaps no flower is more popular with the masses, but it is not peculiar to this country. Prophets and warriors, as well as poets, have favored the violet; Mahomet preferred it to all other flowers and it was chosen by the Bonapartes as their emblem.

The common white daisy, which is usually thought of as a very modest and unassuming plant, but which in reality belongs to a highly distinguished family and is technically known as *Chrysanthemum Leucanthemum*, has been earnestly advocated by some as the floral emblem of the Union, but there are reasons why it is claimed to be ineligible. One reason is that the plant is not a native of this country, but was brought from the old world by the early colonists, and another is that it is not in favor with farmers, as it is considered hurtful to pasture-land. In England our flower is called "ox-eye" and "moon daisy," and in Scotland "dog daisy."

The pansy has a host of admirers and friends, and there is no gain-

saying the fact that it is a beautiful flower; but it is a cultivated plant, a native of England, and consequently this country can lay no special claim to it. The trailing arbutus or Mayflower has a strong hold on the hearts of the people and good arguments are advanced by those who would like to have it designated as the national flower. In a note prefacing his poem, "The Mayflowers," Whittier says: "The trailing arbutus or Mayflower grows abundantly in the vicinity of Plymouth, and was the first flower to greet the Pilgrims after their fearful winter." The arbutus therefore is not only lovely and widespread, but historic, all of which are strong points; but there is the objection that it is in bloom only a short time and possibly refuses to stand transplanting, so it can not be cultivated.

The anemone has its friends, but no very vigorous campaign has been conducted in its behalf. There are several species which are natives of this country, and they bloom at different times during spring and summer. The sunflower is a plant of striking appearance and there are twenty-two species in this country, but while a fairly sound argument can be made favoring it as a national emblem, an insurmountable objection is found in the fact that Central and South American countries have a prior claim to it in this respect. Like the lotus of the East, it is equally a sacred and artistic emblem, figuring in the symbolism of Mexico and Peru.

In Colonial days the tobacco flower was frequently used as a national emblem, but it is doubtful if the idea of adopting it as such now would meet with general approval, for some of the ladies would probably object. The flower of the tobacco plant is modest and pleasing to the eye, and the plant itself is one of the greatest wealth producers. It is native only to our soil and many of our cherished traditions cling around it. Only a few days ago an article was published in one of the leading metropolitan papers in which the writer argued in favor of the Indian paint-brush as the national flower. This is a plant which thrives in marshy soil, averaging about one foot in height, and has bright green leaves and flowers of intense red or scarlet.

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But is it desirable to designate any one flower as an emblem of the whole nation? To be sure England has her rose, Ireland the shamrock, Scotland the thistle, Wales the leek, France the fleur de lis, Canada the maple leaf, Switzerland the edelweiss, New South Wales the waratah or native tulip, Nova Scotia the trailing arbutus, and other nations the chrysanthemum, wistaria, and lotus, but the motto of the United States is *E Pluribus Unum*, one formed of many, and it would seem to be more appropriate, therefore, that if we are to have a national floral emblem it should be in the form of a bouquet or wreath.

Many of the States of the Union have already adopted State flowers, and a bouquet formed of these would make an ideal national emblem. By

special acts of the legislature, different States have adopted floral emblems as follows: Iowa, wild rose; Maine, pine cone and tassel; Michigan, apple blossom; Montana, bitter root; Nebraska, golden rod; Oregon, Oregon grape; Vermont, red clover; Colorado, white and blue columbine; Oklahoma, mistletoe; Utah, sego lily.

Other States have flowers which have been selected by vote of the school children as State emblems, or for other reasons are popularly recognized as such. They are as follows: California, California poppy; Idaho, syringa; Kansas, sunflower; Minnesota, moccasin flower; Nevada, sage brush; Washington, rhododendron; Georgia, Cherokee rose; New York, the golden rod.

It seems to me that a very appropriate and satisfactory solution of the national floral emblem would be to present Fair Columbia or the Goddess of Liberty with a shower bouquet composed of the different State flowers, or crown her with a garland in which they are entwined.

The Dying Tree, and How We Saved It.

By I. W. Blake.

In the spring of 1902 a certain small Catalpa tree failed to leaf out as usual. It appeared to be quite dead, for the bark was gray and dry and seemed ready to scale off. Upon its trunk and lower branches were long scratches which had opened into well-defined cracks, and the cause was quite a mystery. One day this was explained. We discovered that the family cats were making great use of the tree for a hide-and-seek playground. Not as a scratching post for claw-sharpening, but for a grand daily frolic, swinging deftly among and around these conveniently low-growing branches as they chased and dodged one another.

To protect the tree from their antics, the trunk was bound snugly with soft flannel strips from the ground up to the height of perhaps four feet, and wound spirally with the ends lapping, just as a surgeon would bandage a broken arm or leg. The covering was also extended to two of the side branches for a short distance, and then soft white twine was bound around to secure all. There was no particular reason for using flannel instead of cotton cloth. The woolen material chanced to be at hand, but the result may indicate that it was perhaps employed to better advantage than cotton.

Abandoned as a spoiled playground by the cats, the tree was left unmolested for about three months, during which period there were no

signs of life. The foregoing occurred along in late April or early May. Late in July it was noticed that the flannel strips seemed a little out of place, but this attracted only a passing remark, for the tree was considered dead. Suddenly, however, one very hot day there peeped forth from between the folds of the bandage a bit of green. Then came another, and still another. Yet all the unprotected parts of the tree remained as gray and grim as before.

The bindings were quickly cut away, and to our amazement and delight the trunk and branches bore a thickly-matted growth of healthy young shoots, all of a soft ivory white, with the exception of the tips of the few leaves that had been strong enough to work their way through the interstices of the coverings toward the light. Not only that, but a number of these shoots were eight and ten inches in length, showing that they must have been growing for several weeks. It was a curious sight to watch these slowly unfold beneath the warming influence of the sun. One could almost fancy that they were gratefully stretching themselves and rejoicing in their new-found freedom.

These new shoots, so brittle that a finger-touch would snap them like a pipe stem, were several weeks in attaining their natural green color, and much of this tenderness they retained all summer, although those that were allowed to remain and grow became branches five and six feet long before the end of the season.

The dead branches beyond the parts that had been covered were cut away, but the trunk was left to extend above the young growth, to be removed later on when the tree has regained its full health and vigor. Then a space of five or six feet in diameter around the tree was encircled with four-foot-wide poultry netting, which effectually shut off any further outside injury.

The point to be deduced from this experience is, whether or not the tree was saved by the woolen strips? That is, would the result have been equally successful had it been wrapped in cotton instead of woolen? It is a fact that the *life returned only to the covered portions*. Now, can the greater warmth afforded by the woolen coverings in a way have "sweated" the bark back to life? This steam bath, so to speak, may have had the tendency to check the receding of the sap in the dying trunk. The heat may have helped to swell the buds, before dormant, in the bark. Would not all these possible effects result in gradually restoring the almost lost circulation and thus bring back life to the trunk? If so, why may not branches be forced out in bare places upon other trees? It would be an easy experiment to try, for we need only to wrap one or two thicknesses of flannel about some such place upon a healthy branch and await results.

Yet the conditions might be different. As the test branch would be already alive along its entire length the sap would be flowing easily, and

there might not be the same incentive to loiter at any particular spot to "start" a bud. Perhaps in the case of a dying trunk all the strength of the sap would be concentrated in forcing its upward flow, and as soon as it reached a bud possibly its energy would be directly exerted upon that particular point.

Unfortunately a photograph was not secured of the cabbage-like growth before it was cut away. The branches on the right of the tree are long and scraggy. To test the "flannel cure," bandages have been applied, the wish being to better balance the tree.

A Combined Pit and Greenhouse.—A greenhouse suited to many places in the South is made as follows: Dig a pit 4½ feet deep, 8 feet wide, and 14 feet long. The site should be well drained to prevent water standing in the pit and the long side should face south. Along the middle of the pit build a plank walk 2 feet wide laid on supports 2½ feet high. On each side of the walk make benches raised on supports level with the top of the pit, each 3 feet wide. Now you are ready to build the brick back and sides. A double plank wall filled in with sawdust or dry earth will do if brickwork is too expensive. The back wall is 7½ feet high with a door in the center 2½ x 6 feet. The side walls slope from the top of the rear to a sill laid on the ground across the front. Plates are laid on the faces of the end walls and fastened to the sill 3½ feet apart, and three 2 x 4-inch rafters are placed from the top of the wall to the front side. Two feet from the top lay across from end to end a piece 2 x 4 inches and shingle over the top. This saves that much glass and makes it easier to handle the sash.

Have the sash made 3½ feet wide and 5 feet long, and lay the lower ones on the rafters, screwing them by a hinge to the sill. The upper sash are fastened similarly by a hinge to the cross-piece above and lap over the lower sash.

Now make steps from the door down to the plank walk—a space for them should have been left when the bench was put up. Cover the benches with sand and all is ready for the flowers. You can now enter by the door, stand on the plank walk and reach any flower on either side and raise any sash as wanted for ventilation. Stop all cracks and whitewash the inside. A tub of water put in the end of the pit will be a great convenience. A narrow shed, 5 feet wide, built back of the pit and closed, except at one end, is very convenient also for potting plants and storing various things.

We have had a greenhouse like this in use twenty years and have found it very satisfactory. The advantage in this plan is that the temperature is moderated by the pit and you can go in and out in any kind of weather.—*The Southern Farmer.*

Briefer Articles.

A MORE OR LESS MORALLESS FABLE.

It chanced one day in a far corner of the Earth that a traveling Horticulturist came upon a magnificent and useful Plant; said he joyfully, "This must needs be a Good Thing and therefore I will take it to all other corners of the Civilized World and the People shall know it to be a Valuable Introduction." So he secured of the Plant many seeds and with much care he sowed them, but of all the seeds there came only three Plants, of the which two soon died and the other was dwarfed and sickly. Roaming wide again, the Horticulturist came to a New Country and found there a Tree without which the Natives in that Country could not Exist; then he took seeds and young plants of the Tree with him and returning to his People said, "Behold! here have I brought you a new Food which will make you both fat and glad!" But the Soil and the Climate were inimical, so that the Tree was not introduced; and the People said Nothing.

Learning of a Fine Fruit, the Horticulturist after much Effort and vain Attempts, brought it to his own Land and lo! it grew and year by year reached its Normal Size; but of the Fine Foreign Fruits, it bore not one, neither did it show any Flower at all. At last, when he had gained much Experience and lost as much Hope, the Horticulturist succeeded in propagating a Rare and very Economic Species of the Vegetable Kingdom, and he spoke to his People in Triumph, saying, "Now have I given unto you a Great Gift; with this Crop shall your Fields be made richer and your Storehouses be filled, and you shall eat thereof and bless me and my Work." But the People replied thus: "The Fodder of our Fathers fills us fully. For the Grub of Barbarians we hanker not yet."

And the Horticulturist continued with his Work and waited, not vainly nor in vain.

O. W. Barrett.

Mayagüez, Porto Rico.

SOME ABNORMAL FLOWERS OF THE WILD COLUMBINE.

While examining recently a lot of wild columbines planted in a bed close to the north side of the house, my attention was attracted by several blossoms that were erect instead of being pendulous. Closer inspection showed that they were all incompletely developed and were not as brightly colored as the others near them. The five sepals were more pointed than usual, and of a rather greenish red, but appeared to be normal in other respects. All the other parts of the flowers were much stunted in appear-

Abnormal flowers of the Wild Columbine.

ance. The stamens were shrivelled up, and the styles were not more than a quarter of an inch in length—barely twice as long as the stamens. The greatest change was in the petals. In some normal flowers near them they were an inch or more in length, but in these strange ones they were hardly more than a quarter of an inch in length—in one case about five thirty-seconds of an inch. This peculiarity and their erect position made them most conspicuous.

In searching for other abnormal flowers on the same plants, one was found that had ten poorly developed petals instead of five. Four of the sepals were placed opposite one another in pairs with the fifth at one side. Six of the petals succeeded in pushing their spurs between the sepals in the usual manner, but the remaining four were curled up against the base of the sepals. The stamens seemed to be normal, though still immature. The sepals and petals were somewhat tinged with red, but not as deeply as was the case with nearby flowers not so far advanced.

About two weeks before these were noticed there was a severe cold snap that seemed to check some of the spring blossoms, in particular the dogwood. It may be that the buds of these abnormal flowers were injured by the cold at a critical stage in their development.

C. E. WATERS.

POISONOUS EFFECTS OF A CALIFORNIA SHRUB.

ONE of the showy plants of the mountains of Southern California is *Nama Parryi*, a half shrubby member of the waterleaf family, which attains a height of six or eight feet. The leaves are rough-hairy and very glutinous, and the whole plant exhales a peculiar and disagreeable odor, suggestive of the neighborhood of a brewery. In summer, when the pinkish-lavender flowers are blooming in multitudinous clusters along the wand-like branches, the plants present a striking appearance upon their native mountain slopes, and but for the malodor of the foliage the flowers would be a favorite with bouquet gatherers.

That this plant is capable of producing a severe eruptive poisoning upon sensitive skins would appear not to have been recorded heretofore. It has poisonous properties, however, as is proved by the recent experience of the present writer's wife, who unsuspectingly handled the stems while standing in a blossoming bush of which a photograph was being taken. She had grasped the plant in such a way that some of the branchlets were drawn through her fingers and lay against her exposed forearm. The next day the eruption made its appearance upon these exact places, but afterwards spread as in the case of Rhus poisoning, and created great discomfort for two weeks or more. The general characteristics of

the poisoning were those of Rhus, but not so intense—the eruption being much less noticeable to the eye and the blisters smaller.

Mr. S. B. Parish, of San Bernardino, California, than whom no one is better informed as to the flora of Southern California, writes me in regard to this case: "I am quite subject to poisoning from Rhus, but have often handled the Nama without the least injury. That it sometimes has poisonous effects is especially interesting, since such a property is, I think, unknown in the American Hydrophyllaceae."

CHARLES FRANCIS SAUNDERS.

The Wild Flower Preservation Society of America.

OFFICIAL NOMINATIONS FOR THE BOARD OF MANAGERS.

THE terms of the following Managers expire with the current year:

MR. C. D. BEADLE, Biltmore, N. C.
MR. JOSEPH CRAWFORD, Philadelphia, Pa.
DR. C. F. MILLSPAUGH, Chicago, Ill.
MR. A. M. READ, Washington, D. C.

Our constitution requires the Board to prepare a list of not less than two nominations for each vacancy, and to print the same in the October issue of our official organ. The following list of nominees has been selected by vote of the Board:

MR. C. D. BEADLE, Biltmore, N. C.
MR. JOSEPH CRAWFORD, Philadelphia, Pa.
DR. C. F. MILLSPAUGH, Chicago, Ill.
MR. A. M. READ, Washington, D. C.
PROF. STANLEY COULTER, Lafayette, Ind.
MR. STEWARDSON BROWN, Philadelphia, Pa.
MRS. ANNIE MORRILL SMITH, Brooklyn, N. Y.
MR. DAVID WHITE, Washington, D. C.
PROF. L. M. UNDERWOOD, New York, N. Y.

Any ten or more members of the Society may secure the addition of other names to the above list of nominees by filing the nominations, duly signed, with the Secretary not later than November 5. The revised list will be printed in the next issue of THE PLANT WORLD, and voting will thereafter begin. To make the matter clearer, let us repeat: If you have a friend who is a member of the Society, and whom you would like to see nominated for the Board of Managers, secure the signatures of nine other members besides your own and send in the nomination. Address the Secretary at 1854 Fifth Street, Washington, D. C.

Editorial.

"In these bright October days," says the *Springfield* (Mass.) *Republican*, "when the perfection of June is rivalled, and even surpassed, the foot naturally goes afield, led by myriad drawings of the heart and longings of the brain for the clear sun and swift color and sweet, clean wind and far sight from the mountain crest and rich fragrance of ferns and fallen maple leaves, with hazel, sweet fern and dewberries, and the royal golden-rods everywhere."

We wonder how many people there may be, even of those who are "led by myriad drawings of the heart," that go afield for the pleasure of being in closer touch with nature, and that train themselves to observe the plant life. Every one recognizes the value of walking as an exercise, but the majority of persons prefer some ulterior object for their rambles. Plenty of people will tell you that they enjoy walking, and yet, as our above-named contemporary observes, "to get the greatest values from walking one needs to lose the sense of walking altogether, and this can not be well done unless one puts behind him the desire to cover space and delete time, and surrenders his muscular pride and his record of miles to the finer forgetfulness of both time and space in absolute absorption in the charm of the countryside."

In our northeastern States, plant life wears one of its most attractive phases in the fall. The gorgeous tints of the sumacs and maples, relieved by the deep crimson of the oaks and the green that many trees adhere to, form a picture whose charm must be impressed on even the unconscious rambler. And how much more pleasurable would be the walk if one were able to recognize the familiar wayside plants, at least as to their family relationships. It is as if one were greeting old or new acquaintances at a social function. And when to the knowledge of plant life one brings an acquaintance with the birds and mammals and at least a mild interest in insect life, one's cup of enjoyment in his autumn walk is full to the brim.

The rapid disappearance of the best American timbers has developed a new method of economy, which is, in brief, that inferior timbers shall be pressed into service and by proper seasoning and preserving be made to take the place of those more valuable. In the first of a series of bulletins on problems in timber preservation just issued by the Bureau of Forestry as Bulletin 41, "Seasoning of Timber," by Hermann von Schrenk, the seasoning which precedes the preservation treatment is dealt with. Dr. von Schrenk's bulletin contains detailed accounts of different methods of seasoning, both open-air seasoning and by kiln drying; the results of seasoning tests in different parts of the country and with different timbers; tests with telephone poles, etc.

Book Reviews.

AMERICAN HORTICULTURAL MANUAL. In two parts. Part I—Principles and Practices connected with the Propagation, Culture, and Improvement of Fruits, Nuts, Ornamental Trees, Shrubs, and Plants in the United States and Canada. Part II—Systematic Pomology. By *J. L. Budd*, assisted by *N. E. Hansen*. 12mo. Part I, xx + 417 pages, 107 figures; Part II, vi + 491 pages, with many figures. $1.50 each part. New York: John Wiley & Sons.

This manual of horticulture, in spite of its cumbrous sub-title, is one of the most compact and convenient works of its kind since the appearance of Downing's "Fruits and Fruit Trees" many years ago. The two volumes are really entirely distinct, though dealing with kindred subjects, and it would have been better, we think, if the publishers had not linked them by the term "manual," which is always somewhat misleading. In Part I there are chapters devoted to the mode of growth and reproduction; then the subject of propagation is discussed and the various modes described and illustrated. A few chapters deal with the general subjects of pruning, spraying, orchard management, etc., and there are detailed directions for the cultivation of the more important fruits, nuts, and ornamental plants.

Part II, as its name "Systematic Pomology" implies, consists of a descriptive list of all the leading varieties of orchard and small fruits, also of the nuts and subtropical fruits grown in this country at the present time. Professor Budd, who is now Professor Emeritus in horticulture at the Iowa State College, is thoroughly competent to deal with these varieties, the separation and classification of which is often very difficult.

The books are attractive in appearance and make-up, and should have a large sale throughout the country. The chapters on subtropical fruits assume especial importance on account of the increase in activity in Florida, where these can be successfully grown. C. L. P.

THE FLOWER GARDEN. By *Ida Bennett*. New York: McClure, Phillips & Co.

We have long wished for a really satisfying book that should deal entirely with floriculture for pleasure, omitting the tiresome chapters on the kitchen garden usually tacked on a work of this kind. Miss Bennett fills the need completely. Moreover, she writes clearly, convincingly, and entertainingly, and she shows a very thorough knowledge, not only of the fundamental principles of gardening, but of the technical features in plant cultivation. The chapters listing various flowers with respect to their habit and requirements are very useful. The book is copiously illustrated. C.L.P.

MacDougal on Desert Vegetation. A scene in the Salton Basin, Colorado Desert. The white heavy saline incrustation is shown, and the vegetation, composed principally of *Allenrolfea*, is seen to occur in scattered clumps. By permission, Desert Botanical Laboratory, Carnegie Institution.

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Some Aspects of Desert Vegetation.

BY D. T. MACDOUGAL.

A SERIOUS investigation of some of the numerous problems presented by the xerophytic vegetation of arid regions has recently been made possible by the establishment of the Desert Botanical Laboratory of the Carnegie Institution, which has been located at Tucson, Arizona. While any of the more important phases of botany might be the subject of investigation by means of the facilities offered by this laboratory, yet its special function consists of an inquiry into the morphology, physiology, habit and general life-history of the species indigenous to the deserts of North America, an area which amounts to more than a million square miles.

The conditions afforded vegetation in these districts show such wide departures from those of humid temperate, and those of tropical regions; the living flora is accessible to so few workers and the entailed investigations are necessarily so wide in scope, so extensive and difficult in execution, that the advance of knowledge of the life of desert plants has been comparatively slow. Nearly a decade has elapsed since any notable investigations have been made upon xerophytic vegetation as such, and in that period morphology and physiology have made a marked general advance, while heredity and the origin of species have taken on a renewed interest because of the results brought to light within the last few years. It may be expected therefore that a searching study of the vegetation of arid regions will afford information concerning the fundamental processes of

plants that will materially modify some of the most important generalizations current in botany at the present time.

A brief sketch of investigations dealing with desert vegetation has recently been published in the report of the Advisory Board of the Desert Laboratory, together with a bibliographical appendix which includes the principal papers bearing upon the subject.*

It may be profitable to point out some of the striking features of the more prominent types of plants indigenous to arid regions, and to call attention to phases of their life-history needing investigation, at the outset of the activity of the Laboratory.

A general inspection of the southwestern deserts during the active vegetative season and during the resting period shows that the following groups of plants may be distinguished upon the basis of seasonal habit and general composition of the shoot and root. In citing these groups it is by no means intended that the divisions in question are to be taken to include the entire flora. The ideas set forth in this crude classification however may serve as a point of departure for an exhaustive analysis of the flora upon a more exact basis of habit and habitat:

I. Herbaceous annuals which start into activity from seeds soon after the beginning of the rainy or favorable season, and quickly develop a complete flowering shoot.—The formation of flowers and the maturation of seeds ensues under conditions not widely different from those encountered by species living in the same latitude in moister regions. The roots of such plants are not distinguishable by any special characteristics, and do not exhibit any unusual capacity for the penetration of the soil, horizontally or vertically. The greater number of forms of this group however show a comparatively greater development of the lateral roots through the upper layers of the soil in a manner that places these organs in a position to make use of the scant rainfall before it sinks deeply into the soil. The shoots do not present marked xerophytic adaptations beyond a heavy cuticle, and the usual regulatory devices for controlling the action of stomata. The total leaf surface of the shoot may be very great, and the whole plant so delicate that it quickly wilts when uprooted. The more marked structural features are to be found in the seeds, which are provided with extremely resistant coats; for it is the seeds of such species that must endure the rigors of drought and extremes of temperature of the desert. The seeds of many forms are so well protected by impervious coatings that they may be soaked in strong acids and other corrosive solutions for some time without injury to the embryo or the storage material within.

II. Perennials with woody, bulbous or tuberous stems, which are chiefly subterranean, or which lie closely on the surface of the soil.—

* Desert Botanical Laboratory of the Carnegie Institution. Origin and Site. F. V. Coville and D. T. MacDougal, Publication 6, Carnegie Institution. Washington, 1903.

MacDougal on Desert Vegetation. *Yucca radiosa;* young plant, Tularosa Desert, New Mexico. By permission, Desert Botanical Laboratory, Carnegie Institution.

Plants of this group are almost entirely dormant during the season unfavorable for growth, and produce a rosette of leaves with a shoot of greater or less extension on which are borne the flowers during the rainy or favorable season. *Limonium limbatum* Small, which has recently come under the notice of the author, may serve as an example. This plant seems to be known only from near the White Sands in the Tularosa Desert in New Mexico, and during February of this year the numerous shallow "washes" that extend across the arid plain west of Alamagordo were seen to bear many thousands of the short stems of these plants bearing the grayish-brown scales and dead leaves of the previous season and having every appearance of being lifeless. When specimens of this kind were brought under suitable cultural conditions and supplied with water an irregular open cluster of elongated leaves was formed, from one of the axils of which a widely branching inflorescence arose that reached a height of 70 cm and bore numerous flowers. The maturation of the seeds was soon followed by the death of the aerial shoot and basal leaves, the plant quickly resuming the inert appearance of the previous season. (Fig. 1.)

Fig. 1. *Limonium limbatum* Small. After a photograph of a plant from White Sands, N. M., cultivated in the New York Botanical Garden.

III. Perennial shrubs or trees which bear deciduous leaves. — The leaves are formed during the rainy season or under favorable conditions of temperature and are discarded during the periods of most intense aridity. As a compensation for the comparatively brief season during which the plant has the benefit of the photosynthetic activity of the leaves the stems are are generally rich in chlorophyl and carry on a limited amount of this work during the greater part of the year. This is still further supplemented by the petioles and midribs of some species which are retained while the leaflets are discarded, as may be seen in some of the Leguminosae. *Ipomœa arborescens*, the tree morn-

ing glory, may be included within this group. The trunk of this tree does not appear to be formed by the successive and progressive activity of a distinct cambium layer as in ordinary hard-wood trees, but is of a herbaceous type, and a new cambium is formed every year external to the bast, which endures only during the season in which it is formed. The entire trunk is soft, generally rich in water and storage material, while the external layers including the bark are succulent and rich in chlorophyl. The leaves are cast off during the dry season, but flowers are produced in some profusion by the aid of the water and food material stored in the trunk. *Acacia greggii*, and the mesquite (*Prosopis*) may be included in this group as well as *Parkinsonia*. The last-named tree is the "palo verde" of the Mexicans, and the amount of chlorophyl and material constructed by its activity present in the branches is so great that the tree forms a most excellent forage for cattle, horses, and deer, which also eat the branches of *Ipomœa arborescens*. The leaflets of *Parkinsonia* are often discarded while the petiole remains and carries on the leaf-functions in diminished measure. (Fig. 2.)

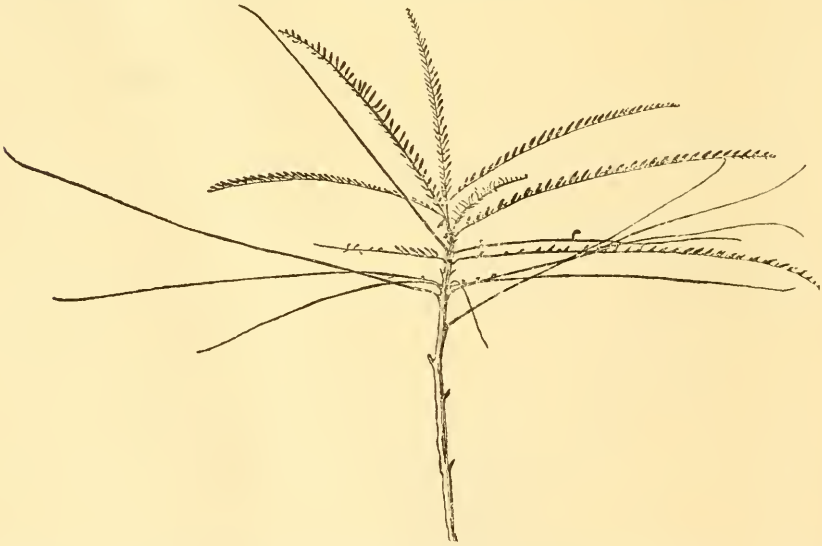

Fig. 2. Plantlet of *Parkinsonia*, some of the leaves of which have discarded the leaflets and retained the green petioles.

Another interesting variation in the method of casting of the leaves has been found in the recently discovered *Fouquieria macdougalii*. The branches of this tree are very rich in chlorophyl and continue the functions of photosynthesis during almost the entire year. The casting of the simple leaves is carried out in such manner however that the petiole is not cut off at its base near the trunk. On the other hand the line of separation begins on the lower (outer side) of the petiole near the basal

MacDougal on Desert Vegetation. *Echinocactus emoryi*, near Torres, Sonora.
By permission, Desert Botanical Laboratory, Carnegie Institution.

end of the laminae and cuts slantingly down through the petiole, reaching the upper (inner) surface of the petiole at its base. The portion of the petiole remaining is sharp-pointed and remains for a long period, making a most effective spine. (Fig. 3.)

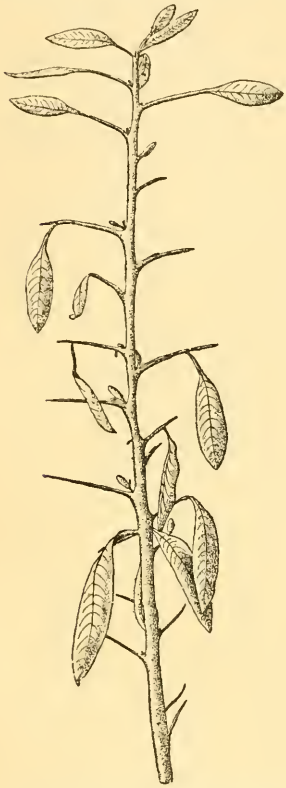

Fig. 3. Leafy branch of *Fouquieria macdougalii*, showing manner of casting of leaves, and formation of spines.

It is among trees of this group that some very extensive root-systems have been noted, the tips of the smaller roots being found many yards from the base of the trunk.

IV. Perennials of a spinescent habit with reduced leaves, which do not exhibit any marked seasonal alterations in activity, but continue development more or less slowly throughout the entire year.—The leaf-surfaces of plants of this character are reduced and practically non-existent except upon young plants, the stems and branches being highly chlorophyllose, with many marked transpiratory adaptations of the epidermis.

Fig. 4. *Ephedra* sp. growing in gypsum, White Sands, New Mexico.

The cortical tissues of the stems are sometimes palisaded after the manner of leaves. The spines of this group are generally atrophied branches. Not all plants which share the above characteristics form spines however. *Koeberlinia*, *Holacantha emoryi*, and *Ephedra* may be offered as representatives of the group. (Fig. 5.)

V. Perennials with regular foliar organs protected by varnish, wax,

resin, or other water-proof material, or furnished with a volatile oil.—One of the more common and widespread examples of this large group is the creosote bush (*Covillea tridentata*), which is a characteristic plant of extensive desert areas of North America. The endurance of the leaves varies with the locality and the conditions, but in some instances it is known to produce two crops of leaves and flowers during the year. In general it may be said that the reddish-brown resin secreted by the leaves is most abundant in the drier periods immediately following the rainy seasons. *Covillea* is not furnished with spines, but the resin is so strong in odor and taste that it is but little attacked by animals. (Pl. 35.)

VI. Perennials with succulent stems or leaves, or with other special devices for the storage of water.—This group includes a wide diversity of morphological types, and the species showing greatest capacity for storage of water are most abundant in the regions in which the rainfall occurs within a comparatively brief period. The total surface exposed from which transpiration may take place is generally comparatively small in proportion to the volume of the body of the plant. The reduction of the shoot and the adaptation of organs to water storage show the greatest diversity in different species.

Fig. 5. *Cereus greggii*, from Tucson, Arizona. Cultivated in the New York Botanical Garden.

In *Cereus greggii* the main root and the base of the shoot appear to be converted into a storage organ containing a large amount of water, while the shoot shows an extreme reduction. The tuberous underground portions of this plant are beet-shaped, a foot or two in length, and may weigh as much as ten or fifteen pounds. This means that an amount of water sufficient to meet the ordinary needs of the plant for a year is held in reserve. (Fig. 5.)

Ibervillea sonorae, the guarequi of the Mexicans, is an example of a plant that has converted the basal perennial portion of the stem into a storage organ which holds a supply of water sufficient to keep the plant alive for years. The large compressed tubers which lie on the surface of the soil may attain a diameter of 40 cm across and half that amount vertically. The woody pulp contains in addition to water, reserve food-material and some poisonous substance, the nature of which has not yet been ascertained. It is evident, however, that it is sufficiently potent to secure the tubers against the attacks of grazing animals. The tubers may be seen lying on the sand under arborescent opuntias and acacias during the dry season, and quickly send up the characteristic leafy stems of the Cucurbitaceae upon the approach of rains. Seeds are produced within two months from the beginning of activity and the

MacDougal on Desert Vegetation. *Covillea tridentata*, near Tucson, Arizona. By permission, Desert Botanical Laboratory, Carnegie Institution.

climbing stems die back as the rains cease and the plant enters into another resting period. When in this inert condition it may be thrown about like so many pieces of wood without injury. Tubers of guarequi, which were obtained from Torres, Sonora, in February, 1902, have lain about on the metal benches in the greenhouses in the New York Botanical Garden, and occasionally start into activity. A number placed in the exhibition cases in the Museum sent out vines in 1902, and in August, 1903, eighteen months after being lifted from the soil, a second crop of tendril-bearing stems were produced in the museum cases. (See Plate XVII, Publication 6, Carnegie Institution, Washington, 1903.)

A large number of examples of this general type is offered by the flattened and cylindrical opuntias and cereuses, in which the leaves are reduced and quickly fall off, while the much reduced shoot is made of stems and branches containing a comparatively large proportion of succulent tissue. The amount of water which may be stored in such tissues may be sufficient for all of the needs of the plant for many months and perhaps more than one season. It is characteristic of this type that the water-storage tissue is found throughout the entire shoot, so that when a single section or "joint" of such a stem is detached it carries with it a supply that may enable it to propagate the plant under the most arid conditions. The presence of spines on nearly all of the plants of this type prevents their extermination by animals, which would otherwise soon destroy them for the water to be obtained from them. During seasons of extreme drought, ranchers sometimes cut great numbers of opuntias and burn off the spines by means of fires of brushwood and then feed the denuded branches to cattle and other animals. (Pl. 36.)

The large barrel-shaped echinocactuses consist of a great swollen stem and a root-system penetrating the rocky and sandy soil in all directions. It is impossible to calculate the practical storage capacity of these plants, but even the most casual inspection would tend to show that a supply of water equal to the entire transpiration of the plant for years is kept in reserve. The Indians of southern California, Arizona, and Mexico habitually make use of this supply when traveling in arid regions away from pools and streams. (Pl. 34.)

The yuccas may be used to illustrate a different type of plant exhibiting water storage. In many of the species of this family huge rosettes, or crowns of long, tapering, fleshy leaves are formed, which in some species have a capacity for the storage of large quantities of water and food-material. The arrangement of the sharp-pointed leaves, and the further devices of cutting edges and spines prevent plants of this type also from being plundered by animals for the sake of the water. (Pl. 33.) Water storage in leaves is also exhibited by *Lycium fremontii* and other species of the genus, the small obovoid leaves of these shrubs being rich in

water and easily detachable from the plant. In this instance a large number of animals make use of the leaves as a water supply, eating both leaves attached to the branches and those which have fallen to the ground.

VII. Species adapted to soils containing large proportions of soluble salts.—Great areas in deserts have soils from which the soluble salts are not washed by reason of lack of rainfall, and in certain places around saline springs and alkaline pools the concentration of the salts is extremely high. Many of the plants capable of living in soils of this character show the same structural adaptations as those of the saline districts near the sea-shore, being truly halophytic in character. The stems and the leaves of some species are succulent and are brittle, being easily broken into fragments. A good illustration of the features of halophytes may be obtained by a comparison of the two eastern species of *Tissa*, one of which, *T. marina*, is an inhabitant of sandy salt-saturated soils and the other is found on arid ridges and on dry hills. Quite a number of forms are characteristic of the saline and alkaline regions in western deserts, among which may be mentioned the salt-bushes (*Atriplex*) and *Allenrolfea*, while *Juncus Cooperi* may be cited as the case of a plant which finds suitable environment only in the briny wet soils around saline springs and has been collected only in the Mohave and Colorado Deserts, and in the Death Valley region. (Pl. 32.)

The most important features then of the environment encountered by desert vegetation consist in scanty and unequally distributed water supply, coupled with high concentration of soil salts in most instances; an extremely dry atmosphere, with the occurrence of high air and soil-surface temperatures. The actual difference of temperature between the root and shoot is quite unlike that of plants in moist regions, and as I have previously pointed out, must be of great influence in all of the vegetative processes.*

The general features of desert vegetation offer some most alluring problems in the study of the origin of species. Here a general interpretation of the face of nature might lead one directly to the conclusion that xerophytic species are examples of a direct adaptation to environmental factors and the consequent development of forms adapted to these conditions. This alluring generalization has the academic advantage and disadvantage of being most difficult of proof and disproof and may be supported only on theoretical grounds, for no one has ever actually seen a species arise in this manner, and for every argument brought forward to support the theory, the advocate of natural selection will adduce equally cogent, and quite as theoretical proof, that desert forms arose otherwise. The study of the extreme types presented by the vegetation of arid regions might

* MacDougal, D. T. Soil Temperatures and Vegetation. *Monthly Weather Review*, 31:375, 1903. Washington.

MacDougal on Desert Vegetation. *Opuntia arborescens* in Tularosa Desert, New Mexico. By permission, Desert Botanical Laboratory, Carnegie Institution.

well lead to some positive evidence upon the general method of origin of species, and if the entire effort of the Desert Laboratory inquiry resulted in bringing to light positive evidence as to the actual origin of two species of plants its energy would have been well expended by reason of the value of such results to evolutionary science in general.

The long standing questions as to the causal facts in regard to the various protective structures of xerophytes have advanced but little toward their final solution in the last decade. Are the spines, thorns, prickles and poisons of desert plants really the results of efforts on the part of the plant for self-protection? So many of the special features of xerophytic vegetation have been interpreted in the spirit of an enduring optimism that leans on the future for a confirmation of its conclusions, which have been received with patient credulity by the botanical world, that it is necessary to ask ourselves the most elemental questions about the best known and most apparent features of the vegetation of the desert.

Not the least interesting of the results to be obtained from studies of the plants of arid regions, are those which may be expected as to the physiological and mechanical causes accountable for the remarkably low density of distribution, one of the most highly characteristic features of the flora of the desert.

Extracts from the Note-Book of a Naturalist on the Island of Guam.—XII.*

By William E. Safford.

Saturday, October 28.—Busy to-day helping the officers of the Spanish Commission to arrange their affairs. The president of the commission, Don Cristobal de Aguilar, is a man of good education and most agreeable personality. He says that Spain should have disposed of these islands years ago; that since the independence of Mexico she has derived no benefit from them, and that they have been a continuous source of expense. He recognizes their value to the United States as a naval station and as a landing-place for a trans-Pacific cable. He seemed surprised that we have converted the new building of the college of San Juan de Letran, erected from the fund bestowed upon this island by Maria Ana of Austria for the education of the natives, into a barracks for the marines, and he made inquiries about the hospital for lepers, which also depended in some way on this fund. It seems to me that the natives of the island should continue to receive the income intended for their education. I asked what had become of the principal, but I could not learn anything definite. It is certain that it has dwindled through dishonesty; and it is doubtful if any part of it can be recovered.

* Continued from the October issue. Begun in September, 1902.

We are in a quandary as to the best way to educate the children of the natives. The native teachers are miserably paid. We should like to have American teachers, but we have not a sufficient income from the island to pay their salaries, and we wish the island to be self-supporting. It is all very well for those who are not responsible to protest against taxing the natives and levying duties upon imports; but we must have a revenue from some source to keep up the roads and bridges, to make it possible for our gobernadorcillos and justices of the peace to live, to feed and clothe our native military company, who perform most faithfully and efficiently the duties of rural police, and to pay the salaries of our Administrador de Hacienda (Island Treasurer) and the clerks and writers of the Recorder's office, court of justice, and island treasury. As it is, the native officials of the outlying villages get only a nominal salary,—in reality only an allowance for stationery,—while they have great responsibility thrust upon them, and must take the time from their own affairs to perform official duties for which they are not paid. This must necessarily lay them open to receiving bribes from litigants, not perhaps in money, but in the form of presents of eggs or fruit or an occasional pig.

My night school is progressing finely. I teach three nights a week and on the alternate nights I go to Father Palomo or to Don Juan de Torres for instruction in the island vernacular, hoping to publish some day a grammar of the Chamorro language which may be of use to people living on this island and of interest to philologists generally.* Father Palomo is a great help to us. He seconds our official orders from the pulpit and tries earnestly to make his people good, law-abiding, self-respecting citizens. The other day I called him my Richelieu, and he did not seem to be offended.

By order of the Governor I wrote to Fray Francisco that his request to return to this island and reside here until regularly relieved is not granted. The Governor directed me to say that our Government does not recognize the Catholic Church as a political power, and that we could take no notice of the orders of ecclesiastical officials to their subordinates. He reassured the friar as to the spiritual welfare of the natives, informing him that more than fifty marriages have taken place since his departure from the island with a view to legitimizing children born out of wedlock, and that the natives more than ever before are trying to follow the customs of civilized society.†

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* See "The Chamorro Language of Guam," by William Edwin Safford. *American Anthropologist*, N. S., Vol. 5, 1903, p. 289 *et seq.*

† A report was made in consequence of this letter to the church authorities at Manila, and by them to the United States authorities. This finally led President McKinley to direct the War Department to order General Wheeler to proceed to Guam and investigate conditions existing there, the administration of the United States officer in charge, etc. See "Report on the Island of Guam," by Brig.-Gen. Joseph Wheeler, U. S. Army, War Department, Adjutant-General's Office, No. XXVIII, June, 1900.

Monday, October 30.—Departure of the *Uranus* with the Spanish Commission on board, bound for the island of Saipan, of this group, and Yap, of the Caroline group.

This day I received, in my capacity of "President of the Military Commission," a report against one of our marines, charged with insulting a citizen of the island and "throwing stones at him while he was in his own house, and this without provocation." This will necessitate a formal trial, examination of witnesses, recording of testimony, etc. It is apparently a case of a man, usually quiet and peaceable, who misbehaved while under the influence of liquor. Thus far the only disorder occurring on the island has been caused by our own men. The natives are quiet and law-abiding. The Governor is determined to put a stop to the selling or even the giving of intoxicating liquor to any one visiting or living on the island.

Wednesday, November 1.—The Governor issued the following order:

"1. On and after November 3, 1899, it is prohibited to import or to sell, issue, provide, or in any way to dispose of any intoxicating stimulant (liquid, gelatinous, or solid) in the island of Guam or in the contiguous waters, reefs, or lands thereof, to any person residing or visiting within the limits of the above-stated territory, except by a special license issued by the Government; and any person convicted of violating this order may be punished for the first offense by a fine not exceeding $100 (Mexican money) or imprisonment not exceeding thirty days, or both, and for each succeeding offense the penalty may be doubled, on approval of the Governor, and for each conviction the offender's contraband goods shall be confiscated.

"2. Residents or visitors on this island are forbidden to purchase or procure any intoxicating stimulant referred to in this order except by special permission of the Government, and any person who violates this order will be punished at the discretion of the local authorities.

"3. Drunkenness, the chief source of all crime and trouble in this island, must and shall cease."

This afternoon I took a walk with Don José Herrero up the road leading to Sinahaña. By the roadside there was a clump of castor-oil plants (*Ricinus communis*), called *Agaliya* by the natives of this island and *Tangantangan* by the Filipinos. This species was introduced into Guam many years ago and has now spread pretty well over the island. The natives know that its seeds are purgative, but they make little use of them. What attracted me this afternoon was a number of wasps which were visiting the nectaries, evidently in quest of honey. These nectaries occur not only at the junction of the blade and petiole as in the case of Aleurites and other Euphorbiaceae, but also along the petiole itself, on the nodes of the stem, and on the peduncles of the inflorescence. The flowers themselves were devoid of nectaries, but there were small glands at the base of some of the pedicels. Noticed the curious branching

stamens of the male flowers and the viscid fleshy red pistils of the female flowers, which are cleft at the tip. On the serrations of the young unfolding leaves there were minute waxy glands — also nectaries, in all probability. The wasps would go from nectary to nectary — from the glands on the nodes to those along the petioles and to the large pair at the base of the peltate leaves. Watched them chase away some flies and other insects which were also attracted by the sweet excretion of the glands. The tender opening leaf-buds were studded with nectaries. In noticing them I was immediately struck with the thought that it would not be well for caterpillars or other insects to try to eat them while the wasps were upon them ; and then I noticed that not a leaf of the plant showed evidence of having been attacked by insects. Possibly in the original home of the species it had enemies which were repelled by the wasps or ants who were attracted by the nectar of its glands. The whole subject of the occurrence of nectar in flowers and on leaves and other parts of plants is interesting. I have already noted the occurrence of the glands in the midribs of some of the Malvaceae and Leguminosae growing on this island. (Entry in Note-book, September 19.) To-day I also noticed the glands at the base of the veins of coffee leaves.*

Since writing the above my attention has been called to a most interesting paper by Trelease on "Nectar, its Nature, Occurrence, and Uses," which is embodied in the Report on Cotton Insects by J. Henry Comstock, U. S. Department of Agriculture. This paper was called forth by the importance of the nectar glands of the cotton plant in their influence upon the natural enemies of the cotton and boll worms. The nectaries of the cotton plant, of *Marcgravia nepenthoides*, and *Poinsettia pulcherrima* are figured as well as those of *Ricinus communis;* and Mr. Trelease gives an extensive bibliography of works on nectar glands, on insectivorous plants which attract their prey by nectar, on the animals which seek floral nectar, and on the fertilization of flowers in general. In summing up the results of his researches he says that "nectar, wherever it occurs, may be considered as excretory, reproductive, protective, or nutritive ; that in some cases, *e. g.*, the leaves of the peach, excretory nectar may possibly be protective also ; that reproductive nectar usually occurs in the flowers but not always ; that protective nectar seems in some cases designed to keep ants from defoliating and deflouring the plant ; in others, to keep larvae from destroying the foliage or immature fruit ; that nutritive nectar may serve in some cases to lead to the capture of wingless, in others of winged, insects ; and finally that the vital force of a plant is taxed so little in the production of nectar that glands once developed and endowed with the power of active secretion may continue to secrete for generations after the necessity for their secretion has ceased to exist." (Op. cit., p. 333.)

* For illustrations of these glands see PLANT WORLD, 6:128, June, 1903.

As we passed by a little path leading up a steep bank to his ranch, Don José said: "Señor, do you know this is All Saints Day?" Then he spoke most tenderly of his dead wife, saying that he and his children had been praying for the repose of her soul. He told me what a good, hard-working wife and mother she had been and how he thought of her every day, especially when he came up this hill and saw the path up which she had so often passed. He was an old man now, he said, and in a few years he would join her and leave his property to be divided among his children. Blessed be God! Then he told me a most interesting story of his early life: how his stern step-father, an exile from Spain, had made him work so very hard; how he had rebelled then against his severity, but how afterwards he blessed him. He spoke of his youth and of the visits of the whaling fleet, when the crews spent money like water on the island and the time of their stay in port was like a continuous fiesta; of the terrible outbreak of small-pox, when he assisted the little Irish doctor, George, to take care of the sick, for whom they had no other remedy than salt water, which they administered as a purge. As we passed through a cut on the top of the hill he told me of a mutiny of Filipino convicts, who had been sent to Guam to serve as laborers, and who had conspired to kill all the officials and marry the prettiest girls on the island. While waiting to send them back to Manila they were kept at work making this cut through which we were passing. Then he spoke of some of the early governors: of Villalobos, who ordered a house-to-house inspection in the evenings to see that the natives observed the hour of the *angelus*, and who went through the palace followed by the government employees reciting the litany; of the governor's friend, Padre Ciriaco del Espiritu Santo, who built the house where we now saw the ruins all overgrown by banyan trees; of another governor, Don Pablo Perez, who fought the priests and was excommunicated. For nearly every turn in the road he had a story: perhaps of runaway sailors, who remained hid until their ships had sailed; perhaps of some love affair or some accident. One account of a murder was especially thrilling. Don José pointed to a cleared space on the hilltop, where a lover went by night to visit his mistress, but was met at the door by her husband, who thrust into his body a knife. "He ran down this hill," said Don José, "and that is the spot where he fell and died." The only vestiges left of human habitation were a few fruit trees, among which were an Anacardium and a Carambola tree. Indeed, Don José's fund of reminiscences seems inexhaustible, and he is a most delightful companion on a walk, varying his tales of adventure and pathos with flashes of humor, and stopping now and then to repeat some Spanish proverb in the form of a rhymed couplet or to recite a short prayer before some wayside cross.

Thursday, November 2.—Arrival from Yokohama of the U. S. S. *Nero*, having finished lines of soundings from Guam to Japan and back. (See entry in Note-book, September 10.) The route surveyed lies to the west of the northern islands of this group and east of the Bonin Islands. For the first 500 geographical miles a level plain 2,100 fathoms deep was found; then a submarine mountain range was encountered which apparently connects the volcanic ridge forming the chain of our islands with the range connecting the Bonin Islands with Japan. In crossing this range the *Nero* discovered a submarine conical peak resembling in form Fujiyama, the sacred mountain of Japan. A trans-Pacific cable is now assured; but whether or not there will be a connection between Guam and Japan is doubtful. In addition to deciding upon a good route for the cable the *Nero* has added much to our knowledge of the contour of the ocean's bottom. Her most important discovery has been the great abyss a short distance to the eastward of this island, the deepest thus far known. It will be called the "Nero Deep." Captain Hodges, the commanding officer of the *Nero*, has asked me to make an inspection of the harbor of Tarofo, on the east coast of this island, and report to him on its apparent fitness as a landing-place for the cable.

This day I bought a piece of property from Vicente Herrero y Roberto extending from the Cienega, or great Marsh, in the locality known as Didigui, on the east, up the hill to the Sinahaña road on the west, and bounded on the south by the property belonging to the heirs of Salome de Torres and on the north by property belonging to Don José Herrero y Aguon and the heirs of Salome de Torres. This includes the hill-top, which I have so often visited, overlooking the city of Agaña, where I shall build my little cottage. The deed was drawn up by the acting notary, Don Joaquin Leon Guerrero, the nephew of Father Palomo, and signed by Don Vicente and myself in the presence of Don José Herrero y Aguon and Don Juan del Rosario y Flores, the alcalde. In accordance with the requirements of the law we were notified by the notary that this deed must be duly registered by the recorder in order that it may be held valid in courts of law. The original was placed by the notary in his files and a certified copy was given to me. Included in the boundaries of my property are two isolated patches of coconut trees claimed by families who planted them. These I shall buy separately, if possible. It has been the case more than once for people to register land in this island including patches of cultivation of others without paying any consideration to the rights of those to whom these patches should in equity belong. Susana can not understand what I can want with so rocky a place as the hill-top; she says it is fit for neither coffee nor coconuts.

[TO BE CONTINUED.]

Briefer Articles.

A FORGOTTEN FRUIT.

HERE in Porto Rico we have a fruit which, though formerly quite popular, has of late usually been omitted from reports and lists. Described some 150 years ago by Linnaeus, *Genipa americana* has never been a bone of contention among botanists, and its synonyms are conspicuous by their absence. Indeed, it is a species of such marked and constant characteristics that there could be no excuse for confusion.

Although its habitat includes northern South America and the West Indies, it seems to attain its greatest development in Porto Rico, where it is one of the commonest trees outside of the small virgin forest areas; here it is known as "Jagua" (pronounced háh-gwah), while in the British islands it passes as "Genipap." In Trinidad it is not counted as a fruit-producing tree at all, and I do not remember having seen it offered for sale in Jamaica; but in Porto Rico it is regularly bought, sold, and stolen.

The fruit is oblong or ovoid, with a somewhat pointed tip, 3 to 6 inches long, russet-brown or grayish-yellow in color, and weighs from 8 to 16 ounces. The pericarp is about one-fourth of an inch thick, creamy white within, with a thin epicarp covered with minute, loosely attached flakes of a silvery-gray substance; upon slight pressure this rind shows irregular, scattered, wrinkle-like depressions which readily open nearly or quite down to the pulp. The endocarp is a light brownish-yellow mass of pulp and flattened seeds; a more or less spurious septum divides this mass longitudinally into halves. Probably the great factor which prevents this fruit from being highly prized is its strong and, to many persons, quite repulsive odor; this effluvium, however, after a few "whiffs" is usually agreeable—and certainly unique. The flavor of the pulp is rather too strong for the unaccustomed palate, but "jagua-ade," made by allowing the pulp and pieces of the rind to stand in water, is one of the most refreshing drinks to be had in the tropics, and according to the natives it is a first-class "blood purifier." The flavor of the fresh, raw pulp has been called "vinous," but I know of none among seventy-five or more tropical fruits to which it can be compared.

The rind cooked in sugar makes a fine marmalade "dulce"; and undoubtedly a good wine, or at least a vinegar, could be produced by fermenting the pulp and rind—and medicinal properties would probably run riot therein. The keeping qualities of this fruit are exceptionally good.

Even outside of pomology *Genipa americana*, standing at the head of the highly respectable family Rubiaceae, deserves attention as a timber tree of the first rank. The heart-wood is of a pale olive-brown, while the sap-wood is a clear creamy white; the specific gravity is given as .80 to .86; is very fine-grained, strong, and susceptible of a good polish, and to be found in every carpenter-shop on the island. Though it does not come well from cuttings, it is readily started from seed and is one of our quickest-growing trees. The trunk is nearly always straight, with few branches, which are tipped with large, obovate or lanceolate leaves; the bark is thickish, smooth, and olive-brown in color. The flowers are about one inch across, with a suggestion of the fragrance of the closely-related *Gardenia*, white at first, but soon turn to a dull yellow.

Mayagüez, Porto Rico. O. W. BARRETT.

FIELD NOTES.

IN A rich woodland eight or nine miles north of Baltimore we came across a plant of the yellow coral-root (*Corallorhiza multiflora flavida*) which had hitherto been found in Nebraska and New York. The whole plant was light yellow and the white lip had no purple spots on it. That was about September 1. Later search brought to light eight more stalks, all of which had only the seed vessels, the flowers having withered.

It has been suggested in the case of many plants that they have their "off years" in which they bloom but sparingly. This seems to be true of *Pogonia verticillata*. In June, 1901, while in Connecticut, I spent one entire afternoon trying to find it in bloom, but failed, though at least one hundred and fifty plants were carefully examined. They appeared to be perfectly healthy and were of a good size. It may not be fair to compare them with Maryland plants, but in 1902 I found dozens of them near Baltimore, a rare find, by the way, in that region. It was too late for flowers, but nearly every plant had a well-developed seed vessel upon it. Next year is looked forward to with interest to see whether they will bloom freely or not. C. E. WATERS.

Dr. C. E. WATERS's note in the October number of the PLANT WORLD, on "Some Abnormal Flowers of the Wild Columbine," recalls to my mind a large colony of these plants which I found in South Deerfield, Mass., last spring. There were perhaps fifty plants growing among loose boulders at the foot of a mountain near the Connecticut River. Nearly all of the flowers were erect, and appeared to have been stunted in their development. All were green with a slight red tint. At the time this phenomenon was attributed to a heavy frost which occurred a short time before. A. VINCENT OSMUN.

Amherst, Mass.

WHAT FORESTRY CAN DO FOR THE REDWOODS.

WHAT is to be done for the Redwoods of the Pacific Coast is a question that has not only agitated California but is of sentimental concern to the whole nation. The Bureau of Forestry, attacking the problem in a thoroughly practical spirit, has worked out conclusions that should appeal as reasonable at once to the lumbermen who cut Redwood on account of its commercial value, and to those who wish this ancient and marvelous type of tree growth preserved.

The results of this study are given in "The Redwood," Bulletin 38 of this Bureau, by R. T. Fisher, recently issued by the Department.

The Redwood forests are, in point of merchantable yield, probably the densest on earth, many stands yielding 150,000 board feet to the acre; and Redwood logging represents the highest development of the lumbering business that has ever been attained on the Pacific Coast. The total supply of Redwood is estimated to be 75 billion feet. The amount cut in 1900 was 360 million feet, with a value of $3,645,608. Although only one-tenth of the forests of the United States is owned by lumbermen, according to the last census, one-fifth of the Redwood is in their hands, and the stands they own are the handsomest and most valuable in the Redwood belt.

The popular idea that the Redwood has no chance of survival is not well founded. The studies of the Bureau of Forestry have proved that possibilities of a new growth of Redwood after the old trees have been removed are excellent. Given half a chance, the Redwood reproduces itself by sprouts with astonishing vigor. Measurements taken by the Bureau on cut-over land show that in thirty years, in a fair soil and a dense stand, trees will be grown 16 inches in diameter, 80 feet high, yielding 2,000 feet board measure to the acre.

With the knowledge that the Redwood as a type need not become extinct, it is possible to consider the impending fate of the giant Redwoods in the old forests with a more cheerful mind. Occasional parks and recreation grounds, such as the Big Basin Redwood Park of the Santa Cruz Mountains, may preserve small areas of virgin Redwood lands; but the richest, the densest, the most beautiful of the forests are owned by lumbermen, and will inevitably be cut. The trees represent invested capital; they are merchantable and will yield a profit now, small as it is. Besides, in the virgin stands most of them are past maturity, and the growth put on is inconsiderable. Every consideration, then, induces the Redwood lumberman, reasoning from his standpoint, to cut his trees.

Realizing that the fate of the old trees can not be stayed, the Bureau of Forestry, instead of wasting itself in attempts to check the cutting, confined itself to proving that it is worth while to the lumbermen to do

less damage to the young trees in logging virgin Redwood lands, and to hold such lands for a second crop. The study made concerns itself with young second growth, rather than with mature trees; with timbered areas rather than with the virgin forest. Where attention was given the old forests and methods of lumbering, it was only that a better knowledge might be gained of second growth and how to deal with it.

The Redwood grows to a greater height than any other American tree, but in girth and in age it is exceeded by the Big Tree of the Sierras. On the slopes 225 feet is about its maximum height and 10 feet its greatest diameter, while on the flats, under better conditions, it grows to be 350 feet high with a diameter of 20 feet. Most of the Redwood cut is from 400 to 800 years old. After the tree has passed the age of 500 years it usually begins to die down from the top and to fall off in growth. The oldest Redwood found during the Bureau's investigation had begun life 1,373 years ago.

The bark of the tree offers such a remarkable resistance to fire that except under great heat it is not combustible. It is of a reddish-gray color, fibrous in texture, and gives to full-grown Redwoods a fluted appearance. Moisture available for the roots is the first need of the Redwood, as any hilly tract of forest will show. Wherever a small gully, or bench, or basin is so placed as to receive an uncommon amount of seepage, or wherever a creek flows by, there the trees are sure to be largest. While moisture of the soil affects the development of the Redwood, moisture of the atmosphere regulates its distribution. The limits of the sea fogs are just about the limits of the tree. The fogs, unless scattered by winds, flow inland among the mountains. Western exposures receive most of the mist they carry, except those higher ridges above their reach, which support, in consequence, only a scattering growth of Redwood.

The seed of the Redwood will not germinate in shaded places; the small seedling demands plenty of light. The crown is almost as thin and open as that of a larch, another sign that the tree is not naturally tolerant of shade. In a mixed stand the Redwood's branches die off more rapidly than those of its companions, and the crown bends eagerly to places where the light enters the forest canopy. But in spite of these signs of its sensitiveness to light, the Redwood forms one of the densest forests that grow.

The reason for this is that the stand is maintained chiefly by suckering from old trees. Supported and nourished by full-grown roots and stems, young trees grow under shade that would kill the small seedling. The sprout will endure an astonishing amount of shade. In stands of second growth, so dense that not a ray of sunlight can enter, saplings 6 or 8 feet high are to be found growing from stumps bare of branch or

foliage except for a few inches of pale green crown at the top. In very dark, damp places in the virgin forest one may find clumps of shoots as white as sprouts from a potato.

The wood possesses qualities which fit it for many uses. In color it shades from light cherry to dark mahogany. It is easily worked, takes a beautiful polish, and is one of the most durable of the coniferous woods of California. It resists decay so well that trees which have lain 500 years in the forest have been sent to the mill and sawed into lumber. The wood is without resin, and offers a strong resistance to fire, as the record of fires in San Francisco, where it is much used, indicate. Insects seldom injure it, because of an acid element it contains. In sea water, however, the marine teredo eats off Redwood piling as readily as other timber.

Redwood timber, says Dr. Herman von Schrenk, of the Bureau of Plant Industry, possesses lasting qualities scarcely equaled by any other wood. Although very light and porous, it has antiseptic properties which prevent the growth of decay-producing fungi. So far as is now known, none of the ordinary wood-rotting fungi grows in Redwood timber. It is because of its resistance to most forms of decay that the Redwood reaches such a great age.

Spinach in Winter.—On private places there are a number of cold frames which can be used to good advantage if given to spinach. A sowing made now will make nice spinach by Christmas. The best variety in my experience is Bloomingdale Savoy Leaved. The seed can be sown in shallow drills about 8 inches apart, covered with the hand and raked lightly to smooth the surface. If the soil be very dry, a light sprinkling may be given with the rose on the water can. Another sowing made about ten days later can be wintered over and gathered in early March at a time when vegetables are scarce. The soil between the rows should be constantly stirred and watered freely. The sash can be left off entirely till the nights get very cold, when they can be put on, and even then a little air, say about 4 inches, may be left on till hard freezing weather sets in. An abundance of air may be given on fine days, and when the glass goes below 16 degrees at night, the frames should remain closed. If these directions be followed you will be rewarded with a crop that will well repay you for all the labor.—*American Gardening.*

The Wild Flower Preservation Society of America.

THE OFFICIAL BALLOT.

THE most important duty of the month for members of the Society is to vote,—not in the municipal and State elections, for you have already done that or ought to have done it if able,—but to vote for members of our Board of Managers. Remember that our Board is charged with the administration of the Society, the planning of its activities, and the management of its revenues; and it is within the power of the members to make their own choice of persons to serve in this capacity.

There are four vacancies to be filled by expiration of the terms of the following:

MR. C. D. BEADLE, Biltmore, N. C.
MR. JOSEPH CRAWFORD, Philadelphia, Pa.
DR. C. F. MILLSPAUGH, Chicago, Ill.
MR. A. M. READ, Washington, D. C.

The following is the official list of nominees:

MR. C. D. BEADLE, Biltmore, N. C.
MR. JOSEPH CRAWFORD, Philadelphia, Pa.
DR. C. F. MILLSPAUGH, Chicago, Ill.
MR. A. M. READ, Washington, D. C.
PROF. STANLEY COULTER, Lafayette, Ind.
MR. STEWARDSON BROWN, Philadelphia, Pa.
MRS. ANNIE MORRILL SMITH, Brooklyn, N. Y.
MR. DAVID WHITE, Washington, D. C.
PROF. L. M. UNDERWOOD, New York, N. Y.

Select ANY FOUR names from the above list and send your vote to the Secretary, Mr. Charles Louis Pollard, 1854 Fifth Street, Washington, D. C. Do not forget to add your own name and address. All members not in arrears for dues are entitled to vote. The Secretary is ready to receive ballots at any time. Notice of the date of the annual meeting will be given in the next issue of THE PLANT WORLD.

NEW LOCAL CHAPTERS.

WITHIN the last few weeks local Chapters have been formed in Philadelphia and in Colorado Springs. The full reports from these will be published when the permanent officers have been elected. Within the last few days the Secretary has received a letter from the representative of a number of ladies in Wilmington, Del., who are also desirous of uniting for active work. We trust this is an indication of the growth of interest in the Society and that it betokens active effort on the part of our members to increase the membership list and the working funds.

Editorial.

We have recently received a very inspiring account of a piece of educational work accomplished in a Maine village that may well be taken as a model in thousands of similar towns throughout the length and breadth of this country. Some five years ago, Mr. George Robley Howe, of Norway, Maine, a man of sterling worth and liberal attainments, noting, as others must have observed in similar environment, the aimless, not to say vicious, tendencies of the average village boys, sought to interest them in better things. He began with nine boys, then about an average age of 10 years, "going direct to nature"; to use his own language, "eschewing all dictation of their personal faults, and leaving them to practically find their own way to the higher discipline of character, I merely undertook to occupy their thoughts more and more with the unimpeachable facts of nature. Gradually they were led to construct, without much teaching, a classification of all the fauna and flora of Oxford County, through the kingdoms, divisions, classes, groups, and orders; to name them in the terminology of modern science, and to correctly refer their specimens, culled from hillside and valley, from stream and lake and forest, to this scheme." Since that time the group has grown until it includes fifty-eight boys, or more than half of the boys of the village between the ages of 10 and 17 years. During the time not a single defection has occurred, and that the movement has been productive of lasting good is beyond question. The boys make excursions once or twice a week, these often leading them many miles from home, and they return laden with the interesting things they have found. This model organization has already attracted the attention of outside scientists, and it will probably not be long before the trained body of accurate observers has begun to make itself felt far beyond the confines of their native village. We wish them all possible good luck, and urge our readers, when opportunity presents, to inaugurate a similar crusade.

We desire to call the attention, not only of our readers, but of the public generally, to the article by Dr. D. T. MacDougal, of the New York Botanical Garden, published in this issue. It will be remembered that the Carnegie Institution last year set aside the sum of $8,000 for the establishment of a botanical laboratory in the desert region of the Southwest, at which the many problems of plant growth in that region could be studied under the most favorable conditions. Mr. Frederick V. Coville and Dr. MacDougal were given charge of the arrangements for the laboratory, and after careful examination selected what seems to be an ideal site near the city of Tucson, in Arizona. Within a few months the laboratory will be extending its facilities to students.

The Home Garden and Greenhouse.

CONDUCTED BY F. H. KNOWLTON.

[The editor of this department will be glad to answer questions of a relevant nature, and also to receive short articles on any phase of this subject.]

TIMELY WORK IN GARDEN AND GREENHOUSE.

Primulas.—Cold frames with any situation except a directly southern one are the best for the summer and fall culture of these most useful winter blooming plants; after September it matters little if the frame faces due south, provided shaded sash, or a covering of tiffany is over the plants during the heat of the day. It stiffens these plants up wonderfully to have the sash removed except during strong sunshine or heavy rain. The copious night dews are very refreshing to them, and until danger of frost threatens they are benefited by all possible exposure. The plants should be in their blooming pots by this time; 5 and 6-inch are good, useful sizes, the *P. stellata* varieties doing better in a size larger than the *P. sinense*. If any old plants have been kept over, 8-inch pots will be none too large, but spring seedlings are far preferable. When the plants become well rooted round the sides of the pot, a pinch of Clay's fertilizer or a watering with soot water will be found bracing. Later in the season stronger liquid stimulants may be used, but the finest Primulas we ever had were grown without liquid manure. These plants are better grown in frames until at least the middle of October. Most of them are now pushing flower spikes, which should be pinched out for at least two months yet.

Freesias.—The last planting of these should not be delayed much longer. Of course, bulbs may be kept until the new year, but they lose much of their vitality ere then. Some growers prefer pots or pans for the culture of these, but fully as good returns may be had from growing them in flats; one 24 by 12 inches and 3½ to 4 inches deep will hold fifty bulbs. We keep the bulbs dark until growth starts, and in the open until frost threatens, when they are transferred to shelves in a house with a night temperature of 50 to 52 degrees. Constant waterings bake the surface of the soil in the flats or pans, and stirring the surface once in ten days helps growth. Freesias are now usually cut clear to the ground when in flower in order to allow of long stems. This is very injurious to the bulbs, and while they may seem of good size when ripened, they fail to start with the vigor of new bulbs after two seasons, and if stems 18 to 24 inches long are desired some new stock must be introduced each year.

Cyclamen.—If seed has not yet been sown for next season's supply, the present is a suitable time for the work. Pans or flats of light, well-

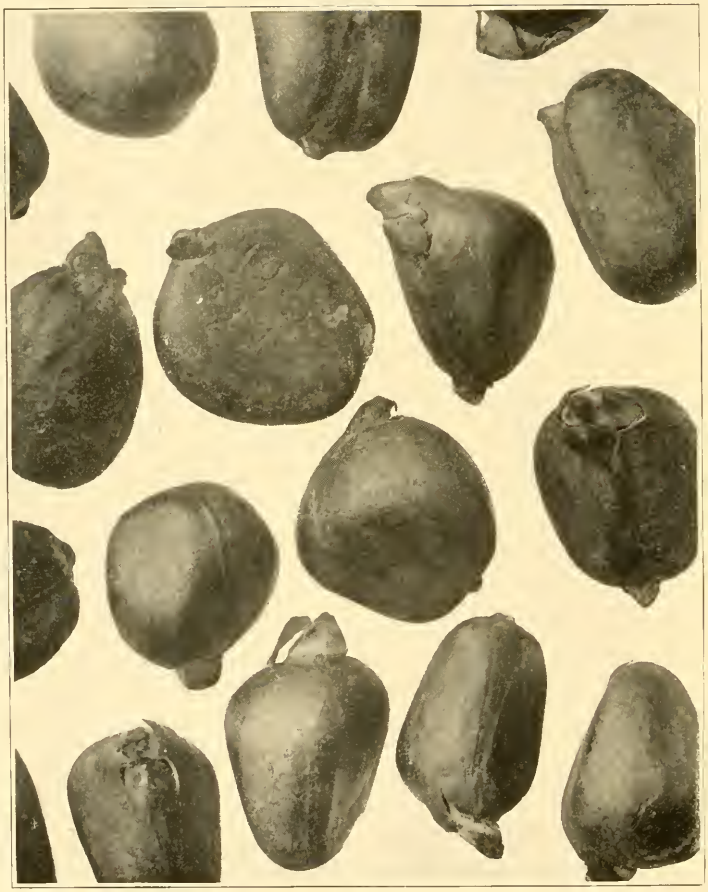
drained compost, the top portion having been passed through a fine screen, should be placed in a warm, moist house; the seed needs but a very light covering. Do not allow any of the greenhouse assistants to water these with the hose, but keep the soil nicely moist until the seeds germinate, when they will stand a somewhat stronger light and slightly lower temperature. Plants raised from seed last fall, if properly cared for, should now be in 6 and 7-inch pots, and many of these will need a further shift a little later. Like Primulas, Cyclamens want abundant air at all times, and are better exposed to the night dews, putting sash on about 9 o'clock on sunny days. Keep a careful watch for thrip, and if any appears fumigate the plants two successive evenings and continue to fumigate once a week for safety. Nothing more quickly destroys Cyclamens than thrip, unless it be the dreaded mite, which seems to be unconquerable.

The Poinsettia.—With the advent of cool nights, when the thermometer drops to 40 degrees, or even lower, it is not wise to leave these plants outdoors, or even in frames, any longer, for, while no apparent injury may be seen at the time, these chills are sure to be followed by a loss of foliage. The plants will do best in a light, airy house, where a night temperature of about 60 degrees can be maintained on hot, bright days. A syringing twice a day is beneficial, using a fine spray. Any plants requiring potting on should be attended to ere the roots become matted. We find a suitable compost to be one composed of loam, well-rotted cow manure and sand, with a dash of horn or bone dust. While nice bracts can be secured from pots as small as 4 or 5 inches in diameter, 6 or 7-inch are preferable if first-class bracts are desired. If extra large bracts are wanted for cut-flower purposes, it is not yet too late to plant a bench; given a rose-house temperature and careful watering in the early stages of growth, with liberal stimulants later when bracts show, it is possible to get heads 20 to 24 inches in diameter. Some growers keep their plants from year to year, but young plants are generally more satisfactory, particularly as regards foliage.

Lilium Harrisi, etc.—The earliest potted bulbs now have the pots well filled with roots and growths 2 to 3 inches high. To secure some of these in bloom for Christmas we remove them to a warm, moist, sunny house, where they are kept growing right along. We like to see the buds early in November to be sure of securing them in flower for the holidays. Plants not required for early forcing are better kept in frames for some time yet. There is still plenty of time to pot up batches of *L. longiflorum*, or *L. Harrisi*, for spring or Easter decoration. Bulbs seem to be plump and of fine quality this season, and it is to be hoped that disease will prove less rife. *Lilium candidum*, the well-known and popular white garden lily, was formerly much grown in pots, but of late years, owing

to the spread of the disease, many gardeners became discouraged and gave up its culture. This is to be regretted, for *L. candidum* when well grown is far superior to either of the regular Easter Lilies in purity of color and majestic beauty. Bulbs of this lily require potting as soon as received. One bulb in a 6-inch, or three bulbs in an 8-inch pot, will be found about right. After potting place in a sunny position outdoors, and leave there until frost threatens to break the pots, when the plants can be given the protection of a frame until required for forcing. This beautiful lily can easily be had in bloom for Easter. It is also superb for piazza decoration during May or early June, for which purpose it can readily be held back in a cold-house. It will not stand such severe forcing as *L. Harrisi*, but comes in bloom at least two weeks earlier from the time the buds show.

Amaryllis Belladonna.—At this season, when good outdoor flowers are getting scarce and the crops of carnations, roses, or chrysanthemums are not yet in season, a batch of this beautiful Amaryllis, with its silvery-white, rose-flushed flowers, borne on stout spikes 2 feet high, each spike carrying five to twelve flowers—according to the strength of the bulb—is a delightful sight. The flowers keep well when cut, the buds opening out in water, and the plants, when interspersed with Adiantums, make a glorious group. Now is the time to secure and pot up bulbs of this fine Amaryllis. As a rule, from three to five will go in an 8-inch pot. Nothing need be expected from them the first season in the way of flowers, although some will bear soon after being potted. It is best, however, to remove these flowers. Grown along in any cool, airy house, placed outdoors in early summer, and when leaves begin to grow sere, the pots laid on their sides in a hot, sunny position, where they can secure a thorough baking, and leave them there until flower spikes begin to push in September; these are necessary details to ensure a fine crop of bloom. —"*Plantsman*," *in American Gardening*.



Germinating seeds of Breadfruit exposed for sale in Porto Rico.
After photograph by G. N. Collins.

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The Breadfruit.—III.*

BY HENRY E. BAUM.

THE breadfruit tree, celebrated chiefly on account of the bread-like appearance of the pulp of the seedless sort, is also not to be despised as a yielder of useful articles to the natives of the climes in which it flourishes. Aside from the edible quality of the fruit there are many uses to which various portions and products of the tree itself are put. The possibilities inherent in the milky viscid juice have already been discussed in the opening paper of this series. Bird-lime, paint medium, caulking for canoes, and sizing for wicker pots are some of the uses to which this milk is put. Rubber, however, from *Artocarpus* is practically settled as being at the best a negative proposition, although many interesting experiments with the latex of this plant are still to be performed before final conclusions can be formulated.

IMPORTANCE TO NATIVES.

Although not so widely used either as a food or useful plant as in primitive times, nevertheless the breadfruit is still one of the most important plants to the Polynesian Islander. Rutland,† writing on the history of the Pacific, quotes from Moresby to the effect that the coconut and breadfruit are the only two large trees capable of growing on the small purely coral islands, hence their importance in Polynesia where so many of these islands exist.

* Concluded from October issue.

† Rutland , Trans. New Zealand Instit., 29 : 9.

Another indication of its value in the eyes of the natives is the existence in Tahiti of a legend which in abstract is as follows: "A father had an only son, whom he loved tenderly and who was unable to eat the red dirt that constituted the diet of the people. After praying earnestly that his dead body might become food for his son, his request was granted and from his buried dismembered body arose a large and handsome tree, clothed with broad shining leaves, and loaded with breadfruit." *

Ellis also records that the appearance of the natives is perceptibly improved in a few weeks after the fruit comes into season, while Captain David Porter tells of natives in the Marquesas who could not conceive of a land without breadfruit.

SEEDS.

The seeded variety of the breadfruit is common in the West Indies, while the existence of the sterile sort in some islands is considered doubtful on account of its scarcity. The tree generally receives the name of "castaña," the Spanish word for chestnut in these islands, on account of the resemblance of the seeds to that nut. These often appear in a germinating condition in the Porto Rican markets and are ready to be eaten after a few minutes' boiling. (See plate.) The seeded variety is called "dug-dug" or "dog-dog" in Guam, while the seeds, rich in oil, are known as "nangka."

WOOD.

According to Grosourdy (2 : 406) the tree furnishes a wood yellowish gray in color; rather light and soft, but strong, resistant, and elastic, and with a specific gravity of 0.495. It resists the attacks of the white ant and only needs to be kept dry to be fairly durable. The framework of Samoan houses is made of the curved limbs of breadfruit, beautifully rounded, and joined together and wrapped at the edges with coconut sennit. Other species of this genius yield valuable woods, among which may be mentioned the "Anjeli" wood (*A. hirsuta*) and *A. chaplasha* of India. The wood of most of the genus is light yellow when cut, but darkens with exposure and age to a mahogany color. The wood of the Jak (*A. integrifolia*) not only takes on a fine mahogany color, but also yields a yellow dye which serves as a mordant for other vegetable dyes.

CLOTH.

In the primitive days in the Pacific, before the advent of the trader with his beads and calico, the natives were dependent upon natural products for their scanty wearing material. The cloth prepared from the inner bark of the paper mulberry (*Broussonetia papyrifera*) was by far the most valuable, although the product of the bast of the breadfruit was not despised as a cloth producer. Mr. W. E. Safford of the Department of

* Full legend is given in Vol. I of Ellis's "Polynesian Researches."

Agriculture says that in Samoa, owing to the abundance of the paper mulberry, the natives do not use the breadfruit in this connection, while in Guam the practice, common in olden times, has of late been discontinued. The paper mulberry does not grow in Guam; the bark is not extracted by the Fijians. In Captain Cook's First Voyage (Vol. 2, pp. 211–213, Hawkesworth Ed.) there is an extended account of the preparation of the cloth from the inner bark of the breadfruit, unfortunately too long for quotation at this time.

MISCELLANEOUS USES.

In the *Journal of the Jamaica Agricultural Society* for November, 1900 (pp. 668, 669), Mr. W. Kirkland suggests the preparing of banana and breadfruit flour for fodder from small and imperfect fruits. The fruits require but a day's drying on the rocks in the sun after being sliced, and are then ready to be ground, sifted, and fed to the stock. According to Mr. Kirkland the flour was eaten with relish by horses and he has often seen stock eating bananas and breadfruits as they lay rotting on the ground. Two bunches of bananas made 10½ quarts of flour according to his account, but no mention is made of the size of the bunches. Outside of the use of this flour as fodder the banana flour makes a good esculent, which can be cooked in various ways, and was preferred by the author to cornmeal, yams, or coconuts.

According to Mr. W. E. Safford the breadfruit grows so plentifully on the island of Guam "that it might prove profitable to utilize it there for the manufacture of starch, or 'arrowroot,' as has been successfully done in the French colonies of Martinique and Réunion, and in Brazil." Horses and cattle are fond of the leaves and they are often used as fodder. In some of the Pacific islands the natives say "that no one eats the breadfuit raw, except hogs," and these animals grow very fat in the breadfruit season.

During the Cuban insurrection many refugees sought sanctuary in New York, and it was then that an attempt was made to transport fruit from Jamaica to the metropolis in accordance with a desire for the fruit among the patriots. Mr. J. W. Gruber, of Montego Bay, Jamaica, claimed that fruits with their outer surfaces charred will keep for months and be readily transportable to New York, but before the experiment could be tried the war was over and a seemingly favorable market ruined. No other similar attempt has been made, so far as records are known to us.

According to Engler in the "Naturlichen Pflanzenfamilien," the roots of the breadfruit possess astringent qualities, a decoction being taken internally in cases of diarrhea and dysentery, while it is also applied externally to cutaneous disorders.

In the tropical Pacific, where it is peculiarly at home, the breadfruit serves as a food-staple along with the banana, yam, taro, and sweet potato, and is also responsible for the development of many interesting culinary customs. A research into the culinary methods employed in the Pacific islands would be an interesting ethno-botanical study; but we can only linger over a few of the leading features and leave origins and migrations alone.

A method spread throughout the Pacific is that of fermenting the fruit in underground pits, in which condition it keeps from year to year. Captain Cook describes the process from Tahiti as follows:

"The fruit is gathered just before it is perfectly ripe, and being laid in heaps, is closely covered with leaves; in this state it undergoes a fermentation, and becomes disagreeably sweet; the core is then taken out entire, which is done by gently pulling the stalk, and the rest of the fruit is thrown into a hole which is dug for the purpose, generally in the houses, and neatly lined in the bottom and sides with grass; the whole is then covered with leaves, and heavy stones laid upon them; in this state it undergoes a second fermentation, and becomes sour, after which it will suffer no change for many months; it is taken out of the holes as it is wanted for use, and being made into balls, it is wrapped up in leaves and baked; after it is dressed it will keep five or six weeks. It is eaten both cold and hot, and the natives seldom make a meal without it, though to us the taste was as disagreeable as that of a pickled olive generally is the first time it is eaten." *

The Samoans called the cakes which they baked from this mixture *masi*, a name which they also apply to ship-biscuits and crackers. The Tahitians call it *mahie*, and use it in much the same way, as do also the Fijians, who call it *madrai*. To European nostrils the aroma of this preparation is far from appetizing, a condition of affairs which is reciprocated, however, when Polynesians are confronted with European cheese. The *masi* or cakes are generally reserved for use during times of scarcity of the fresh breadfruit and taro.

"The general and best way of dressing the breadfruit is by baking it in an oven of heated stones. The rind is scraped off, each fruit is cut into three or four pieces, and the core carefully taken out; heated stones are then spread over the bottom of the cavity forming the oven, and covered with leaves, upon which the pieces of breadfruit are placed; a layer of green leaves is strewn over the fruit, and other heated stones are laid on the top; the whole is then covered with earth and leaves several inches in depth. In this state the oven remains half an hour or longer, when the earth and leaves are removed, and the pieces of breadfruit taken out; the outsides are in general nicely browned, and the inner parts

* "Cook's First Voyage," Vol. 2, p. 198 (Hawkesworth Ed.).

present a yellowish or white, cellular, pulpy substance, in appearance slightly resembling the crumb of a small wheaten loaf. Its color, size, and structure are, however, the only resemblance it has to bread. It has but little taste, and that is frequently rather sweet; it is somewhat farinaceous, but not so much so as in several other vegetables, and probably less so than the English potato, to which in flavor it is also inferior. It is slightly astringent, and, as a vegetable, it is good, but it is a very indifferent substitute for English bread.'' *

Dampier tells us also that the natives of Guam use it as bread, ''gathering it when fully grown, while it is green and hard, and then baking it in an oven, which scorches the rind and makes it black; but they scrape off the outside black crust, and there remains a tender, thin crust, and the inside is soft, tender, and white, resembling the crumb of a loaf.'' Comm. Anson, whose visit to Guam has already been noticed, further tells us that ''the Spaniards slice it, and expose it to the sun, and when brought thereby to a crispature, they reserve it as a biscuit, and say it will bear long keeping when so prepared.'' According to Mr. W. E. Safford of the U. S. Department of Agriculture the natives of Guam also dry these slices in ovens, a photograph of one of these being given in Pl. 14 of this volume.† The fruit, according to the same authority, is rather tasteless, unless eaten with condiments such as butter, salt, gravy, etc. The Chamorro population of Guam have abandoned the custom of fermenting the fruit in underground pits, a custom which is retained, however, by the Caroline Islanders, who sought refuge on the island from tidal waves in their own group years since, and who have retained many of their primitive customs.

Horne,‡ writing of the fruit from the Fijis, says that ''the quality of some of them is excellent, dry and mealy like a potato; that of others as watery and insipid. They are either baked or boiled, and eaten alone, or with pork or fish. Sometimes they are made into puddings, or buried under ground, and made into *mandrai*, *i. e.*, native bread.''

CONCLUSION.

This short sketch of the natural history, history proper, and uses of the breadfruit does not pretend to even approach completeness in any of the three categories mentioned, owing to the absence of literature of a useful character. It only strives to be a foundation, if possible, for future work on the subject which will put the subject-matter in a stronger light.

Flowers, fruits, and trees have always figured largely in song and story; and oriental imagery in particular is full of references to natural

* Ellis's "Polynesian Researches."

† W. E. Safford, "Notes of a Naturalist on the Island of Guam."

‡ Horne, "A Year in Fiji," pp. 82, 83. London, 1881.

products, among which the coconut possibly takes first place. In Polynesian folklore, appropriately enough, the breadfruit, as we have seen, plays an important part, and its praise has been sung by poets of many lands. Lord Byron, inspired by the tales of early voyagers, describes it in the following beautiful lines :

> "The breadfruit tree, which, without the plowshare, yields
> The unreaped harvest of unfurrowed fields,
> And bakes its unadulterated loaves
> Without a furnace in unpurchased groves,
> And flings off famine from its fertile breast,
> A priceless market for the gathering guest."

Extracts from the Note-Book of a Naturalist on the Island of Guam.—XIII.*

By William E. Safford.

Friday, November 10.—I have just returned from a trip to Tarôfôfô, on the other side of the island. Started early yesterday morning, accompanied by my new boy Benancio and by Manuel Baza, who has a finca near the mouth of the Ilig River. Baza has been accused of infringing upon the property of a neighbor across the river ; and he asked me to visit his finca so that I might understand the true state of the case. Another young man, the son-in-law of Doña Francisca Aguon, was to have been one of our party ; but he ran a stick into his foot while on his way to Agaña, and is now in our hospital. Doña Francisca is the widow of Juan Cepeda, who settled in the Tarôfôfô Valley and established there a fine plantation. Her son-in-law has been accused of the same thing as Baza—clearing and cultivating a spot of land within the limits of another man's claim. In addition to visiting these two fincas I was to make an examination of Tarôfôfô Bay to see if it is a suitable place for landing the trans-Pacific cable. This I did at the request of Captain Hodges, commanding the U. S. S. *Nero*.

It was not yet daylight when we set out. As we climbed the hill behind San Ramon,—my hill now,—I brushed against a Bauhinia bush, and noticed that the two lobes of the leaves were folded together. This caused me to examine some vines of *Abrus precatorius*, which I noticed several days ago climbing among the bushes at this place, and found their tiny leaflets all folded downward back to back. A little farther on I knew there was a "Bilimbines" tree (*Averrhoa carambola*). When we

* Continued from the November issue. Begun in September, 1902.

reached it we found its leaves asleep also. Then, as the day was breaking, we came to some bushes of "Aroma" (*Acacia farnesiana*), which was just waking up and beginning to expand its leaves. Baza expressed some curiosity at my stopping to look at these plants; and when I told him of their strange habit of going to sleep every night he exclaimed, "Hesús! senor; are they then alive?" He apparently thought that if they go to sleep they must have some sort of a soul or spirit; and regarded them as uncanny or supernatural. He told me of certain trees on the island, called "Nunu" (banyans), which have many trunks and roots which hang down and strangle other trees about which they twist. These he said are supposed to be haunted by *aniti*, or spirits of the ancients, though, for his part, he did not believe it.

At this point we were joined by Don Joaquin Perez, to whom I have previously referred as filling the office of governor of the island for a time during the recent interregnum. Don Joaquin was going to his ranch, which is situated near the site of Pago, a village on the eastern shore of the island, of considerable importance at one time, which was wiped out of existence by the terrible epidemic of smallpox which swept this island in 1856 and carried off more than two-fifths of the entire population. Notwithstanding the fact that Don Joaquin is one of the *principales* of this island, and occupies the highest social position, he was dressed simply, like any other native, in a loose shirt and trousers, and wore sandals. Hanging to his belt in a leather scabbard was his machete. Conforming to the custom of the natives I also carried a machete,—a very good one it is,—made by the village blacksmith and armorer of our native guard, Don Joaquin Leon-Guerrero. The blade was fashioned out of a condemned musket's barrel, with the steel from the spring of the trigger welded in as an edge. The handle is of carabao horn and is inlaid with coin silver. I was struck with the modesty of Señor Perez's bearing as well as with the intelligence with which he answered my many questions about agricultural methods and products of the island. Indian corn, or maize, is the principal food-staple cultivated; but the natives as a rule plant only barely enough for their wants. Rice is grown in suitable situations, where the land is low and capable of irrigation, especially in the vicinity of Inarahan on the east coast, and Atantano on the bay of San Luis de Apra. Not nearly enough is produced for the need of the island. Nearly every family has its own coffee plantation, its patch of tobacco, and its coconut grove. Yams (*Dioscoreae*) and taro (*Colocasia antiquorum*) are extensively planted, as well as sweet potatoes; but the natives usually sell the latter to ships which touch at the island, the crews of which do not seem to care for yams and taro. It is interesting to note that yams and taro have names in the vernacular of the island (Dago, Nika, and Suni), while sweet potatoes are called by their Spanish-

American name (Kamote or Kamuti). Plows are used in cultivating rice and in low regions where the soil is deep enough. On the *mesa* or plateau, where the soil is too thin and the substratum of coral rock too hard for plows, the only implement is the *foziño*, or *fusiño*, a kind of thrust-hoe, with a broad transverse blade fixed T-like on the end of a long handle, the stem of the T forming a socket for the handle and one arm of the letter being shorter than the other. The short arm is used for cutting small bushes or thick-stemmed plants which might break off the longer arm on account of its greater leverage. It is surprising how much can be accomplished with this simple tool in the hands of a Chamorro. As whole families work together, miniature *fusiños* are sometimes made for the little children. When engaged in weeding a corn-field a family seems to be enjoying a merry-making rather than performing an irksome task.

We had now passed through Sinahaña, a small inland village, with its houses embowered in coffee-bushes, and had climbed the hill beyond it. Here we were met by Baza's boy, with a one-horned cow, saddled and bridled for me to ride. The bridle was in reality only a slender rope of "Pago" fibre (*Hibiscus tiliaceus*), coiled many times about the base of the horns, and then attached by a slipnoose to a gromet, or ring of fibre, through the septum of the nose. I was soon on the animal's back and was given a switch to urge her onward; but I felt reluctant to beat a female, and I could not help thinking of Stevenson's experience with Modestine in his "Travels with a Donkey." I could not brutalize this innocent creature, but let her go at her own pace. At first I did not know how to steer her and I let the boy take her in tow by the line; but after having passed several natives, who saluted me in a most respectful manner, but in whose eyes I thought I detected a shade of amusement, I determined to navigate on my own hook. Baza passed the line over the stub of the animal's left horn, and I soon found that she would go to the left in answer to a gentle pull and to the right in obedience to a jerk.

The road now led across a depression between two hills, where there was a small lake. Here there were many screw-pines (*Pandanus*) and a clump of *Cordyline terminalis*. The latter is the sacred "Ki" of the Hawaiians, a tall liliaceous plant with reddish or green leaves, which they plant about the graves of their dead as a protection from evil spirits. They also use its leaves for wrapping fish and make an alcoholic drink of its root. In Samoa, where it is called "Ti," the natives make their fringe-like skirts ("titi") of its leaves. It was introduced into Guam after the coming of the Spaniards and has no name in the vernacular of the island, the natives calling it *Baston de San José*, or "St. Joseph's staff." It is of wide distribution, and it is strange that it did not find its way to Guam before the discovery, like other Oceanic plants.

The road was now bordered on either side by dense woods, the most interesting trees of which were the leguminous *Intsia* (or *Afzelia*) *bijuga*, which yields the valuable hard wood called *Ifil* in Guam and *Ipil* in the Philippines; and *Hernandia peltata*, called *Nonag* or *Nonak* by the natives. Of the latter we noticed two kinds, one with reddish fruit and a red area at the union of the petiole and the peltate leaf, the other with white or pale green fruit and leaf-marking. The leaves of the young trees were much larger than those of the old ones. The fruit is in the form of a hollow globe open at the top, containing a round ball. This has in some English colonies given it the name of "Jack-in-the-Box."

On the top of a hill we came to a shed where there was a cross and a stone tablet bearing an inscription to the effect that in 1853 the road along which we were traveling was first made passable for vehicles from Agaña to Pago by the Governor, Don Pablo Perez. Don Pablo was the Governor who fought the priests. It is evident from copies of his letters in the archives that he was a hard worker. He did much to improve the island and benefit the natives, but he resented the authority which the priests assumed over the natives. It was only three years after he had finished the road that the town of Pago was wiped out by the smallpox. From the character of the country over which we had been passing, and the condition of the road, we could in a measure realize what a difficult task it was to make it passable, and we thought that Don Pablo had just cause to be proud of the achievement he here recorded. The most difficult part was a stretch of swampy ground where the road was over-arched by giant bamboos. Don Joaquin called my attention to the fact that in such places horses could hardly be induced to go, while cattle stepped in fearlessly. This shows that the latter are essentially more of a marsh-loving animal than horses. I have seen cattle feeding on the water-plants of Lake Titicaca, with the water nearly up to their backs. Carabaos are so fond of wallowing that when dry or tired they will sometimes lie down with their riders in the midst of a marsh or pond.

We now began to hear a rumbling sound, which was the noise of the surf beating on the weather shore of the island. The road passed very near a great spring which the natives think has some mysterious connection with Lake Matan-hanom, the source of the Agaña River on the opposite side of the island, saying that objects thrown into this spring will reappear in the other one. They tell of a sea monster that made its way up that river until the water came to an end. It then began to dig its way through the hill, but when it reached this spot it was stopped by a woman, some say by the Blessed Virgin herself.* This belief of the natives is not very strange, in view of the fact that a number of streams

*See Don Felipe de la Corte y Ruano Calderon, "Memoria descriptiva é histórica de las islas Marianas." Madrid, 1876.

on the island do disappear into sink-holes, and after wandering through underground channels in the lime-stone issue from grottos near the sea.

We now entered the finca adjoining that of Don Joaquin, and stopped for a drink of coconut water. After taking leave of him we crossed the mouth of the Pago River on a balsa, or raft, composed of several layers of bamboo, my cow swimming by the side of the raft. The ferry cable was a rope twisted of hibiscus fibre. I called the attention of Baza to the fact that this rope would be much stronger and more durable if it were thoroughly soaked in tar after the manner in which hemp ropes are tarred for use in the Navy. *Hibiscus tiliaceus*, which yields this fibre, is a littoral tree of wide distribution in the tropics. It has heart-shaped leaves and yellow hollyhock-like flowers with dark centers. The fibre is obtained from the bast, or inner bark.

We now turned to the southward and entered the district called Yoña, which is a level stretch of country of some elevation. We saw no village, but there were several assemblies of small farms called *rancherías*. And Baza entertained me by stories concerning the various owners of the farms as we passed along. The señora who owned this farm had no trouble in getting men to work for her, for she paid them by making hats for them. The owner of another one had gotten into trouble for having shot cattle which he found destroying his corn. Coming to a rancho where we saw a great pile of betel nuts, he told me that the woman who lived here collected the nuts and carried them to Agaña for sale. She was a thrifty woman, but avaricious, and not very much esteemed by her neighbors.*

On the next farm lived a man and wife who were both blind. We were struck by the fine condition of the various garden patches, and I was told that the son of these poor people not only cultivated the farm with his own hands, but took care of his parents personally. As we approached the house Baza called out and we were invited by some one to enter. We found an old man engaged in twisting pine-apple fibre into thread for making cast-nets. He had not even a vestige of eyes, the skin of his forehead and cheeks growing together continuously. His wife, on the other side of the house, was bed-ridden as well as blind. Everything in the house was orderly, and the clothing of the old people looked neat and clean. Not far from the house was a field of corn, a nursery of tobacco seedlings, and a little farther away a plantation of young coconuts set out regularly in rows. At the edge of a wood a sleek little cow was tethered to a tree to keep her out of a neighboring patch of cultivation. In a

* It afterwards came to my notice that this woman, who married one of the young men working for her, in obedience to the order of the Governor, previously referred to, had entered in the register as her property a tract of land including that of a blind uncle, who lived on the adjacent farm. The entry was evidently fraudulent, even for her own land. She said her father had left it to her, and that her sister had no right to any part of it because she was an invalid. The whole family bore marks of inherited disease.

Hibiscus tiliaceus, a fibre-yielding plant of Guam and other tropical countries.

newly-cleared spot where stumps of trees were still standing there was a patch of taro (*Colocasia antiquorum*), and some yam vines twining up poles arranged in a circle and inclined against a tree. As we stood looking about us the son of the blind people came to the house to prepare dinner for them. He was a good-looking young man, and I was glad to see that he bore no marks of the disease which had stricken his parents. I could not help thinking how different the fate of the old blind couple would have been if they lived anywhere else than in Guam and if they had not this noble son to care for them.

On the next farm we were invited to dine, and when we declined to do so we were presented with a number of eggs, some delicious oranges, and a piece of venison, which our host insisted that we should take with us. This sense of hospitality of the Guam natives distinguishes them very decidedly from the natives of Samoa, who always expect to be repaid ten-fold for their hospitality. Here my cow had the bad grace to nip a coconut plant as we passed along. Cattle as well as deer are very fond of young coconut trees. Sometimes a whole plantation is ruined in one night. They are fond of both the bark and leaves of bread-fruit also, and the young trees must be protected from them. As there are no fences about the farms cattle must always be kept tethered. When they have eaten up the grass about them they begin to browse upon the branches of bushes and trees within reach; and among the forage gathered and brought to them bread-fruit leaves are often conspicuous on top of various grasses (*Stenotaphrum subulatum*, *Capriola dactylon*, etc.). On the large stretches of land in the interior, registered as pastures for cattle and carabaos by two or three citizens of the island, the animals wander about freely in small herds. Some of these herds are cared for by boys; others apparently are uncared for. It is in consequence of the killing of some of these cattle, who were found feeding in corn-fields, that the complaints against farmers of Yoña were recently made, the owners of the cattle claiming that the said farmers were cultivating lands included within the limits of their pastures.

On approaching the edge of the plateau of Yoña we had a fine view of the sea, with a flourishing coconut plantation at our feet belonging to our late gobernadorcillo, Don Benancio Roberto. We now descended to the Ilig River, and turning inland followed along its north bank to the finca of my companion Baza. Here we stopped for dinner, and I stretched myself out in a hammock and ate a few oranges while I watched my boy assist in cooking the eggs and venison which had been given us on our way. Baza showed me a small plantation of cacao in a place well sheltered from the wind. The plants were beginning to die of old age. They are not long-lived, and Baza says they are too much trouble to cultivate. He is going to confine himself to coconuts in future, besides raising what

fruits and vegetables he needs for his family. Baza's house is like many other country *ranchos;* but it was the first I had seen in which the wood of the Betel-palm (*Areca catechu*) was used in construction. In many places on this side of the island Betel-palms grow spontaneously, and we saw hundreds of seedlings along the road in damp places. We also noticed large Lemoncito bushes (*Triphasia trifoliata*) forming inpenetrable jungles in several places. Baza pointed out to me the limits of his property, and showed me on the other side of the river the small patch of land he had cleared and cultivated. This was a part of the tract claimed as pasture-land by Don Justo Dungca. I shall have the land surveyed and examine into the title. Whatever I do I must not let my sympathy interfere with a strict sense of justice. Property rights legally established must be respected. If all land were taxed, those who make no use of it would be unwilling to retain it and pay taxes upon what yields them no profit, and they would be content to sell portions of it to others eager to cultivate it. Continuing our journey we returned to the coast and crossed the mouth of the Ilig on a balsa of bamboo like that at Pago.

[TO BE CONTINUED.]

Effects on Vegetation of the Hurricane in Florida.

By Charles T. Simpson.

The hurricane which visited the east coast of Florida on the 11th of September last proved very destructive to vegetation in general. Thousands of pine trees were snapped off or uprooted, and in the hard-wood hammock lands live oaks, red bays, mastic, and many species of tropical trees were destroyed or badly broken up, and nearly all were more or less stripped of their foliage. Cultivated trees which had reached any considerable size fared as badly as did those of the forests. But in the hammocks and cultivated grounds the remaining trees at once commenced new growth, which in many cases has reached a foot or more, and save for a few gaps and broken limbs, one would at this writing scarcely know there had been a storm. The hammocks and the cultivated trees are now about as green and fresh as a northwestern forest in June.

Not so with the vines. I had planted here on my place a large variety of vines and creepers, some of which had reached a height of twenty feet or more in the single season I have been here. Without an exception all of these which grew upon the trees are either killed outright or so

badly injured that they might as well be dead. A fine *Passiflora pfordti*, which had climbed a tree to a height of 25 feet, was carried down by the tree which was blown over. I unfastened it and led it to a tree near by, where for some little time it seemed to be all right, but it turned yellow and died root and branch. Several other passion vines, *Clerodendron thompsoni*, *Cissus discolor*, *Stephanotis floribunda*, *Lygodium scandens*, *Antigonon leptopus*, *Manettia bicolor*, and *M. cordifolia* have been killed back, and in several cases are apparently dying. A fine *Ipomoea leari* had climbed some ten feet up a string on a live oak. Since then it has died back to near the ground and has repeatedly put forth feeble shoots and leaves, but it is in a very unhealthy condition. Since the storm a seed of *Canavalia obtusifolia* came up on the opposite side of the same tree, and at present the vine is twelve feet high and in full vigor. *Ipomoea bona-nox*, which climbs to the tops of the loftiest trees, has died back in many cases almost to the ground, and is only making sickly, straggling growth. *Vitis rotundifolia*, which is everywhere most abundant in the hammocks, is in a very bad condition; the same is true of the common Virginia creeper, the poison oak, *Echites paludosa*, *Metastelma*, etc. The vines which have climbed trees are generally sick, dying, or dead. In some cases they were severely damaged by being switched and thrashed about in the storm, but I do not believe this to be the main cause of the trouble.

Flammarion, in "The Atmosphere," Harper's edition, page 336, tells of a hurricane which occurred in St. Vincent in which a whole forest was killed by electricity without a tree being thrown down, and of another in Europe in which many trees had their bark skinned off, though they remained upright. I am strongly inclined to believe that the electricity in the atmosphere caused the damage to the vines of this region; that while it was not sufficiently powerful to kill the trees, it caused the vines on them to act as conductors with most disastrous, if not immediate, effect. As evidence in this direction I have an *Ipomoea* from Cuba (*I. sidaefolia* perhaps) which had climbed twenty feet or more up a tree and was growing with remarkable vigor at the time of the storm. Since then it has died back nearly to the ground, and has only thrown out a few sickly, feeble growths. A neighbor who has the same plant, which covered an extensive arbor some seven feet high, had the arbor blown down and the vines so badly whipped with the wind that he was obliged to cut up and throw away quantities of them in order to rebuild. But it has immediately started into the strongest, most healthy growth, so that at this writing the vine entirely covers the arbor, and is full of blossom buds.

I have a large number of native and exotic Tillandsias, orchids, and other epiphytes on the trees of my hammock, and except where these were torn loose, they appear to be uninjured.

Lemon City, Florida.

Briefer Articles.

SOME INTERESTING PLANTS FORMERLY ABUNDANT NEAR GERMANTOWN, PA.

In looking over the herbarium of the late William Wynne Wister, Mr. Stewardson Brown, curator of the Botanical Section of the Academy of Natural Science in this city, has found a great amount of material of interest in general, and to the members of the Wild Flower Preservation Society in particular, so that I have appended a small list in order to show what ravages have been committed within a few years as well as to show what a fine flora was around our town but a short time ago.

This collection was the result of the labors of a gentleman of leisure and a lover of nature with a keen observation. It comprised a period of about fifty years, actually beginning with a portion of the farther time, and the records are very clear, complete, and unusually interesting, so that the Botanical Section can be congratulated upon acquiring such a natural history prize.

At the time most of this was made Germantown was not so easy of access nor the business center that it is now, but was largely given over to fine residences with ample grounds attached.

Now, however, solid sections of houses cover most of the territory, and steam and trolley roads appropriate their share, while the few remaining hills and hollows once so beautiful with the choicest of forest flowers have suffered alike by the hands and feet of the picnic multitude and other city outgrowths.

These are some that graced the hills, and kindly note them well: Large Yellow Lady's Slipper (*Cypripedium hirsutum*), Tubercled Orchis (*Perularia flava*), Yellow Fringed Orchis (*Blephariglottis ciliaris*), Northern Pogonia (*Triphora trianthophora*), Rose Pogonia (*Pogonia ophioglossoides*), Heart-leaved Twayblade (*Listera cordata*), Fen Orchis (*Leptorchis Loeselii*), Green Adder's Mouth (*Achroanthes unifolium*), Arethuse (*Arethusa bulbosa*), the various coral roots (*Corallorrhizas*), Fringed Gentian (*Gentiana crinita*), Pennywort (*Obolaria virginica*), Bog Bean (*Menyanthes trifoliata*), Rose Pink (*Sabbatia angularis*), Pursh's Phacelia (*Phacelia Purshii*).

Even the lowly fern forms shared the same extinguishing fate, and the botanist will kindly note the following: Scott's Spleenwort (*Asplenium ebenoides*), Wall Rue Spleenwort (*Asplenium Ruta-muraria*), Nuttall's Spleenwort (*Asplenium pinnatifidum*), together with the tall member of

the same family, the narrow-leaved spleenwort (*Asplenium angustifolium*).

It is truly to be regretted that there had not been a little concerted action of a determined character by these gentleman of the manor at that time, for legislation of the required sort could then have been accomplished without difficulty and perhaps it would have been sufficient for all time. Now, however, our legislators are too practical to realize the necessity of preserving the plant life of our forest and plain.

To show just how far some of the noted plants are removed from this locality, let me mention some distances of my own knowledge: The Fringed Gentian's nearest locality is 40 miles, and it is there uncommon; the fine orchids enumerated will range from 20 to 50 miles, with most of them nearing the latter figure. The ferns fare worse. Scott's Fern is not known as growing anywhere in the State; Nuttall's is found on the Susquehanna River rocks below Safe Harbor, more than 75 miles from this city; the Oak Fern and the Beech Fern are very rare under 75 or 100 miles.

This sweeping reduction of typical species can be said to be true in many other families of plants that are not so prominently public as the orchids and ferns, nor so attractive to the eye; but these illustrations are sufficient to stir the souls of the present-day plant lovers to real righteous indignation at such needless and wholesale destruction, and may this lesson urge us to use all possible persuasion to stay the destroying hand by private as well as public means or power. JOSEPH CRAWFORD.

Philadelphia.

BONIATO — A TREE OR A YAM?

IN THEIR comprehensive and useful work on the economic plants of Porto Rico (Contr. U. S. Nat. Herb. 8: No. 2), which I have had occasion recently to use a good deal, Messrs. Cook and Collins include the word "Boniato." Having heard this word, or one very like it, applied to certain plants in other islands of the West Indies, I was naturally interested in what they might have to say about it. They define "boniato" as "a tree from all parts of the island; height 10 to 12 feet * * * wood dark, streaked with yellow; hard; * * * used in cabinet-making." The omitted portions contain a few additional measurements and the specific gravity of the wood.

As authority for this definition Messrs. Cook and Collins cite "Exp. 1857," which on reference to the preface we find to be an old Spanish volume containing a catalogue of the collection of Porto Rican woods exhibited at the Madrid Agricultural Exposition of 1857. Therefore it is not probable that our authors met with the word in actual use.

In the supposition that the Spanish vernacular name of a plant, printed in a Spanish volume, must certainly have some rational etymology, I turned to Zerolo's large Encyclopedic Dictionary of the Spanish language, and there found the word *boniato* entered as a variant of *buniato*, which was defined as follows: "Planta de la raiz bulbosa y azucarada, parecida á la batata. De *bunio*," which signifies simply "a plant with a bulbous and sugary root, resembling a yam. From *bunium*." The latter is a Latin word derived from the Greek, and means an earth-nut.

It was thus that I found my own experience vindicated; for in Cuba the word "boniata," evidently a corruption of "boniato," is everywhere used among the people to indicate a variety of yam (*Dioscorea*), though I was unable to identify it with any particular botanical species. How it was possible for the word ever to come to signify "a tree with hard dark brown wood" is more than I can fathom, and I wish that Mr. Cook or Mr. Collins would let us have their experience as to its usage, if they have ever happened to hear "boniato" mentioned by the natives.

J. R. Thompson.

Prizes have been offered and more than 70,000 packages of flower seeds have been distributed this season among the school children of a Kansas city, with instructions for the best methods of growing. The interest spread rapidly from the children to their parents and many adults called for a share in the distribution. It is likely that there will be a most exciting rivalry as to the success of the flower-growers, and in the awarding of prizes.—*Country Life in America.*

It is easy to preserve autumn leaves for Christmas decoration, says *Country Life in America's* Christmas Annual. The common way is to place them between papers under a heavy weight, exactly as botanical specimens are made. Some people will then go over the leaves once with a moderately warmed flat-iron that has been rubbed with paraffine. Small branches can be placed between folds of carpet stored in the attic. The objection to the pressing method, however, is that it crushes all the life out of the leaf, flattens the venation and makes it thin, brittle, and unnatural in appearance. The hot-sand method may be a little more trouble, but it is worth the extra effort. Thoroughly dry silver sand is best for the purpose. Put the leaves in a large, shallow pan. Cover each one with a good layer of sand and put the pan on the back of the kitchen stove for twenty-four hours. If properly handled the leaves will come out perfectly dry, but with a lively look and all their bright colors well preserved.

The Wild Flower Preservation Society of America.

THE ANNUAL MEETING.

THE Society held its second annual meeting at 4.30 P. M. December 12, in the Museum building of the New York Botanical Garden. The report of the Board, printed herewith, was read and accepted. Announcement was made that Prof. L. M. Underwood, of Columbia University, Prof. Stanley Coulter, of Purdue University, Dr. C. F. Millspaugh, of the Field Columbian Museum, and Mr. C. D. Beadle, of Biltmore Herbarium, had been elected for terms of three years each. A brief general discussion was then held on the work of the Society.

The Board of Managers met the same evening at the residence of Dr. N. L. Britton, who served as proxy for Mr. Coville. The election of officers resulted in the choice of the following: President, Professor Charles E. Bessey, University of Nebraska; Vice-President, Dr. F. H. Knowlton, U. S. Geological Survey; Secretary, Mrs. N. L. Britton, New York; Treasurer, Dr. C. E. Waters, Johns Hopkins University.

The election of these officers, all of whom were members of the Board, created four vacancies in the latter, which under the Constitution the Board was empowered to fill until the next annual election. The following were chosen for these vacancies: Prof. W. J. Beal, Michigan Agricultural College; Prof. C. F. Wheeler, U. S. Department of Agriculture; Mr. Joseph Crawford, Philadelphia, and Mr. Charles L. Pollard, Springfield, Mass. Next December, therefore, the Society will vote for eight Managers.

Several amendments had been proposed to the Constitution, and received careful consideration. The most important was one relating to the annual dues. When it became known that the subscription price of THE PLANT WORLD was to be increased, it was originally proposed to make the dues two dollars instead of one dollar, and send the magazine free to members as now. But it was felt that while this might yield the same amount of revenue, it would certainly prevent the membership from growing as rapidly as desired. Therefore the suggestion made by one of the Board to follow the example of the Audubon Society was adopted.

THE NEW MEMBERSHIP DUES.

After January 1, 1904, the annual membership dues will be fifty cents. This entitles members to all the privileges except the official organ of the Society, which will be furnished for one dollar per year to members only, its regular subscription price being $1.50. Thus every

one joining the Society will have the opportunity of choosing whether he wishes to receive THE PLANT WORLD, which as heretofore will contain all the announcements and publications of the Society, or whether he wishes simply to contribute to the latter without caring for its publications. By this new arrangement the Society will be an immense gainer, for it will receive fifty cents from each member instead of twenty-five as heretofore; and with this increased income it is proposed to furnish the Secretary with clerical assistance so that our correspondence and other activities can be carried on much more extensively than heretofore. From the members' standpoint it should silence all dissatisfaction, if any exists; for it will enable those who do not care for the journal to maintain their connection with the Society at half the present cost; while those who subscribe for the journal will receive it at two-thirds the price to those outside of the Society. We trust that all of the members will continue to take THE PLANT WORLD, for under Mrs. Britton's administration as Secretary there will doubtless be many interesting papers printed, and the doings of the Chapters will also be fully chronicled.

Members who have already paid dues in advance to some date in 1904 will of course continue to receive the magazine without further charge. All others will have the option extended to them on January 1.

THE present Secretary lays aside his duties with regret, for his relations with the members have always been cordial. His change of residence, however, made it impracticable to continue the work, and the Society is to be strongly congratulated on its great good fortune in securing the consent of Mrs. Britton to serve in that capacity. We confidently believe that the excellent showing of the past year in the annual report will be even exceeded in 1904.

It is an occasion for regret that Mrs. Harris has found it impossible to serve longer as Treasurer; but the Society will continue to have the benefit of her advice and assistance in many ways, it is hoped. The selection of Dr. Waters for this post was a happy one, for he is well known to most of our members, and as President of the Baltimore Chapter is carrying on active work for plant protection in that region.

Correspondence should be addressed after January 1 to the newly-elected officers; a full list of these will appear on the back cover in the next issue of THE PLANT WORLD. The latter will also contain an interesting account of the status of plant protection on the Pacific Coast, by Mr. M. W. Gorman, one of our members. In this connection we wish to call attention to Mr. Crawford's article on another page of this issue, pointing out some of the plants that have vanished from the vicinity of Philadelphia.

CHARLES LOUIS POLLARD,
Secretary.

ANNUAL REPORT OF THE BOARD OF MANAGERS.

To the Members:

As the annual report submitted by the Board in December, 1902, covered only the first six months of the Society's existence, we are now for the first time in a position to judge the progress of the past and the projects of the future. A brief summary of the various activities carried on by the Society during the year will first be presented.

LITERATURE.

Two essays dealing with the subject of plant preservation have been published in The Plant World; one by Miss Ruth E. Messenger and one by Mr. David George. A most instructive article on "The Christmas Tree Harvest" was also reprinted from the *New York Sun*. Following our custom of last year, these essays have been sent out freely to all who have applied for them. The list of members, complete to May 1, 1903, has also been distributed in connection with circular letters inviting persons to join the Society. The essays printed during the previous year, prepared by Dr. Knowlton, Mrs. Britton, and Dr. Grout, have been in constant use and the edition of these is almost exhausted. Articles of this sort are of great value in teaching people the needs of plant protection, especially if they could be well illustrated; and members who have had experience in this work are urged to prepare additional papers for publication during the coming year. Aside from the reading which they receive at first hand, these articles are often more or less extensively quoted in the public prints, and thus may sow the seed of moderation in plant gathering.

LECTURES.

With the aid of a grant from the Stokes fund held by the New York Botanical Garden, and with the consent of the Managers, the Secretary of the Society undertook a brief lecture tour in May, visiting eight cities in the Middle West and delivering nine free public lectures, illustrated by lantern slides; his topic, "Vanishing Wild Flowers," being suggested by Mrs. Britton's essay with that title, published two years ago. The lectures were well received, and a large amount of literature was distributed among the audiences; about forty new members were secured. The Secretary has also spoken in Wilmington, Del., and in New York City, and during the coming spring will lecture before the Brooklyn Institute on this subject.

Dr. C. E. Waters, the President of the Baltimore Chapter, has delivered a number of addresses in that city dealing with the work of the Society. It is probably due to this that the Baltimore Chapter has the largest membership of any of our local chapters. Dr. Knowlton has lectured at Brandon, Vt., partly in the interest of the Society. This

branch of our work is of the utmost importance; and it has been suggested that a grant be made to each of the local chapters to be used in the purchase of a suitable stock of lantern slides, which could then be used by any one competent to speak for the Society in that locality.

CORRESPONDENCE.

It is a pleasure to record here the great benefit which the Society has derived from the untiring efforts of its Treasurer, Mrs. Carolyn W. Harris. She has written large numbers of personal letters and has promoted the interests of plant protection in every possible way, and one of the largest increments of our membership has come through her labors. Her determination not to accept the Treasurership for the coming year will be seriously felt by the Society; but it is not, of course, reasonable or just to expect one member to bear so heavy a burden indefinitely. It must be remembered that the officers and the Board of Managers give their services to the cause as a labor of love, and the amount of work accomplished in this way is far below what they could wish for, and what they confidently anticipate when the growing strength of the movement shall yield requisite means. It is an excellent testimony to the loyalty of the members that only three resignations have occurred during the year.

OFFICIAL ORGAN.

Without an actual vote by the members it is impossible to know what proportion have been influenced in entering by the receipt of a monthly magazine, or what proportion would prefer the abandonment of the organ; but one fact remains clearly evident, and that is that with our present income it would be an impossibility to print and distribute independently an average of 3,000 essays in a year, with a corresponding number of circulars of information, at less than three times the cost of the present method. Since the distribution of literature is one of the most effective of the Society's activities, it follows that a publication organ of some kind is a virtual necessity. Whether the present method, however, is preferable to that followed by the Audubon Societies, in which members pay a fee of either 25 cents or $1.00, and if they desire the official organ, subscribe for it separately, is a matter to which the Board will give careful consideration at the forthcoming meeting.

LOCAL CHAPTERS.

Following is the list of these, in the order of their establishment:

Baltimore,	31 members,	December 19, 1902.
Syracuse,	13 "	May 13, 1903.
Colorado Springs,	6 "	September, 1903.
Philadelphia,	6 "	September, 1903.

The chapters have not sent in recent reports of their work, but they are operating on the lines best adapted to their individual localities. Some method of providing funds for the chapters' use is under consideration.

ENROLLMENT.

The Society is now constituted as follows: Patrons, 3; fellows, 8; members, 354. One year ago we had 167 members.

FINANCES.

The report of the Treasurer is subjoined. The Secretary acts merely as the agent of the latter, and turns over all membership dues, for which he holds the Treasurer's receipts as vouchers. As all expenditures are made by the Treasurer, her report shows the financial condition of the Society with reasonable completeness.

RECEIPTS.		EXPENDITURES.	
To membership dues	$290.00	By the PLANT WORLD	$212.37
To two patrons	200.00	By postage, etc., of officers	42.03
To two fellowships	50.00	By printing	94.40
Interest on deposits	2.90	By expressage	6.70
Balance brought forward	83.79	By exchange on checks	.60
			$356.10
		Balance on hand	270.59
	$626.69		$626.69

In submitting this report to the members, the Board earnestly desires the advice and assistance of every one who has given thought to this important subject of plant protection, and who feels that our method of work can be improved in any particular. It furthermore makes an appeal for more strenuous endeavor and active canvassing among the thousands to whom the movement is yet unknown. With greater resources come greater opportunities, and in direct ratio follow greater results.

FREDERICK V. COVILLE,
President.

Editorial.

Owing to the delay in going to press this month, caused by the necessity of securing reports of the proceedings of the Wild Flower Preservation Society at its Managers' meeting, we shall defer the full announcement of our plans for the coming year until the next issue. As an indication, however, of one of the departments which will receive careful attention, it may be stated that Professor Francis E. Lloyd, of the Teachers' College, Columbia University, New York, will join our staff as editor in charge of the nature study and teachers' department. Professor Lloyd needs no introduction to the readers of The Plant World, and we believe that he will make the magazine valuable to every teacher of biology in the country.

In view of the improvements, past and present, in this publication, it has been determined to advance the subscription price to $1.50 per year, on and after January 1, 1904. Those who renew before that date will be privileged to do so at the old rate, and those whose subscriptions are already paid ahead will, of course, continue to receive the magazine without further charge until the expiration of their terms.

We have not taken this step without careful consideration, and we have consulted a number of our old subscribers, whose comments have been so gratifying that we do not consider any apologies necessary other than to state that we propose to make The Plant World every whit worth its price.

To members of the Wild Flower Preservation Society the magazine will be sent at a special price, in addition to the annual dues, which have been reduced from one dollar to fifty cents. The Secretary's announcement on another page will explain this matter fully.

We extend to all past, present, and future subscribers our cordial greetings of the season, and ask them to give us an opportunity during the next few months to prove the justice of the statement made long ago by one of our readers, that "The Plant World would be well worth twice the price you ask for it."

As we go to press, St. Louis is preparing to receive the American Association for the Advancement of Science and the numerous affiliated societies that will hold their sessions with it during convocation week. Botany will be represented by Section G of the Association; by the Botanical Club of the latter; by the Botanical Society of America; and by the Botanists of the Central West. The Society for Plant Morphology and Physiology will not meet in St. Louis.

Book Reviews.

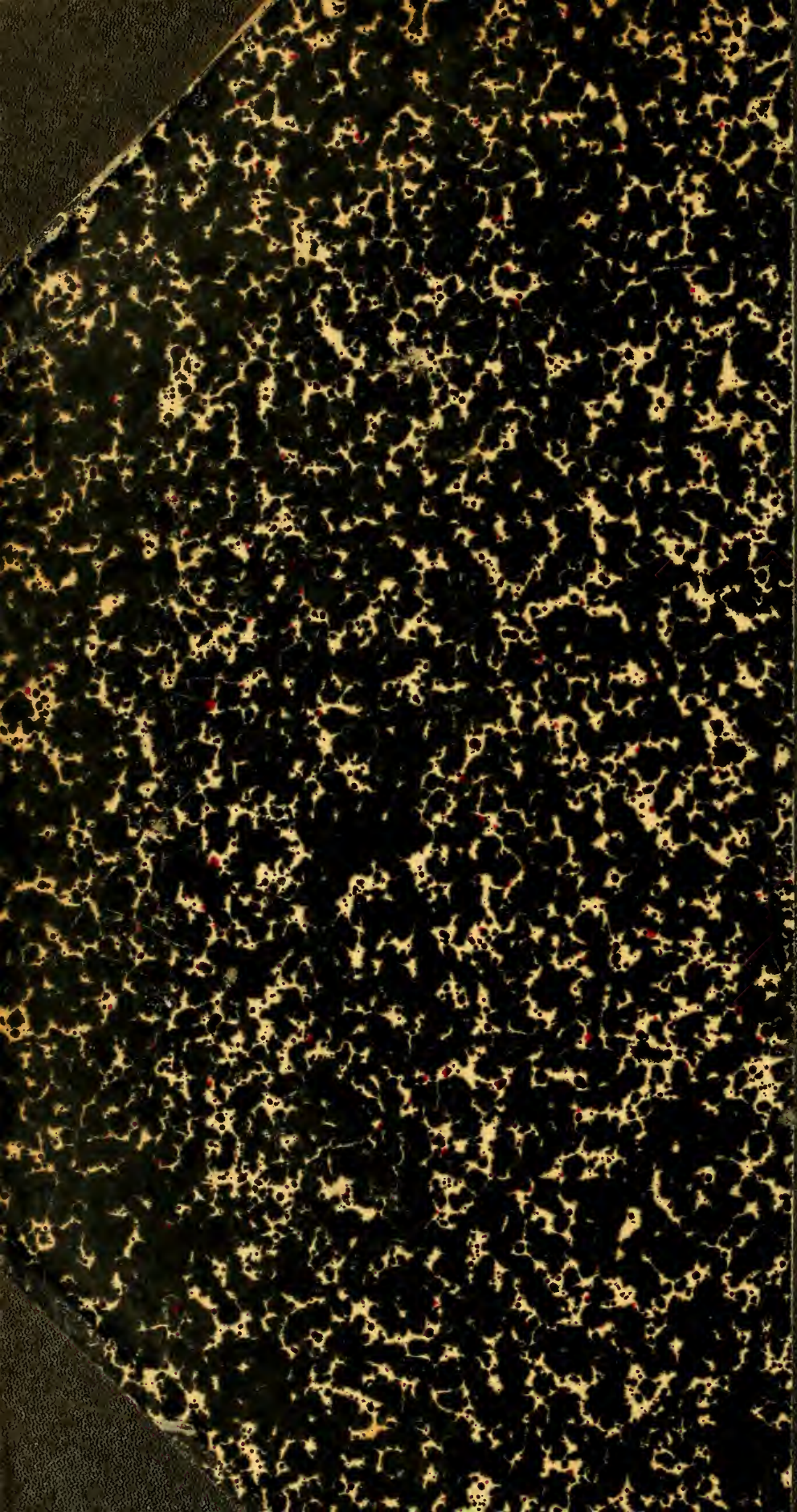
PRINCIPLES OF AMERICAN FORESTRY. By *Samuel B. Green*. 12 mo, pp. xiii+334, illustrated. New York: John Wiley & Sons, 1903. Price, $1.50.

This is an eminently practical book, adapted to the needs of the student of forestry and to the general reader as well. It presents a comprehensive survey of the cardinal principles of the science of forestry, and the various operations are described in plain and terse paragraphs. Lists of trees adapted for various purposes are given, tables and directions for measurement of standing timber, and much additional information. A unique and valuable feature of the book is the portion devoted to questions and answers concerning forest management, the cases detailed covering almost every possible contingency of soil, situation, or requirement. There are many excellent illustrations. The author is well known as the professor of horticulture and forestry in the University of Minnesota, and the book seems to have been written with especial attention to the students of this subject in the Northwest, although it is well adapted to the whole country. C. L. P.

FERNS. A MANUAL FOR THE NORTHEASTERN STATES, WITH ANALYTICAL KEYS BASED ON THE STALKS AND ON THE FRUCTIFICATION. By *Campbell E. Waters*. New York: Henry Holt & Co. 1903.

Considering the number of popular works on ferns and their general high character, a new aspirant for favor must of necessity possess sterling merit, but as one turns the pages of Dr. Waters's *Ferns* it needs but little inspection to prove that he has not only measured up to the standard, but set an even higher one. In fact, in the opinion of the reviewer, it is in every way an ideal book, and presents the subject in a thoroughly dignified and attractive manner. It does not represent that extreme of attempted "popularity" which eschews all scientific language, nor on the other hand is it so technical as to repel the chance observer; but as another reviewer has put it, it occupies a dignified middle ground. In the matter of nomenclature, too, it is refreshing, for while it is conservative enough, its pages are not marred by invective against the so-called reform movement. Beginning with a short chapter on reproduction, it passes to the subject of classification, which is followed by two distinct keys, one of which is based on the usual point characters and the other on the structure of the stalks, the latter a field first exploited by the author. Then follows the body of the work devoted to the species found

growing within the area under description. Perhaps the most marked and valuable feature of the book are the numerous high-grade illustrations with which its pages are profusely embellished. These, to the number of more than two hundred, are all from original drawings and photographs by the author, and consist of full-page plates showing the species as they appear in their native haunts, of individual plants, and what is of especial value, enlarged photographs of the fructification. The student should have little difficulty in identifying any species of fern found in the northeastern States. The closing chapter is devoted to fern photography, in which Dr. Waters tells how it is possible to attain the results with the camera that his illustrations show to be possible. In the matter of bookmaking only praise is due the publisher, for the typography and printing are superb. If we were to offer any criticism it would be that the external appearance of the book does not compare with the interior. Altogether we do not hesitate to pronounce it the ideal fern-book.

F. H. K.

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