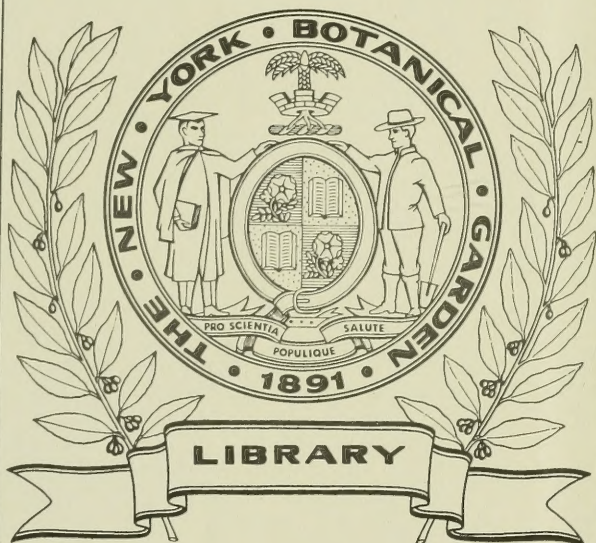


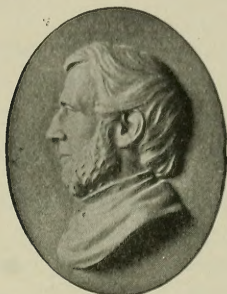
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Vol. 16
1916



TORREYA

A MONTHLY JOURNAL OF BOTANICAL NOTES AND NEWS



JOHN TORREY, 1796-1873

EDITED FOR
THE TORREY BOTANICAL CLUB

BY
NORMAN TAYLOR

Volume XVI

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NORMAN TAYLOR

Brooklyn Botanic Garden
Brooklyn, N. Y.

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BOTANICAL SKETCHES FROM THE ASIATIC TROPICS

BY HENRY ALLAN GLEASON

IV. CEYLON

(Continued from November, 1915, Torreya)

On the afternoon of February 28, 1914, the highest mountain peak of Ceylon broke into our view over the mists northwest across the Indian Ocean. That evening our boat skirted the well-lighted south shore of the island, and before daybreak lay at anchor in the harbor of Colombo. The mountainous character of the interior of the island was visible even from the shore, and the sun rose behind the sharply pyramidal summit of the sacred mountain, Adam's Peak.

Colombo offers no attraction to the botanist, other than the two public parks, Victoria Gardens and Cinnamon Gardens. The latter occupies the site of an old cinnamon plantation. These parks have a fair representation of the more important ornamental species of the tropics, and some of them are labelled with their scientific names. The following morning, March 2, we took the train inland to Peradeniya, the site of the Royal Botanical Gardens.

The first part of the 72-mile ride was not particularly interesting. It is over flat ground, only a few feet above sea level, with a good deal of brackish water, lined with tall grasses and *Pandanus*. Then one reaches low hills, with many rock outcrops and frequent dikes, indicating volcanic activity. We saw one field of rubber and one of cacao, but the commonest

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crops are rice and coconuts. The country is not settled nearly so densely as Java, and the vegetation is by no means as luxuriant. At this dry season of the year, the rice fields are used chiefly merely for pasture. The roadsides are broad, and frequently weedy, the rice fields are generally unkempt, and there are many small areas of unused ground, covered with a jungle of shrubbery or second-growth forest. The country appears to offer much better opportunity for botanical collecting than Java, but in neatness, trimness, and intensive cultivation it is far behind. This is doubtless partly due to the sparser population, and partly



FIG. 28. The Royal Botanical Garden at Peradeniya, Ceylon.

also to the season, for at this time of year there had been virtually no rain for the two months previous, and would be none in these lowlands for over a month afterward.

The little villages, scattered at short intervals along the line, have the usual cultivated plants, coconut, sugar palm, and betel especially. There were the usual tropical weeds, the low tangles of sensitive plant, an herbaceous *Spilanthes*, two species of shrubby *Lantana*, and a species of *Stachytarpheta*, very similar to our American *Verbena hastata*.

At an altitude of 250 feet, the line reaches the first tea plantation, and at Rambukkana, 52 miles out, it leaves the low country

and enters the mountains. The trains make good speed across the level coastal plain, but through the mountains travel at a vexatiously slow rate, even though there are two engines and a maximum grade of 100 feet per mile.

Our train was an hour in covering the next thirteen miles, winding around the sides of mountains and through a dozen short tunnels. The mountain sides, although seldom over 2,000 feet high, are very steep and picturesque, while below the railway lie innumerable rice terraces in the valleys, and more rugged mountains beyond. The highest altitude reached is about 1,700 feet, and in the last few miles the line descends slightly to Peradeniya, at an altitude of 1,550 feet.

The railway branches at Peradeniya junction, and it is less than half a mile on to New Peradeniya. Neither place is a town, or even a village, so far as can be seen from the railway. There is a postoffice at New Peradeniya, chiefly for the convenience of the garden staff, and the station itself is primarily for the convenience of the garden and the numerous tourists who visit it. The nearest city is Kandy, four miles farther on, with probably 30,000 inhabitants.

The Botanical Garden lies about three fourths of a mile north of the station, and is reached by a beautifully macadamized road, lined with huge *Bombax* trees and bordered by tea plantations.

We secured quarters at the government rest-house, directly across the street from the main (and only) entrance to the garden. These rest-houses have been built throughout the island where no hotel accommodations are available, and in this one certain rooms are set apart for the free use of visiting botanists. One must pay five rupees per day for meals, with small extras for fees and baths. The meals can not be very highly recommended, and an American misses ice, which seems to be unknown. Unless it is desirable to spend all the time possible at the garden, visitors will be much more comfortable in the Kandy hotels, at only a rupee or two more per day. There is frequent and convenient train service to Peradeniya, or one can use carriage or rickshaw if he prefers. In the cool of the morning, it is a pleasant walk. In Kandy there are good shops and attrac-

tive scenery, and plenty of English-speaking people as well. There is also a small hotel at Peradeniya Junction, in which we were very comfortable for two weeks, but which requires a two-mile walk or a rickshaw ride to reach the garden.

The Botanical Garden was established in 1821, with Alexander Moon as the first superintendent. The scientific importance of the garden was attained under the long directorship of Dr. Thwaites, who retired in 1880. He was followed by Dr. Trimen, author of the *Flora of Ceylon*. After his death in 1896, Dr. J. C. Willis was appointed director, and retired in 1911.

The garden has an area of approximately 150 acres. It has the shape of a horseshoe, the curving sides of which are formed by the river Mahaweli-ganga, the largest river of Ceylon, while the main wagon road to Kandy forms the other side. Its surface is gently rolling, and is well laid out with numerous carriage drives and footpaths. In the background in every direction rise the mountains, partly covered with second-growth forest, but mainly with tea estates, so that the garden has a particularly charming setting.

The buildings of the garden are few and unpretentious. There is a one-story office building, with the office of the director; a library, containing an excellent collection of botanical references; a museum and herbarium building, containing below museum exhibitions of considerable interest and above a good herbarium; and a general laboratory, one story high and without any adequate provision for visiting scientists. Botanists will in general find better facilities and much better accommodations for any sort of investigation at Buitenzorg.

In general appearance, the garden is strikingly different from the one at Buitenzorg. There are broad lawns, arbors, and flower beds, apparently intended to make the place look as much like a British park as possible. Since the trees are planted farther apart, it is frequently possible to get photographs of individual specimens and of general landscapes. This is usually impossible in Buitenzorg, because the vegetation is too dense. All in all, the garden is much more attractive than Buitenzorg, but not nearly so rich scientifically.

The climate is also radically different from that of western Java. Here the influence of the monsoons is distinctly felt, and there are pronounced wet and dry seasons. With the northeast monsoon, beginning in autumn, most of the rainfall ceases, and each succeeding month is drier, until in February and March practically no rain falls. The southwest monsoon begins in April, after a period of unusually hot weather, and brings the rains. The average rainfall amounts to about 90 inches per year, just about half that of Buitenzorg. The temperature is equable; but not so uniform as in Java. During our stay, the nightly minimum was about 70° , while the maximum was about 90° at one o'clock.



FIG. 29. *Ficus elastica*, with unusual root dependent. Ceylon.

This alternation of wet and dry season has an obvious effect on the vegetation. When we reached the garden, no rain had fallen for more than a month, and none fell during the first five weeks of our stay. As a result, the grass was brown and dry and resembled an Illinois lawn after an August drought. Epiphytes are few, and the epiphytic ferns during the dry season are flaccid and wrinkled, and feel like a rubber band. Many trees show no effects whatever, but there is noticeably a large proportion of species with xerophytic leaves, such as the India

Rubber, *Ficus elastica*. Other species are completely leafless. Many species bloom just at the end of the dry season, so that the display of flowers was particularly brilliant just at the time of our visit. The huge *Bombax* trees along the roadside, completely bare otherwise, have great crimson flowers on the branches, the *Stereospermums* are similarly covered with white flowers, and so for many other species. The garden paths are frequently strewn with red or white or yellow flowers, dropped from some tall tree above.

The number of flowers on some of the trees is almost incredible. There was an average of 25 flowers per square inch under a large tree of *Terminalia belerica*, covering a space of fifty feet in diameter, and amounting to certainly five million flowers already fallen, to say nothing of those still on the tree. After every breeze the air was filled with them as with yellow snow flakes.

It is not necessary to describe in detail the brilliancy of the floral display in the garden, because it is not characteristic of the tropics. Selective planting has emphasized it in the garden, and produced a riot of color, in which scarlet and crimson predominate. Two genera only need be mentioned.

Several species of *Brownea* are planted, producing their scarlet or orange flowers in spherical clusters as much as six inches in diameter, and composed of hundreds of flowers. *Amherstia nobilis* produces its flowers in pendent racemes a yard long. The rachis and pedicels are crimson. On each pedicel are two crimson bracts, each three inches long, and beyond the bracts is a crimson flower with crimson stamens, each petal three inches long. When a hundred or more of these racemes are blooming on a tree the size of an American cherry, the result is remarkably vivid.

Throughout the whole of March and the first few days of April the same weather continued, continuous sunshine, except for the occasional shade from a light fleecy cloud, and a dry piercing heat that seemed to grow more intense every day, until the climax came on April 4. At noon on that day the heat was oppressive. The mountains on the horizon seemed to quiver

through the heated atmosphere. The sky and the white clouds were iridescent. Every plant seemed to show the effect of too great heat, and the pinnæ of the coconut leaves were actually drooping. Even the native children, who generally play bare-headed in the open sun, kept in the shade. Still the shade temperature probably did not exceed 95° , although a black bulb thermometer would have registered possibly some 50 degrees higher. At one o'clock the hotel proprietor announced his belief that the monsoon had arrived. By three dark clouds began to travel across the sky from the southwest, and shortly after the



FIG. 30. Ornamental plantings in the Botanical Garden, Peradeniya, Ceylon.

rain fell in torrents. During the remainder of our stay in the island there was a heavy rain every afternoon, and in a very short time the lawns were green and all the trees had brightened up wonderfully. It is quite likely, however, that the improved appearance was due as much to washing away the accumulation of dust as to new growth.

The prevailing habit among the plants of blooming at or near the close of the dry season certainly gives them the advantage of a continuous supply of moisture for the development of their fruits and seeds. It does not appear probable, however, that the habit has been developed as a result of this advantage, but

rather that the continued drought induces the flowering of the trees and shrubs. Herbaceous plants frequently die during the dry season, and new shoots and flowers appear after the opening of the rainy season.

Entering the garden by its main entrance, the visitor follows the main central drive, almost half a mile long. Its continuity is interrupted by an island of palms just within the entrance and another half way down the drive. It is bordered by dense plantings of shrubbery in some places and by open lawns in others, so that it lacks completely the magnificence of the Canary Avenue at Buitenzorg. At the farther end, the main drive unites with the river drive, paralleling the shore almost around the garden. The latter offers many interesting views of the river and the mountains beyond, and is shaded by huge clumps of the giant bamboo, *Dendrocalamus*, at least 80 and possibly 100 feet in height. The farther half of the garden is occupied by the arboretum, rather densely planted to trees, but in no systematic order.

There is a small artificial lake, plots for fruit trees, vegetables and spices, a small herbaceous garden, a shaded plot for ferns, aroids, and marantas, experimental grounds, and interesting collections of bamboos, cycads, *Pandanus*, and palms. The residences of the curator and director are near the main road in one corner, and the propagating grounds and work rooms near the road at the other corner. There are throughout the garden numerous interesting plants which the botanist will examine, and the following notes will present some of the observations made by the writer.

Near the laboratory building are several tall and exceedingly slender trees of *Araucaria Bidwellii* and *A. Cooki*. *A. Bidwellii* has drooping lower branches and horizontal ones at the middle and near the summit. Each branch is produced from an obliquely conical knot or protuberance on the trunk, as much as six inches wide. On all the branches, the leaf-bearing twigs are clustered near the apex, and drop off behind, leaving naked branches. The ground beneath the trees is covered with the fallen twigs, some of them as much as five feet long.

The trees always show dimorphic leaves, after the manner of the American red cedar. The larger are nearly two inches long, divaricately spreading, and more or less plagiotropic, forming a flattened spray. The smaller are only half the size, ascending and not at all plagiotropic. One tree of *A. Bidwellii* has on its lower branches about equal numbers of each sort of leaf, arranged in regularly alternating zones, while a second tree produces the larger leaves almost entirely. Towards the top of the tree the proportion of small leaves increases, and the long fallen twigs are composed of them almost exclusively. It is dangerous to hazard a guess as to the cause of the dimorphism, but it seemed that it might represent the effect of the dry season on the shaded branches. At this season at least all the branches were producing the smaller leaves.

There are several magnificent trees of the Kauri pine, *Agathis robusta*, with massive straight erect trunk and smooth grayish brown bark. Some of them have a trunk diameter of six feet, and a height of probably seventy-five feet. Their trunks are strictly excurrent in habit, but are occasionally branched. The branch rises so nearly vertically beside the trunk that it may be ten feet or more from the point of origin to its final separation.

A staminate tree of *Lodoicea seychellarum*, with trunk a foot in diameter and eighteen feet high, was blooming early in March. The spikes of flowers are two feet long, with short projecting clusters of yellow-brown stamens.

There is an excellent specimen of the banyan, *Ficus altissima*, showing in an interesting fashion the production of prop roots. The mature prop roots seldom show any evidence of fusion or branching, at least externally. Yet the young roots before reaching the ground are freely branched, forming a tangled sheaf of slender (2 mm.) rootlets, swaying in the wind, and with their terminal growing points at about the same level. These tips are easily injured, for which reason they are frequently protected by enclosure in a section of bamboo. After they once establish themselves, usually several at a time, fusion takes place, and the growth in thickness must be very rapid, as small prop roots are seldom seen.

Normally these roots are thicker below than above, *i. e.*, on the youngest part. Others may be seen smallest in the middle, and still others irregularly thickened. They are almost invariably straight, either vertical or oblique, and the latter direction is probably caused by the gardeners, who anchor the tips somewhat out of the vertical.

When the prop roots are crowded, the amount of fusion may be very great. For example, two prop roots originate near each other on the same branch, about 35 feet from the ground. They



FIG. 31. Avenue of Palmyra palms, *Borassus flabelliformis*. Ceylon.

are fused for about twelve feet before separation. Ten feet below, they pass on different sides of a lateral branch, and both fuse with it. This branch also produces a prop root, which fuses with both the others, and there are other fusions among the three or their branches near the ground.

The main "trunk" of this banyan is over ten feet in diameter, and the peripheral fusion of the roots which compose it is so extensive and so complete that in many places it is shown only by elliptical cavities, extending through the peripheral root system, and usually more or less filled with termite deposits.

Other species of banyans differ, of course, in the details of behavior. They all agree in providing, on the horizontal

branches and between the fused roots, excellent sites for epiphytes, and the trees are usually pretty well covered with them.

There are numerous giant specimens of other species of *Ficus*, and one species is planted as a shade tree outside the garden. The specimens of this in the golf links near the rest-house have massive trunks, immense spreading crowns, and are probably a hundred feet high.

One of the most interesting displays in the Botanical Garden is made by the two huge trees of India rubber, *Ficus elastica*. The age of these trees is not known, but they have at present a trunk diameter of five or six feet. At the height of about fifteen feet the trunk breaks up into numerous large spreading branches which form a dense crown probably sixty or eighty feet across and about as high. There are not very many prop roots, but those which are present are all of large size and appear close to the main trunk. The larger branches of the tree are well covered with various species of epiphytes, among which is a triangular stemmed cactus belonging probably to the genus *Cereus* which is especially prominent. There are also the smaller epiphytic ferns and a few larger bird's-nest ferns. The leaves on the principal branches are only one half the ordinary size, as we see them on the smaller plants in our greenhouse, but leaves of normal size appear regularly on the rapidly growing stems. At the base of the tree is a huge tangle of horizontal roots extending out in all directions from the tree for a distance of about fifty feet. The thickness of these roots is generally less than a foot but their upper surface is irregular and sometimes at least a yard from the ground.

Trees of the sacred fig, *Ficus religiosa*, are, of course, planted freely in the Botanical Garden and through the whole vicinity. Besides the planted ones, wild trees are seen coming up in many different places. They seem to show an especial predilection for brick or stone walls and even appear occasionally on the roofs of the houses. As is well known, this tree is sacred to the Buddhists and a true Buddhist is not allowed to destroy or injure a tree in any way. Consequently if one of these trees takes possession of a house roof the fate of that house is usually

settled, and one sees frequent instances in Ceylon of piles of rubbish and masonry overgrown with one of these sacred figs, very likely marking the spot where some building formerly stood. We did not see the famous sacred fig tree of Anuradhapura. This tree was planted according to reliable historical evidence in 288 B.C. It is, therefore, now well over 2,000 years old and is one of the oldest trees whose age is accurately known in the world.

The highway near the Botanical Garden is lined by a double row of large *Bombax* trees. They have an appearance not unlike our American ash trees. At the time of our visit they were completely leafless, but they followed the general plan of many other trees of Ceylon and were in full bloom during the month of March. Numerous large crimson flowers four or five inches in diameter appear on the branches and ovoid pods of last year's crop of fruit were still persistent.

The collection of screw pines is interesting and includes several different species. This display seems to be much better than the corresponding one at Buitenzorg. In one species the prop roots make a labyrinthine tangle, as much as fifteen feet high. The dead leaves which seem to fall at regular intervals become tangled among these roots, forming an opaque thatch and shutting off all light from the base of the tree.

There are various trees of the Bignoniaceae planted in the Garden and many of these also bloom at the close of the dry season. In front of the rest house was a small tree of *Jacarandra mimosaeifolia*. As the name indicates, its foliage resembles that of the mimosa and before the flowers appeared we considered it related to that plant. Its flowers appear close to the branches and give the tree an aspect not unlike the American red bud. An unnamed species of Bignoniaceae, leafless at the time of our visit, produces huge flat pods up to a yard in length and four inches wide. These pods generally fell to the ground before discharging the flat-winged seeds. Two species of Legumes were also interesting because of their winged pods. The first of these, *Pterospermum*, has the wing at one side only, but the curving of the pod produces a wing which is almost circular.

A tree of the travellers' palm, *Ravenala madagascariensis*, is at least thirty feet in height to the last leaves and makes a most conspicuous appearance against the background of trees of ordinary foliage.

There is an interesting avenue of the royal palm and another of the related cabbage palm. The trunks of the latter species are so smooth and symmetrical that they appear artificial. The avenue of Palmyra palms, *Borassus flabelliformis*, is very picturesque. As the leaves fall off with old age, the persistent leaf bases make a very rough trunk. They point alternately in opposite directions. Each leaf base extends over one half the diameter of the trunk, but the expansion of the trunk splits it at the base into two halves, each half attached to the opposite side of the tree and with the wood fibers ravelled out on the split edge. As the palm tree grows still older, the leaf bases also fall off, leaving the trunk smooth and ringed. These leaves occur in definite spirals, giving a conspicuous screw-like appearance to the trunk. Both left-handed and right-handed spirals occur in approximately equal numbers. The avenue of the trees exhibited 31 left-handed and 39 right-handed.

The best display of palms which we saw in the tropics was the avenue of Talipot palm, *Corypha umbraculiformis*. These trees were planted in 1885 and already had a trunk diameter of three or four feet, including the persistent leaf-bases. A single specimen of this tree in a different part of the Garden was about seventy-five feet high, with a crown twenty feet in diameter at the top, a straight ringed trunk, and hanging dead leaves at the top fifteen feet long. The young leaves were just appearing at the time of our visit. Terminating this huge tree was the inflorescence, a huge pyramidal cluster of flowers fifteen feet high and of equal diameter, forming a most magnificent display. As is well known, these trees bloom only when forty to sixty years old and they die after flowering. Therefore, the avenue of Talipot palms has only twenty or thirty years more to live.

There is one large specimen of a strangling *Clusia* on a palm tree. It has the general habit of a strangling fig but differs in the detail of its roots. These fuse with each other more freely

and more regularly than the roots of the fig, making a rather symmetrical network along the trunk of the palm. Its leaf branches are now already so large that they shade the leaves of the palm and it would appear that the palm is doomed in a very short time.

The American rain-tree, *Pithecolobium saman*, is planted freely in the Botanical Garden and elsewhere in the vicinity. It seems to flourish just as well as it does in the Philippines but the Ceylonese trees are mostly larger, with more widely spreading convex crowns. Their flowers are about two inches wide in close umbels with numerous exerted stamens. We were interested in observing the sleep movements of this plant. By five o'clock in the afternoon, although the sun is still shining, the stomata are closed but most of the leaves are not yet in sleep position. A few of the leaves at the ends of rapidly growing stems approach the sleep position, but this may be due more to their age. The petiole remains motionless, while the pinnae of the double compound leaf soon begin to drop. Shortly after the stomata have closed, the pinnae reach an angle of forty-five degrees from the vertical. By 5:30 they are only fifteen degrees from the vertical and by six o'clock, one hour after the stomata have closed, they are nearly or quite vertical, bringing the opposite pinnae together. At the same time the leaflets fold upwards so that they bring their upper surfaces together and at the same time point forwards. This condition continues through the night, and by 6:30 in the morning the stomata are again open. At this time the pinnae are still almost vertical and the leaflets not yet unfolded, but in half an hour or an hour more they have returned to their usual daylight position. It will be observed that the movement of the leaf is always preceded by the opening or closing of the stomata and one might suspect that there was some correlation between the two phenomena.

Several trees of the sea-shore tree, *Barringtonia speciosa*, are growing in the garden, where they bear fruit freely, and others are planted along the lake-shore in Kandy. The petals of these flowers are about an inch long but the conspicuous feature of them is the mass of white stamens. These are three inches

long and a single flower may contain more than five hundred of them.

One of the most curious trees in the Botanical Garden is the cannon-ball tree, *Couroupita guianensis*. The trunk of large specimens is almost hidden by a tangle of crooked irregular branches about three feet long, on which the flowers are produced in huge racemes. One cannot say that these flowers are produced along the main trunk, but the flower-bearing branches

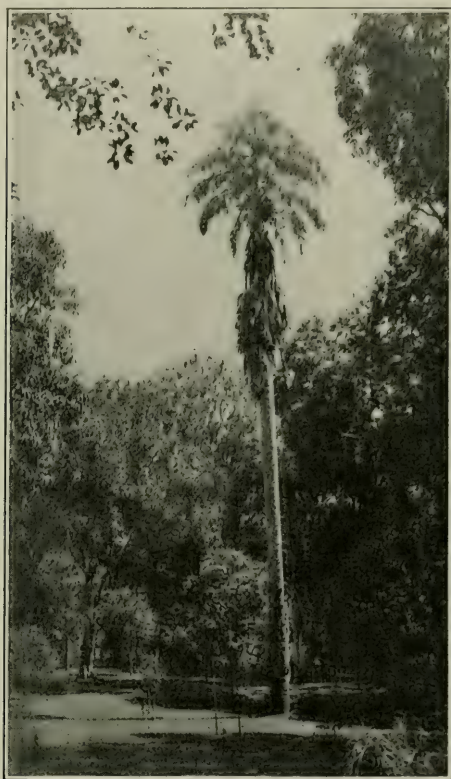


FIG. 32. Talipot palm in bloom. Ceylon.

appear there only, so that after all it seems to represent one form of cauliflory. The flowers themselves are interesting in their structure but the tree is especially conspicuous because of its huge spherical fruits up to a foot in diameter and greatly resembling the object for which the tree is named.

There is an avenue of canary trees, *Canarium commune*, which exhibits the best but not the largest buttresses that we ever saw. These appear on the sides of the trunk, as much as twenty feet above the ground, as thin triangular outgrowths three or four feet high, four inches thick, and projecting one or two feet. Most of these have a thickened place below as if the buttress was forming about a broken or a pruned branch. This is probably the case, as one was seen twenty feet up the tree with a branch scar already partly covered with callus; other lower branches frequently have the buttresses already formed. These stem buttresses are not necessarily homologous with the basal ones which appear to arise above a root. Those are long, flexuous, thin, branched, and undulating on the top, so that portions of them may be underground and then reappear eight or ten feet out. These buttresses are as much as six feet high at the base and of every conceivable shape and direction.

The upper branches of these canary trees are kept completely leafless by the colonies of flying foxes which roost there every day. These large fruit-eating bats leave the trees in the evening, and early in the morning may be seen returning to them in flocks. Their manner of attaching themselves to the branch is interesting. They fly just above it, hook their claws around it as they fly, apparently stumbling over it, swing back and forth for a few seconds, and then come to rest in a vertical position. They rest there all day in the hot sun, although at intervals one wakes up and disturbs his neighbors. The whole colony is aroused if one pounds on the buttress at the base of the trees, and then for a few minutes the air is black with thousands of them circling around their roost. Once during our visit the employees tried to frighten them away with a shotgun and one day kept them from having any sleep, but the next day the whole colony returned to its original place.

The only American species seen in the garden were the red cedar and the long leaf pine. Another plant was labelled *Rhus glabra*, but was clearly very different from our American sumac.

The vicinity of Peradeniya offers interesting landscape and mountain scenery, but has few attractions for the botanist.

All the land is planted to tea or used for the native villages and their accompanying rice fields. The shade trees used in the tea gardens at present are almost all Para rubber and the planter expects to get two crops from the same land, one of rubber and one of tea. It is doubtful whether this practice is a good one, for even here the altitude is too high for rubber and scarcely high enough for first-class tea. Other species of shade trees have been used in the past, especially eucalyptus and Australian oak, and a few specimens of these are still remaining.

Very little land is wasted in tea estates. There seems to be no soil too rocky nor no hillside too steep to be planted. Not far from the garden a huge boulder, almost an acre in extent, had one small pocket of soil almost in the middle and in this pocket five or six plants of tea were growing. There is some waste land along the river and at the edge of the native plantations, but this is occupied generally by the common weeds of the region and we really had no experience with the native flora of this part of Ceylon.

(To be continued)

ENDEMISM IN THE FLORA OF THE VICINITY OF NEW YORK*

BY NORMAN TAYLOR

Of the 2,038 native species in the flora near New York† twenty-two or something over one per cent. are endemic, which, as here considered, means that they are found nowhere else in the world. The endemics are as follows:‡

<i>Sporobulus Torreyanus</i>	<i>Hypericum Bissellii</i>
<i>Savastana Nashii</i>	<i>Hibiscus oculiroseus</i>
<i>Amphicarpon Amphicarpon</i>	<i>Kneiffia Allenii</i>
<i>Calamovilfa brevipilus</i>	<i>Ludwigiantha brevipes</i>
<i>Juncus caesariensis</i>	<i>Pyrola oxypetala</i>
<i>Uvularia nitida</i>	<i>Dendrium buxifolium</i>
<i>Salix squamata</i>	<i>Stachys atlantica</i>
<i>Dentaria incisifolia</i>	<i>Eupatorium resinosum</i>
<i>Dentaria anomala</i>	<i>Euthamia floribunda</i>
<i>Prunus Gravesii</i>	<i>Helianthus Dalyi</i>
<i>Prunus alleghaniensis</i>	<i>Senecio Crawfordii</i>

The causes of this endemism are very obscure; perhaps in the very nature of the case there may be a considerable element of chance in it. Some things stand out in connection with our local endemics however, that may throw light on the problem, and it seems certain that a number of related subjects should catch more or less direct illumination in the course of such a study.

It has been argued by Sinnott and Bailey that endemism is a criterion, at least to a considerable extent, of the antiquity of a flora. Their reasons for this have been so clearly and so recently set forth in the *Annals of Botany* and in the *American Journal of*

* Contributions from the Brooklyn Botanic Garden No. 12.

† Nomenclature, and the range considered, the same as in the writer's "Flora of the Vicinity of New York: A Contribution to Plant Geography." Mem. New York Bot. Gard. 5: 1-688. 1915.

‡ It will be seen that the list differs from that in Mem. New York Bot. Gard. 5: 32, by the inclusion of *Prunus alleghaniensis* and exclusion of *Vaccinium caesariensis*. The first has been found in a few Pennsylvania counties just outside the range, the second now appears to extend south of our area.

Botany that only mere mention of them is necessary here. Conversely, Willis* has argued that the endemic element in the flora of Ceylon is a criterion of its youth. He says, in fact, that the endemic element in the Ceylon flora is the youngest. Is one, or the other, or both, of these diametrically opposed statements to be discarded? Or is endemism in a flora a matter with which antiquity or youth has little or nothing to do? An answer to these questions seems to be furnished by the behavior of the endemics in the local region. A middle course, a compromise if you will, between the champions of youth and age may be not only "playing it safe," but true.

One of the points made by Bailey and Sinnott is, that on the whole, endemic species are not only the most ancient element in any given flora, but that they are also more apt to be of a woody than an herbaceous type. They came to this conclusion after an elaborate study of the problem from many angles, one of which was phytogeographic. Furthermore their contention is that of the endemic species in a flora, the species of the endemic genera would be still greater criteria of antiquity and still more apt to be woody. The facts, as illustrated in our region scarcely support either of these opinions. In the total flora of the vicinity of New York 83 per cent. of the vegetation is herbaceous† and 17 per cent. woody. Of the 22 endemic species only four, *Prunus Gravesii*, *P. alleghaniensis*, *Salix squamata*, and *Dendrium buxifolium*, are woody, which is 18.18 per cent. of the total endemic element. The percentages of woody plants among the endemics and among the total flora, are too nearly alike to support the theory that the endemic element of a flora is predominately woody, for in our area it is no more or less so than 1.2 per cent. which means nothing. In other words, the woody and herbaceous elements of the total vegetation bear essentially the same ratio, one to the other, that we find among the purely endemic species.

As to the antiquity of the endemic element in our native flora

* Willis, J. C. The endemic flora of Ceylon with reference to geographical distribution and evolution in general. Phil. Trans. Royal Soc. London B. 206: 307-342. 1914.

† Am. Jour. Bot. 2: 23-31. 1915.

some rather suggestive facts present themselves. It would seem that the theory demands most of our endemics to occupy that part of our area, which, as supporting the oldest vegetation we have, the pine-barrens of New Jersey, has the greatest title to antiquity of any region near New York. Of the 22 endemics only 7 are found in the pine-barrens, *Sporobulus Torreyanus*, *Juncus caesariensis*, *Eupatorium resinosum*, *Dendrium buxifolium*, *Uvularia nitida*, *Calamovilfa brevipilus*, and *Amphicarpon Amphicarpon*. The balance of the endemics are found as follows: 6 on the coastal plain (not of course, in the pine-barrens), which is recent, 7 in the glaciated area to the northward, probably still more recent, and most offending of all, 2 are confined to salt marshes which are almost new enough for their origin to have been seen.

Coming now to the question of the antiquity and woodiness of the endemic species of the endemic genera, which should best illustrate the theory under consideration, it should be stated that *endemic genera* are here understood to mean those found only in America. The species of the endemic genera are:

<i>Amphicarpon Amphicarpon</i>	<i>Dendrium buxifolium</i>
<i>Calamovilfa brevipilus</i>	<i>Ludwigiantha brevipes</i>
<i>Uvularia nitida</i>	<i>Euthamia floribunda</i>
<i>Helianthus Dalyi</i>	

We should expect the woody element to predominate in this group whereas only *Dendrium* is woody, less than 15 per cent. Of the seven species, four, *Amphicarpon Amphicarpon*, *Calamovilfa brevipilus*, *Uvularia nitida* and *Dendrium buxifolium* are found in the ancient pine-barren region, the rest are scattered along the very recent coastal plain. This is scarcely overwhelming evidence for antiquity or woodiness among the species of the endemic genera.

Indeed the case for either woodiness or antiquity among either the whole group of endemics, or among the endemic species of endemic genera, seems decidedly not proven, so far as our local vegetation is concerned. The ratios in these cases are too near those of the total vegetation not to be open to great suspicion.

It may be objected that, in using such a small area, a very slender weapon has been taken with which to attack a great conception, splendidly worked out from many angles not touched on here. The obvious retort would be that part of the argument used by the authors of that conception is phytogeographic, and it is solely phytogeographic evidence in our local region that leads to the suspicion that endemism may not really be a criterion of antiquity or of woodiness at all. Many endemics may possess both these not necessarily related qualities, or only one of them, but that either woodiness or antiquity have much to do with endemism seems a very open question.

An altogether different viewpoint is that of J. C. Willis, who has argued that the endemic species in a flora are the most recent, especially if they are very local and not widespread. He would measure the antiquity of an endemic by its ability to spread, and he has shown that in the flora of Ceylon those endemics are oldest which are the commonest, and that the most recent are the endemics which have been found only once or twice, or at a few localities. "On the average the commonness of a species depends upon its age from the time of its arrival in, or evolution in, the country. The commonness of any individual species will, of course, also depend upon its degree of adaptation to local conditions, and upon many things which can only be regarded as chance, such as the sudden appearance of new factors, like disease, etc., in the problem." Upon this conception all species would start as endemics, very local in youth, becoming more widespread in middle age, and in old age either ceasing to be endemics because they become too widespread to be entitled to that name, or else, through specific senility, disease, or other cause, dying out altogether.

Our local endemics are so well known that their distribution is easily checked with these points in view. Ten of them are very rare, having been found only in one or two localities. They are as follows:

Savastana Nashii
Salix squamata
Dentaria incisifolia

Hypericum Bissellii
Pyrola oxypetala
Helianthus Dalyi

Dentaria anomala
Prunus Gravesii

Euthamia floribunda
Ludwigiantha brevipes

It is certainly significant that all these are found in the very recent glaciated area or on the coastal plain, not one of them in the ancient pine-barren region. This certainly agrees with Willis's conclusion that rarity and youth go hand in hand. It is also true that all the pine-barren, and therefore ancient, endemics, mentioned on page 20 are frequent or even very common in that region. Which seems to prove that commonness and age, like rarity and youth, have some relation to each other, just as Willis has argued. Evolutionary theory, and especially mutation, would also lead to the conclusion that rare endemics are recent.

A rather serious objection to this theory, however, is furnished by *Prunus alleghaniensis*, *Senecio Crawfordii*, *Kneiffia Allenii*, *Hibiscus oculiroseus*, and *Stachys atlantica*. All these are certainly not rare, and all are found in geologically the more recent part of our region, while the *Hibiscus* is a salt-marsh plant and therefore very "new." Some of these extra-pine-barren, and presumably recent endemics, have already occupied more area and become commoner than the pine-barren, and presumably ancient endemics, which is not at all what we should expect if the Willis theory were wholly true.

While our local endemics seem to fit the theory of Willis better than they do that of Sinnott and Bailey, the fit in both cases leaves much room for doubt. In both cases, too, the theories attempt to explain the results, rather than the underlying origin of endemism.

So far as our local endemics are concerned a few can be dismissed, as to their origin, by the statement that they are relict endemics. Such seems to be the case with *Ludwigiantha brevipes*, *Amphicarpon* *Amphicarpon*, *Calamovilfa brevipilus*, *Dendrium buxifolium*, and *Uvularia nitida*. In all except the last, the only related species are found in Florida or somewhat to the north of it, there being a considerable break in the distribution along the coast between these widely separated generic outposts. None of the first four have any relatives in the

immediate region, and are therefore to be regarded as relict endemics, which could not have arisen recently, from related species, for there are none from which they could have been derived. Evidently they are relicts of that ancient southern flora, some of which has been lost, leaving these generic outposts in our area. Although *Uvularia nitida* belongs to a genus containing two other species, within our area its nearest relative (*U. puberula*) is a plant from the southeastern United States. On this account it should, in all probability, be considered a relict endemic like the others, all of which, with it, are species of endemic genera. Only *Dendrium* is woody, although this group of endemics is to be considered the most ancient of any that are found here.

There is another group of local endemics which seems to be, and probably is, of very recent origin. They are found in genera that, so far as the local region is concerned, dwindle in numbers in their passage through the region. In the following table are given the endemics of this class, the number of local species in the genus in which they are contained, and the number of native species of that genus that reach their distribution outposts here:

Endemic Species.	Number of Local Native Species in Genera Containing Endemics.*	Number of Species Reaching Distribution Outposts in the Area.
<i>Sporobulus Torreyanus</i>	7	2
<i>Juncus caesariensis</i>	27	7
<i>Salix squamata</i>	19	5
<i>Prunus alleghaniensis</i>	7	2
<i>Hypericum Bissellii</i>	13	3
<i>Kneiffia Allenii</i>	5	1
<i>Eupatorium resinosum</i>	14	3
<i>Euthamia floribunda</i>	3	1
<i>Helianthus Dalyi</i>	8	3
<i>Senecio Crawfordii</i>	5	2

It would seem that to this generic instability, if it can be so called, is due the origin of the endemic species in the above list.

* In each case less one species, the endemic one. As will be seen subsequently it is obviously improper to count the endemic species in this column. The basis of the argument is that they are derivatives of the generic content of our flora, and therefore should not be included in a count of the elements of that content. As derivatives we must exclude them from the count of the material from which they have been derived.

For it is well known that genera are more prolific of new forms at the edge than at the center of their range. A striking case in our area is that of *Panicum* and *Carex*, which both have dozens of specific outposts in the region. As it happens none of these are endemic here, but that in no way invalidates the contention, as the species may spread as in both these cases, so as not to be endemic in our particular region.

In somewhat the same category are those endemics which, while they do not belong to genera that dwindle in our region, are related to species that find their distribution outposts here or very near here. Such are *Dentaria incisifolia* (related to *D. maxima*), *Hibiscus oculiroseus* (related to *H. Moscheutos*), *Stachys atlantica* (related to *S. hyssopifolia*), and *Pyrola oxypetala* (related to *P. chlorantha*).

Here again, as in the endemics that are found in the dwindling genera, it is the element of instability, which seems to be the underlying cause of the production of new forms. There may have been thousands of such forms produced in our area but only a few have been detected. Some of these are already widespread, but it does not seem clear that they are therefore, as Willis would have us believe, the most ancient of the endemic element. For the speed with which the endemic *spreads* may have little or nothing to do with the cause of its origin. So many factors enter into the *distribution* of an endemic, that it seems scarcely safe to take this as a criterion of its age in any given area. Other things being equal, we should expect to find our newest endemics the most restricted, and *vice versa*. But other things are not equal, indeed the inequality of other things, is, as we have seen, so great that such a criterion of antiquity in endemism must be used with extreme caution.

In the whole native flora of the region about 20 per cent. of the species reach their distribution outposts within the area. Excluding the relict endemics, noted above, all the rest of our endemics except three to be treated presently, belong to genera that dwindle, or are related to species that are on or near their outposts, in this region. The inference that generic and specific instability is the chief factor in the origination of these endemics

seems unescapable. It cannot be without significance that so many of our endemics are in genera, or are related to species which, if the phrase be permitted, appear to flutter along the edge of things. This generic and specific waywardness is forcibly impressed on us by the dropping out of species as the genus diminishes through the area, or by the number of species related to endemics, which find their outposts here or very near here.

Excluding the species of the endemic genera, which are as we have seen, nearly all relict endemics, it proves interesting to see what relation our eastern American proportion of species in each genus containing endemics, bears to the distribution of the whole genus. The following table gives these figures, for all the endemics except species of endemic genera and three others which will be considered presently.

	Native Species in E. N. America	Total New World Species	Total Old World Species
<i>Sporobulus</i>	19	40	43
<i>Juncus</i>	47	60	103
<i>Salix</i>	39	47	196
<i>Prunus</i>	8	31	86
<i>Dentaria</i>	6	6 or 7	10
<i>Hibiscus</i>	5	63	200
<i>Hypericum</i>	21	82	166
<i>Kneiffia</i>	8	12	3 (?)
<i>Pyrola</i>	8	13	7
<i>Stachys</i>	11	16	150
<i>Eupatorium</i>	21	130	265
<i>Senecio</i>	20	500*	535

As throwing a broader light on this question of the production of endemics far from the center of distribution of a genus, it is not without significance that in only three cases, in the table above, does the region in eastern North America seem to be anywhere near the generic center. In *Kneiffia*, which may be all American, as there is some doubt as to the Old World species being correctly credited to the genus; and in *Pyrola* and *Dentaria*, which are nearly all of the North Temperate Zone and almost impossible of generic centralization, we have the only exceptions. It would seem as though these three were not enough to upset the main contention of this paper which is that endemism is most likely to occur at or near the periphery of generic distribu-

* Nearly all tropical.

tion rather than near the center. Certainly nearly all our local evidence points that way, and on a much wider scale, the distribution of the genera which happen to contain local endemics, further supports the argument. If this is correct, it will be seen that endemism may have little to do with woodiness or antiquity; indeed, as we have seen, it does not seem to bear much relation to either of these qualities in our local area. Nor may it have much to do, either, with rarity or commonness, for it has also been shown that these questions relate to the subsequent performance of endemics rather than to their origin. The powers of adaptation, which must be the measure of the capacity to spread, differ so widely and are influenced by so many factors with which endemism has confessedly nothing to do, that the use of the rarity or commonness of any particular endemic as a criterion of its age is likely to lead to grave error.

There are still three more endemic species in the local flora area that have not been accounted for. In some ways they are the most puzzling cases of the lot, for they do not seem to be in the category of their fellows. In the case of two of them they might be called "habitat endemics." *Prunus Gravesii* is obviously a rock-loving offshoot of the predominately sand-inhabiting and widely dispersed *P. maritima*. This curious form has only been found at one locality, on a rocky ledge, where the difference between its habitat and that of its probable progenitor is very marked. The other habitat endemic is *Savastana Nashii*, which is the only salt-marsh species of the genus known in the area. The inference that it has been derived from the closely related *S. odorata* is obvious. In fact there are taxonomists that doubt the specific validity of this endemic at all. About the third and last of our local endemics little is known, either of its origin or of the causes of that origin. There seems, in this case, so little collateral evidence that one is almost glad to record merely its name, *Dentaria anomalal*

SUMMARY.

Endemism, as found in the flora of the vicinity of New York, does not appear to be a criterion of antiquity, for many endemics are very recent. Neither are the endemics prevailingly woody,

for the occurrence of only four woody forms out of a total endemic element of 22 species, disproves this contention. Nor do anti-quity or woodiness prevail among the species of endemic genera.

Rarity or commonness do not appear to have much to do with the age of our local endemics. For it has been shown that some of our most widely spread species are among the newest in point of origin. Speed of distribution, may be, and usually is, controlled by factors with which the origin of an endemic has nothing to do.

Relict endemism accounts for five of the local species which are shown to be outpost survivals of a preëxisting flora. All of these are species of endemic genera; only one is woody although these are probably the most ancient of all our endemics.

Generic and specific instability seems to account for the great majority of our endemics, 14, in all. These species are all shown to belong to genera that dwindle, or to be related to species, that are on or near their limits, in the local region. Further support of this view is given by the proportion of species in eastern North American genera containing endemics, to the number of species found in the rest of the country and abroad. It was also shown that while only 20 per cent. of our whole vegetation finds its limits in the area, much over half of our total endemics belong to genera that dwindle, or are related to species that find their limits, here or very near here.

"Habitat endemism," where a species seems to have been thrust off from a well known and widely dispersed form, into a totally different habitat from that of the supposed progenitor, seems to account for two of our local endemics. And one other is anomalous.

Endemism seems, then, to be a quality in the making of which many forces are operative. It may not always be possible to say as to just what is to be attributed the origin and succesful spreading of any particular endemic. The various tendencies, outlined above, seem to shape themselves from a study of the local species, but it may be found that the principles here set forth must be modified when they are applied to other and wider fields.

REVIEWS AND NOTES

Bailey's Principles of Fruit Growing*

The volume just issued is the twentieth edition of the work. Although representing a new edition of a former work, practically the entire book has been rearranged and rewritten. All phases of the subject are considered from the selection and location of the land to the harvesting and marketing of the crop.

The early chapters are devoted to a careful consideration of the physical factors concerned in fruit raising, such as topographical features, climate, soil, fertilizers and the best methods of tillage. The following two chapters deal with the selection of the varieties, and the planting and subsequent care of the trees. Considerable attention is given to the matter of pruning.

Under accidents and injuries a list of the principal insect and fungous enemies is given with suggestions for their control. The concluding chapter is devoted to the harvesting and marketing of the product. The entire work is well illustrated and so written as to appeal to the amateur as well as to the professional fruit-grower.

F. J. SEAVER

Baden's Observations on the Germination of Spores of *Coprinus sterquilinus*†

Miss Baden in an attempt to study the sexuality in the Basidiomycetes reports that the spores of *Coprinus sterquilinus*, a European ink-cap which resembles somewhat *Coprinus stercorarius* do not germinate in Kuster's solution. However when the spores are subjected to digestive juices or are placed in a decoction made of horse dung the spores are found to produce germ tubes. The cause of germination the author ascribes to the influence of certain rod-shaped bacteria. To prove this contention filtered and sterilized horse dung decoction was inoculated with the spores in question but no germination took place. When the natural dung bacteria were present germination took place readily. Another point of considerable interest which Miss

* Bailey, L. H. The Principles of Fruit Growing, pp. i-xiv, 1-432, figs. 186. Macmillan Co., 1915. \$1.75.

† Baden, Margaret L. Observations on the Germination of Spores of *Coprinus sterquilinus*. Ann. Bot. 29: 135-142, pl. 7. 1915.

Baden makes is that after five or six days further germination of spores and growth of the germ tubes already formed is inhibited through the action of another form of bacillus present in the cultures. The characteristics of these two types of bacilli have not been determined. Miss Baden gives no explanation of how *Coprinus* spores free from bacteria may be obtained. That *Coprinus* spores germinate in the presence of bacteria is well known to the mycologist. The problem lies in growing spores of various fungi in pure culture. Then and only then may we dare to approach the question—"What is the origin of the binucleated condition in the Basidiomycetes?"

MICHAEL LEVINE

NEWS ITEMS

Dr. Henry S. Conard, professor of botany in Grinnell College, Iowa, will be in residence at Harvard University during the second semester of the current school year as "Visiting Lecturer," on the Exchange Relation of the colleges of the middle west.

Mr. R. C. Faulwetter at Columbia University has been appointed Plant Pathologist at the Experiment Station of South Carolina at Clemson College. Mr. Faulwetter's new duties begin in January.

The friends and colleagues of Professor Peck, who has recently retired from the position of New York State Botanist after nearly fifty years of service, have expressed a wish to commemorate his important labors in the field of mycology by placing in the new rooms of the New York State Museum an exhibit of reproductions of the Edible and Poisonous Fungi of New York. Further information may be obtained from Dr. J. M. Clarke, Education Building, Albany, N. Y.

At the Columbus meeting of the American Association for the Advancement of Science a group of botanists and zoologists interested in ecology organized the American Ecological Society. This action was the culmination of a meeting in Philadelphia in 1914, reported in *TORREYA* for November, 1915. The first

officers of the new society are: *President*, Victor E. Shelford; *Vice-President*, William M. Wheeler; *Secretary-Treasurer*, Forrest Shreve.

The officers for the Botanical Society of America for the coming year are *President*, R. A. Harper; *Vice-President*, G. T. Moore; *Treasurer*, Arthur Hollick; *Secretary*, H. H. Bartlett. The society voted to do away with the class of membership heretofore known as fellows, but failed to create a class of honorary membership as outlined in a proposed amendment to the constitution.

A series of free public lectures for amateur gardeners and those interested in plant growth has been established at the University of Pennsylvania. The lectures are being given on Wednesday evenings by Dr. John M. Macfarlane, professor of botany and director of the botanical gardens of the university.

The Plant World announces the offering of two prizes for the best papers embodying original work in soil physics. The first prize will be \$50 and the second \$25, with the reservation of the right to withhold both prizes if no worthy papers are submitted or to combine the prizes for the rewarding of a paper of exceptional merit. The conditions governing the award will be similar to those employed in connection with the prizes for papers on the water relations of plants which were offered in April, 1915. The contesting contributions should be in the hands of the editor of *The Plant World* by December 1, 1916, and the announcement of the award will be made not later than March 1, 1917.

Associate Professor H. P. Barss has been promoted to be professor of botany and plant pathology at the Oregon Agricultural College in place of Professor H. S. Jackson, who recently resigned to accept the position of plant pathologist at Purdue University.

Dr. Paul Bartsch and Dr. J. N. Rose have been selected as delegate and alternate to represent the Biological Society of Washington at the Pan-American Scientific Congress.

At the annual meeting of the New York Academy of Sciences held at the Hotel Manhattan on the evening of December 20, 1915, members of the New York Academy were enabled to con-

verse with members of the California Academy of Sciences in San Francisco, by the courtesy of the American Telegraph and Telephone Company. Dr. Britton talked with Miss Alice Eastwood, curator of the botanical collections of the California Academy, obtained information relative to specimens of certain cactuses collected on the Galapagos Islands, and asked that they be loaned to him for study, which request was granted; a letter written by Miss Eastwood on December 30 states that the specimens will be sent to the New York Botanical Garden in a short time. A record is here made of this event, as doubtless the first instance when botanical specimens were borrowed over a telephonic distance of more than three thousand miles.

The Torrey Botanical Club

Contributors of accepted articles and reviews who wish six gratuitous copies of the number of *TORREYA* in which their papers appear, will kindly notify the editor when returning proof.

Reprints should be ordered, when galley proof is returned to the editor. The New Era Printing Co., 41 North Queen Street, Lancaster, Pa., have furnished the following rates:

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TORREYA

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THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR



JOHN TORREY, 1796-1872

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BOTANICAL SKETCHES FROM THE ASIATIC TROPICS

BY HENRY ALLAN GLEASON

IV. CEYLON

(Continued from January Torreya)

The shade trees used in the tea gardens at present are almost all Para rubber, *Hevea brasiliensis*, and the planter expects to get two crops from the same land. It is doubtful whether this practice is a good one, for even here the altitude is too high for rubber and scarcely high enough for first-class tea. Other species of shade trees have been used in the past, especially *Eucalyptus* and *Grevillea*, and a few specimens of them are still remaining.

After three weeks at the Botanical Garden, we took the train for Nuwara Eliya, the chief summer resort of the English, located near the southern end of the island at an altitude of 6,200 feet.

There are few railway routes which pass through a more picturesque country than the railway from Peradeniya to Nuwara Eliya. For once one does not regret the slow Ceylon trains. Over similar mountain railways in America, the running time would be two hours or at most three, but here it drags out to six. It is a steady climb of about 100 feet per mile all the way. The builders of the railway seem to have had an aversion to bridges and tunnels, so the line winds back and forth on the sides of the mountains, ascends the valleys to their head on one side and returns on the other, and has more curves and loops than any American railroad.

[No. 1, Vol. 16, of TORREYA, comprising pp. 1-32, was issued 17 January, 1916]

Near Peradeniya the tea estates appear only in the background, and the valley land is planted to diminutive fields of rice. In the numerous villages the huts of the natives are surrounded by cacao, coconuts, betel palms, bananas, and bread fruit. As the line ascends progressively higher and higher, these tropical fruits disappear one by one, the banana being about the last to go, at an altitude of 3,800 feet. The little villages gradually disappear also, and the natives all live near the tea factories in barracks called coolie lines. As the villages and tropical vegetation are left behind, the tea gardens expand and eventually monopolize the landscape. It is remarkable what a large amount of space they occupy. One scarcely realizes that the whole world can consume all the tea which they produce, and the scene can be compared only to the almost continuous cornfields of Iowa.

In America one never sees any mountain in cultivation, except a few little clearings here and there, but in Ceylon a whole mountain will be one continuous tea garden from the valley at its base to its very summit. Not an acre of the original jungle is left. Picture a deep valley with the train on one side of it 500 feet or so up. On the opposite side the mountain rises from the valley some 1,500 or 2,000 feet. In either direction, up or down, for a distance of five miles or so the valley is visible, so there is in sight at one time a strip of land ten miles long and probably two or three miles wide. This whole area is almost a solid mass of uniform dark green tea plants, set out in regular rows. Zigzagging over the sides of the mountain are yellow lines where the roads are located. At the bottom of the valley a broader yellow line locates the well-made automobile road. Running vertically up the mountain are rows of light green shade trees about 100 feet apart, standing out sharply against the sky on the very crest and disappearing over the other side. At four or five places in the landscape are the tea factories, huge three-story buildings, black with white trimmings. Somewhere out in the tea fields there are a hundred black specks where the Tamil coolies are picking tea. Now stretch this panorama out over fifty miles of country and it may give some imperfect idea of the Ceylon tea industry.

Here and there the train passes a village where a few English and a crowd of coolies meet it. Occasionally small rock gorges with white waterfalls in them open out into the valley; rarely there is a small patch of forest in a gorge or along an especially rocky place; but in every direction there is tea and yet more tea as far as the eye can reach.

Tea will flourish at great altitudes in this country. Several years ago the government decided to sell no land above the 5,000-foot level. This is intended not merely to preserve the forest and to make permanent the supply of forest products, but chiefly to control the headwaters of the rivers and reduce the dangers of floods. Before this decision was made a good deal



FIG. 33. The mossy forest of Ceylon, altitude 6000 feet.

of land at the higher elevation had already been sold and is now planted to tea. Nevertheless, the tops of most of the higher mountains are still forested, and one can easily see how some of the estates run right up to the limit, leaving a horizontal forest margin around the whole mountain. This is the only reason for the absence of tea, however, and it is quite likely that the whole mountain region of Ceylon would be one vast tea garden but for this governmental regulation.

The shade trees in the lower levels are mostly Para rubber.

As one goes higher the cooler climate prevents the growth of rubber and it is replaced by acacia, Australian oak, and eucalyptus. In still higher altitudes shade trees are not necessary.

We left the mountain line of the railway at Nanu-oya and completed our trip to Nuwara Eliya by a seven-mile ride over a narrow-gauge railway. In this distance it climbs an even thousand feet and is even more crooked than the main line. At this altitude, well above the governmental limit, much of the original forest is left and from the train window one gets an excellent view across the valleys of its superficial appearance.

From this bird's-eye view, the mossy or subalpine forest presents a most picturesque and characteristic appearance. Across the valley one sees only the tops of the trees and notes nothing of their height or the shape of their trunks. It is the color which is strange. Of course, the color is green, speaking generally, but there is every shade from the palest yellow green to the darkest olive. Mingled with these are all sorts of russets, browns, crimsons, yellows, and neutral tints, but all soft in tone and harmonious. These colors are partly natural to the full grown leaves, but they generally indicate trees on which the young leaves are just unfolding or the old leaves are dying. I did not believe before reaching Ceylon that tropical trees may turn as bright in color as those of temperate zones when the leaves get ready to fall, but several species of these mossy forests are as brilliant as our American oaks and maples. The general effect of this color combination makes the forest a very pleasant mosaic, not at all monotonous like the summer green of an American forest. When seen at a greater distance on the sides of distant mountains the separate colors tend to lose their identity and blend to form an exceedingly rich soft velvety green.

The little town of Nuwara Eliya contains a large number of good hotels and its sole function seems to be to provide a cool climate for the English during the hot season in the lowlands. At night the thermometer drops into the forties and on one occasion during our stay there was a heavy white frost. During the day the sun is exceedingly bright but the temperature does not exceed 75. With a bracing climate, comfortable hotels,

and virgin vegetation on every side, it is a most attractive place for a botanist to visit, and the mountain garden at Hakgala is only six miles away.

Mountains rise on all sides of the flat valley in which Nuwara Eliya is situated. Most of these reach an altitude of 7,000 feet or more, and at the north side of the town stands Pidurutalagala, commonly called Pedro by the English, about 8,300 feet high and the highest mountain in Ceylon. This is an old settlement



FIG. 34. Young *Rhododendron arboreum* in the patana. A mature tree appears at the left. Ceylon.

and some tea estates were planted before the altitude restriction went into effect, so that the sides of some of these mountains are now planted with tea. Most of them, however, are still covered with the virgin mossy forest.

Entering the mossy forest on the sides of Pedro, one finds that the interior is very different from its charming exterior. The trees are low, not over 30 feet high, and crooked with gnarly branches. The leaves are small, stiff and leathery, and mostly clustered at the ends of the branches. Trunks and branches alike are overgrown with mosses. The undergrowth is remarkably dense and in some places the forest is well-nigh impenetrable. We were able to recognize but few of the herbaceous species,

but it was easy to see that many of them are of temperate-zone affinity. They are violets and brambles, various species of composites and valerians, and several species of melastomes. There are tall specimens of *Solanum indicum* with blue flowers and very prickly stems, a *Vernonia*, a few gingers with clusters of red flowers, and a matted, tangled, impenetrable bamboo with hispid, almost nettle-like, leaf sheaths.

The most remarkable feature of the forest, however, is the frequent dense growth of *Strobilanthus*. This is a short-lived shrub of the *Acanthus* family. It has opposite leaves and a square stem which is seldom freely branched, so that it assumes the habit of a giant *Coleus*. The bark is rather thick, but soft and juicy, and grayish brown in color. The stem is slightly enlarged at each node and may be three or four inches in diameter. These plants do not occur everywhere through the mossy forest, but only in dense patches, where the stems are almost as close as wheat. Being short-lived the ground is carpeted with fallen stems and since these are woody they do not decay at once but may accumulate to a depth of two or three feet. Walking through a patch of *Strobilanthus* is an exceedingly arduous task, as one can easily imagine.

Trimen in his *Flora of Ceylon* has an interesting paragraph on the habits of *Strobilanthus*: "Many of the species which grow in the upper montane zone are remarkable for their gregarious occurrence in vast abundance and over large areas. The principal ones, especially common, and together or separately forming unbroken sheets of undergrowth in the forests, are *S. viscosus*, *asperrimus*, *calycinus*, and *sexennis*. . . . These live for several years without flowering, growing close together with straight erect stems, which in some reach a height of 8-10 ft., are quite woody, and several inches in diameter. A few flowers may here and there be found every year, but it is not until the plants reach a certain age, apparently usually from 10-13 years, that the whole patch or area bursts into simultaneous blossoming. These patches or districts are often of great extent, and the boundaries between those of different ages are very conspicuous, being as distinct as if artificially sown. After this general and

profuse flowering the whole patch begins to wither and ripen to seed—a process which takes several months or even a year (whence ripe seed is rarely found in herbariums), and then dies down. There is probably a patch to be found flowering somewhere in the mountains every year. The wood is hard but brittle, with a large pith and makes very good fuel, and the flowers are often beautiful.”

The height given by Trimen is sometimes exceeded. We estimated the average height of one patch at twelve feet, and measured one plant of sixteen feet.

All this underbrush makes a very dense interior and once within the forest all view of it is shut off completely. In the deepest and shadiest ravines there are small tree ferns ten feet high or less.

In the original forest the smaller plants must be confined chiefly to shaded rock outcrops and to the immediate vicinity of streams. They are found most easily along the paths cut through the forests. These are nearly always on the hillsides and consequently have a vertical face as well as a little strip of flat ground. Here the ground is covered with numerous small species, including *Viola serpens*, with a flower like our *V. striata*; a melastome, *Osbeckia* sp., with a flower like a wild rose; a smaller melastome, *Sonerila zeylanica*; some leafy liverworts and mosses, and various small ferns of various form and genera.

The flat valley in which Nuwara Eliya is located is largely treeless and occupied by gently rolling meadows which appear as if artificially cleared. These meadows are a part of the peculiar formation known in Ceylon as patanas. The first of these are found near Nuwara Eliya and towards the south and east from that place they occupy ever increasing proportions of the land. At this altitude they are mostly in virgin condition and offer interesting opportunities to the plant ecologist.

The first patana which we visited is called Moon Plains, lying some four miles east of Nuwara Eliya. Ascending a winding path through a tea estate, one catches occasional glimpses of the open plain ahead, and finally comes out at one end of the patana, some hundred feet above it, and with its whole area in

full view before him. Moon Plains is approximately a mile long from east to west and half a mile wide. It lies at an altitude of about 6,500 feet, but is itself of comparatively low relief. From the edge of the patanas on the hills to the rather broad valleys is probably always less than 200 feet, and usually less than 100. However, from the highest end of the patana to the bottom of the canyon which drains it at the other end may be as much as 300 feet. The slopes of the hills lie at a low angle



FIG. 35. The sharp transition zone between the patana and the mossy forest. Ceylon.

also, so that the whole patana has a gently undulating surface. From one end to the other, hundreds of *Rhododendron* trees, *Rhododendron arboreum*, are scattered over it, but always at considerable intervals, so that they can in no case be dignified collectively by the term grove, forest, or thicket.

Even from a distance one can distinguish by their color the three component associations. One of these, which may be called for convenience the dry grassland, occupies probably 90 per cent of the area.

The dry grassland association occupies all the hilltops and hillsides from the edge of the forest down nearly to the bottom of the valleys. Throughout, the soil is loose, coarse, and gravelly,

and drainage must be rapid and thorough. The lower margin of the association shows an obvious correlation in space with the drainage system, and is probably determined physiologically by the water relation of the plants.

The ground cover is a close, heavy, matted sod, four to six inches thick, composed apparently of five dominant species of grasses, and, near the end of the dry season in March, a dull grayish green in color. One species only still retained the old culms and inflorescences, but the latter were so badly shattered that we were unable to recognize even the tribe to which it belonged. All the species have matted narrow leaves, and some of them are decidedly pubescent, indicating the xerophytic conditions under which they live during the dry season.

The secondary species are (in March, at least) exceedingly few in number and show little indication of any vegetative activity. Their usual height is about a foot. The commonest species, *Anaphalis brevifolia*, has a few spreading branches and is closely gray-pubescent. The association is speckled with them in every direction, and reminds one of the appearance of similar gray plants in the short-grass association of the American prairies.

Most of the secondary species were completely unrecognizable at the time of our visit. The few that could be identified included the melastome *Osbeckia Walkeri*, *Vernonia Wightiana*, the rubiad *Heydotis verticillaris*, simulating in habit a diminutive yucca, and *Pteris aquilina*. In general, the composites and melastomes seemed to be most abundantly represented. At the lower margin of the association, an occasional plant of the prostrate creeping *Lycopodium carolinianum* appeared, and a few other plants belonging properly to the next association.

At the bottom of the valleys lies the second association, which may be termed conveniently the wet grassland. It is narrow or wide, depending on the contour of the valley; sometimes interrupted, where the drainage has eroded a vertical-sided gorge, sometimes extending in a narrow line up the hills almost to the forest margin, or spreading out below over areas a hundred feet or more wide. Here, again, the dominant species are grasses,

but they grow now in large bunches, forming a loose tangle one to two feet thick. Also, even in the dry season, they retain their green color. Secondary species are no commoner and no more conspicuous than in the dry grassland, but they are greener and in every way more mesophytic. *Lycopodium carolinianum* is especially common, and *Ranunculus sagittifolius* is frequent.

The third association is very limited in size, and occurs only on muddy spots on the hillsides where subterranean drainage



FIG. 36. A residence in the mountain garden; Hakgala Peak rises abruptly at the rear of the garden.

comes to the surface. The dominant grass here is *Arundinaria densifolia*, two to three feet high, with erect crowded leaves. On the mud beneath it are mats of *Lycopodium carolinianum*, a blue-flowered bladderwort, *Utricularia coerulea*, a sundew, *Drosera Burmanni*, *Juncus prismatocarpus*, *Eriocaulon*, and various other species.

The *Rhododendron* trees demand close attention. They may be found in a number of stages, from little ones a foot or so high up to mature trees of twenty feet. The young trees are not safe from fires until they reach a height of five or six feet. Below that size the stems are easily killed, and numerous sprouts appear from the base, and grow up to meet the same fate a year or two

later. Such clumps of sprouts are very common, especially in the wet grassland association. If the tree is spared until it has passed the critical size, it apparently grows to maturity in spite of later fires. Almost every one of the older trees shows the scars of fire, invariably on the southwest side of the trunk, and seldom extending over four feet from the ground. The older trees are doubtless protected from fire by their thick heavy bark. In some cases, repeated fires have destroyed one side of the tree completely, leaving only a U-shaped zone of living tissue.

The branches of the *Rhododendron* are stiff, gnarled, and crooked, and the thick leathery elliptical leaves are grouped in rosette-like clusters at the tip of the twigs. The tree has a peculiarly fantastic appearance which can not be paralleled in temperate North America, unless possibly in the chaparral of the extreme southwest. The habit is however by no means uncommon among the trees of the mossy forests which surround the patanas.

The forest margin is everywhere abrupt, but especially so on the northeastern side of the patanas. Here there is usually a marginal zone of a tall *Andropogon*-like grass (possibly *A. nardus*), five feet wide, then a narrow zone of *Rubus* and melastomaceous shrubs, three feet wide, and beyond that the vertical, opaque, apparently impenetrable forest wall. As Willis wrote, in two strides one can pass from forest to patana, or the reverse.

The opposite margin of the patana is not so abrupt. The *Rhododendron* trees become more numerous nearer the forest, the zone of shrubbery broadens out and includes many more species, and the forest itself slopes back, in profile view, from small trees in front to larger ones behind.

Various theories have been advanced to explain the origin of the patanas. Whatever their origin may have been, their perpetuation is certainly due to the annual fires which sweep across them. March is the driest month at Nuwara Eliya, and shortly after the opening of the southwest monsoon, in April or May, the patanas are fired. The old grasses are burned off, many of the young trees killed, and, as a result of repeated burnings, the forest itself is slowly invaded, especially at the northeast

side, the direction toward which the fire advances. In the opposite direction, toward the southwest, the fire moves more slowly, and probably seldom attacks the forest margin. On this side, therefore, the zone of marginal shrubbery is much wider.

There are a few places near Nuwara Eliya where tea estates and patanas are adjacent. Here the fires have been carefully prevented in order to avoid damage to the tea. In such places the patanas have been rapidly overgrown with *Rhododendron*



FIG. 37. A drive through the mountain garden at Hakgala, Ceylon.

and other trees and shrubs, and various other species of the mossy forest are colonizing among them. Apparently only a few years are necessary for the complete reestablishment of the mossy forest.

The shrubs of the broader forest margins and of the earlier stages in reforestation are very interesting. Most conspicuous among them is *Hypericum mysorense*, eight to ten feet tall, with numerous showy yellow flowers. It looks exceedingly bizarre to see its branches occupied, as they frequently are, by the mistle-toes *Loranthus sclerophyllus* and *L. suborbicularis*, or sometimes by a small orchid. Melastomes of several species are abundant, including *Osbeckia rubicunda* and *Rhodomyrtus tomentosus*. Other common species are *Pavetta involucrata*, of the Rubiaceae, and *Rauwolfia densiflora*, of the Apocynaceae.

In these thickets are several species of temperate zone affinities, including *Berberis aristata*, *Rubus lasiocarpus*, *R. moluccanus*, *Lysimachia ramosa*, *Valeriana Moonii*, *Campanula fulgens*, *Sanícula europaea*, *Gaultheria fragrantissima*, *Rubia cordifolia*, and *Cynoglossum micranthum*. *Ulex europaeus* is naturalized freely in the patanas immediately about the town of Nuwara Eliya, and seems to flourish. *Verbascum Thapsus* is also a common roadside weed, but appears less hairy than in America.

The most noteworthy roadside plant of the region is a lobelia, *L. nicotianaefolia*. It has the general habit of the mullein, and grows in the same habitat, but its suffrutescent stems reach a height of twelve feet.

Six miles from Nuwara Eliya along a beautiful macadamized road lies the mountain garden of Hakgala. It is located at an altitude of about 5,000 feet, at the foot of the precipitous Hakgala Peak. The garden grounds are very attractive, and present a very interesting display of conifers and tree ferns.

(The end)

PARTHENIUM LLOYDII, A NEW MEXICAN GUAYULE

BY HARLEY HARRIS BARTLETT

In the summer of 1909 Prof. F. E. Lloyd referred to the writer for study and description a *Parthenium* which he believed should be segregated from *Parthenium argentatum*, the rubber-plant of Chihuahua and neighboring states. Since that time Prof. Lloyd has pointed out and illustrated the distinctive characters of the two plants,* so that it is only necessary to present an abstract of his account and a formal diagnosis of the new species.

In *Parthenium argentatum* the monopodial growth of the seedling is terminated by the development of the first inflorescence. Extension of the stem system takes place at the base of the well-differentiated peduncle, by the growth at that point of two or three branches, whose growth is in turn terminated by inflorescences. As a result of this sharp delimitation of leafy stem and

* See p. 55 of his monograph entitled Guayule, a Rubber-Plant of the Chihuahuan Desert. Carnegie Institution of Washington, Publication No. 139, 1911.

peduncle the branching of old plants is closely and repeatedly divaricate. Grown plants are often finely symmetrical.* In *Parthenium Lloydii*, however, the branching is like that of the mariola, *Parthenium incanum*. The stem is more slender than in *P. argentatum*, and the leafy peduncle is not sharply delimited. Well up toward the inflorescence it bears short leafy spurs which elongate after the close of the flowering season. A grown plant of *Parthenium Lloydii* is therefore characterized by intricate interweaving of the branches. In herbarium specimens the striking difference between the two species lies in the form of the leaves, which in *P. argentatum* are relatively only half as wide as in *P. Lloydii* and rather deeply lacinate, whereas in *P. Lloydii* they are typically sparsely dentate or denticulate.

Parthenium Lloydii sp. nov. *P. argentato* valde similis, sed ramis gracilioribus more *P. incani* implicatis. Foliorum majorum laminae oblanceolatae, 15–18 mm. longae, 5–8 mm. latae, integerrimae vel parce denticulatae, apice acutae vel obtusiusculae, basi in petiolum 2–3 mm. longum angustatae. Inflorescentiae axis foliosus altero anno ramulifer.—Hacienda de Cedros, Partido de Mazapil, Zacatecas, Mexico, F. E. Lloyd, Nos. 255 and 256, in Gray Herbarium. Illustrated by Lloyd, Guayule, a Rubber-Plant of the Chihuahuan Desert, Carnegie Institution of Washington, Publication No. 139, plates 12 and 13, 1911.

In the type material of *P. Lloydii* the pappus awns are slightly incurved toward the base, but diverge at the apex. In most material of *P. argentatum* the awns curve away from one another at the base and are somewhat incurved at the apex. This distinction, pointed out by Professor Lloyd, does not seem to hold throughout the large series of specimens of *P. argentatum* in the Gray and the National Herbaria, but in view of McCallum's recent report† that the guayule consists of as many as 125 segregable elementary species, the occasional inapplicability of this character is not to be wondered at. The curvature of the pappus may serve to distinguish *P. Lloydii* from certain segregates, but not from others.

UNIVERSITY OF MICHIGAN,
ANN ARBOR, MICHIGAN

* Lloyd, l. c. plate 11, fig. A.

† Science, n.s., 42: 395. 1915.

BRYOLOGICAL NOTES

II. TWO MOSSES NEW TO ICELAND

BY A. LEROY ANDREWS

Present knowledge of the moss-flora of Iceland rests substantially upon the work of Grönlund,* who besides his own collecting was at considerable pains to bring together previous collections and publications and subjected everything to a salutary critical revision, relying upon the assistance of such bryologists as Zetterstedt, Berggren, Lindberg and C. Jensen. These lists are supplemented somewhat by notes of Helgi Jónsson contained in oecological papers on the flora of various parts of the island,† his bryophytes also having passed through the hands of C. Jensen. The Botany of Iceland, edited by Rosenvinge and Warming, of which two parts have already appeared,‡ promises soon a part on the bryophytes by A. Hesselbo. My own collections were made in the summer of 1914. I have already§ called attention to an hepatic not hitherto known from the island. The two following mosses are likewise additions, I trust of sufficient interest to justify this note.

Dicranum Anderssonii (Wich.) Schimp. This species was first recognized by Wichura among his collections from Lapland (Swedish) in 1859|| and is distinguished from its nearest relatives, *D. fulvellum* and *D. hyperboreum*, and for that matter from all other northern *Dicrana* by its very short seta, the capsule not

* Bidrag til Oplysning om Islands Flora. 2. Hepaticae og Musci (Botanisk Tidsskrift, 2 Raekke, 3 Bind. 1873); Islands Flora. 1881, Tillaeg, 144ff.; Afsluttende Bidrag til Oplysning om Islands Flora (Bot. Tidsskr., 14 Bind, 4 Hefte; 1885); Tillaeg til Islands Kryptogamflora (Bot. Tidsskr., 20 Bd., 1 Hefte. 1895). a list of Kindberg (1888) often cited in bibliographies rests, so far as Iceland is concerned, on Grönlund.

† Studier over Öst-Islands Vegetation (Bot. Tidsskr., 20 Bd., 1 Hefte. 1895); Floraen paa Snaefellsnaes og Omegn (Bot. Tidsskr., 22 Bd., 2 Hefte. 1899) with Vegetationen paa Snaefellsnes (Vidensk. Meddel. fra den Naturhist. Foren. Kjöbenhavn. 1900); Vegetationen i Syd-Island (Bot. Tidsskr., 27 Bd., 1 Hefte. 1905).

‡ I, 1. The Marine Algal Vegetation by Helgi Jónsson. 1912; I, 2. An Account of the Physical Geography by Th. Thoroddsen. 1914.

§ The Bryologist, XVIII, 51f. 1915.

|| Flora, XLII, 432 with Tab. VII, Fig. 3-8.

projecting beyond the tips of the perichaetial leaves. Brotherus* gives no further localities, Williams† adding a North American one in Port Wells, Alaska, where it was collected by Trelease and identified by Cardot and Thériot.§ Paris‡ had in the meantime included a couple other interesting localities: the Faroe Islands and the isolated Arctic island of Jan Mayen. Authority for the first of these was C. Jensen, who reported it|| from a single locality on the island of Vaagö. His two good plates represent various details both of his own plants and the original or type material of Wichura. The inclusion of Jan Mayen is explained by the citation as a synonym of "*Grimmia Jan Mayensis* Arnell, Bihang till K. Sv. Vet.-Akad. Handl., Bd. 26, Afd. III, n. 13, t. V et VI."¶ Paris's citation is garbled, as is frequently the case. The author of this species was P. Dusén, who acknowledges assistance of both Arnell and C. Jensen in determining his plants, but takes entire responsibility for the new name. Plates V and VI belong not to this paper, but to the work last mentioned. Dusén's article is however accompanied by an unnumbered plate and a text-figure, both purporting to illustrate his *Grimmia Jan Mayensis*. Of these the latter, evidently executed by Dusén himself, may well represent *Dicranum Anderssonii*,¶ the plate executed by another ("Th. Eklblom del.") is less clearly identified.

I can report finding the species in Iceland in the summer of 1914, first on the eastern wall of the gorge Almannagjá leading down to Thingvellir (July 25), later on a lava-block in the vicinity of the bridge over the glacial river Ölfusá near the farmstead Selfoss (Aug. 7). I find it also mixed with a specimen of *Lophozia alpestris* taken from the lava by Hafnarfjörðhur (Aug. 8). All

* Engler und Prantl, Natürl. Pflanzenfam., I, 3, 326. 1901; cf. however 453. 1902.

† North American Flora, XV, 116. 1913.

‡ Harriman Alaska Series of the Smithsonian Institution, V, 257ff. 1910, reprinted from Proceedings of the Washington Academy of Sciences, IV, 297ff. 1902.

§ Index bryologicus, 2 ed., II, 35. 1904.

|| Botany of the Faeröes, 158f, with plates V and VI. 1901.

¶ Pages 13ff. 1900.

**Dusén was inclined to admit the synonymy of his new species after his attention had been called to the fact by Hagen; cf. Bihang till K. Sv. Vet.-Akad. Handl. 27, Afd. III, n. 1, 57. 1901.

of these stations represent in a general way the southwestern part of the island, but are at very considerable distances from one another. One rather wonders that it has not been collected there before. The related *D. fulvellum* has long been known from Iceland, was indeed collected there by Mörch before 1825, if the *Dicranum Moerkianum* of Hornschuch* is correctly referred to this species.† I also found what I take to be *D. fulvellum* in the Almannagjá, but not growing with the other species.‡ The two seemed to hold their characters entirely well in the places where each was growing. They were fruiting abundantly, as was *D. Anderssonii* also in the other two stations. My specimens were all found growing upon post-glacial basaltic lava.

Pleuridium alternifolium Brid. This plant was found in a single spot growing on thin soil formed on the lava-field about Hafnarfjörður (July 23). Its case is quite the opposite of that of the preceding Arctic plant, as this is so far as I know decidedly its northernmost station, in fact the most northerly for any species of *Pleuridium*. It was a surprise to find it so near the Arctic Circle and I doubt that it will prove to be at all generally distributed in Iceland. The impression most strongly made upon me by my observations upon the Icelandic moss-flora was that one has to do here not with a relict-flora, as in the familiar case of our glacial relicts and perhaps also in the case of the so-called "Atlantic species" on parts of the west coasts of Ireland, Scotland, Norway and in the Faroes, but that it was rather clearly a question of an immigrant flora, species of which had been able to establish themselves there within relatively recent times. The flora is on the whole a rich one, interesting no less in the species lacking than in those actually found, and many questions of distribution in their relation to wind and ocean-currents, pre- and post-glacial lavas of different chemical constituency, etc., represent interesting problems for investigation.

ITHACA, N. Y.

* Flora, VIII, 78f. 1825.

† The plate 2002 in Flora Danica, of which Mr. R. S. Williams has kindly made me a tracing, is not identifiable as *D. fulvellum*; cf. Lindberg's note on this plate in his *Revisio critica iconum*. 1871.

‡ Grönlund also speaks of finding *D. fulvellum* in this place (*Tidsskrift f. populære Fremstillinger af Naturvidenskaben*, 5 R., IV, 345. 1877).

SHORTER NOTES

AN INTERESTING TROPICAL LICHEN NEW TO THE UNITED STATES.—Some time ago Mr. W. S. Labrot sent me a small lot of lichens collected at Avery Island, New Orleans, Louisiana, by Mr. Edward McIlhenny, in January, 1915. Among them was one which was kindly determined for me by Dr. L. W. Riddle as *Trypethelium madreporiforme* Eschw. (in Martius' *Flora Brasiliensis* 1: 156. 1833). As this species has been known previously from South America only, where it has been found in Brazil, French Guiana, and Colombia, its occurrence in the United States is of considerable interest. Furthermore, it is the only member of the Trypetheliaceae found in the United States that has muriform spores. It should, therefore, now be placed in the genus *Laurera* as ***Laurera madreporiformis*** (Eschw.) Riddle in litt. **comb. nov.**

R. HEBER HOWE, JR.

THOREAU MUSEUM,
CONCORD, MASS.

REVIEWS

Fungoid Diseases of Farm and Garden Crops*

This condensed treatise on plant diseases is addressed mainly to farmers, gardeners, and agricultural students, as well as to lecturers and others who teach agricultural subjects. The author has discussed the more important diseases of the common field and garden crops necessarily very briefly, but nevertheless with scientific accuracy. He apparently has a clear conception of the practical needs and limitations of the modern agriculturist and has undoubtedly succeeded in presenting a very readable and, withal, accurate and useful little book. Professor Bessey has contributed a prefatory note, besides some subject matter on a few of the pages.

Following a chapter on general information, treating of the general characteristics of the disease-producing organisms, the author classifies his diseases according to hosts, and treats of the principal fungous diseases of cereals, of leguminous plants, of

* By Thomas Milburn, with a prefatory note by E. A. Bessey, pp. 1-118. Longmans, Green and Co., 1915. Price 65 cents net.

potatoes, of crucifers, of mangels and beets, and, finally, of farm animals. In each case is discussed the symptoms, the cause and the preventive measures, for the most part with adequate completeness.

E. W. OLIVE

NEWS ITEMS

Dr. J. J. Taubenhaus, until recently associate plant pathologist of the Delaware Experiment Station, will deliver the John Lewis Russell lecture before the Massachusetts Horticultural Society on March 27, on "Diseases of Sweet Peas." He has recently been appointed head plant pathologist and physiologist at Texas Agricultural Experiment Station, College Station, Texas, where letters may be addressed after February 20.

At the meeting of the Society of American Bacteriologists held at the University of Illinois at the end of December, Dr. Thomas J. Burrill, formerly vice-president of the university, was elected president of the society for the coming year.

On December 15, 1915, Dr. C. Stuart Gager addressed the Rhode Island Horticultural Society, at Providence, on the effects of electricity and radium-rays on the growth of plants.

Work is now under way for the completion of the laboratory building and first range of plant houses at the Brooklyn Botanic Garden. The completion of these buildings at this time was made possible by the donation, by three friends of the garden, of \$100,000 on the condition that a like sum be appropriated for the same purpose by the City of New York.

At the seventh annual meeting of the American Phytopathological Society, held at Columbus, Ohio, from December 28 to 31, the following officers were elected: *President*, Dr. Erwin F. Smith, Bureau of Plant Industry, Washington, D. C.; *Vice-president*, Dr. Mel. T. Cook, New Jersey Agricultural Experiment Station, New Brunswick, N. J.; *Secretary-Treasurer*, Dr. C. L. Shear, Bureau of Plant Industry, Washington, D. C.; *Councilor*, Dr. F. D. Kern, Pennsylvania State College, State College, Pa. Dr. E. C. Stakman, Minnesota Agricultural College, Minneapolis.

Minn., was elected a member of council vice Dr. Mel. T. Cook. Dr. W. A. Orton was elected one of the chief editors of *Phytopathology*, and Professor H. T. Gussow, Dr. C. W. Edgerton, Dr. E. C. Stakman, and Dr. V. B. Stewart were elected associate editors.

Dr. Irving E. Melhus, formerly pathologist, office of cotton and truck diseases of the Bureau of Plant Industry, has assumed charge of the work in plant pathology in the Iowa State College.

Dr. H. S. Graves, the government forester, in his report to Secretary of Agriculture Houston, for 1915, says: "The nursery and plant station at Halsey, Nebraska, has been designated the Bessey Nursery in honor of the late Dr. C. E. Bessey, of the University of Nebraska, a leading American ecologist and for many years active in promoting reforestation in Nebraska."

Dr. and Mrs. N. L. Britton and Mr. Percy Wilson, of the New York Botanical Garden, sailed for Cuba on January 29. Most of their explorations will be in western Cuba and on the Isle of Pines.

The herbarium and other botanical collections of Dr. E. B. Southwick, comprising many thousands of specimens have been presented by him to the Brooklyn Botanic Garden. The collection is rich in woods, and in seeds of hundreds of native American and foreign plants.

Professor H. H. Whetzel, of Cornell University, and Dr. E. W. Olive, of the Brooklyn Botanic Garden, will sail for Porto Rico on February 19 to collect fungi and to study plant diseases.

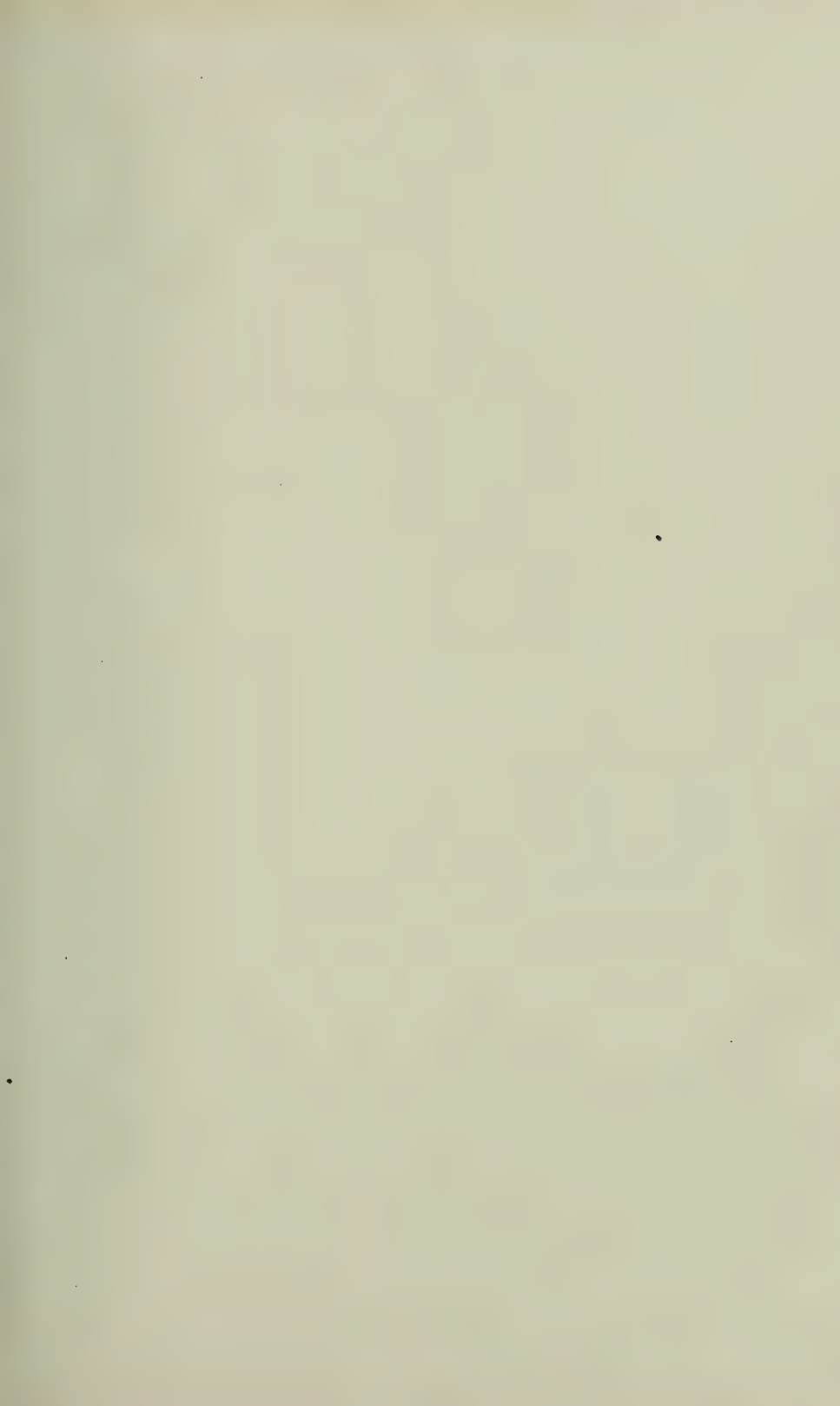
The summer mountain laboratory of the University of Colorado will hold its eighth annual session at Tolland, Colorado, from June 26 to August 5, 1916. Courses are offered in botany and zoölogy; all are chiefly of an ecological nature. The botanical work will be in charge of Professor Francis Ramaley, who may be addressed at Boulder, Colorado, for additional information.

Miss Grace Emily Cooley (Ph.D., Zürich), who had been for several years a teacher of biology in the East Side High School of Newark, New Jersey, died in Newark on January 27, 1916.

Dr. Cooley was born in East Hartford, Connecticut, July 26, 1857. She was instructor in botany in Wellesley College from 1883 to 1896, and associate professor of botany in the same institution from 1896 to 1903. She had published several botanical papers, of which the principal are "Impressions of Alaska, with a list of plants collected in Alaska and Nanaimo, B. C., July and August, 1891" (1892); "On the reserve cellulose of the seeds of Liliaceae and of some related orders" (1895); "Ecological notes on the trees of the botanical garden at Naples" (1904); "Silvicultural features of *Larix americana*" (1904). Dr. Cooley was a woman of ability and personal charm, and her death will be mourned by a wide circle of friends.

Mr. Frank J. Smiley, assistant in botany at Harvard University, has been appointed instructor in botany and assistant curator in the Herbarium at the University of California.

"After consultation with leading firms of drug dealers and medical men, the Women's Herb-Growing Association, recently formed in England, has drawn up a list of the medicinal plants which it is both desirable and profitable for women to grow in their gardens and allotment plots. In the old days England used to grow most of its own drugs, but in recent years the industry has passed largely to Germany, Austria-Hungary, and the Balkans. The new association intends to prove that the industry can be carried on just as well in England by women. Among the plants in urgent demand are monkshood, chamomile, deadly nightshade, thorn-apple, henbane, purple fox-glove, fennel, opium poppy, valerian." (*Evening Post*, 10 February.)



The Torrey Botanical Club

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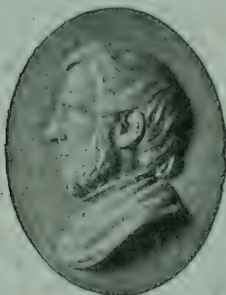
A MONTHLY JOURNAL OF BOTANICAL NOTES AND NEWS

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR



JOHN TORREY, 1796-1873

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March, 1916.

Vol. 16

No. 3

COMMON MOSSES. ACCORDING TO HABITAT. A NON-TECHNICAL DESCRIPTION BASED ON MACROSCOPICAL CHARACTERS

BY DAISY J. LEVY

INTRODUCTORY

Few groups of plants are of more importance in giving a charm and attractiveness to the out-of-doors, than the mosses. Perhaps none are less appreciated, for quite apart from their beauty, it must be remembered that in the economy of the earth, they play a rôle second only to the lichens.

Lack of familiarity with these forms is largely due to the fact that their identification is based upon features so minute as to require a microscope to reveal them and, furthermore the descriptions are so burdened with technical terms as to discourage the beginner. The following pages are designed to enable the beginner to become acquainted with our common mosses, through the use of his own unaided eye.

Everyone knows that there are two distinct portions to a moss plant. First, the stem, bearing minute leaves. This part of the plant is the *gametophyte* and may vary in size from a fraction of an inch to two or more inches in length (Fig. 2, *E*). From the lower end of the gametophyte are minute hair-like outgrowths, which penetrate the soil. These outgrowths are known as the *rhizoids* (Fig. 2, *E*). Secondly, that part of the plant which arises from the gametophyte bears a stalk called the *seta*, which in its turn is capped with a structure resembling a box, called the *capsule*. The capsule (Fig. 3) is variously crowned by a hood or *calyptra* (Fig. 2, *E*). That part of the plant comprising seta, [No. 2, Vol. 16, of TORREYA, comprising pp. 33-54, was issued 26 February 1916.]

capsule and calyptra is known as the *sporophyte* (Fig. 2, *E*). The capsule contains minute bodies, the *spores*.

What is the life-history of a moss plant? Let us take a capsule

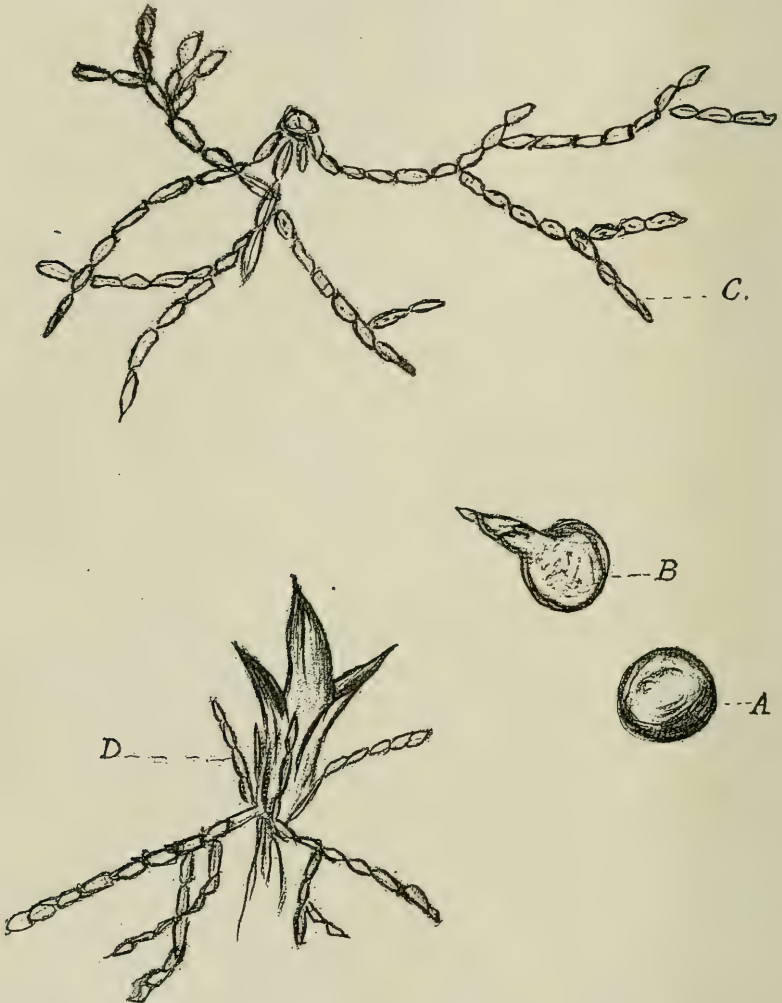


FIG. 1. A, spore; B, germinating spore; C, protonema; D, bud. All much magnified.

and with a pair of forceps gently lift off the calyptra. We shall find that the capsule is covered by a lid called the *operculum*

(Fig. 2, *O*). The operculum is cut off by a ring of cells called the *annulus*. Remove the operculum, then with a hand-lens carefully examine the rim of the capsule and note the fringe of teeth

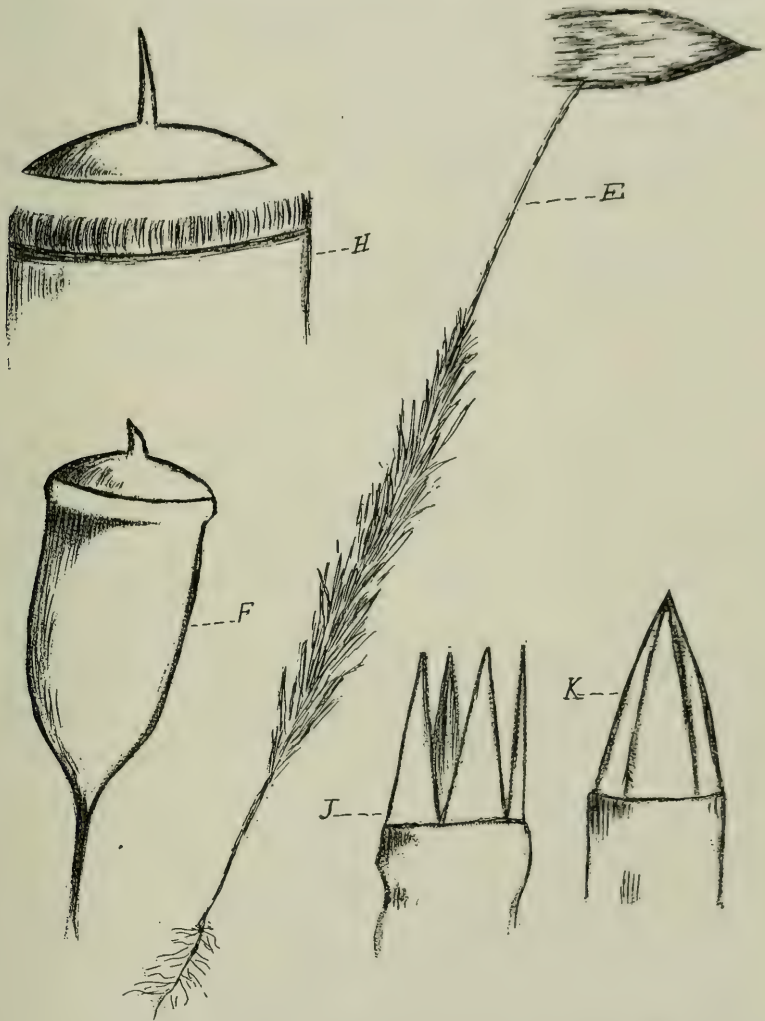


FIG. 2. *E* is a moss plant, consisting of an upper or sporophyte portion, composed of a seta, surmounted by a capsule with calyptra, and a lower portion, the gametophyte, consisting of rhizome, stem and leafy portion; *F*, capsule with lid closed; *H*, the same, with lid removed; *J*, peristome in dry weather; *K*, the same in wet weather, or before the maturity of the spores.

which border its mouth. This fringe is called the *peristome* (Fig. 5). When the spores are mature, the annulus by its contractions forces off the operculum and calyptra. The dispersal of the spores is brought about by the opening and closing of the peristome which acts as a sifter for the spores. The peristome is very hygroscopic and thus serves to control spore dispersal according as the conditions are favorable or unfavorable (Fig. 2).

The spores are carried by the wind and if a favorable substratum be found, the spore will germinate. The germination of the spore consists in the rupture of its wall followed by the protrusion of the germ tube (Fig. 1, *A, B*). This soon produces branching algal-like filaments known as the protonema. The protonema produces rhizoids, these absorb nourishment from the substratum. Buds soon appear on the branches. These buds grow out to be the leafy stem or gametophyte of the moss plant (Fig. 1, *C, D*).

Sex organs are developed on the ends of stems or branches. The male branches are called the *antheridial* branches (Fig. 4). The female branches are called the *archegonial*. Plants are either *monoecious* or *dioecious* according as antheridia or archegonia are found on one or separate plants. Antheridia are usually carried to the archegonia by a drop of water. After fertilization, the growth of the sporophyte generation commences. The germination of the gametospore or fertilized egg results in the development of seta and capsule with its contained spores and also the protecting modifications, the peristome, operculum and calyptra (Fig. 2).

In order to ascertain the name of a particular moss, several features must be noted.

First of all, the place of origin of the seta on the stem. This is of importance, for it enables one to see at a glance the two great divisions into which all mosses are divided. If the seta originates at the apex of the leafy stem, then all forms having this arrangement are grouped together under the division known as the *acrocarpous* forms. If, on the other hand, the seta arise from a lateral branch, then mosses of this kind are included in the division called the *pleurocarpous*.

The second point to note are the conditions or surroundings in which the plant lives. This must be carefully noted. The place upon which it grows is called its *habitat*. The habitat may be the *deep woods* or the *open fields*; upon *rocks* or *trees*; while others may be *water loving*. These five habitats will cover practically all the conditions under which mosses may be found.

Another feature which will assist the beginner in the identification of his specimen is the form and shape of the calyptra. The calyptra may be *cucullate*, that is hood shaped, but opened on one side only; or it may be *mitrate*; that is hooded, but opened in several places.

Fourth, and a most important character, is the shape of the capsule. This may be long and cylindrical or short or ovoid, or urn shaped, or it may be round or globose.

HOW TO USE THE KEY

Care should be taken in selecting a plant, that it be fruiting. The greater number of sterile plants are impossible of determination for the beginner. Place the specimen in an envelope or bag, carefully noting on the outside of the wrapper the date and place and also the habitat or conditions under which the plant is growing.

The following is the order to observe for classification.

1. Does the fruiting body grow from the end of the leafy portion, that is the gametophyte portion, or does it grow from a side or lateral branch? If from the first, then the specimen belongs to the *acrocarpous* group of mosses; if from the second then it belongs to the *pleurocarpous* group. The collector will find the key divided first into these two groups; the acrocarpous mosses are discussed in the first half, the pleurocarpous in the second.

2. There are *five habitats* considered; here careful observations must be made. If the specimen be found on Habitat 1, that is, on humus, logs or ground in woods, then note from which of these particular conditions the specimen was picked. If from Habitat 2, that is, on the bark of trees, note whether the specimen grew on the upper part of the bark, on the middle, or at the base about the roots. Is the bark living or dead? From Habitat 3,

distinguish between aquatic and sub-aquatic; if entirely submerged or above water mark. Distinguish between swamp plants or brook-loving forms. Habitat 4 is fields, roadways and waste places. Habitat 5 considers those plants found on stones or rocks. Note carefully whether the plant grows from a slight soil substratum or whether it grows quite close to the rock.

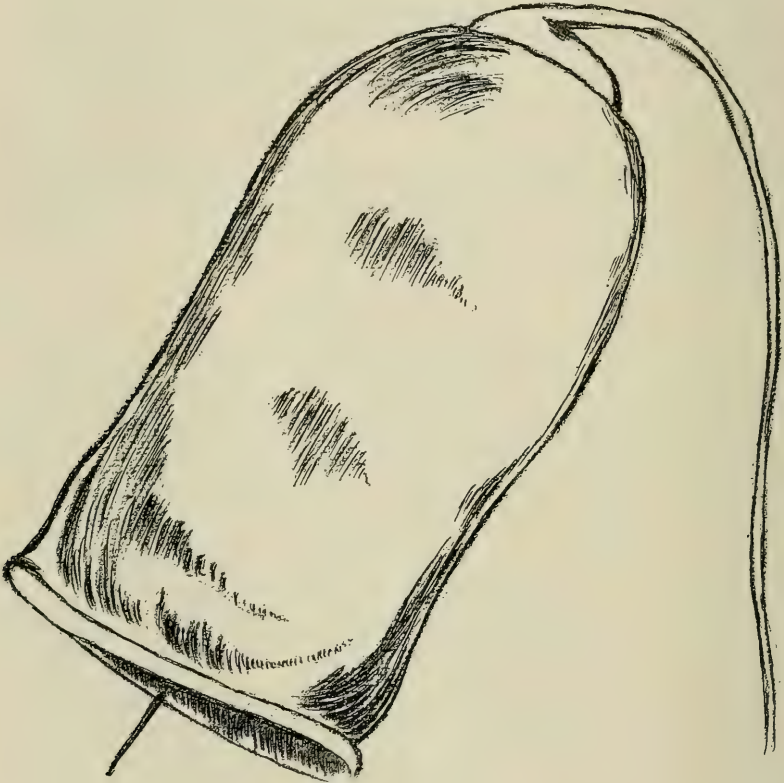


FIG. 3. Capsule, with calyptra removed.

3. The calyptra is the next point of classification. Is the calyptra *cucullate* or *mitrate*? Often the calyptra is wanting, then we pass on to:

4. The capsule: This is a very important diagnostic character. Most capsules are either cylindric or ovoid. A few assume odd shapes; as the urn of *Pottia*; the square of *Polytrichum*; the sphere

of *Bartramia*; the ventricose of *Webera*. Then, the position is of importance, too. Some are quite *erect*; others *sub-erect*; again others are *horizontal*; others inclined to quite *pendulous*. Some may be quite *exserted* beyond the gametophyte, while others may be quite *immersed* in the leafy portion, as in *Neckera*.

5. Hold the leaf up to the light and with a hand lens determine if a *costa* be present or not. If present, note the distance which it occupies with regard to length and breadth of leaf and note, too, if it is prolonged beyond the apex, that is, is it excurrent? Leaves without costa are said to be *ecostate*.

6. The margin is next to be examined. Is it toothed, that is serrate, or entire? Sometimes, mosses are slightly serrate at apex and entire for the remainder of the leaf.

7. Note the apex of the leaf. Most mosses will conform to one of two classes, that is, the acute or acuminate apex. These often grade into each other. Sometimes an obtuse apex is found or one quite rounded as in *Calliargon*.

After "running down" to this point turn to the description of the genus which you suspect your specimen to be. This description will be found in the second part of the work and arranged in alphabetical order.

The mosses described are the common mosses of the local flora range. That the list is limited is due to the fact that only macroscopic characters are noted. This work has not attempted anything more than the simplest presentation. Technical terms have been avoided as much as pos-



FIG. 4. Male plant, with rosette of leaves at the summit.

sible and in no case has a diagnostic character been cited which would depend upon the microscope for verification.

The literature on the systematic classification of the mosses within the local flora range is, in part, as follows:

Musci Appalachiani, C. F. Austin, 1870.

Bryophyta, a contribution, E. A. Rau, Geological Survey, N. J. 1889.

Preliminary List of Mosses of Staten Island, E. G. Britton. Proceedings of the Natural Science Association, S. I. 1890.

Cryptogamic Notes from Long Island, S. E. Jelliffe, Bulletin, Torrey Botanical Club. 1894.

Mosses with a Hand-lens and Microscope, A. J. Grout.

Catalogue of the Bryophyta and Pteridophyta of Penn, T. C. Porter. 1904.

Bryophyta of Connecticut, A. N. Evans and G. E. Nichols, State Geological Survey. 1908.

ACROCARPOUS FORMS

I. In woods: on humus, logs, or ground

B. CALYPTRA CUCULATE.

C. CAPSULE CYLINDRIC, MOSTLY ERECT.

D. Costate.

E. Entire.

F. Acuminate.

Dicranella heteromalla.

Weisia viridula.

Tortella caespitosa.

Ditrichum pallidum.

tortile.

Tortula.

Barbula.

Tortula.

Leucobryum glaucum.

Georgia pellucida.

FF. Obtuse or acuminate.

EE. Serrate.

F. Acuminate.

Ditrichum tortile.

Dicranella heteromalla.

FF. Acute.

Fissidens.

CC. CAPSULE UNSYMMETRIC, INCLINED, OBLIQUE PENDULOUS.

D. Costate.

E. Entire.

F. Acuminate.

Dicranella heteromalla.

Dicranum scoparium.

Ceratodon purpureus.

EE. Serrate.

F. Acuminate.

Pohlia nutans.

Rhodobryum roseum.

Bryum bium.

caespitium.

argenteum.

Leptobryum pyriforme.

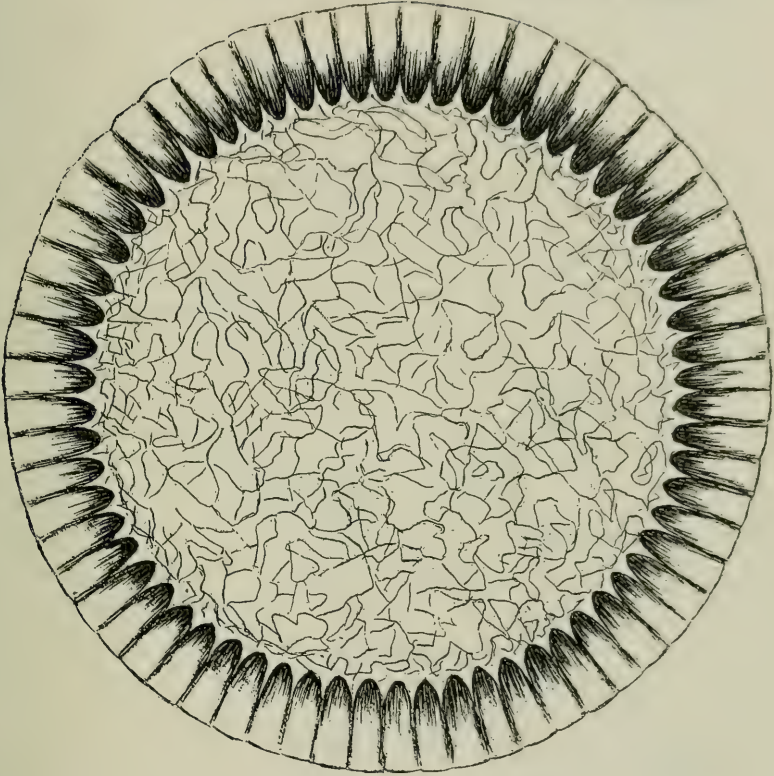


FIG. 5. Peristome of Haircap moss.

FF. Acute or obtuse or rounded.

Aulacomnium heterostichum.

Mnium.

Funaria hygrometrica.

CCC. CAPSULE GLOBOSE.

* Immersed or slightly emergent.

D. Costate.

E. Entire.

F. Acuminate.

Phascum cuspidatum.

** Long exserted.

- D.* Costate.
E. Serrate.
F. Acuminate.

Bartramia pomiformis.

BB. CALYPTRA CONICAL.

C. CAPSULE CYLINDRIC.

- D.* Costate.
E. Entire.
F. Acute.
EE. Serrate.

Barbula.

Pogonatum brevicaule.
Catherinia angustata.
undulata.

CC. CAPSULE URN SHAPED.

- D.* Costate.
E. Entire.
F. Acute.

Pollia truncatula.
Physcomitrium turbinatum.

CCC. CAPSULE SQUARE OR ANGLED.

- D.* Costate.
E. Serrate.
F. Acuminate.

Polytrichum commune.
ohioense.

CCCC. CAPSULE VENTRICOSE.

- D.* Costate.
E. Serrate at apex.

Webera sessilis.

- DD.* Ecostate.

Buxbaumia aphylla.

II. On trees

B. CALYPTRA CUCULLATE.

C. CAPSULE SYMMETRIC ERECT.

- D.* Costate.
E. Entire.
F. Acute.

Drummondia clavellata.
Tortella caespitosa.

BB. CALYPTRA MITRATE.

C. CAPSULE CYLINDRIC.

- D.* Costate.
E. Entire.
F. Acute or obtuse.

Orthotrichum strangulatum.
Ulata crispa.

III. Aquatic or sub-aquatic

B. CALYPTRA CUCULATE.

C. CAPSULE CYLINDRIC, INCLINED OR ERECT.

D. Costate.

E. Entire.

F. Acute or obtuse.

Conomitrium (Fissidens)
Julianus.

EE. Serrate.

F. Acuminate.

Bryum bimum.

FF. Acute.

Aulacomnium palustre.

CC. CAPSULE GLOBOSE.

D. Costate.

E. Serrate.

F. Acuminate.

Philonotis fontana.

DD. Ecostate.

E. Entire.

F. Acute.

Sphagnum.

IV. Open fields, pastures, roadways and waste places

B. CALYPTRA CUCULATE.

C. CAPSULE CYLINDRIC.

D. Costate.

E. Entire.

F. Acuminate.

Weisia viridula.
Ceratodon purpureus.
Bryum argenteum.
caespiticiu.
Ditrichum pallidum.
Dicranella heteromalla.

CC. CAPSULE UNSYMMETRIC, INCLINED.

D. Costate.

E. Entire.

F. Acute or acuminate.

Mnium.
Funaria hygrometrica.
Bryum argenteum.
caespiticiu.

CCC. CAPSULE GLOBOSE.

* Immersed or slightly emergent.

- D. Costate.
 E. Entire.
 F. Acuminate.

Phascum cuspidatum.

** *Long exserted.*

- D. Costate.
 E. Serrate.
 F. Acuminate.

Bartramia pomiformis.

BB. CALYPTRA CONICAL.

C. CAPSULE SQUARE OR ANGLED.

- D. Costate.
 E. Serrate.
 F. Acuminate.

Polytrichum commune.

CC. CAPSULE CYLINDRIC.

- D. Costate.
 E. Serrate.
 F. Acuminate.

Pogonatum brevicaule.

Catherina angustata.
undulata.

V. Stones

B. CALYPTRA CUCULATE.

C. CAPSULE CYLINDRIC, ERECT; OR UNSYMMETRIC
 INCLINED.

- D. Costate.
 E. Entire.
 F. Acuminate.

Weisia viridula.

Tortella tortuosa.

FF. Obtuse or acute.

Tortula muralis.

Barbula.

Rhacomitrium aciculare.

Orthotrichum anomalum.

- EE. Serrate.
 F. Acuminate.

Dicranum.

Leptobryum pyriforme.

Bryum caespiticiun.
argentum.

Mnium.

Fissidens incurvus.

BB. CALYPTRA MITRATE OR CONICAL.

C. CAPSULE IMMERSED, CYLINDRICAL.

D. Costate.

E. Entire.

F. Acuminate.

Grimmia.

CC. CAPSULE IMMERSED SPHERICAL.

D. Ecostate.

E. Entire.

F. Acute.

Hedwigia albicans.

CCC. CAPSULE SQUARE OR ANGLED.

D. Costate.

E. Serrate.

F. Acute.

Polytrichum.

CCCC. CAPSULE CYLINDRIC, EXsertED.

D. Costate.

E. Entire.

F. Acute.

Ulota americana.

CCCCC. CAPSULE URN SHAPED, EXsertED.

D. Costate.

E. Serrate.

F. Acute.

Physcomitrium turbinatum.

(To be continued)

A NEW SPECIES OF METZGERIA FROM THE
GALAPAGOS ISLANDS*

BY ALEXANDER W. EVANS

The collection of Hepaticae made in the Galapagos Islands by Dr. Alban Stewart, while acting as botanist to the Expedition of the California Academy of Sciences, includes between fifteen and twenty species. One of the most interesting of these is the *Metzgeria* described below. It is not only a distinct addition to the genus but it apparently represents the first member of the Metzgeriaceae (Jungermanniales anacrogynae) to be reported from this group of islands.

* Contribution from the Osborn Botanical Laboratory.

Metzgeria grandiflora sp. nov.

Whitish or yellowish green, becoming brownish with age, growing in tufts: thallus spreading more or less from the substratum, apparently pendulous, dichotomous, well-developed branches mostly 1–1.5 mm. wide when explanate and 3–6 mm. long between the forks, strongly convex, the margins almost meeting ventrally; costa bounded both dorsally and ventrally by two rows of cortical cells; wings about fifteen cells wide, the cells similar throughout, with slightly thickened walls and minute, scarcely evident trigones, averaging about $45 \times 35 \mu$; hairs scattered, restricted to the margin, sometimes truly marginal, sometimes slightly displaced to the ventral surface, occurring singly, rarely more than 60μ long and often much shorter, straight or nearly so, thick-walled: inflorescence dioicous: female branch much longer than is usual in the genus, sometimes attaining a length of 0.8 mm.; central portion several cells thick but without a distinct costa, strongly concave dorsally; wings reniform, about 0.4 mm. wide, more or less pressed together, one cell thick; hairs marginal, scattered, usually occurring singly, rarely in pairs, similar to those of the thallus but often longer and sometimes attaining a length of 150μ ; archegonia numerous: male branch strongly curved and inflated, elliptical in outline, about 0.6 mm. long and 0.4 mm. wide, delicate in texture, without hairs; costa distinct; antheridia numerous: calyptra and sporophyte not seen [FIGS. 1–5].

On bushes and trees. Chatham Island, February 23, 1906, *A. Stewart* 2785, 2786; Abingdon Island, September 19, 1906, *A. Stewart* 8524. No. 2785, a portion of which is deposited in the herbarium of Yale University, may be designated the type of the species; No. 2786 is mixed with *Frullania aculeata* Tayl. and a sterile *Plagiochila*; No. 8524 is mixed with a sterile *Frullania*, apparently referable to *F. brasiliensis* Raddi.

The female branches in *M. grandiflora* (FIGS. 3, 4) are unusually large and yield some of the most distinctive characters of the species. In most members of the genus these branches are small and obcordate, the dorsal surface is plane or nearly so, the archegonia are borne in a small cluster, and the hairs are often scattered over the ventral surface. In *M. grandiflora* the dorsal surface in the median portion is so strongly concave that the wings are almost pressed together, and it is only with difficulty that they can be flattened out in one plane; the wings are reniform and

rounded at each end, the archegonia are borne in a large cluster, and the hairs are restricted to the margin. The male branches likewise (FIG. 5) are considerably longer than is usual in the genus but they are typical in other respects. No gemmae were observed in the material examined.

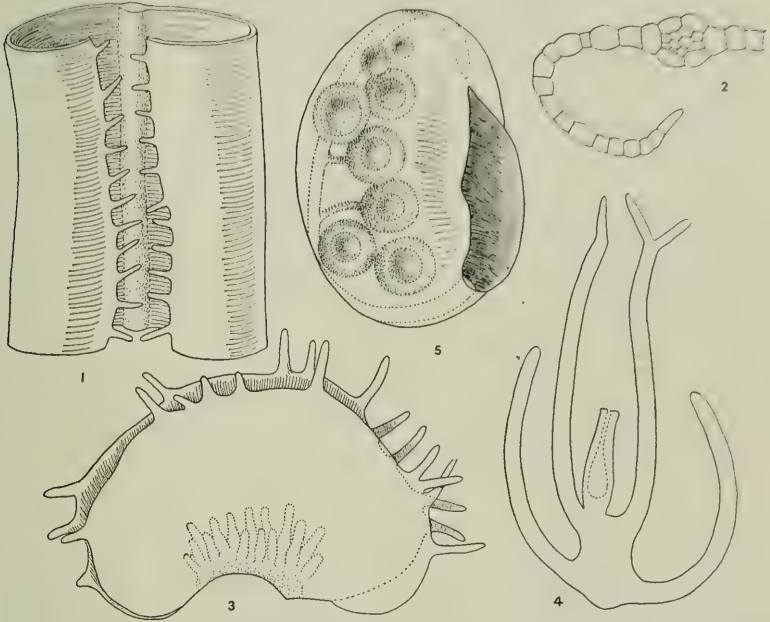


FIG. 1. *METZGERIA GRANDIFLORA* Evans. Portion of thallus, ventral view, $\times 50$. FIG. 2. Cross section of costa and wing, $\times 60$. FIG. 3. Female branch, $\times 50$. FIG. 4. Section through thallus and female branch, the wing on the left showing one marginal hair, that on the right showing two, $\times 50$. FIG. 5. Male branch, $\times 50$. FIGS. 1-4 were drawn from the type specimen; FIG. 5, from No. 8524.

The characters of the thallus (FIGS. 1, 2), which should be especially emphasized, are the following: the strong convexity, the cortical cells of the costa in two rows both dorsally and ventrally, the presence of hairs along the margins of the wings, and the lack of hairs on the costa and on the surfaces of the wings. In the first volume of his *Species Hepaticarum** Stephani recognizes three species of *Metzgeria* with hairs restricted to the

* Bull. Herb. Boissier 7: 939. 1899.

margins of the wings and with a costa of the type found in *M. grandiflora*. These species are *M. comata* Steph. (of New Caledonia), *M. glaberrima* Steph. (of Chile, Patagonia, New Zealand and Australia), and *M. sinuata* Loitles. (of Peru). The first and third of these are known to the writer from description only. In *M. comata* the plants are epiphyllous, the thallus is plane, and the cells of the wings are unusually large, measuring $126 \times 54 \mu$ according to the description. In *M. glaberrima* the thallus is plane and is often naked throughout, even marginal hairs being absent; the female branch, moreover, bears surface hairs, as is usual in the genus. In *M. sinuata*, which is known only from the original material, the thallus is strongly convex as in *M. grandiflora*, but the wings are often thirty-five cells wide, the hairs are 150μ long, and the margin is described as being deeply sinuate or, rather, interruptedly recurved, a condition which is apparently never duplicated by *M. grandiflora*. Unfortunately *M. sinuata* was described from sterile material, and there may be difficulty in recognizing it again.

SHEFFIELD SCIENTIFIC SCHOOL,
YALE UNIVERSITY

SHORTER NOTES.

A NEW PHACELIA FROM COLORADO.—*Phacelia denticulata* sp. nov. Annual, the stem one to three dm. or more high, sometimes branching from near the base, pubescent and somewhat viscid-glandular; the leaves broadly linear in outline, five to six cm. long including the petiole, one and one half to two cm. wide, the small plants having smaller leaves, the lower part divided, the upper part pinnatifid, hispid pubescent on both surfaces; the inflorescence scorpoid and of several branches on the larger plants, the longer ones becoming four to six cm. long in fruit; the calyx lobes linear, obtuse, hispid and minutely glandular; the corolla blue or bluish, about five mm. long, the lobes denticulate, the stamens and style included; the seed capsule becoming five or six mm. long, equaled by the calyx lobes, four seeded, the seeds oblong, four mm. long, and lightly faveolate.

Phacelia denticulata belongs with *P. glandulosa* Nutt. and *P. Neo-Mexicana* Thurber; the leaves are like those of the former, but the flowers are nearer those of the latter. Dr. Gray, in the

Synoptical Flora of North America, under *P. NeoMexicana*, wrote: "A peculiar state of a short-stemmed form, with much less dissected leaves and almost oblong capsule, coll. in central part of Colorado by *Brandegee*, needs further inquiry." I suppose this is the plant to which he referred. It begins to blossom about the first of June. The type specimens were collected in the vicinity of what is known as the Glades, between Fort Collins and Livermore, Larimer County, Colorado, June 18, 1915. Osterhout no. 5233.

GEORGE E. OSTERHOUT

WINDSOR, COLO.

SNOW INJURY TO TREES.—A recent visit to Tarrytown, N. Y., and a trolley trip from Tarrytown toward White Plains, N. Y., showed the trees suffering severely as a result of breakage from snow. The damage was in the form of broken branches, split trunks, etc., not at all an unusual type of injury, but, to the writer at least, unusual in that it was due to snow and not to ice, and also unusual in its severity.

The snowstorm had occurred about the middle of December, and was of the ordinary wet snow type as far as my informant had noted, but judging from the results, it evidently must have been more than ordinarily heavy. In Tarrytown, the street had been covered with branches, wires were broken down, and where trees were close together along a street, sidewalks had been made impassable. Without any attempt at making a record of species, it may be noted that dogwood, maple, and horse chestnut were seen from which branches had been broken. Probably no kinds were exempt. Nearly every tree testified to the injury by the presence of the pruned stumps of large and small limbs. It may be noted that much of the pruning had left too much stump.

In open woods outside of Tarrytown, it also appeared that almost every tree had suffered. The gray birches were still bent double. Seplintered scars showed everywhere. Forking trunks were split apart. Very often, of course, the scars showed evidence of bad wood, but in many cases there was no such evidence. Sound limbs as much as four or five inches thick had been broken off, together with a mass of lesser limbs. For anyone interested in

getting illustrations of natural pruning, there is just now an unusual opportunity in the woods near Elmsford, just east of Tarrytown.

R. C. BENEDICT .

REVIEW

Chamberlain's Methods in Plant Histology*

During the fifteen years which have elapsed since its initial appearance, Chamberlain's "Methods in Plant Histology" has come to be generally regarded as an almost indispensable part of every teaching botanist's equipment. The first edition (1901), followed four years later (1905) by a second, has now been superseded by a third. This volume follows the same general scheme as the second edition. In Part I (pp. 1-147) the principles and methods of technique have been described in a general way. As before, there are chapters on apparatus, reagents, stains and staining, temporary mounts and microchemical tests, freehand sections, the glycerin method, the Venetian turpentine method, the paraffin method, the celloidin method, and special methods, while a new chapter has been added on photomicrography and lantern slides. Part II (pp. 151-307) is devoted mainly to the application to specific cases of the methods evolved in Part I. In addition, attention is given to the collection of material, its cultivation to secure reproductive phases, etc.

Although the general plan of this volume is identical with that of the preceding editions, it is virtually a new book. The subject matter has been thoroughly revised and brought up to date and has been largely rewritten. The number of pages in the present volume is fifty pages greater than that in the second edition.

GEORGE E. NICHOLS

SHEFFIELD SCIENTIFIC SCHOOL,
YALE UNIVERSITY

* C. J. Chamberlain. *Methods in Plant Histology*. Third Edition. Pp. xi+314. 107 f. in text. University of Chicago Press. 1915. \$2.25 plus postage.

PROCEEDINGS OF THE CLUB

OCTOBER 27, 1915

The meeting was held in the laboratory of the New York Botanical Garden at 3:30 P.M. President Harper occupied the chair. Eighteen persons were present.

The minutes of the meeting of May 25, 1915, were read and approved.

The following persons were nominated for membership: Prof. Ira D. Cardiff, Pullman, Wash.; Dr. A. L. Gunderson, Brooklyn Botanic Garden, Brooklyn; Mr. John Dreyer, 147 E. 55th St., Brooklyn; Mr. Maturin L. Delafield, 31 Boulevard Haussmann, Paris, France; Miss Ruby Wilber, Sound Beach, Conn.; Miss Freedoling C. Jud, 119 Franklin St., Jersey City, N. J.; and Mrs. E. Scholl, 2650 Marion Ave., New York City.

Mr. Percy Wilson, chairman of the field committee, read a report on the excursion to the pine barrens held September 10 in connection with the Celebration of the Twentieth Anniversary of the New York Botanical Garden. Mr. Wilson's report showed that three hundred and forty-four (\$344) dollars had been contributed by members of the Club and two hundred and sixty-five dollars and thirty cents (\$265.30) had been expended, leaving a balance of seventy-eight dollars and seventy cents (\$78.70). This report was accepted with a vote of thanks to the field committee for their successful efforts. On a motion by Dr. M. A. Howe the balance of the funds on hand was turned into the general funds of the Club.

Mrs. E. G. Britton, chairman of the program committee, reported that in consequence of suggestion from Dr. Jean Broadhurst and others the committee had deemed it advisable to hold certain meetings of the Club at Columbia University during the coming year, and asked that the committee be authorized to call such meetings at their discretion. The request was granted by a vote of the Club.

The announcement of the death of Mr. Samuel Thorne on July 4, 1915, was read. A committee consisting of Dr. N. L. Britton and the secretary was appointed to draw up suitable resolutions.

The scientific program was then carried out. Dr. Marshall A. Howe spoke on "A Visit to Porto Rico for Collecting Marine Algae," referring to an expedition in June and July of the present year, undertaken as a part of the general natural history survey of this island that is being carried on by the New York Academy of Sciences, the American Museum of Natural History, and the New York Botanical Garden, with financial coöperation of the insular government of Porto Rico. Special attention was given to dredging operations, with Ensenada, on Guanica Harbor, as a base. Specimens were exhibited, particularly of the genus *Caulerpa*, of which nine or more species occur in or near Guanica Harbor. Photographs, also, were shown. A more detailed report of this expedition is published in the Journal of the New York Botanical Garden for October.

Mr. R. S. Williams followed with a paper on "A Species of *Sphagnum* native to the New York Botanical Garden." He said in part: "*Sphagnum palustre* L. or *S. cymbifolium*, as it is more commonly known, is a cosmopolitan species. It has been found at no great distance on both sides of the Botanical Garden but apparently not recorded before from within its limits. The depauperate, dull green specimens, with tallest stems about 4 cm. high, occurred in a rather damp shaded ravine in three very small, separate tufts near stumps or decayed wood."

Some of the specimens, collected October 17, were exhibited, along with other well-developed forms, the most robust and finest in North America coming from the vicinity of Mt. Tacoma, Wash."

B. O. Dodge spoke briefly on the subject "Botanical Observations at Camp Columbia, Bantam, Connecticut." Specimens and photographs of several species of fungi collected in this region were exhibited. Attention was called to a form evidently causing a heart rot of the apple trees. *Polyporus admirabilis* Peck was found growing on living apple trees at a number of different localities. One specimen was eighteen inches in diameter. A specimen of *Amelanchier canadensis* growing on the grounds of Camp Columbia was found to measure nine feet in circumference.

In the absence of Dr. W. A. Murrill, Dr. F. J. Seaver read by title a paper "Preliminary Report of Upper St. Regis Fungi" which is being published in *Mycologia*. The report comprised a list of fungi collected in that region during the last week of August by Dr. Murrill and his associates. Of the three hundred species collected, only twelve were Ascomycetes. Photographs of the region were shown.

Dr. Seaver reported on "An Interesting Case of Girdling." A tulip tree was observed in upper Van Cortlandt Park which had been girdled, apparently by having had a cable passed around its trunk about four feet from the ground. Although the part of the tree below the point of girdling was dead and partially decayed that portion of the tree above the point of girdling, with the exception of the topmost branch, was alive and in apparently good health. It was estimated that the tree had been girdled from five to seven years, since the diameter above the point of girdling was about eight inches greater than that below this point. Photographs of the tree were shown. A more complete account of this interesting case of girdling will be published at some future time.

Dr. N. L. Britton closed the program with a paper on "Porto Rican Sedges."

Meeting adjourned.

B. O. DODGE,
Secretary

NOVEMBER 9, 1915

The meeting was held in the lecture room of the Department of Botany, Columbia University, at 8:15 P.M. President Harper presided. Nineteen persons were present.

There being no business for consideration, the president introduced Dr. P. A. Rydberg, who read a paper on "The Life Zones in the Rocky Mountain Region." The lecture was illustrated with many colored lantern slides. It will be published in full in the *Memoirs of the New York Botanical Garden*.

Meeting adjourned.

B. O. DODGE,
Secretary

NOVEMBER 24, 1915

The meeting was held in the Morphological Laboratory of the New York Botanical Garden at 3:30 P.M., President Harper presiding. Fourteen persons were present.

The minutes of the meetings held October 27 and November 9 were read and approved.

Miss Susan Dixon, 541 E. 78th St., Junior League Hotel, New York City, was nominated for membership by Dr. Stout.

Dr. N. L. Britton presented the following resolutions which were adopted:

WHEREAS: The Torrey Botanical Club has learned with deep regret of the death of Mr. Samuel Thorne, who has been a member of the Club for many years, and who took great interest in the sciences of botany and horticulture, and who was always glad to aid in their advancement,

Resolved: That the Club sincerely regrets the loss of Mr. Thorne, and tenders its sincerest sympathy to his family in their bereavement.

A letter from Hon. Albert Johnson, M.C., relating to the adoption of the Centigrade scale of temperature measurement as the standard in the United States publications, was read. The proposition as outlined in the "revised draft of bill to abolish the Fahrenheit thermometer" was indorsed.

Miss Susan Dixon was then elected to membership in the Club.

The first paper on the announced scientific program, "Cuban Species of the Genus *Pilea*," was read by Dr. N. L. Britton. A large number of specimens of plants belonging to the genus *Pilea* were exhibited by the speaker.

Dr. A. B. Stout followed with a paper on "Induced and Inherited Fasciations." The following brief abstract was furnished by the speaker:

A report was made on the phenomenon of fasciation as it has appeared in certain cultures of *Verbascum Blattaria* and of *Cichorium Intybus* grown at the New York Botanical Garden.

Those in *Verbascum* are evidently induced by the special conditions of growth. The attempts to force the plants as annuals is not fully successful, and of the plants that bloom in the

second year, about thirty per cent show banded stem fasciation with, however, a wide range of variation.

In *Cichorium Intybus* the heredity of fasciations has been studied in two generations of pedigreed plants. From a cross between two fasciated plants and F_1 progeny twelve plants were all fasciated, and of the F_2 generation of eighty-six plants all but eight were fasciated in some degree. The fasciation here is of the grooved stem type, and exhibits a great range of variation.

The concluding number on the program was given by Miss Margaret Slosson, "The Identity of *Trichomanes pyxidiferum* L."

Many specimens and photographs were exhibited in illustrating the characteristics of this species.

Adjournment followed.

B. O. DODGE,
Secretary

DECEMBER 14, 1915

The meeting of December 14, 1915, was held at the American Museum of Natural History at 8:15 P.M. President Harper presided. Thirty persons were present.

The announced scientific program consisted of an illustrated lecture on "A Trip through Cuba," by Dr. Mel T. Cook.

Adjournment followed.

B. O. DODGE,
Secretary

NEWS ITEMS

"During recent years practically all of the chestnut on Long Island, New York, has been killed by the chestnut blight. The hickories and oaks are now threatened by a similar fate but from a very different and preventable cause, viz., the attack of two species of native insects, the habits and seasonal histories of which and methods of control are known. These methods are simple and inexpensive and their efficiency has been demonstrated. A preliminary survey of Long Island has been undertaken by this department to determine the distribution of these insects as serious enemies of the trees and to give free instructions to interested local owners on practical methods of ending the

trouble. Therefore, since answers to the questions on the return card will greatly facilitate this work, we will appreciate the assistance of postmasters in forwarding these cards to parties at the post offices and rural routes, who, they think, will be interested and will answer the questions promptly." This notice has been issued by the Bureau of Entomology at Washington and people interested in the question are invited to communicate with that bureau.

At a meeting of the Club held February 23, at the New York Botanical Garden, the proposed amendments to the by-laws, framed with the idea of creating a class of associate membership open only to teachers in the secondary and high schools, and students in botanic gardens and universities, were voted down.

Professor L. R. Abrams, of Stanford University, has been giving Professor Jepson's course in dendrology at the University of California during the first semester.

Dr. C. A. McLendon, field pathologist of the South Carolina Experiment Station, has accepted a position as expert in cotton breeding with the Georgia State Board of Entomology, Atlanta, Ga.

The twenty-ninth annual announcement of the Woods Hole Marine Biological Laboratory has been issued. The chief course of instruction offered for the coming semester in botany is designed to give "as detailed an understanding of the algae as time will permit." Further information may be had from Dr. G. A. Drew, Woods Hole, Mass.

Volume one, number one of *Genetics*, which, as its title indicates will be of chief interest to animal and plant breeders, has just been issued. It is a bimonthly, issued from the Princeton University Press, and is managed by an editorial board among which the following botanists are noted: B. M. Davis, E. M. East, R. A. Emerson and Raymond Pearl. Professor G. H. Shull, of Princeton University, is the managing editor. A very fine frontispiece is a copy of an old painting of Mendel.

The Torrey Botanical Club

Contributors of accepted articles and reviews, who wish six gratuitous copies of the number of *TORREYA* in which their papers appear, will kindly notify the editor when returning proof.

Reprints should be ordered, when galley proof is returned to the editor. The New Era Printing Co., 41 North Queen Street, Lancaster, Pa., have furnished the following rates:

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OTHER PUBLICATIONS

OF THE

TORREY BOTANICAL CLUB

(1) BULLETIN

A monthly journal devoted to general botany, established 1870. Vol. 42 published in 1915, contained 698 pages of text and 33 full-page plates. Price \$3.00 per annum. For Europe, 14 shillings. Dulau & Co., 37 Soho Square, London, are, agents for England.

Of former volumes, only 24-42 can be supplied entire; certain numbers of other volumes are available, but the entire stock of some numbers has been reserved for the completion of sets. Vols. 24-27 are furnished at the published price of two dollars each; Vols. 28-42 three dollars each.

Single copies (30 cents) will be furnished only when not breaking complete volumes.

(2) MEMOIRS

The MEMOIRS, established 1889, are published at irregular intervals. Volumes 1-15 are now completed; No. 1 of Vol. 16 has been issued. The subscription price is fixed at \$3.00 per volume in advance. The numbers can also be purchased singly. A list of titles of the individual papers and of prices will be furnished on application.

(3) The Preliminary Catalogue of Anthophyta and Pteridophyta reported as growing within one hundred miles of New York, 1888. Price, \$1.00.

Correspondence relating to the above publications should be addressed to

DR. BERNARD O. DODGE

Columbia University

New York City

TORREYA

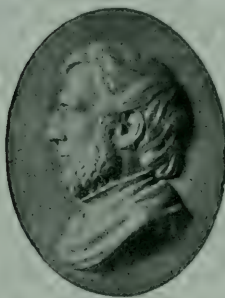
A MONTHLY JOURNAL OF BOTANICAL NOTES AND NEWS

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR



JOHN TORREY, 1796-1873

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TORREYA is furnished to subscribers in the United States and Canada for one dollar per annum; single copies, fifteen cents. To subscribers elsewhere, five shillings, or the equivalent thereof. Postal or express money orders and drafts or personal checks on New York City banks are accepted in payment, but the rules of the New York Clearing House compel the request that ten cents be added to the amount of any other local checks that may be sent. Subscriptions are received only for full volumes, beginning with the January issue. Reprints will be furnished at cost prices. Subscriptions and remittances should be sent to TREASURER, TORREY BOTANICAL CLUB, 41 North Queen St., Lancaster, Pa., or Columbia University, New York City.

Matter for publication, and books and papers for review, should be addressed to

NORMAN TAYLOR

Brooklyn Botanic Garden

Brooklyn, N. Y.

TORREYA

April, 1916.

Vol. 16

No. 4

THE WILD FLOWER PRESERVATION SOCIETY OF AMERICA

At a meeting of the executive committee of the board of managers of the Wild Flower Preservation Society of America held on December 15, 1915, a copy of the articles of incorporation was presented by Mr. Norman Taylor, and the secretary-treasurer was authorized to send out notices requesting the approval of the members. The report and financial statement of the secretary-treasurer were accepted after having been duly audited. It was also decided to present a resolution at the annual meeting of the Torrey Botanical Club, asking that TORREYA be the official organ of the Society, and that any additional expense be met by the Wild Flower Preservation Society of America. The secretary-treasurer was also authorized to have a button printed for sale and distribution, to be made from a design of the flower of the "American Laurel," a colored sketch of which has been prepared by Miss Eaton at Mrs. Britton's request. The budget for the following year was also approved.

The following officers were elected for the ensuing year:

PRESIDENT: Dr. C. F. Millspaugh, Field Museum, Chicago.

SECRETARY-TREASURER: Norman Taylor, Brooklyn Botanic Garden.

EXECUTIVE COMMITTEE

Dr. N. L. Britton

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Dr. F. H. Knowlton

Prof. R. A. Harper

Miss Delia W. Marble

At the annual meeting of the Torrey Club held on January 11, 1916, the application of the Society to have TORREYA act as the

[No. 3, Vol. 16, of TORREYA, comprising pp. 55-78 was issued 17 March, 1916.]

official organ of the Wild Flower Preservation Society of America was approved. Hereafter notices to the members, and other matter of interest to them will appear in *TORREYA*,* and reprints of such notices will be made as occasion demands and mailed to members of the Society and others.

In connection with the button, mentioned above, one has been sent to each member of the Society and additional buttons will be furnished at the rate of 2 cents each, or \$1.50 per hundred. It is hoped that they will have a wide usefulness for school children and others.

Application for extra buttons, or any other information about the Society's business should be sent to the new secretary-treasurer,

NORMAN TAYLOR

BROOKLYN BOTANIC GARDEN,
BROOKLYN, N. Y.

COMMON MOSSES ACCORDING TO HABITAT. A NON-TECHNICAL DESCRIPTION BASED ON MACROSCOPICAL CHARACTERS

BY DAISY J. LEVY

(Continued from *March Torreya*, p. 67)

DESCRIPTION OF ACROCARPOUS SPECIES

AULACOMNIUM.

A. heterostichum.

Capsules wrinkled when dry. Costa ends below the apex. Capsule contracted. Operculum long rostrate. Plant radiculose. Mature in spring.

A. palustre.

Leaves light colored, long lanceolate, bearing numerous pseudopodia; serrate at apex, revolute below; erect spreading; transversely undulate; costa ending below the apex. Capsule curved, unsymmetric, plicate when dry. Operculum long beaked. Seta long. Plants light colored, yellow green; very tomentose. Mature in early summer.

BARBULA.

Leaves erect spreading, mucronate, margin recurved below; costa usually ends below the apex. Capsule small. Seta yellow; operculum beaked. Small tufted plants. Mature in winter.

* The subscription price of *TORREYA* is one dollar a year and subscriptions may be sent to Dr. B. O. Dodge, department of botany, Columbia University, New York City.

BARTRAMIA.

B. pomiformis.

Leaves costate, serrate, long acuminate, narrow. Usually papillose, yellow green, revolute below. Seta short. Capsule globose, striate. Plants robust, forming large wooly tufts in wet cool places. Mature in spring.

BRYUM.

The capsule of the *Bryum* is unsymmetric, inclined or pendulous, fairly large, mostly pear-shaped. Seta is long. Operculum conical. Plants vary in size.

B. argenteum.

This species is found in dry soil between rocks or cracks in wall. They are small, silver gray in old plants. Costa ends below the apex. Plants small, julaceous. Seta dark red. Mature in autumn.

B. bimum.

Leaves acuminate, serrate at apex, decurrent, margin revolute, costa red or purple. Capsule pendent or pyriform, inclined. Plants moisture-loving, large bright green, loosely cespitose. Mature in summer.

B. caespitium.

This is our most common form. Leaves mostly entire, acuminate, with costa excurrent, ovate lanceolate, margin revolute, slightly serrate, imbricate, narrowly acuminate. Capsule horizontal or pendent, oblong pyriform. Cells of the leaf narrow at margin. Plants form dense tufts on dry soil; they are bright green, of medium size. Mature in spring or summer.

BUXBAUMIA.

B. aphylla.

Capsule ventricose, exserted, oblique. Leaves few at base. No chlorophyll. Protonema brown. Plants very minute. Found on the ground or on rotten wood. Mature in spring.

CATHARINAEA.

C. angustata.

In the genus *Catharinaea*, the calyptra is conical, the capsule cylindric. The leaves are bordered, large, obtuse, but not so serrate as in *undulata*. Costa is wider, the leaves narrower. Plants found in dry, more open situations.

C. undulata.

Resembles the above, but the leaves are strongly undulate transversely, while the costa occupies but a smaller part of the leaf. Plants are densely cespitose, and grow in moist shady places. Both forms of *Catharinaea* mature in autumn or winter.

CERATODON.

C. purpureus.

A common moss of fields, pastures and roadways. Leaves costate, entire, acuminate, long lanceolate, with margin revolute. Apex slightly serrate, often reflexed. Capsule dark red, horizontal, ovate oblong, striate, sulcate when dry, neck short. Plants dark green, growing close together, of medium size. Mature in spring.

CONOMITRIUM.

C. Julianum (*Fissidens Julianus*).

Plants large, 2 to 6 inches in length, filiform, floating, leaves distant, linear lanceolate, with *Fissidens* habit, with leaves placed flat and arranged in one plane. Seta short. Found on stones in running brooks.

DICRANELLA.

D. heteromalla.

Calyptra cucullate. Leaves narrow, secund, base broad, apex subulate, channeled, serrate at tip. Seta yellow. Capsule cylindric mostly erect, plicate when dry. Plants small forming dense silky tufts, of yellow green color. Mature in spring and winter.

DICRANUM.

D. scoparium.

A common form of *Dicranum*. Plants forming large tufts, yellow green. Leaves large falcate secund, dense and silky. A common plant along wood paths and around the base of trees. Mature in summer or autumn.

DITRICHUM.

D. pallidum.

Leaves serrate, acuminate, lanceolate, costa long excurrent, margin recurved. Seta yellow. Plants small, caespitose, dull green. Mature in spring.

D. tortile.

Closely resembles *Ditrichum pallidum*, but the costa is short excurrent, seta is red or orange, and matures in the autumn.

DRUMMONDIA.

D. clavellata.

A tree loving form. Calyptra cucullate. Capsule symmetric, erect, ovate, globose. Leaves open erect, ovate lanceolate. Costa ends below the apex. Forms dark green tufts. Seta long. Stem long.

FISSIDENS.

The genus *Fissidens* is characterized by flat plane of growth. The leaves are distichous, that is they are two ranked, forming two opposite rows. Only a genus description can be given, for the species require microscopical examination. For the long floating form found in the water see *Conomitrium Julianum*, also called *F. Julianus*. *Fissidens incurvus* is often found on stones. Other species of *Fissidens* are common on soil in deep woods.

FUNARIA.

F. hygrometrica.

Capsule unsymmetric, inclined, oblique; its mouth is turned to one side, it is pyriform and gibbous. Seta is twisted or cord-like, therefore it is called the cord moss. It forms dense tufts on barren soil or burnt waste places. Plants of medium size, mature in summer. Leaves are serrate, acute or obtuse.

GEORGIA.

G. pellucida.

Capsule cylindric, mostly erect, green with operculum reddish when

young. Leaves blunt, entire, costa ends below the apex. Seta long and twisted. Slender cups are often found at the apex of the branches, these cups contain little green bodies called gemmae. These gemmae are able to propagate the plant asexually. The plants are found on decayed trunks and mature in summer.

GRIMMIA.

The genus *Grimmia* is characterized by its smooth calyptra. Capsule ovoid symmetric, often immersed. Leaves are costate, entire, acuminate. They spread somewhat when moist, are usually hyaline at the apex. The margin is often recurved and they are lanceolate in shape. The plants are small, light green above, black below, they are tufted, are always to be found on rocks. Mature in the spring. Species determination depends upon microscopical examination.

HEDWIGIA.

H. albicans.

The capsule is always immersed and spherical in shape. The leaves are ecostate, entire, acute, serrate and hyaline at tip. The plants appear hoary at top but are black at base. They spread when moist. They are of medium size and mature in spring. Leaves are recurved and concave, Mature in spring.

LEPTOBRYUM.

L. pyriforme.

This is one of the *Bryum* group and like them it has an unsymmetrical, inclined capsule which in this species is pear-shaped. Leaves are long acuminate running off into a long hair-like point. The base of the leaf is broad; costa excurrent. Apex is serrate. Cells of the leaf are narrow and linear. Plants are pale shining green and form rather large tufts. Mature in spring and summer.

LEUCOBRYUM.

L. glaucum.

Capsule cylindric, with cucullate calyptra. Leaves ovate, enclosed with hyaline cells, obtuse or acute, costate, entire. Plants form large dense white cushions in deep woods. They are of medium size. Mature in spring, or winter.

MNIUM.

The plants of this genus are large, forming loose wide tufts in deep woods, loving moist substratum. The plants form stolons and are usually woody and tomentose. Capsule large, unsymmetric and inclined. Leaves serrate, costate, usually acute or obtuse, large and oval. Seta long.

M. cuspidatum.

This is the early spring form. The leaves are bordered, serrate with single teeth in the upper half only. Capsule single.

Other common forms of *Mnium* are:

M. hornum with serrate leaves and teeth in pairs. Costa vanishing below the apex.

M. punctatum with leaves costate to the apex, entire and minutely apiculate.

M. punctatum var. *elatum*, the costa vanishes below the apex. The leaves are very large.

ORTHOTRICHUM.

O. anomalum.

This form is usually found growing on stones. The calyptra is very hairy and the capsule is exserted. The leaves are costate, entire, acuminate, ovate in shape. Plants form large dense cushions. They are dark green. Mature in spring.

O. strangulatum.

Calyptra mitrate, naked, capsule cylindric. Leaves costate, entire, acute or obtuse. Margin of leaf revolute. Plants small, growing on trees. Mature in spring.

PHASCUM.

P. cuspidatum.

These plants are very minute, with the capsule immersed. The calyptra is cucullate. The capsule is globose or ovate oblong, with an apiculate operculum. The leaves are entire, acuminate, with an excurrent costa. They are ovate to ovate-lanceolate, often revolute in the upper part. The plants are dark green, densely tufted. They grow in waste places, in fields, and on clay banks. Mature in spring.

PHILONOTIS.

P. fontana.

Calyptra cucullate. Capsule globular. Leaves costate, serrate, acuminate, revolute, ovate lanceolate. One or two plicae on either side of the costa. Costa usually excurrent. Capsule large and brown, striate. Seta dark red. Plants form large tufts, aquatic or semi-aquatic. They are usually yellow green. Medium to large. Mature in spring.

PHYSCOMITRIUM.

P. turbinatum.

Capsule urn shaped. Leaves costate, entire, acute. Costa ends below the apex. Leaves are obovate, often serrate above the middle. Plants are small, bright green, growing in open places. Mature in spring. *Physcomitrium* closely resembles *Pollia*, but *Pollia* matures in the autumn, and its costa is excurrent.

POGONATUM.

P. brevicaule.

This species is easily recognized by the persisting protonema, which forms a soft green felt like mass on fresh turned clay banks. Leaves are very few and grow at the base of the plant. Calyptra is conical and hairy. The capsule cylindrical. The leaves are costate, serrate. On the back of the leaf, the costa forms outgrowths called lamellae. The margin of the leaf is spinulose. The plants are one or two inches high and form a pretty cluster with the glistening white of the operculum or calyptra. Mature in autumn.

POHLIA.

P. nutans.

One of the prettiest of the spring mosses. It resembles *Bryum caespiticium*, but the choice of habitat is peculiar to each. The *Bryum* prefers dry open situations, the *Pohlia* prefers moist soil in deep woods. The

capsule is unsymmetric, inclined, yellow brown at maturity. The leaves are serrate, acuminate, yellow green, linear lanceolate. The costa is thick and reddish. Mature in summer and spring.

POLYTRICHUM.

The Polytrichums are all large mosses and are among our most common forms. They grow from underground stems, and bear lamellae on the back of the leaf. Capsules are borne on long seta and are angled. Male plants are easily distinguished by the arrangement of the leaves at the summit of the plant in rosettes. The calyptra is densely hairy. Our two most common forms are described below.

P. commune.

The leaves are costate, serrate, open recurved, long sheathing. Capsule is sharply angled, cubical with short beak. Operculum short, seta long. Plants large, very loosely cespitose, in woods or open fields. Mature in spring.

P. ohioense.

Closely resembles the preceding. The capsule, however, is longer than broad, with a long beak. The beak is tapering. It grows in deeper woods and in more moist situations.

POTTIA.

P. truncatula.

Capsule is urn shaped. Leaves are costate, entire, acute and mucronate. They are ovate and oblong. The costa is excurrent. Seta short and slender. Plants grow in open ground, form loose mats, small, dull green in color. *Pottia* resembles *Physcomitrium* from which it differs in the excurrent costa and in time of maturity. *Pottia* matures in the autumn.

PTYCHOMITRIUM.

P. incurvum.

Calyptra is plicate. Capsule oval, erect. Leaves crispate when dry, erect, incurved when wet. The leaves are linear lanceolate, entire, with a costa which reaches to just below the apex. The apex is acute. The plants grow on rock, forming dark green, dense cushions. Plants mature in winter or in early spring.

RHACOMITRIUM.

R. aciculare.

A form difficult to distinguish without the aid of a microscope which will reveal the sinuose walls. This species closely resembles *Grimmia*, but the plant is much larger, and is found in subalpine regions on wet rocks. The leaves are costate, not hyaline tipped. The margin is recurved, it is entire, with a few low teeth at the apex, which is round-obtuse. The leaf is ovate-oblong in shape. The calyptra is mitrate, long-beaked, smooth. The capsule is exserted. The seta is erect and straight. Mature in the spring.

RHODOBRYUM.

R. roseum.

The capsule is fairly large, clustered, pendent, smooth. Seta long, operculum conical, apiculate. The leaves are costate, serrate, obtuse.

The plants are found in cool moist places in deep woods. Mature in autumn. They are large and *Mnium*-like, often called the giant *Bryum*. They grow from stolons, the leaves are clustered at the top of the stem, forming rosettes. The plants are deep green in color, and form large loose mats.

SPHAGNUM.

The *Sphagnums* or peat mosses are the large, light, almost white, green mosses found in bogs or in stagnant water. The genus only can be described, for the microscope is necessary for species determinations. The capsules are globular. The leaves are ecostate, entire, acute, translucent. The plants grow in compact masses. Mature in summer.

TORTELLA.

T. caespitosa.

This species is usually found upon trees. The calyptra is cucullate. The leaves are costate, entire, acuminate. The costa is mucronate, excurrent. Margin plane. Leaves linear lanceolate, spreading when moist, spirally contorted when dry. Basal cells hyaline. Plants caespitose, radiculose, of medium size. Yellow green. Mature in spring.

T. tortuosa.

This form is found upon stones. The leaves are linear lanceolate, acuminate, spreading when moist. The costa is excurrent. Densely imbricate in habit, with undulate leaves. Plants medium to large. Mature in late summer.

TORTULA.

T. muralis.

Leaves oblong, obtuse, margin revolute. Costa yellow, excurrent to a long hyaline point about $\frac{1}{2}$ the length of the leaf. Cells papillose. Capsule ovate-oblong, sub-cylindric. Seta purple. Operculum long beaked. Tufts small, forming dense white-green cushions on stones and rocks. Mature in spring.

ULOTA.

U. americana.

This *Ulot*a is always found on rocks. Calyptra hairy. Capsules erect and symmetric, exserted. Leaves costate, entire, acuminate, lanceolate, curly when dry. Capsule is striate with a long neck. Plants black-green. Mature in spring.

*U. crisp*a.

This *Ulot*a is to be found on trees. It agrees with the above form in calyptra and capsule characters. The leaves are costate, entire, acute, ovate, crispate when dry. Hyaline cells at base of leaf. Plants form dense cushions. They are small, bright green. Mature in spring or early summer.

WEBERA.

W. sessilis.

This is a unique form growing close to the ground in dense mats. The capsule is ventricose, immersed, surrounded by a tuft of hairs and almost sessile on the gametophyte. The leaves are lanceolate-acuminate. Its habitat is a soil bank in deep woods. Mature in summer.

WEISIA.

W. viridula.

Calyptra cucullate. Capsule cylindric. Leaves costate, entire, acuminate, erect spreading, mucronate, margin involute, upper leaves larger than the lower. Capsule plicate when dry. Operculum long beaked. Plants small, forming tufts on soil usually dry or sandy. Plants bright green. Mature in spring.

PLEUROCARPOUS FORMS

I. In woods, on humus, ground, or decaying logs

B. OPERCULUM CONIC TO SHORT ROSTRATE.

C. CAPSULE OVOID, INCLINED.

D. Costate.

E. Serrate.

F. Acuminate.

*Bryhnia Novae-Angliae.**Brachythecium.**Hylocomium.*

CC. CAPSULE OVOID, ERECT OR SUB-ERECT.

D. Costate.

E. Serrate.

F. Acuminate.

*Brachythecium cyrtophyllum.**acuminatum.**oxycladon.*

CCC. CAPSULE CYLINDRIC, INCLINED.

D. Costate.

E. Entire.

F. Acuminate.

*Camphylium chrysophyllum.**Hypnum Haldanianum.*

EE. Serrate.

F. Acuminate.

*Camphylium hispidulum.**Amblystegium.**Hypnum (Ctenidium) molluscum.**(Stereodon) imponens.**(Stereodon) reptile.**(Ptidium) Crista-castrensis.**Cratoneuron.*

DD. Ecostate or costa short and double.

E. Entire.

F. Acute.

*Plagiothecium.**Calliergon Schreberi.*

EE. Serrate.

F. Acuminate.

*Hypnum (Stereodon) Patientiae.**(Stereodon) imponens.**(Stereodon) reptile.**Plagiothecium.*

CCCC. CAPSULE CYLINDRIC, ERECT OR SUB-ERECT.

D. Costate.

E. Serrate.

F. Acute.

*Climacium.**Anomodon rostratus.*

DD. Ecostate, or costa short and double.

E. Entire.

F. Acuminate or acute.

*Hypnum Haldanianum.**Entodon.*

BB. OPERCULUM LONG ROSTRATE.

C. CAPSULE OVOID, INCLINED.

D. Costate.

E. Serrate.

F. Acuminate or acute.

*Cirriphyllum Boscii.**Eurhynchium.*

CC. CAPSULE CYLINDRIC, INCLINED.

D. Costate.

E. Serrate.

F. Acuminate.

Thuidium.

EE. Entire.

Thuidium.

DD. Ecostate. *

E. Serrate.

F. Acuminate.

Hypnum recurvans.

II. Bark of trees

1. ABOVE THE BASE

C. CAPSULE CYLINDRIC, ERECT, EXsertED.

D. Ecostate or costa faint.

E. Serrate.

F. Acuminate.

Pylaisia Schimperi.

CC. CAPSULE CYLINDRIC, IMMERSED OR EXsertED.

D. Ecostate or costa faint.

E. Entire.

F. Acute.

Neckera pennata.

2. NEAR THE BASE

C. CAPSULE CYLINDRIC, ERECT.

**Erect, exserted.*

D. Costate.

E. Serrate.

F. Acute.

Thelia.

EE. Entire.

F. Acuminate.

Anomodon.

DD. Ecostate or costa faint.

E. Entire.

F. Acute.

Entodon.

***Erect, immersed or exserted.*

D. Ecostate.

E. Entire.

F. Acute or acuminate.

Leucodon.

Neckera pennata.

CC. CAPSULE CYLINDRIC, UNSYMMETRIC, HORIZONTAL
OR INCLINED.

D. Costate.

E. Serrate.

F. Acuminate.

Hypnum (Stereodon) reptile.

Thuidium scitum.

DD. Ecostate or costa faint.

E. Serrate.

F. Acuminate.

Hypnum recurvans.

EE. Entire.

F. Acute.

Amblystegiella adnata.

CCC. CAPSULE OVOID, ERECT OR INCLINED.

D. Costate.

E. Serrate.

F. Acuminate.

Brachythecium salebrosum.
acuminatum.

Thuidium.

EE. Entire.

F. Acute.

Leskea.

3. ABOUT THE ROOTS

C. CAPSULE ERECT OR INCLINED.

D. Costate.

E. Serrate or entire.

F. Acuminate.

Campylium hispidulum.

Anomodon attenuatus.

DD. Ecostate or costa faint.

E. Serrate.

F. Acuminate.

Hypnum (Stereodon) imponens.
reptile.

Plagiothecium.

CC. CAPSULE OVOID, ERECT OR SUB-ERECT.

D. Costate.

E. Serrate.

F. Acuminate.

Brachythecium.

III. Aquatic or sub-aquatic

C. CAPSULE CYLINDRIC.

D. Costate.

E. Entire.

F. Acuminate.

*Scorpidium scorpioides.**Amblystegium irriguum.**fluviatile.**riparium.**Dichelyma.*

FF. Acute.

*Hygrohypnum ochraceum.**Calliergon cordifolium.**Schreberi.*

EE. Serrate.

F. Acuminate.

*Drepanocladus.**Campylium chrysophyllum.**hispidulum.*

FF. Acute.

Climacium.

CC. CAPSULE OVOID.

D. Costate.

E. Serrate.

F. Acuminate or acute.

*Brachythecium rivulare.**plumosum.**Plagiothecium striatellum.**Eurhynchium rusciforme.**Hygrohypnum ochraceum.*

CCC. CAPSULE SESSILE OR SUB-SESSILE.

D. Ecostate.

E. Entire.

F. Acute.

Fontinalis.

IV. Open fields, roadways, waste places

B. CALYPTRA CUCULATE.

C. CAPSULE CYLINDRIC, ERECT OR CERNUOUS.

D. Costate.

E. Serrate.

F. Acuminate.

*Thuidium.**Thelia.*

DD. Ecostate.

E. Serrate.

F. Acute or acuminate.

Hypnum.

EE. Entire.

F. Acute.

Calliergon Schrebri.

CC. CAPSULE OVOID, ERECT OR INCLINED.

D. Costate.

E. Serrate.

F. Acuminate.

Cirriphyllum Boscii.

Brachythecium.

(To be continued)

NOTES ON PHILIPPINE VEGETATION: THE CASUARINA ASSOCIATION

BY FRANK C. GATES

One of the most striking impressions one receives in different countries is a similarity of the appearance of vegetation, *en masse*, produced by entirely different plants. Even a second general look at the vegetation as a whole may not disclose the differences which, however, a closer observation reveals.

The vegetation of the sandy river-bottom flats in Central



FIG. 1. A general view of a grove of *Casuarina equisetifolia*. Villar, Zambales Province, December 24, 1914.

Zambales Province, Philippine Islands, furnishes an excellent example. As is shown in the figures, the resemblance of the

forests of *Casuarina equisetifolia* Forst. (Casuarinaceae) to a coniferous forest is considerable. It is summed up in the common name, jointed pine, which many apply to *Casuarina*. The jointed branches with their very much reduced leaves closely resemble a spray of white pine (*Pinus strobus*), although the general appearance of the bark and the mode of branching is less similar. The jointed branches ("needles") on the ground and the grassy, park-like appearance of the grove furthers the general resemblance.

The habitat here occupied by *Casuarina* is the low sandy flood plain flats along the rivers. The soil is a coarse, light-colored sand, deficient in food materials. Upper flats—former



FIG. 2. An average grove of *Casuarina*, showing the openness of vegetation at the ground. Villar, Zambales Province, December 24, 1914.

flood plains, but now high above the river and fire-swept each year—are not occupied by *Casuarina*.

The climate is severe. Six and one half months are hot and very dry, while, during three of the remaining five and one half months, rain is nearly continuous. The average rainfall for the year is 3952 mm.* (156 inches) of which 3,771 mm. (149 inches) or 95.5 per cent. falls from May through October, during the period of southwest winds. 3,595 mm. (142 inches) or 91 per

* Records furnished through the courtesy of the Philippine Weather Bureau.

cent. falls from May through September. In the rainy season the excess of rain over the needs of the vegetation is considerable. During the northeast monsoon, which blows the rest of the year, precipitation is very deficient and the vegetation withers. The following table summarizes the temperature conditions by months:

	Highest	Lowest	Year
	° C.	° C.	° C.
Absolute maximum.....	37.8 April	32.5 August	37.8
Average maximum.....	33.1 April	29.9 August	31.5
Mean.....	28.0 May	24.9 January	26.5
Average minimum.....	23.2 June	19.0 January	21.5
Absolute minimum.....	21.7 August	13.9 January	13.9

The structure of the association is very simple, as *Casuarina* is normally the only tree present on the flats. Although the needle-like branches are very slender, in a normal grove the aggregate shade cast is very great. Very few herbaceous plants—largely low grasses, as *Eragrostis spartanoides*, *Eleusine indica*,



FIG. 3. An opening in a grove of *Casuarina*, vegetated with the grasses, *Saccharum spontaneum* and *Miscanthus sinensis*. Villar, Zambales Province, December 24, 1914.

Panicum patens, and *Oplismenus compositus*, and "weeds," as *Ageratum conyzoides*, *Amaranthus spinosus*, *Aneilema vitiense*, *Anisomeles indica*, *Cyperus difformis*, *Desmodium laxiflorum*,

Elephantopus spicatus, *Emilia sonchifolia*, *Hyptis capitata*, *Hyptis spicigera*, *Sida acuta*, *Triumfetta* sp., and *Waltheria americana* grow on the ground. A very few shrubby plants—*Flemingia cumingiana*, *Cassia alata*, *Ehretia polyantha*, *Grumilea luconiensis*, *Helicteres hirsuta*, *Melastoma polyanthum*, *Hominoia riparia*

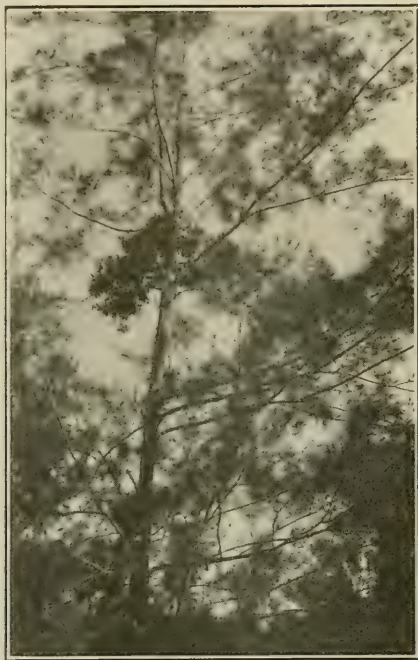


FIG. 4. *Loranthus* sp., hemiparasitic on *Casuarina equisetifolia*. Pombato, Zambales Province, December 21, 1914.

(only at the edge of the streams), and *Acacia confusa*—and vines—*Abrus precatorius*, *Deeringia baccata*, *Piper interruptum*, *Quisqualis indica*, and *Streptocaulon Baumii*—may be present. A hemiparasite, *Loranthus* sp. often forms dense clumps in the crowns of *Casuarina*, as shown in Fig. 4. The dark green color of *Loranthus* is in direct contrast to the light grayish green of *Casuarina*.

Openings made in *Casuarina* groves generally become covered with the tall grasses, *Saccharum spontaneum*, *Rottboellia ophiur-*

oides, and *Miscanthus sinensis*. (See Fig. 3.) The growth of grass is gradually replaced by *Casuarina*, provided the area is sufficiently free from fire. A stand of young *Casuarina* is very dense and in appearance greatly resembles a stand of young white pine.

CARTHAGE COLLEGE,
CARTHAGE, ILL.

PROCEEDINGS OF THE CLUB

JANUARY 11, 1916

The annual meeting was held January 11, 1916, at the American Museum of Natural History at 8:15 P.M., President Harper presiding. Twenty-six persons were present.

The minutes of meetings held November 24 and December 14, 1915, were read and approved.

The following persons were nominated for membership: Mr. C. M. Shipman, Rossville, N. Y.; Dr. A. F. Blakeslee, Cold Spring Harbor, N. Y.; Dr. Walter Mendelson, 159 West 74th St., New York; Miss Wanda M. Kirkbride, 1230 Amsterdam Ave., New York; Miss Isabel C. Darrow, 503 W. 121st St., New York; Mr. E. S. Schultz, Columbia University; Miss Edna Adams, Hartsdale, N. Y.; Mr. Edwin L. Keeler, White Plains, R. F. D. No. 1, N. Y.

Mr. Percy Wilson, chairman of the field committee, read the following report:

"Thirty-one field meetings were scheduled by the field committee between Saturday, April 3, and Sunday, October 17. In all there were 488 persons present, an average attendance of 16.

"As some members were unable to attend the Saturday meetings, the field committee was authorized by the club to arrange an occasional field meeting on Sunday. At the eight Sunday meetings held, 123 persons were present, an average attendance of 15.

"The largest attendance of any one of the field meetings, excluding the special field meetings held during the Twentieth Anniversary Celebration of the New York Botanical Garden,

was 41, at the meeting of Sunday, May 9, at Eagle Rock, West Orange, N. J. Forty persons were also present at the following meeting, Saturday, May 15, at Fort Lee, N. J. The largest attendance at the special field meetings held during September was 64 at Great Kills, S. I., on September 8; the second largest was on the excursion to the pine-barrens of New Jersey, September 10, when 50 persons were present. The smallest attendance at any field meeting held during the year was 5.

"The programs announced for July 10 and October 2 were not carried out, one on account of unfavorable weather, the other owing to insufficient attendance.

"As far as practicable, the field committee designated special topics for each field meeting, covering a wide range, as follows: Salt-water algae, fresh-water algae, hepaticae, lichens, woody fungi, fleshy fungi, ascomycetes, mosses, ferns, trees, wild flowers, and fossil plants.

"The chairman or some other member of the field committee personally attended most of the field meetings. Over 1,350 specimens of local plants were collected by the chairman on these excursions, more than half of which have been mounted and added to the local herbarium."

The report was accepted.

Dr. M. Levine, in the absence of the chairman of the committee on membership reported on the work of this committee.

Dr. J. H. Barnhart, chairman of the finance committee, rendered the report of this committee.

Mr. Norman Taylor, Dr. T. E. Hazen and Dr. M. A. Howe reported briefly on the activities of the committees on local flora, with which they are connected.

The committee consisting of Dr. M. Levine, Dr. M. A. Howe and Mr. Norman Taylor, on associate membership, reported through its chairman.

The following amendments to the by-laws were proposed for the committee by Dr. Levine:

1. To substitute for the first two sentences of Article XII, as published in May, 1889, the following:

The Club shall consist of active, associate, corresponding, and honorary members.

"The active members shall be such as are elected under that designation and conform to the regulations of the Club. Associate membership shall be limited to teachers in elementary and high schools and to registered students in colleges and universities."

2. By adding to Article XIV, as amended on December 11, 1906, the following:

"The annual dues for associate members are two dollars. The payment of the annual dues entitles each associate member to receive *TORREYA* and all notices pertaining to activities of the Club."

On the motion of Dr. Gager the proposed amendments were referred to the committee in accordance with the constitutional provisions regarding the adoption of amendments.

The president referred the question to the committee originally proposing the amendment.

The report of the editor, Professor Alexander W. Evans, was read and ordered placed on file.

Mr. Norman Taylor, editor of *TORREYA*, submitted a report relating to the publication of this journal.

The secretary's report was read and accepted.

The report of the treasurer was referred to an auditing committee consisting of Sereno Stetson and T. E. Hazen.

Dr. J. H. Barnhart, delegate to the council of the New York Academy of Sciences, read his report, which was adopted.

Mr. Norman Taylor read the following communication:

"At the meeting of the executive committee of the Wild Flower Preservation Society held on December 15, 1915, it was decided to request the Torrey Botanical Club, to allow the use of *TORREYA* as the official organ of the Club, with the understanding that the Wild Flower Preservation Society of America (Inc.) share whatever additional expense may be incurred, for reprints, etc., and with the expectation that additional subscriptions will be received from its members."

Mr. Taylor then proposed the following resolution:

"*Resolved*, that the editor of *TORREYA* be empowered to print such matters relating to the Wild Flower Preservation Society of

America as are necessary and of sufficient interest and that no extra expense be involved by the Club."

The resolution was adopted.

A vote of thanks was extended to the director of the American Museum of Natural History for the courtesies extended the Club during the past year.

The resignation of Mr. F. Serringhaus was read and accepted.

The following persons were then elected to membership: Mr. C. M. Shipman, Dr. A. F. Blakeslee, Dr. Walter Mendelson, Miss Wanda M. Kirkbride, Mr. E. S. Schultz, Miss Isabel C. Darrow, Miss Edna Adams, Mr. Edwin L. Keeler.

The election of officers for the year 1916 resulted as follows: *President*, R. A. Harper; *Vice-Presidents*, John Hendley Barnhart, Herbert M. Richards; *Secretary and Treasurer*, B. O. Dodge; *Editor*, Alexander W. Evans; *Associate Editors*, Jean Broadhurst, J. A. Harris, Marshall Avery Howe, Herbert M. Richards, A. B. Stout, W. Marquette, Norman Taylor; *Delegate to the Council of the New York Academy of Sciences*, John Hendley Barnhart.

Meeting adjourned.

B. O. DODGE,
Secretary

NOTES AND NEWS ITEMS

DESTROYING THE WILD FLOWERS.—Within a few days our own Russ hordes will begin making incursions into the loveliest regions of Chicago's environs to look at nature's new smiling face. They will be composed of amiable people, yielding to a gracious, esthetic impulse. They will be nice folk, well disciplined, considerate, and kindly.

They will devastate field and wood. They will yank wild flowers out by the roots and scatter withered blossoms along every trolley and railroad track. They will fill baskets with flowers that cannot stand even the trip back into town, and, if they could, would lose most of their beauty when dragged from their proper environment.

It would astonish these folk to tell them that they are exterminating the wild flowers in places accessible from Chicago.

Already violets, orchids, May apples, bloodroot, jacks in the pulpit, spring beauties, arbutus, columbine, and many other flowers which once were plentiful must have protection or they will be as rare as prairie chicken in these parts.

Already people who see what the destruction is are endeavoring to restock the woods and fields, where it is possible to keep them under scrutiny. If the damage were being done by people to whom considerateness is unnatural, the case might be hopeless except so far as fences and threats of prosecution might deter, but the enemies of the wild flowers are really their misguided friends.

They do not know that indiscriminate picking prevents the flower from continuing its kind. Regions in which once fringed gentians and speckled tiger lilies were numerous now present them as rare phenomena. The country hereabouts will lose half the charm of its spring invitation unless the destroyers of flowers have their attention called to the destructiveness of their fondness. (From an editorial in the *Chicago Tribune*, 18 April, 1915.)

The following is from the Rome correspondent of the *London Daily Chronicle*: "Whence does Germany get the special substance used for the manufacture of the lachrymatory and asphyxiating gases? Sicilian correspondents recount that an Italian business man, who has returned to Syracuse after a long sojourn in Venezuela, has cleared up the mystery. 'In many regions in that country,' says the traveler, 'there grows in abundance a species of seed in form and color like oats, and locally known as *sabadilla*, which, when stored, emits a piquant smell so strong as to cause the eyes to water copiously, besides making breathing very painful. Sometime before the war Germany began ordering huge quantities of these seeds, which till then had no export sale at all. For a long time neither the bands of natives employed in the new industry of *sabadilla* gathering, nor the forwarding agents themselves, could discover the uses to which this merchandise was being put, and the matter remained one of eager speculation. Lately, however, the secret leaked out.'" The plant from which these seeds come is *Asagraea*

officinalis of the Melanthaceae, a native of tropical America. The poisonous principle is sabadillic acid, found in the seeds, and it is of interest that this substance is so dangerous that its use as medicine was abandoned by civilized practitioners, long ago.

Dr. Frederick H. Blodgett began his duties as plant pathologist in the extension service of the Agricultural and Mechanical College of Texas, January 1. Very little field work has been done on plant diseases in the state, and the increasing volume of inquiries from farmers and others made the full time services of a pathologist imperative.

A. S. Marsh, who held a studentship in botany in Caius College, Cambridge, and had made valuable contributions to plant ecology, has been killed in the war.

In an article on Shakespeare and gardens, appearing in a recent number of a periodical issued by a well-known botanic garden there is a long and interesting list of the plants mentioned by Shakespeare, with the botanical equivalent for the old English names, and citations to the plays in which the plants are mentioned. While "the list is believed to be as accurate as anything of the kind that could be prepared," a few of the items are as follows:*

SHAKESPEARE'S NAME	BOTANICAL NAME	PLAY
Ash	<i>Fraxinus americana</i>	Coriolanus, IV, 5.
Birch	<i>Betula nigra</i>	Measure for Measure, I, 4.
Elder	<i>Sambucus canadensis</i>	Merry Wives of Windsor, II, 3.
Hazel	<i>Hamamelis virginiana</i>	Romeo and Juliet, I, 4.
Holly	<i>Ilex opaca</i>	As You Like It, II, 7.
Wheat	<i>Hordeum vulgare</i>	Merchant of Venice, I, 1.
Yew	<i>Buxus sempervirens</i>	Romeo and Juliet, V, 3.
"Angels and ministers of grace defend us!"		Hamlet I, 4.

A trip to Virginia Beach and Dismal Swamp, under the auspices of the Ecological Society of America, will be conducted by Prof. J. W. Harshberger on April 23 to 26. The party will

* The first five are North American plants described by Linnaeus over 130 years after Shakespeare died. Wheat is *Triticum vulgare* and the yew is a *Taxus*!

leave Broad St. Station, Philadelphia, at 11.17 p. m. (New York, 9 p. m.), on Sunday, April 23, reaching Norfolk, Va., via Cape Charles, at 9.20 a. m., on April 24. The dunes and strand at Virginia Beach will be visited on that day. Dismal Swamp and Lake Drummond will be visited on the 25th and 26th by launch from Norfolk. The party will leave Norfolk at 6 p. m., on the 26th, reaching Philadelphia at 5 a. m. (New York, 7.32 a. m.), on Thursday, April 27. Members of the Society who are interested in this trip should notify Prof. J. W. Harshberger, Dept. of Botany, University of Pennsylvania, at as early a date as possible.

We learn from *Science* of the death of Prof. E. Heckel who was the professor of botany in the University of Marseilles.

The announcement for the Biological Station of the University of Michigan for the coming summer has just been issued. Many courses in zoology and botany are offered, among the latter being courses in field and forest botany, systematic botany, ecology and plant anatomy. There will also be opportunity for special and research work in botany. Further information may be had from Dr. O. C. Glaser, University of Michigan, Ann Arbor, Michigan.

Dr. Homer D. House, the recently appointed state botanist of New York, announces the preparation of a "Memoir of the Wild Flowers of New York" in two volumes, to be illustrated with 250 colored plates. It is expected to illustrate over 300 species comprising the better known plants of the state. The books will supplement a similar publication on the "Birds of New York State."

A "constant reader" of TORREYA, whose interests are quite varied but do not include bacteriology, mycology, histology, physiology, pathology, genetics, and some other laboratory sciences, writes that he "is constantly receiving pamphlets on these subjects from men he is not personally acquainted with; and as he does not like to waste his own papers by sending them to persons who would probably make no more use of them than he does of theirs, he hardly knows how to reciprocate, which is

embarrassing. Apparently the senders of such literature are unmindful of the fact that in these days of specialization it is impossible for any one person to be seriously interested in all the botanical sciences and arts, and think that every one who belongs to a botanical society or is called a botanist should be interested in all botanical literature; or else they find it easier to waste a certain percentage of their separates than to prepare a new mailing list of presumably interested persons for each paper they publish. Perhaps the time is not far distant when on account of its indefiniteness the term "botanist" will be as little used as "naturalist" and "biologist" are now, and persons who work with plants will be more specifically designated as taxonomists, physiologists, geneticists, ecologists, phytogeographers, etc."

ERRATA

We regret to be obliged to print the following corrections to the article on "The Genus *Cetraria*," etc., *TORREYA* 15: 213-230. 1915. The author's copy was correct.

Page 216: † after "*vulgaris*," line 28, should follow with its footnote, "1910," line 6, page 217, *i. e.*, the footnote on page 216 under the † is the type locality, and original description of *C. hiascens* var. *macrophylla*.

Page 218: Omit under fig. 2, "(reduce to 2 in. wide)." These were pencil instructions given to cut maker, and should not have been printed.

Page 219: † following "*vulgaris*," line 30, should be substituted by two asterisks—a method used to denote forms below species. The "† littoral examples," last line on page 219 should have been on the bottom of page 221, and a † should have followed the word "olivaceous," line 5 of same page.

Page 222: The * and †, lines 5 and 7, should have appeared on page 222, the * after "1850)" line 14, the † after "1850)" line 19, *i. e.*, the first footnote, *, page 222, is original description for *C. islandica* γ *tubulosa*, page 221; the second footnote, †, page 222, the type locality and original description for *C. islandica* ξ *erinacea*, page 221.

The Torrey Botanical Club

Contributors of accepted articles and reviews who wish six gratuitous copies of the number of *TORREYA* in which their papers appear, will kindly notify the editor when returning proof.

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A monthly journal devoted to general botany, established 1870. Vol. 42 published in 1915, contained 698 pages of text and 33 full-page plates. Price \$3.00 per annum. For Europe, 14 shillings. Dulau & Co., 37 Soho Square, London, are, agents for England.

Of former volumes, only 24-42 can be supplied entire; certain numbers of other volumes are available, but the entire stock of some numbers has been reserved for the completion of sets. Vols. 24-27 are furnished at the published price of two dollars each; Vols. 28-42 three dollars each.

Single copies (30 cents) will be furnished only when not breaking complete volumes.

(2) **MEMOIRS**

The MEMOIRS, established 1889, are published at irregular intervals. Volumes 1-15 are now completed; No. 1 of Vol. 16 has been issued. The subscription price is fixed at \$3.00 per volume in advance. The numbers can also be purchased singly. A list of titles of the individual papers and of prices will be furnished on application.

(3) **The Preliminary Catalogue of Anthophyta and Pteridophyta** reported as growing within one hundred miles of New York, 1888. Price, \$1.00.

Correspondence relating to the above publications should be addressed to

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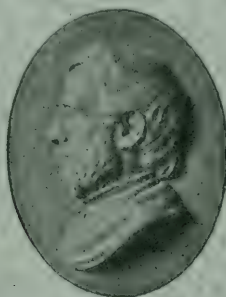
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BY

NORMAN TAYLOR



JOHN TORREY, 1796-1873

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COMMON MOSSES ACCORDING TO HABITAT. A NON-TECHNICAL DESCRIPTION BASED ON MACROSCOPICAL CHARACTERS

DESCRIPTION OF PLEUROCARPUS SPECIES.

BY DAISY J. LEVY.

(Continued from April TORREYA)

V. ON STONES OR ROCKS

C. CAPSULE CYLINDRIC, HORIZONTAL OR INCLINED.

D.—Costate.

E.—Serrate.

F.—Acute or acuminate.

Amblystegium.

DD.—Ecostate.

E.—Entire or serrate.

F.—Acute or acuminate.

Hypnum.

Amblystegiella adnata.

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E.—Serrate.

F.—Acute.

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Climacium.

CCC.—CAPSULE IMMERSED OR SLIGHTLY EXsertED.

D.—Ecostate or costa faint.

E.—Entire.

F.—Acute.

Neckera.

CCCC.—CAPSULE OVOID.

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E.—Serrate.

F.—Acuminate.

Brachythecium.

Bryhnia Novae Angliae.

Cirriphyllum Boscii.

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AMBLYSTEGIELLA.

A. adnata.

This form is common on stones and about the base of trees. The species closely resembles *Hypnum* from which it differs in that it is usually ecostate. The leaves are mostly entire, acute or acuminate; they are erect spreading, not curved, oblong ovate, concave. Capsules suberect. Plants fine and thread-like, resembling *Hypnum reptile*. They are dark green to yellow-green. Mature in summer.

AMBLYSTEGIUM.

The genus *Amblystegium* consists mostly of plants of minute size. They live in deep moist woods and are exceedingly common. Capsules are suberect or cernuous. The seta is smooth. Costa single, very rarely ecostate.

A. fluviatile.

This plant is of medium size and is to be found floating in brooks. It is dark green with long branches, the branchlets are few and suberect. Leaves are entire, remote, ovate with blunt apex, sometimes oblong lanceolate, concave, costa not excurrent; somewhat spirally imbricated. Capsule very long and suberect, constricted below the mouth. Tufts are flat, soft and prostrate, leafless at base. Mature in summer.

A. irriguum.

This species is also aquatic. Plants very small, hard and gritty, very black. Leaves long acuminate, rigid with acute apex, decurrent, ovate. Capsule cernuous subcylindric, seta long. Plants dark black green, stem thick, prostrate, often pinnate, branches erect or procumbent. Mature in summer.

A. riparium.

Plants creeping or floating, forming large loose tufts of dirty yellow green. Leaves with long slender acumen, subsecund, shortly decurrent. Capsule oblong cylindric, inclined. Operculum large orange. Mature in spring.

A. varium.

A very varied form, with a varied habitat. It is found growing on moist soil, on stones, trees. Leaves are long acuminate with long slender acumen; strongly costate. Seta long. Mature in spring.

ANOMODON.

Plants larger than *Leskea*. Primary stems stoloniferous, leafless. Secondary stems leafy and erect. Capsule erect, symmetric, oblong, cylindric, brown. Leaves are opaque with a pellucid costa, distant, small, ovate or lanceolate. Paraphyllia lacking.

A. attenuatus.

Plants forming wide loose tufts mixed with many filiform or flagelliform branches or stolons. Leaves are apiculate, subsecund, decurrent, papillose. Seta is long and twisted. On rocks or base of trees. Mature in autumn.

A. rostratus.

Leaves imbricate with ovate base which tapers to a lanceolate upper part. Apex long-apiculate. Costa strong, vanishing below the apex. Capsule ovoid, seta short. About the roots of trees and about moist rocks. Mature in autumn.

A. tristis.

Leaves imbricate when dry, squarrose when moist, apiculate. Costate to the middle, costa narrow. Fruit has never been reported.

BRACHYTHECIUM.

The macroscopic determination of this genus lies mainly in the capsule, which is short ovoid, and rather thick, of a rich brown color. The capsule is with few exceptions horizontal or inclined. The leaves are costate more than half way. Plants usually large, forming loose mats. Branching irregular. The seta may be smooth or rough.

B. acuminatum.

This form has a rather varied habitat, and is found on stones and rock as well as on earth in deep woods. The capsule is almost erect, seta smooth. The leaves are costate, serrate, acuminate, striate, concave. Costa ending about the middle. Plants dark green or glossy, of medium size. Mature in autumn.

B. cyrtophyllum.

Seta smooth as in the above, leaves subjulaceous, slender. Branch leaves ovate, concave, margin reflexed. Plants slender, caespitose, glossy to dark green. Mature in autumn or spring.

B. oxycladon.

Capsule suberect. Leaves plicate. Plants yellow, shining green.

B. plumosum.

One of our most common Brachytheciums. Found on soil, stones, rock. Leaves costate, serrate acuminate, leaves not plicate, ovate lanceolate, concave, decurrent, closely imbricated. Capsule light brown when young, black when old. Seta rough above, smooth below. Plants forming large dense mats, robust, yellow green, densely foliate. Stem prostrate. Branches erect or curved. Mature in winter.

B. rivulare.

Aquatic or subaquatic, on stones in brooks. Leaves costate, serrate, acuminate, large open ovate, costate almost to the middle. Capsule cernuous. Seta rough, long. Mats large, robust. Stems woody, prostrate, dendroid in appearance. Mature in autumn.

B. salebrosum.

Leaves costate serrate, acuminate, margins reflexed. Stem leaves ovate lanceolate, plicate, close erect, imbricate when dry. Capsule inclined to horizontal, cernuous, seta smooth. Plants form large yellow-green mats. Stems pinnately branching. On stones, roots or trunks of trees. Mature in autumn or winter.

BRYHNIA.

B. Novae-Angliae.

Closely related to *Brachythecium*. Leaves costate, serrate, acuminate, decurrent, concave. *Apex twisted*. Branches subjulaceous, erect. Costate to the middle. Operculum conic to short rostrate. Seta rough. Plants rigid.

CALLIERGON.

C. cordifolium.

Leaves distant, cordate, ovate, obtuse, decurrent, entire. Costate to

near the apex, often cucullate at the apex. Capsule oblong cylindrical horizontal. Seta long. Tufts tall, loose, green, erect or prostrate. Habitat-swamps, brooks, wet meadows. Mature in summer.

C. Schreberi.

Leaves close, imbricated, slightly plicate oval-oblong, very concave, entire. Costa short, double or faint. Apex round or obtuse, incurved. Seta long. Capsule horizontal. Stems woody and erect and red. Tufts large, glossy or yellow green. Found in shaded woods on humus, logs or ground. Mature in autumn.

CAMPYLUM.

Campylum species are characterized by *strongly squarrose* leaves. Branching irregular. Leaves lanceolate, long-acuminate, decurrent, costate or ecostate. Capsule horizontal.

C. chrysophyllum.

Stems prostrate with erect or sub-erect branches, which are pinnate. Leaves strongly costate, faintly secund, entire or slightly denticulate at base. On ground or rocks. Mature in summer.

C. hispidulum.

Ecostate or costa short and double. Leaves close, squarrose, subsecund, base cordate ovate. Apex very long acuminate. Plants slender. Branches pinnate, erect. Tufts dense, yellow-green. Found about the roots of trees and on stones. Mature in summer.

CIRRIPHYLLUM.

C. Boscii.

Plants julaceous, large robust, bright yellow-green. Leaves costate, serrate acuminate, imbricate, apex twisted to a filiform point, concave, oblong ovate, costate to middle or beyond. Mature in autumn.

CLIMACIUM.

This genus is characterized by its exceedingly large size. Their general habit is tree-like. Leaves acute, serrate, oblong lanceolate, usually decurrent. Leaves often variable. Capsules clustered, oblong-cylindric, erect. Seta long, smooth. The stem underground. Habitat, wet places, swamps, in deep shady woods. Mature in autumn.

It is difficult to distinguish species without a microscope. Our two most common forms, are *C. Americanum*, with a habit like a miniature tree; and *C. Kindbergii*, which grows in a looser, more tangled mass.

CRATONEURON.

C. filicinum.

Plants medium size, pinnately branched, with numerous paraphyllia and dense radicals. Leaves cordate, falcate secund, decurrent, plicate. Operculum conic. Seta long. Mature in spring or summer.

CTENIDIUM *molluscum*. See *Hypnum molluscum*.

DICHELYMA.

D. capillaceum.

This genus is strictly aquatic, leaves long, narrow, floating. Leaves costate, entire, acuminate. Stem often denuded of leaves. Branches curved at the ends, often twisting about their hosts in the water. Mature in summer. *Dichelyma* resembles *Fontinalis* but differs in that *Dichelyma* is costate, *Fontinalis* is not.

DREPANOCLADUS.

Species impossible to distinguish with a hand lens only. Leaves serrate, acuminate, long falcate secund, almost circinate, plicate. Capsule inclined to horizontal. Tufts pale green, never red or purple, distinctly pinnate, rarely erect, slender. Branches hooked. No paraphyllia. In wet places, not submerged. Mature in spring or summer.

ENTODON.

The genus *Entodon* only can be described. In color, the plants are glossy yellow green. The habitat ranges from woods, soil or about the base of trees. Leaves are turgid, concave, ecostate or costa very faint, entire or slightly serrate at tip, sometimes flattened. Capsule erect. Mature in autumn or winter. The most common form is *Entodon secundrix* with stems and branches julaceous.

EURHYNCHIUM.

This genus closely resembles *Brachythecium*. The cell structure, which is one of the differences, can be seen with a microscope. The operculum also varies, for it is mostly very long beaked.

E. hians.

A rather common plant. Soil-loving. Leaves serrate acute to acuminate. Costate about one third of leaf. Seta rough. Capsule horizontal. A depressed habit. Yellow green. Leaves loose, cordate ovate. Mature in autumn.

E. rusciforme.

An aquatic plant, almost black green. Large and robust. Leaves open ovate, acute to acuminate. Capsule cernuous, neck short and distinct. Seta smooth. Mats caespitose, floating or pendent. Stem woody and prostrate. Found in brooks. Mature in summer or autumn.

FONTINALIS.

Closely resembles *Dichelyma*, which is costate, while *Fontinalis* is ecostate. Capsule mostly immersed. Plants long, slender, floating, branched, dark green. Leaves distant, flat, sometimes concave. Calyptra conical. Mature in spring.

HETEROPHYLLUM *Haldanianum*. See *Hypnum Haldanianum*.

HYGROHYPNUM *ochraceum*. See *Hypnum ochraceum*.

HYLOCOMIUM.

In this genus, recognition of species again depends upon the microscope. The genus is wood-inhabiting, on humus, logs or ground. Leaves costate, serrate, acuminate. Costa single or double, operculum conic to short rostrate. Leaves often bipinnate, plicate, complanately branched or irregularly branched. Costa is never percurrent. Paraphyllia present or lacking. Leaves squarrose or spreading, secund, ovate. Capsule ovoid, short, thick, unsymmetric. Seta smooth. Plants form wide loose patches. They are large and robust. Mature in spring.

HYPNUM.

This is the largest group of mosses, and the form most often collected. They are difficult to describe because of their great variation in habit and structure. The leaves are sometimes pinnate, sometimes they are secund. Costa is short or double or wanting. In some species the leaves are falcate

or circinate. Capsule mostly curved or inclined. Seta smooth. Plants form prostrate, often loose, mats.

HYPNUM (*Ptilium*) *Crista-castrensis*.

Leaves serrate, acuminate, entire at base. Capsule large, horizontal, curved. Plants large, robust, bright yellow-green, plume-like. One of our most attractive mosses. Leaves complanate. Stems erect or ascending, recurved at apex. Mature in summer. Found in rich moist places, in ravines and moist woods.

HYPNUM (*Heterophyllum*) *Haldanianum*.

A common form in deep woods, forming loose mats on decaying wood or humus. Dark yellow green. Stems long. Branchlets distant. Leaves faintly costate, acuminate, imbricate, concave, oblong ovate. Capsule suberect or inclined.

HYPNUM (*Stereodon*) *imponens*.

Leaves strongly falcate second, pinnate, plumose, ovate lanceolate. Costa short double or lacking. Leaves imbricate. Capsule suberect or inclined. Plants prostrate, forming densely interwoven mats of a golden green color. The golden color of the basal cells can be seen with a hand lens. Mature in autumn or winter.

HYPNUM (*Ctenidium*) *molluscum*.

Leaves serrate, acuminate, pinnate, plumose, golden green, falcate second, narrowly lanceolate, auriculate at base, decurrent. Costa short double or lacking. Leaves densely imbricate, undulate at apex. Capsule subhorizontal, thick, short. Seta thick. Plants form wide feathery tufts. Mature in spring.

HYPNUM (*Stereodon*) *Patentiae*.

Leaves ecostate or costa very faint, entire, acuminate, falcate second. Apex serrulate, not cordate, decurrent not crowded, often imbricate. Capsule plicate. Plants form large yellow-green tufts; those in water are black. Plants erect or irregularly branched, often prostrate with ascending branches which are often hooked. Mature in spring.

HYPNUM (*Raphidostegium*) *recurvans*.

Capsule cylindric inclined. Leaves acuminate, falcate second, ovate lanceolate, serrate above, close imbricate. Capsule unsymmetric. Operculum strong beaked. Stems prostrate. Plants yellow green, glossy. Found at the base of trees and on old logs. Mature in winter.

HYPNUM (*Stereodon*) *reptile*.

Leaves strongly falcate second with bristly points, ovate lanceolate, margin revolute. Capsule subcylindrical, suberect. Plants small dark green, pinnately branched, appearing julaceous. Mature in summer.

LEUCODON.

This genus is found on trees above the base. Leaves ecostate, almost entire, slightly serrate at apex, acute. Calyptra cucullate, operculum conic to short rostrate. Capsule ovoid to subovoid, erect. Leaves concave. Margin recurved, spreading when moist, decurrent, julaceous when dry. Main stems slender, filiform, erect, stoloniferous, densely leaved. Mature in winter. The two most common forms are *L. julaceus* and *L. sciuroides*. These differ in that, in *julaceus* the leaves are short acuminate and ovate, while in *sciuroides* they are acuminate.

LESKEA.

L. obscura.

Found at the base of trees or on rotten wood, or more rarely on stones. Leaves costate, entire, acute, ovate or ovate lanceolate, asymmetric, round, obtuse, costa ends below the apex. Leaves concave recurved, appressed when dry, spreading when moist. Capsule erect straight. Plants small to medium, dark green. Mature in summer.

NECKERA.

N. pennata.

Capsule more or less immersed, ovoid. Calyptra cucullate. Operculum conic to short rostrate. Leaves ecostate or costa short and faint. Margin entire, transversely undulate, ovate lanceolate, acute or acuminate slightly serrate at apex. Large plants with slender stems. Pinnately branching, usually complanate foliate, sometimes flagellate, bright yellow-green. Mature in spring.

PLAGIOTHECIUM.

The habit of this genus is characteristic. The leaves present a flattened or complanate appearance. The habitat varies, they are to be found on rocks, soil, or on trees. They vary also in size from small plants to those of medium size. Capsules ovoid to cylindrical. Leaves costate, mostly entire, acuminate, ovate or oblong, lanceolate, thin. Capsule slender or suberect. Seta smooth. Stems irregularly branched, not pinnate, stoloniferous, loosely tufted yellow green.

Three forms most often met are *P. sylvaticum*, *striatellum*, *denticulatum*. In *striatellum* the plants are not complanate, the leaves are squarrose spreading. In *sylvaticum*, the leaves shrink when dry, in *denticulatum* the leaves are asymmetric.

PTILIMUM *Crista-castrensis*. See *Hypnum Crista-castrensis*.

PYLAISIA.

P. Schimperii.

A plant found on trees or fallen logs. Capsule emergent. Leaves ecostate or costa short or double. Margin entire. Apex long acuminate, falcate, second, ovate-lanceolate, concave, slightly serrate at tip. Leaves close. Capsule cylindric, erect, branches slender. Mats thin and dark. Medium size. Mature in autumn.

RAPHDOSTEGIUM.

Plants of very slender appearance. Mats thin and light green. *R. adnatum* is found on trees which are living, the other forms on stones. The leaves of this genus are ecostate or costa faint. They are scarcely second, almost entire. Capsule not large, ovoid, inclined or erect, unsymmetric. Branches loose. Mature in summer or autumn.

SCORPIDIUM.

S. scorpioides.

A large bog moss, very robust, brown green in color, forming loose mats. Leaves are crowded, imbricate, second, falcate, ovate and concave. costate or ecostate. Capsule inclined, curved. Mature in summer.

SEMATOPHYLLUM *recurvans*. See *Hypnum recurvans*.

STEREODON *imponens*. See *Hypnum imponens*.

Patientiae. See *Hypnum Patientiae*.

reptile. See *Hypnum reptile*.

THELIA.

T. asprella.

Plants of light green color. Habitat, the base of trees. Capsule ovate cylindrical, erect. Leaves ciliate all around, julaceous about the stems. Costate half way. Leaves ovate running into an abrupt point. Plants not pinnate.

T. Lescurii.

Strongly resembles the last. Habitat, usually sandy soil. Color white-green. Leaves with shorter acumen. Mature in autumn.

THUIDIUM.

The common name of this moss truly describes it. It is called the fern moss because of its very regular pinnae. The paraphyllia variations which determine the species cannot be determined with a hand lens. The capsule is cylindric, horizontal or inclined. Plants large and fern like. Principal stems are rooting, secondary stems pinnate branching. Leaves costate, serrate acuminate, decurrent. Stem leaves cordate triangular. Branch leaves smaller. Seta long. Mature in summer or autumn or winter.

T. delicatulum.

A common form, bipinnately branching. Stem leaves erect when moist. Found on moist decaying logs or humus.

T. paludosum.

Found in moist fields or swampy places. Leaves open erect, cordate at base.

T. scitum.

Found on the base of trees in thin mats, appressed, light or yellow-green in color. Very pinnate. Leaves cordate, short acuminate, concave with a pellucid costa.

MATURITY TABLE

ACROCARPUS

SPRING

Aulacomnium heterostichum
Barbula
Bartramia pomiformis
Bryum argenteum
caespiticium
Ceratodon purpureus
Ditrichum pallidum
Funaria hygrometrica
Hedwigia albicans
Mnium
Orthotrichum anomalum
strangulatum
Phascum cuspidatum
Philonotis fontana
Pohlia nutans
Polytrichum commune
Ohioense

Pottia truncatula
Ptychomitrium incurvum
Racomitrium aciculare
Tortella caespitosa
Ulota americana
crispa
Weisia viridula

SUMMER

Aulacomnium palustre
Bryum bimum
Dicranum scoparium
Ditrichum pallidum
Leptobryum pyriforme
Leucobryum glaucum
Sphagnum
Tortella tortuosa
Webera sessilis

AUTUMN

Buxbaumia aphylla
Catharinaea angustata
undulata
Dicranella heteromalla
Dicranum scoparium
Ditrichum tortile
Georgia pellucida
Grimmia

SPRING

Amblystegium riparium
Brachythecium cyrtophyllum
Calliergon cordifolium
Cratoneuron
Drepanocladus
Hygrohypnum ochraceum
Hylocomium
Hypnum (Clenidium) molluscum
Hypnum (Stereodon) Patientiae
Neckera pennata
Plagiothecium striatellum
sylvaticum

SUMMER

Amblystegiella adnata
Amblystegium fluviatile
irriguum
Campylium chrysophyllum
hispidulum
Dichelyma capillaceum
Drepanocladus
Eurhynchium rusciforme
Fontinalis
Hygrohypnum ochraceum
Hypnum (Ptilium) Crista-castrensis
Hypnum (Clenidium) molluscum
Hypnum (Stereodon) reptile
Leskea obscura
Plagiothecium denticulatum
Raphidostegium

Physcomitrium turbinatum
Pogonatum brevicaule

WINTER

Dicranella heteromalla
Fissidens incurvus
Grimmia
Ptychomitrium incurvum

PLEUROCARPUS

Scorpidium scorpioides
Thuidium scitum

AUTUMN

Anomodon attenuatus
rostratus
Brachythecium acuminatum
rivulare
Calliergon Schreberi
Cirriphyllum Boscii
Climacium americanum
Kindbergii
Entodon
Eurhynchium hians
rusciforme
Hypnum Haldanianum
Hypnum (Stereodon) imponens
Pylaisia Schimperi
Raphidostegium
Thuidium scitum

WINTER

Anomodon attenuatus
Brachythecium plumosum
Hypnum Haldanianum
recurvans
Leucodon
Thuidium delicatulum
paludosum
scitum

HABITAT TABLE

ACROCARPUS

I. Woods: on humus, logs, ground

Aulacomnium heterostichum
Barbula
Bartramia pomiformis
Bryum bimum
caespiticiun
Buxbaumia aphylla
Catharinaea angustata
undulata
Ceratodon purpureus
Dicranella heteromalla
Dicranum
Ditrichum pallidum
tortile
Fissidens
Funaria hygrometrica

Georgia pellucida
Leptobryum pyriforme
Leucobryum glaucum
Mnium
Phascum cuspidatum
Physcomitrium turbinatum
Pohlia nutans
Pogonatum brevicaule
Polytrichum commune
ohioense
Pottia truncatula
Tortella caespitosa
Tortula
Webera sessilis
Weisia viridula

II. On trees

<i>Drummondia clavellata</i>	<i>Tortella caespitosa</i>
<i>Orthotrichum strangulatum</i>	<i>Ulotia crispa</i>

III. Aquatic or sub-aquatic

<i>Aulacomnium palustre</i>	<i>Philonotis fontana</i>
<i>Fissidens Julianus</i>	<i>Sphagnum</i>

IV. Open fields, pastures, roadways, waste places

<i>Bartramia pomiformis</i>	<i>Ditrichum pallidum</i>
<i>Bryum argenteum</i>	<i>Funaria hygrometrica</i>
<i>caespitium</i>	<i>Mnium</i>
<i>Catharinaea angustata</i>	<i>Phascum cuspidatum</i>
<i>undulata</i>	<i>Polytrichum commune</i>
<i>Ceratodon purpureus</i>	<i>Pogonatum brevicaule</i>
<i>Dicranella heteromalla</i>	<i>Weisia viridula</i>

V. On stones or rocks

<i>Barbula</i>	<i>Orthotrichum anomalum</i>
<i>Bryum argenteum</i>	<i>Polytrichum</i>
<i>caespitium</i>	<i>Ptycomitrium incurvum</i>
<i>Dicranum</i>	<i>Rhacomitrium aciculare</i>
<i>Fissidens incurvus</i>	<i>Tortella tortuosa</i>
<i>Grimmia</i>	<i>Tortula muralis</i>
<i>Hedwigia albicans</i>	<i>Ulotia Americana</i>
<i>Leptobryum pyriforme</i>	<i>Weisia viridula</i>
<i>Mnium</i>	

PLEUROCARPUS.

I. Woods: on humus, logs or ground

<i>Amblystegium</i>	<i>Eurhynchium hians</i>
<i>Anomodon rostratus</i>	<i>serrulatum</i>
<i>Brachythecium acuminatum</i>	<i>Hypnum (Ptilium) Crista-castrensis</i>
<i>cyrtophyllum</i>	<i>Hypnum Haldanianum</i>
<i>oxycladon</i>	<i>Hypnum (Stereodon) imponens</i>
<i>salebrosum</i>	<i>Hypnum (Ctenidium) molluscum</i>
<i>Bryhnia Novae Angliae</i>	<i>Hypnum (Stereodon) Patientiae</i>
<i>Calliergon (Hypnum) Schreberi</i>	<i>Hypnum recurvans</i>
<i>Campylium chrysophyllum</i>	<i>Hypnum (Stereodon) reptile</i>
<i>hispidulum</i>	<i>Hylocomium</i>
<i>Cirriphyllum Boscii</i>	<i>Plagiothecium denticulatum</i>
<i>Climacium americanum</i>	<i>sylvaticum</i>
<i>Kindbergii</i>	<i>Rhyncostegium serrulatum</i>
<i>Cratoneuron</i>	<i>Thuidium delicatulum</i>
<i>Entodon</i>	<i>paludosum</i>

II. On trees

<i>Amblystegiella adnata</i>	<i>Hypnum recurvans</i>
<i>Amblystegium</i>	<i>Hypnum (Stereodon) reptile</i>
<i>Anomodon attenuatus</i>	<i>Leskea obscura</i>
<i>tristis</i>	<i>Leucodon</i>
<i>Brachythecium acuminatum</i>	<i>Neckera pennata</i>
<i>cyrtophyllum</i>	<i>Plagiothecium</i>
<i>salebrosum</i>	<i>Pylaisia Schimperii</i>
<i>Campylium hispidulum</i>	<i>Raphidostegium</i>
<i>Entodon</i>	<i>Thelia asprella</i>
<i>Hypnum (Stereodon) imponens</i>	<i>Thuidium scitum</i>

III. Aquatic or sub-aquatic

<i>Amblystegium fluviatile</i>	<i>Climacium</i>
<i>irriguum</i>	<i>Dichelyma capillaceum</i>
<i>riparium</i>	<i>Drepanocladus</i>
<i>Brachythecium plumosum</i>	<i>Eurhynchium rusciforme</i>
<i>rivulare</i>	<i>Fontinalis</i>
<i>Calliergon cordifolium</i>	<i>Hygrohypnum ochraceum</i>
<i>Schreberi</i>	<i>Plagiothecium</i>
<i>Campylium chrysophyllum</i>	<i>Scorpidium</i>
<i>hispidulum</i>	

IV. Open fields, roadways, waste places

<i>Calliergon Schreberi</i>	<i>Hypnum</i>
<i>Cirriphyllum Boscii</i>	<i>Thelia asprella</i>

V. On stones

<i>Amblystegiella adnata</i>	<i>Bryhnia Novae-Angliae</i>
<i>Amblystegium</i>	<i>Campylium chrysophyllum</i>
<i>Anomodon rostratus</i>	<i>Climacium americanum</i>
<i>Brachythecium plumosum</i>	<i>Kindbergii</i>
<i>salebrosum</i>	<i>Neckera pennata</i>

GLOSSARY

Acrocarpus: applied to a group of mosses having the sporophyte an outgrowth from the terminal part of the stem.	Gemmae: bud-like bodies which give rise asexually to new plants.
Acuminate: long pointed.	Gibbous: swollen on one side.
Acute: abruptly pointed.	Glaucous: covered with a bloom.
Antheridia: male organs.	Habitat: place or situation.
Apical: pertaining to the apex.	Hispid: covered with stiff hairs.
Apiculate: an abrupt point.	Hyaline: transparent.
Archegonia: female organ.	Imbricated: overlapping, as the tiles of a roof.
Calyptra: the hood which covers capsule and operculum.	Immersed: covered or concealed in leaves.
Capsule: fruit or spore case.	Involute: rolled.
Cernuous: nodding.	Julaceous: catkin-like.
Caespitose: forming close mats.	Lanceolate: lance-shaped.
Complanate: flattened; lying in one plane.	Lid: the operculum.
Cordate: heart-shaped.	Mitriform: mitre-shaped.
Costa: the midrib of the leaf.	Mucro: an abrupt short point continuous with the costa.
Cucullate: hood-shaped; conical and cleft to one side; applied to the calyptra.	Mucronate: tipped with a mucro.
Decurrent: applied to the leaf if continued down the stem.	Ovate: shaped like an egg.
Dendroid: appearing tree-like.	Papillate: covered with small protuberances.
Diagnostic: peculiar to.	Paraphyllia: leaf-like or filiform appendages.
Distichous: in two opposite rows.	Pellucid: thin; hyaline.
Ecostate: without costa or mid-rib.	Percurrent: applied to the costa when it extends through the entire leaf.
Excurrent: extending beyond the apex of the leaf.	Pleurocarpus: applied to a group of mosses having the sporophyte an outgrowth from the lateral branch.
Exserted: protruding beyond.	Plicate: folded lengthwise.
Falcate: scythe-shaped.	Pseudopodia: leafless branches bearing asexual organs.
Fascicled: clustered.	Pyriform: pear-shaped.
Filiform: thread-like.	

Radicals: ends or the rootlets.
Revolute: rolled.
Rostellate: short beaked.
Rostrate: beaked.
Secund: turned to one side.
Serrate: toothed.
Sessile: close-sitting; stalkless.
Seta: the pedicel of the capsule.
Spinulose: thorny.
Spores: bodies within the capsule which upon germination give rise to new plants.
Squarrose: spreading open widely.

Stoloniferous: stems which run parallel to the substratum.
Striate: marked with fine lines or furrows.
Subulate: awl-shaped.
Sulcate: longitudinally grooved.
Terete: awl-shaped.
Tomentose: covered with wool-like hairs.
Turbinate: top-shaped.
Undulate: wavy.
Ventricose: enlarged on one side.
Verrucose: covered with wart-like projections.
Verticillate: whorled.

LIST OF SPECIES DESCRIBED

Amblystegiella adnata
Amblystegium fluviatile
 irriguum
 riparium
Anomodon attenuatus
 rostratus
 tristis
Aulacomnium heterostichum
 palustre
Barbula
Bartramia pomiformis
Brachythecium acuminatum
 cyrtophyllum
 oxycladon
 plumosum
 rivulare
 salebrosum
Bryhnia Novae Angliae
Bryum argenteum
 binum
 caespitium
Buxbaumia aphylla
Calliergon cordifolium
 Schreberi
Campylium chrysophyllum
 hispidulum
Catharinaea angustata
 undulata
Ceratodon purpureus
Cirriophyllum Boscii
Climacium americanum
 Kindbergii
Conomitrium Julianum
Cratoneuron
Ctenidium molluscum
Dichelyma capillaceum
Dicranella heteromalla
Dicranum scoparium
Ditrichum pallidum
 tortile
Drepanocladus
Drummondia clavellata
Entodon

Eurhynchium hians
 rusciforme
Fissidens incurvus
 Julianus
Fontinalis
Funaria hygrometrica
Georgia pellucida
Grimmia
Hedwigia albicans
Heterophyllum Haldanianum
Hygrohypnum ochraceum
Hylocomium
Hypnum Crista-castrensis
 Haldanianum
 imponens
 molluscum
 Patientiae
 recurvans
Leptobryum pyriforme
Leskea obscura
Leucobryum glaucum
Leucodon
Mnium
Mniumhornum
 punctatum
 punctatum var. *elatum*
Neckera pennata
Orthotrichum anomalum
 strangulatum
Phascum cuspidatum
Philonotis fontana
Physcomitrium turbinatum
Plagiothecium denticulatum
 striatellum
 sylvaticum
Pogonatum brevicaulis
Pohlia nutans
Polytrichum commune
 ohioense
Pottia truncatula
Ptilium Crista-castrensis
Ptychomitrium incurvum
Pylaisia Schimperii

Raphidostegium
Rhacomitrium aciculare
Scorpidium scorpioides
Sematophyllum recurvans
Sphagnum
Stereodon imponens
Patentiae
reptile
Thelia
Thuidium delicatulum

NEW YORK

paludosum
scitum
Tortella caespitosa
tortuosa
Tortula muralis
Uloa americana
crispa
Webera sessilis
Weisia viridula

A FREAK OF NATURE

BY O. A. FARWELL

While walking through Algonac, Michigan, I observed a peculiar freak of nature which may prove of interest to readers of TORREYA. Two trees of *Populus alba* were growing side by



FIG. 1. *Populus alba*. "Siamese Twins."

side, the lower parts in close contact, and were located on a residential corner lot. The freak consists of a small branch, eight or nine inches in diameter, of one tree piercing the trunk of the other, completely passing through and showing on the

other side; the branch passes through the trunk a little to one side of its center, bridging the space between the two trees. The branch extended several feet beyond the pierced trunk but ultimately died. Two photographs were taken just after the pruning of the tree had been accomplished and in the one reproduced on page 115 the ladder used in the operation is seen still resting against the bole of the tree. The butt is four inches in diameter and appears to be emerging from both the bole and its branch. The probable explanation of this condition is that when both trees were young, a branch of one crossed a branch of the other, resting firmly in the axil or crotch formed by the bole and its branch; the friction caused by the natural growth of the parts involved, assisted by winds and storms, probably wore away the barks until the cambium layers were reached, when a union of these tissues took place resulting ultimately in completely covering the intruding branch with wood and bark of the other tree, bringing about the present appearance which might be likened unto that of "Siamese Twins." This process resulted in the gradual strangulation, cessation of growth, and death of that part of the branch beyond the tree; the other part or "bridge" continued its growth and its union with the tree is so perfect that its bark is as normally continuous with that of the pierced trunk as with that of the parent tree.

DEPARTMENT OF BOTANY.

PARKE, DAVIS AND COMPANY,
DETROIT, MICH.

AN UNPUBLISHED LETTER BY GRONOVIVS

BY HELEN A. CHOATE

This letter from Gronovius to John Bartram, the original of which was recently acquired and is now in the historical collection of the botanical library of Smith College, seems never to have been published. Both because of the light it throws on the current botanical life of that time, and as showing something of the relations then existing between scientific men of Europe and

those in this New World, the letter seems of sufficient interest for publication.

The words or phrases indicated in the printed copy in [] represent insertions by some one other than Gronovius, and I am informed by Mr. John W. Jordan, librarian of the Historical Society of Pennsylvania, that the handwriting of these insertions is probably Peter Collinson's.

Four other letters from Gronovius to Bartram, the originals of which are now in the possession of the Historical Society of Pennsylvania, have been published in the *Memorials of Bartram and Marshall* (edited by Darlington, Philadelphia, 1849).

"MR. BARTRAM

(1)

"Dear Friend

"It was in Decemb. laste year, that I hath the favour to get a letter from Mr. Collinson, whereby he acquaint me, that he was sending to me your journal. The frost and snow hindered that ships upon the Mase-river could not reach [come] up to Rotterdam, but were obliged for the Ice to stay two months betwixt the Sea and Rotterdam, which was very tedious for me. But at last I got that journal, written by your own hands, reading it over and over very judiciously, and I don't give it any farther encomium, but refer myself to the preface of your printed journal at London, which I got yesterday from Mr. Collinson, by the care of Mr. Slatter from pensilvania, by whom also I got the favour of your letter dated the 30 of Novemb. 1750. The last war hath spoiled our correspondence for some years, which I hope will now revive. I was forced to make a new edition of my Index, in which I made mention of you in a decent way. That time I hath a prospect to get again some of the goods [curiosities] you sent to me, and Mr. Collinson, by a ship (if I remember well The Queen of Hungary) (2) which was taken by the French or Spanyards, being somme of the things sold at Diepe in France: being all come in the hands of Mr. Jussieu at Paris: but all what I could get bak, were only some seeds. Else I hath [had] a mind to print after my Index a treatise with the Title of Bartramia,

that is your journal in Latin, with notes to it containing the places where you hath found so many curious pieces [articles], which really are an ornament to my Supellea, particular your great River shells. I got also your letter of the 24 of January 1750, with the fine drawing of the gape at the blew mountains, which indeed is very curious. It is now the 26[th] of June, when Dr. Thomson acquaint me of his going to London. So I take this opportunity to send to you a copy of my Index, and also a copy of the Bibliotheca Botanica of Linneus, lately printed at Amsterdam, much enlarged and in better order, than the first edition. It is pity we had not, before this Bibliotheca was printed, your journey [al], else you would have hath a place in it at the 163 page, under this title

“PENSILVANIA

“BARTRAM Johannes

“Observationes in itinere ex pensilvania in canadam

Lond. 1751. oct. pag. 79 tab. 1. fig. 2

“You have really obliged the world with such curious observations, as you have [made in] most every page. What hath been a great work about 50 years ago (3) to find out the place where the Ninzi [Ginseng] is growing, which you have discovered so easily. It was to be wished that all Travelers hath been so curious about the nature of the ground, as you have showed.

“Linneus has printed his Philosophia Botanica, which I expect with the first ship from Sweden. He wrote to me that they have sent a Learned Botanist to China, and another to the Holy Land, to discover plants. So that in few years the garden at Upsal will be the finest of all. [if they had more sun and a milder climate.]

“I sent at this occasion to you few specimens of dried fishes, to be kept as plants in an Herbarius; the great misfortune is, that the colour perish; else it shows a good way to find out their characters 1. by number of the bones in the membrana branchiostega, which you see in flying Trigla marked with black; 2. by the number and position of the Fins, and the bones in them. 3. by the Course of the linea lateralis running in each fish from the back part of the head to the tail. *Hebenskeit* a professor at

Leipsich hath invented this methode, but he never would communicate the way to prepare them so; till at last I found it out a few years ago, and communicate it to our good friend Mr. Collinson, by whose care it is printed in the philos. Transact. num. 463. I send also to you a bit of what Tournefort calls *Fucus manum referens*, and which is exceeding wel represented. [Docr] Boerhave taketh it for a fucus. this body is frequent at our sea coast, having at first a great reference to the Spongia, being full of water, but this once being pressed out, it never soaks (4) water again, but then it appears that it is a congeries of pipes, wherein breeds the polypi, but four times larger than the sweet water polypi of Mr. Trembly, and so plentifull that I believe in this little bit were more than a million of these creatures, which being cut in four or five pieces, do live, grow and become soon the same posture [shape], as the first was.

"Now I give you the witch names of the shells you was pleased to send to me.

"1. Large fresh water muscle breeding in the creeks in the hilly part of the countrey. Concha testa oblonga, media antice contracta. Linn. faun. 1331.

"34. Antiqua. this creature is the Heremite [Crab] Cancer macrourus cauda molli testa cochlea inclusa; chela dextra minore. We have such a creature to at our sea coast, but differs that the chela dextra is much larger.

"35. Under this nummer you sent to me 3 sorts of shells

"a. cochlea oblonga fluviatilis. petiv. gazoph. t. 18 f. 8

"b. cochlea trium orbrum. List. conch. t. 140 f. 16

"c. concha testa subglobosa glabra, carnei coloris, sulco transverse. Linn. faun. 1336.

"39. Sea clam. chama fusca lata planor. List. conch. t. 423 f. 259

"40. Bay clam. pectunculus margine dense crenato, velut ex viola purpurascens ib. t. 271. f. 117

"41. Oyster. Ostrea virginiana List. conch. t. 200 n. 35

"2. Sea blak smal muscle. concha testa oblonga laevi subviolacea. Linn. faun. 1333.

"6. Shining Sea snails

"a. Buccinum brevirostrum clavicula brevior, labio interno insigniter repando, ore atro purpureo splendente

"b. —brevirostrum striatum & cancellatum, labro interno repando et splendente, mucrone costato, atro purpureum.

(5) "There is good prospect for the affairs of *Mr Slaughter*, being very happy for him, that I hath the occasion to gain the favour of the Deputys of the Synode for him.

Now Dear Sir wishing you and your family all health and prosperity I remain

Your most obliged Servant

Joh. Fred. Gronovius

Leyden June 26. 1751.

"[as all the Goods etc. was ship'd on board I don't know whether I can send the Roots etc. by this ship.]"

REVIEWS.

Kraemer's Scientific and Applied Pharmacognosy *

"Scientific and Applied Pharmacognosy" is the title of a recent book by Professor Henry Kraemer, of the Philadelphia College of Pharmacy. This volume might well have been given the title "Systematic Plant Morphology," for between its covers we find arranged according to "Die Natürlichen Pflanzenfamilien" of Engler and Prantl all of the more important groups of plant families with a summary of the principal outer and inner morphological characteristics of each. Morphological and anatomical descriptions of some four hundred specific food or drug products are given under the proper plant families. These products represent practically all of the plant families, and hence the work at once becomes a valuable one on the comparative anatomy of plants. This should make the book helpful to systematists as well as morphologists. Furthermore it will prove very helpful to botanists who are looking for material to aid them in their teaching.

* Kraemer, H. Scientific and applied Pharmacognosy, pp. 1-850. [Illust.]. No. 145 No. 10th Street, Philadelphia, Pa. Price \$5.00.

The book is intended for the use of pharmacists, pharmacologists and food and drug analysts and is much more comprehensive than the usual volume on plant morphology. Physiological and ecological problems are usually involved in the study of vegetable drugs, and this work contains a large amount of material which should be of interest to physiologists and ecologists.

The facts regarding the detection and isolation of cell contents in small quantities of material, in some cases being merely a few sections will be very helpful to research workers, especially cytologists; for example: The detection of iodine in the kelps as given on page 25. The micro-sublimate crystals of agaricinic acid in *Polyporus* as illustrated on page 37. The illustrations of crystals of lichenostearic acid obtained by micro-sublimation of pieces of the thallus of *Cetraria* on page 48. Crystals from exudations and extracts as of catechu, gambir, aloes, benzoic acid, page 126, etc. Again the accurate study of the principal crystallizable constituents by means of the petrographical microscope as of vanillin, page 173, coumarin, page 175, morphin, etc., page 325-330, etc. The work of the great masters in pharmacognosy and botany have been utilized and frequent references to original articles are given throughout the text. There are many new things in the book which are generally not available, regarding the true source, formation of spruce gum, the origin of Oregon balsam and descriptions of very many little used drugs as *Manaca*, *Coto*, etc.

This new volume should prove to be an encouragement to the directors of botanical departments in universities and in technical schools in their efforts to extend and introduce courses in histological applied botany. "Applied and Economic Botany," an earlier volume by Professor Kraemer, contains the fundamental considerations of outer morphology, inner morphology, etc., such as should precede the work covered by the present volume.

In view of the fact that some teachers may feel that the data concerning applied plant physiology and ecology as contained in this book is inadequate, it should be pointed out that very little is known concerning the proper application of these principles, with the end in view of securing a more uniform quality of vege-

table drugs. Here, then, is a great field for research; and no doubt future editions of this book by Professor Kraemer will contain much which some may expect to find in the present volume.

Especial attention should be called to the chapters dealing with the problems of pharmacognosy, animal drugs, and to the key and systematic classification of powdered drugs. The volume is illustrated with about 1,000 separate figures, the majority of which are original with the author, and supplement the text.

E. L. NEWCOMB.

PROCEEDINGS OF THE CLUB

JANUARY 26, 1916

The meeting of January 26, 1916, was held in the morphological laboratory of the New York Botanical Garden at 3:30 P.M. Vice-president Barnhart presided. Twenty-nine persons were present.

The minutes of the annual meeting held January 11 were read and approved.

Dr. Levine, chairman of the committee on the amendment of the constitution proposed at the last meeting, reported that the committee was unable to report at this meeting. The subject, however, was discussed informally.

President Harper then took the chair.

The application of Dr. E. W. Olive for a grant of two hundred dollars (\$200.00) from the Esther Herrman Fund to enable him to collect aquatic fungi, insect-attacking fungi, short-cycled and other rusts, as well as lower fungi of Porto Rico, was indorsed.

The resignation of Dr. E. B. Southwick was read. No action was taken at this meeting.

The first number on the announced program was a paper by Dr. N. L. Britton on "Recorded Flora of the Isle of Pines." The speaker gave a brief description of the topography of this island and reviewed the work of various collectors. Attention was called to an apparent similarity between certain species found on the Isle of Pines and on the South American coast.

The second paper, on "The Pan-American Scientific Congress," was read by Dr. W. A. Murrill. The speaker exhibited a collection of the Daily Bulletin issued in English, Spanish and Portuguese, as well as copies of several scientific papers read at the meetings.

Mrs. Britton called attention to a gift of Brazilian orchids that the New York Botanical Garden had received from Dr. Y. de Oliveira Botelho, Brazilian delegate to the Pan American Scientific Congress. This valuable collection of orchids was selected from plants grown in his fine garden at Rio de Janeiro. They number about one hundred specimens and have been placed in one of the propagating houses.

Meeting adjourned.

B. O. DODGE,
Secretary.

FEBRUARY 8, 1916

The meeting of February 8 was held at the American Museum of Natural History at 8:15 P.M. Mr. Norman Taylor presided. Fifty-two persons were present.

The minutes of January 26 were read and approved. Mr. James F. Adams, 420 West 121st St., N. Y. City, and Dr. Toyozaburo Tanaka, U. S. Department of Agriculture, Washington, D. C., were nominated for membership.

Mr. Stetson reported that the auditing committee had examined the books of the treasurer and found them to be correct.

Dr. M. Levine, chairman of the committee on the constitutional amendment, announced that the committee wished to report in favor of the adoption of the amendment. The report of the committee was accepted.

The treasurer announced the contribution of eighteen dollars and fifty cents (\$18.50) from Professor C. C. Trowbridge for illustrations in the *Bulletin* of the Club.

The resignation of Miss Ellen E. Shaw was read and accepted.

Dr. Tanaka and Mr. Adams were then elected to membership.

The announced scientific program consisted of an illustrated lecture by Prof. W. Mansfield on "Poisonous plants of Eastern United States." The speaker treated the subject under two

divisions: those plants poisonous to animals and those poisonous to man.

Adjournment followed.

B. O. DODGE,
Secretary

NEWS ITEMS

A garden of Shakespeare's plants was dedicated in Central Park, New York City, on April 24, with exercises by the Permanent Shakespeare Birthday Committee. Dr. E. B. Southwick, for many years the City Entomologist, who planned the garden, is to have charge of it.

The announcement of the Biological Station of the University of Montana has been issued. The courses, which are held at Yellow Bay, Flathead Lake, Montana, extend from June 19 to August 18, and cover the usual ground. Further information may be had from Morton J. Elrod, Missoula, Montana, whose address after June 15 will be at the summer Biological Station.

On April 22 the cornerstone of the structure which will complete the building and greenhouses of the Brooklyn Botanic Garden was laid with brief ceremonies. A spring inspection of the grounds followed by a tea was held at the New York Botanical Garden on May 4, and at the Brooklyn Botanic Garden on May 9. At the latter institution memorial trees were planted by Mr. Alfred T. White and Mr. A. Augustus Healy.

Dr. Edgar W. Olive and Professor H. H. Whetzel have returned from Porto Rico where they have been collecting fungi.

The Torrey Botanical Club

Contributors of accepted articles and reviews who wish six gratuitous copies of the number of *TORREYA* in which their papers appear, will kindly notify the editor when returning proof.

Reprints should be ordered, when galley proof is returned to the editor. The New Era Printing Co., 41 North Queen Street, Lancaster, Pa., have furnished the following rates:

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Zygomycetes: A. F. Blakeslee

Chytridiaceae.

Myxomycetes: Mrs. H. M. Richards

Yeast and Bacteria: Prof. J. Broadhurst

Insect galls: Mel T. Cook

OTHER PUBLICATIONS

OF THE

TORREY BOTANICAL CLUB

(1) BULLETIN

A monthly journal devoted to general botany, established 1870. Vol. 42 published in 1915, contained 698 pages of text and 33 full-page plates. Price \$3.00 per annum. For Europe, 14 shillings. Dulau & Co., 37 Soho Square, London, are, agents for England.

Of former volumes, only 24-42 can be supplied entire ; certain numbers of other volumes are available, but the entire stock of some numbers has been reserved for the completion of sets Vols. 24-27 are furnished at the published price of two dollars each ; Vols. 28-42 three dollars each.

Single copies (30 cents) will be furnished only when not breaking complete volumes.

(2) MEMOIRS

The MEMOIRS, established 1889, are published at irregular intervals. Volumes 1-15 are now completed ; No. 1 of Vol. 16 has been issued. The subscription price is fixed at \$3.00 per volume in advance. The numbers can also be purchased singly. A list of titles of the individual papers and of prices will be furnished on application.

(3) The Preliminary Catalogue of Anthophyta and Pteridophyta reported as growing within one hundred miles of New York, 1888. Price, \$1.00.

Correspondence relating to the above publications should be addressed to

DR. BERNARD O. DODGE

Columbia University

New York City

TORREYA

A MONTHLY JOURNAL OF BOTANICAL NOTES AND NEWS

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR



JOHN TORREY, 1796-1873

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ECOLOGIC NOTES ON DROSERA ANNUA

BY E. L. REED

In the spring of 1914 while on a field trip, near College Station, Texas, the writer observed some specimens of *Drosera* growing in an open oak wood that is invading an abandoned field. The habitat was a gentle slope of what appeared to be a comparatively dry, sandy soil. The *Drosera* in question, upon further examination, proved to be a new species to which the name *D. annua* was given.* Later a number of other stations of the same general character were observed and *D. annua* was found to be quite common in the vicinity of the college. In this region the plant was never found in or near ponds or streams; in the eastern part of the state, however, it sometimes grows in moist sand near ponds but has not been reported as growing in or at the edge of bodies of water. Since such a habitat for species of *Drosera* was unusual, an ecologic study was begun, in order to determine the environmental conditions under which it grows.

The climate of this region is warm temperate, or perhaps, subtropical, and is divided generally into a wet and a dry season. The former begins about the middle of November and extends well into March. It in turn may be divided into three periods, two of heavy rainfall separated by one of light rainfall. The first period of heavy rainfall extends to about the beginning of January; in January the precipitation is light, while the second wet period is from about the first of February to the end of March. The summer season is usually one of slight rainfall. The early

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* Reed, E. L., *Drosera annua*, sp. nov. TORREYA, Vol. 15, No. 11, November, 1915.

spring flowers, such as the Spring Beauty and the little Bluets, begin to bloom in January.

Table I shows the maximum, minimum, and mean annual temperatures for a period of four years as reported by the Experiment Station.

TABLE I. TEMPERATURES AT COLLEGE STATION, TEXAS

Year	Maximum	Minimum	Mean Annual
1911	106	12	70.7
1912	105	10	67.6
1913	106	18	67.7
1914	106	17	67.4

The character of the vegetation of this region is transitional between the mesophytic of the Mississippi valley and the xerophytic of the Great Plains, inclining to the latter type.

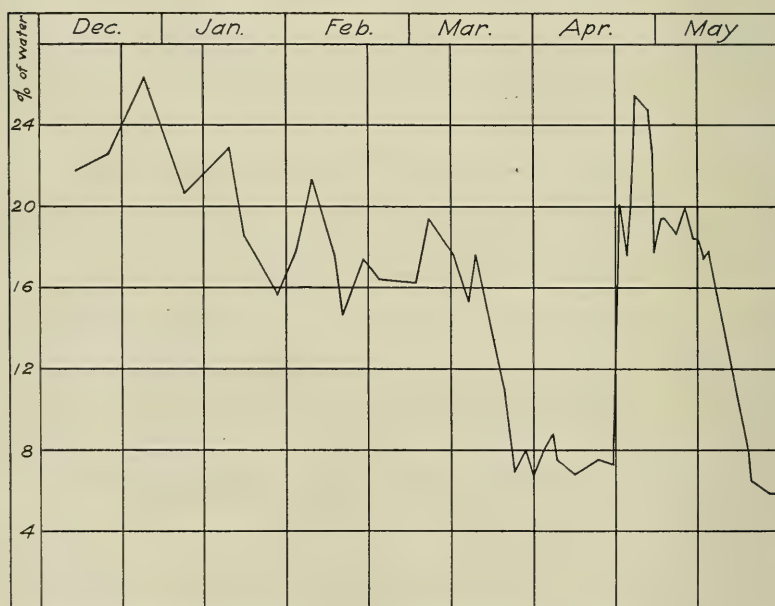


FIG. 1. Graph of water content for period of observation.

In order to determine the water content of the soil of the stations, samples were collected from December 6, 1914, to June 9, 1915. From December 6, to the time of the appearance of the

seedlings—about February 1—samples were taken at intervals of four to twelve days, thereafter at intervals of two to six days. Since *D. annua* is small and has a poorly developed root system, most of the soil samples were taken to a depth of from four to six inches only.

Table II shows the date, depth in inches, and per cent of water, in terms of dry soil, of a series of such samples.

TABLE II. WATER CONTENT OF SOIL SAMPLES FROM THE HABITAT OF *Drosera annua*

Date	Depth in Inches	Per Cent Water	Date	Depth in Inches	Per Cent Water
Dec. 6	1 to 6	21.86	Apr. 3	1 to 2	8.50
" 14	1 " 6	22.86	" 3	1 " 5	8.86
" 23	1 " 6	26.47	" 4	1 " 2	7.83
Jan. 3	1 " 6	20.60	" 4	1 " 5	7.34
" 14	1 " 6	22.78	" 6	1 " 5	7.06
" 18	1 " 6	18.48	" 6	1 " 2	7.28
" 18	6 " 12	19.68	" 8	1 " 5	6.82
" 18	12 " 18	21.00	" 14	1 " 5	7.37
" 26	1 " 6	15.63	" 18	1 " 5	7.26
" 26	6 " 12	17.66	" 20	1 " 5	20.13
" 30	1 " 6	17.66	" 22	1 " 5	17.57
" 30	6 " 12	22.00	" 22	1 " 5	16.75
Feb. 4	1 " 6	21.43	" 22	1 " 5	18.26
" 4	6 " 12	21.41	" 24	1 " 5	25.63
" 4	12 " 18	21.23	" 27	1 " 5	24.71
" 10	1 " 6	17.69	" 28	1 " 5	22.59
" 12	1 " 6	14.63	" 29	1 " 5	18.48
" 12	6 " 12	22.46	May 1	1 " 5	19.23
" 17	1 " 5	17.53	" 2	1 " 5	19.17
" 21	1 " 5	16.45	" 5	1 " 5	18.87
Mar. 2	1 " 5	16.25	" 7	1 " 5	20.06
" 3	1 " 5	20.36	" 8	1 " 5	18.55
" 6	1 " 5	19.66	" 9	1 " 5	19.40
" 9	1 " 5	17.52	" 11	1 " 5	17.38
" 13	1 " 5	15.13	" 12	1 " 5	17.77
" 14	1 " 5	17.42	" 13	1 " 5	18.82
" 22	1 " 5	19.87	" 15	1 " 5	14.75
" 24	1 " 5	6.80	" 19	1 " 5	10.55
" 25	1 " 5	7.15	" 22	1 " 5	7.80
" 26	1 " 5	8.12	" 23	1 " 5	6.40
" 28	1 " 5	6.52	" 23	1 " 5	6.70
" 30	1 " 5	7.38	" 27	1 " 5	5.72
" 30	1 " 2	6.47	" 29	1 " 4	5.12
" 30	1 " 2	3.46	" 30	1 " 5	5.77

Fig. 1 shows a graph of the water content for the period of observation. Fig. 2 gives the rainfall in inches for the same period, as reported by the Experiment Station. The rainfall for three years divided into two periods each is shown in Table

III. By reference to Figs. 1 and 2, it will be seen that the water content of the soil bears a more than usually close relation to the rainfall. This may in part be accounted for by the fact that the subsoil is only from twelve to eighteen inches below the surface and is a hardpan almost impervious to water. The drainage is therefore poor. Moreover the structure of the soil is such that a very few days of dry weather causes a rapid decrease in its water content.

TABLE III. RAINFALL AT COLLEGE STATION, TEXAS

Year	Nov. 1 to May 31, Inches	June 1 to Oct 31, Inches	Total, Inches
1912-1913	22.50	7.92	30.42
1913-1914	38.20	10.93	49.13
1914-1915	30.20	17.07	47.27

From Table IV it appears that during the time of observation there were two periods of high water content and two of low in these soils.

TABLE IV. WATER CONTENT OF SOIL SAMPLES BY PERIODS

Period	Maximum Per Cent	Date	Minimum Per Cent	Date	Mean
Dec. 6 to Mar. 22	26.47	Dec. 23	10.26	Mar. 22	18.53
Mar. 22 to Apr. 18	8.86	Apr. 3	6.52	Mar. 28	7.33
Apr. 18 to May 19	25.63	Apr. 24	10.55	May 19	18.45
May 19 to May 30	7.80	May 22	3.82	May 29	6.28

The young *Droseras* appeared about the middle of the first period of high-water content and disappeared shortly after the beginning of the last period of low-water content. However, on March 30, the plants in the upper portion of the field were found to be dying. Upon examination the first two inches of soil of this part showed a water content of 3.46 per cent, as compared with 6.47 per cent in samples of like depth from localities in which the plants were still growing. The plants grew vigorously in all places having a water content of 6 per cent or more during the period from March 24 to April 18. The rosettes of leaves reached a maximum size in most of the plants and the scapes attained a height of one centimeter or more. The first blossoms appeared about April 30.

A careful study of the soil of several habitats confirmed the observation that *D. annua* grows normally with a water content of six per cent; when the proportion falls below this minimum the plants die. The soil on analysis was found to contain 0.02 per cent nitrogen.* A mechanical analysis gave the following:†

	Per Cent
Very fine sand.....	84.78
Silt.....	8.12
Clay.....	7.10

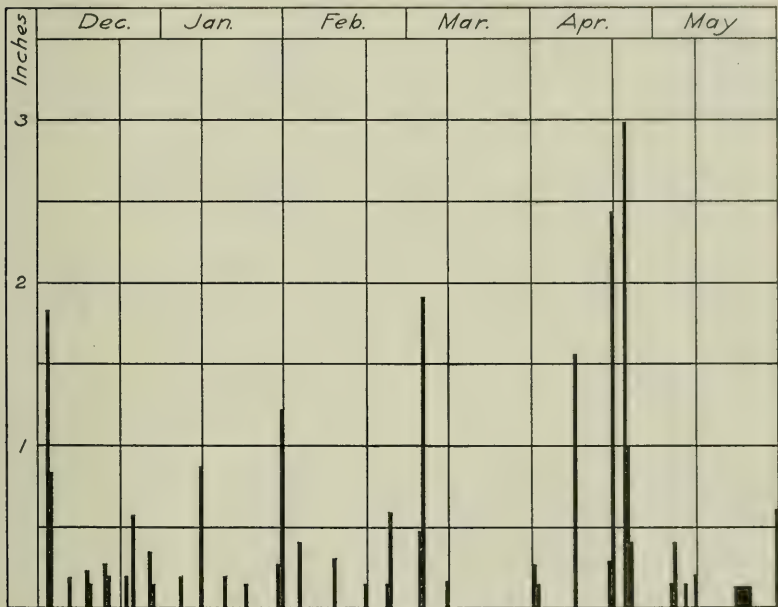


FIG. 2. Graph of rainfall for period of observation.

The soil is therefore a fine sand, poor in nitrogen. Owing to the impermeability of the subsoil, the overlying soil becomes waterlogged during heavy rains, or a series of showers, but its porous sandy nature permits rapid drying. Figs. 1 and 2 show this graphically.

* Analysis made by Mr. M. T. Garret, senior student in agronomy, A. and M. College.

† Analysis made by Professor C. A. Wood, of the Department of Agronomy, A. and M. College.

A study of a meter quadrat in a typical field during the month of May, 1915, gave the following result:

<i>Phlox tenuis</i>	189
<i>Oenothera lineafolia</i>	44
<i>Oenothera sinuata minima</i>	13
<i>Krygia occidentalis</i>	43
<i>Rumex hastatulus</i>	41
<i>Linum multicaule</i>	13
<i>Sabbatia campestris</i>	30
<i>Lechia Drummondii</i>	31
<i>Drosera annua</i>	52
<i>Hedeoma</i> (not identified)	270

Outside of the quadrat but associated with *D. annua* were the following:

<i>Linaria canadensis</i>	<i>Lepuropetalon spathulatum</i>
<i>Lepidium intermedium</i>	<i>Polygala incarnata</i>
<i>Castilleja indivisa</i>	<i>Tithymalus leiococcus</i>
<i>Asclepiodora viridis</i>	<i>Jatropha stimulosa</i>
<i>Geranium carolinianum</i>	<i>Opuntia grandiflora</i>
<i>Legousia perfoliata</i>	<i>Helianthemum rosmarinifolium</i>
<i>Allium Nuttallii</i>	<i>Tragia ramosa</i>
<i>Verbena Halei</i>	<i>Diodea teres</i>
<i>Linum medium</i>	<i>Houstonia patens</i>
<i>Oenothera serrulata</i>	<i>Crusea allococca</i>
<i>Talinum parviflorum</i>	<i>Polypremum procumbens</i>

No attempt was made to identify the grasses and plants below the spermatophytes growing in the quadrat.

Summary.—*Drosera annua* is an annual, appearing about February 1.

The soil is a fine sand with a small per cent of silt and clay. Hence it dries rapidly. The nitrogen content is low.

The water content of its habitat ranges from six to twenty-five per cent during the life period of the plant.

The minimum requisite of water in this particular soil, as shown by the death of the plants, is six per cent, while the optimum lies somewhere beyond this point.

AGRICULTURAL AND MECHANICAL COLLEGE OF TEXAS,
COLLEGE STATION, TEXAS

DISTRIBUTION OF *CAREX AGGREGATA* IN THE
PHILADELPHIA REGION

BY BAYARD LONG

Of new species in *Carex*, proposed in recent years, few have been more instrumental in clearing up long-standing difficulties in a critical group than *Carex aggregata* Mackenzie, of the *Muhlenbergianae*.

The describing of new species in groups acknowledged by all students to be difficult does not always meet with general approval, however, especially where certain of the species are rather commonly recognized as not being formed of a thoroughly consistent series. The reason is patent: a group is often made even more confusing and difficult for practical use than before. Certain well-known genera of the Rosaceae (in its more comprehensive sense), which have figured largely in botanical literature in late years, come to mind. But when a form is as well differentiated as Mr. K. K. Mackenzie's *C. aggregata* we can have no criticism about "close splitting," but only appreciation of the author's close and careful study and the benefit accruing to the science by this competent understanding and solution of a troublesome problem.

The mute evidence on the labels of the plant now known as *Carex aggregata*, from the Philadelphia region alone, is sufficient to show that critical work in segregation has long been needed among the allies of *C. Muhlenbergii*. There need be selected from the Herbarium of the Philadelphia Botanical Club only three sheets to find that the gamut has been run all the way from *Muhlenbergii*, *sparganoides*, and *cephaloidea* to *alopecoidea* and *conjuncta*. This material has passed through the hands of some half-dozen botanists, all men more or less well known to botanical literature, and amply demonstrates, I think, the difficulty experienced by the older botanists in naming Carices of this alliance.

My acquaintance with the plant dates from 1909. June 19, near Fern Rock Station in Philadelphia, I have the distinct recollection of finding on a thicket margin a sedge with rather

the habit of what we now know as *Carex normalis*—but very evidently belonging to the allies of *C. Muhlenbergii*. The long, lax culms and soft, broad and spreading leaves of this strange plant were very different from the stiffly erect, wiry habit of characteristic *C. Muhlenbergii*, but the spikes were rather similar. The impression of this plant was deepened by two days later finding the same form frequent in similar habitats near Frazer in Chester County. Again, the following day, along the Conestoga Creek above Lancaster in the county of the same name, two colonies were seen—one, of plants quite like those at Frazer and Fern Rock, with the spikes of the head (except the uppermost) slightly separated; another, with a somewhat shorter, closer head. I had the courage to name the last *C. cephaloidea*, but, though all these plants of the previous several days' collecting apparently had to be put into this same species, there was found more than one discrepancy between my plants and the manual descriptions of *cephaloidea*; while the specimens under that name in several herbaria consisted of a very patently heterogeneous series.

Curiously enough, after seeing this plant on three almost successive days in 1909 in three widely separated localities, I did not meet it again for three years.

On June 2, 1912, while being guided over some interesting country along Darby Creek above West Chester Pike by Mr. Charles S. Williamson, the plant was found again. This station is near Adele in Delaware County, Pennsylvania. Five days later the margin of the wooded slopes along the Schuylkill River below Ivy Rock, in Montgomery County, again produced the same species.

My early experience with *Carex Muhlenbergii* and its allies was probably in no manner very different from other botanists not specialists in this genus—as the naming of material in any general collection amply shows. I had found that "*Muhlenbergii*" seemed to be the source of popular solution of all the odds and ends of plants of this group, unless the specimen was left unnamed, or possibly "*cephaloidea*" chosen. The chief characteristic of the latter seemed to be that the inflorescence was in

a "head," while in the former it was elongated and the spikelets somewhat separated. I had found that the keys when made to work conclusively at all (commonly with both, or all, divisions used and the elimination method necessary) generally threw together plants which certainly did not form a thoroughly consistent series. Several years ago a student of *Carex* at whom I thrust our accumulation of puzzling *Muhlenbergianae* in the Herbarium of the Philadelphia Botanical Club, in endeavoring to associate the specimens with species known to him, was compelled, on my pressing him for opinions, to throw together plants which on examination showed in series a very palpable lack of homogeneity.

Under such circumstances the general botanist, everywhere, apparently, rather gives up in despair of naming such plants and waits for a more convenient season to work upon them or the coming of the specialist.

It was no small satisfaction to see Mr. Mackenzie take up this matter and find several well-marked new species in the *Muhlenbergianae*. When the opportunity arose to assist Mr. Mackenzie in gathering data on the regional distribution of various of our less well-known Carices in his work upon the *Carex* portion of Mr. Norman Taylor's Flora of the Vicinity of New York, a number of these puzzling *Muhlenbergianae* were brought forward with high hopes of an ultimate and satisfactory solution of their identity.

Some of these were only *Muhlenbergii*, a few *cephaloidea*, but several proved to be the little-known austral species *Carex aggregata*, which Mr. Mackenzie wrote me were the first specimens he had seen from north of Washington, D. C. With this authentically determined material and the original key* for this group in the new Illustrated Flora it was soon found that, especially in the *Muhlenbergianae* plant so long familiar to me, we had evidence of quite a well-distributed occurrence of this species through southeastern Pennsylvania, extending from the valley of the

* The absence of bracts in *cephaloidea* (in contrast to their presence in *aggregata*) proves to be a weak character and one unsatisfactory for use in a key. The key in Taylor's Flora has been much improved over that in the new edition of the Illustrated Flora. The sheath and the scale characters are very distinctive.

Conestoga eastward for more than sixty miles to the valley of the Tacony—embracing the drainage of both the Susquehanna and the Delaware Rivers.

Since that time, besides several new stations near Philadelphia, a number of interesting occurrences of the species have been noted, some of considerable importance and representing range extensions of many miles northward.

May 27, 1914, the plant was found on the Coastal Plain of New Jersey. This was of notable interest as all the previously known localities in the Philadelphia region had been in the Piedmont area of southeastern Pennsylvania. Curiously enough I had been exploring the steep wooded slopes of Rancocas Creek in the vicinity of Vincentown, Burlington County, New Jersey, because of their already recognized richness in types more characteristic of the Pennsylvania uplands than the Atlantic Coastal Plain. Among numerous interesting discoveries there, was a colony of several large stools of *C. aggregata*—a species previously unknown in the state.

During a preliminary examination of the region in Berks County, Pennsylvania, selected for the 1915 joint Symposium of the Torrey and the Philadelphia Botanical Clubs, an important new station was found June 27 on the southerly edge of the Irish Mountains in the valley of Beaver Creek near Lobachsville. July 5 of the Symposium week at Fleetwood the plant was discovered just outside the village.*

Mr. Mackenzie, in explorations along the Delaware River, June 19 of the past season, extended the range of the species to Milford, Hunterdon County, New Jersey—the most northern station yet known. As at the two northern stations in Berks County, it is here also to be noted as rare.

The local distribution of the plant in the Philadelphia region makes it quite clear that this is an austral species pushing up the larger river valleys, on the northern edge of its range. In its

* The long, very lax culms, additionally weighted by the spikes of mature fruit, were bent far over and many of the heads quite hidden among the grass and other vegetation. Experience has shown that this is a rather characteristic feature of the species. In this stage the plant often has the appearance of mere "grass" and may readily escape notice.

occurrence well up the valley of the Schuylkill River toward the Blue Mountains, it is doubtless to be associated with the notable group of plants of austral affinity including the Papaw, the Red Bud, the Persimmon. It is probably to be classed among Carolinian types.

An apparent local center of abundance near Philadelphia, as shown by stations, is, I believe, quite illusory and due mainly to the more extensive work which has been carried on in this immediate vicinity. The several days of systematic exploration in the Fleetwood region of Berks County, coupled with a knowledge of the plant and its possibility there, demonstrated its occurrence in two localities.

It is of likely occurrence at least throughout southeastern Pennsylvania and immediately adjacent New Jersey, following well up the Delaware, as Mr. Mackenzie's station at Milford shows. In the southern portion of New Jersey it will probably be found to be closely confined to the richer soils along the streams of the Delaware system. No doubt were the lower Susquehanna valley as thoroughly explored as the lower Delaware, the plant would be shown to have a wider distribution there than only along the Conestoga.

The following stations in the Philadelphia area may be noted.

NEW JERSEY: Milford, Hunterdon County, June 19, 1915, *K. Mackenzie* 6478; Vincentown, Burlington County, May 27, 1914, *B. Long* 9793.

PENNSYLVANIA: Fleetwood, Berks County, July 5, 1915, *B. Long* 12767; Lobachsville, Berks County, June 27, 1915, *B. Long* 12665; Betzwood, Montgomery County, May 28, 1901, *Alex. MacElwies* 2262; Ivy Rock, Montgomery County, June 7, 1912, *B. Long* 7329, June 8, 1895, *J. Crawford*; "Rdg. RR. above Manyk. tunnel" [= West Manayunk, Montgomery County], 1865, *C. E. Smith*; Whitemarsh, Montgomery County, May 24, 1914, *B. Long* 9760; Ashbourne, Montgomery County, July 7, 1914, *B. Long* 10194; Robinson's Knoll [= Fairmount Park, Philadelphia], May 13, 1865, *C. E. Smith*; Wister's Meadow [= Germantown, Philadelphia], June, *W. Wister*; Fern Rock, Philadelphia County, June 19, 1909, *B. Long* 975; Darby Creek

above West Chester Pike, Delaware County, June 2, 1912, *B. Long* 7094; Wawa, Delaware County, May 23, 1909, *F. W. Pennell* 2072; Frazer, Chester County, June 21, 1909, *B. Long* 980; Lancaster, Lancaster County, June 22, 1909, *B. Long* 1033, 1034.

Specimens of all these collections are in the Herbarium of the Philadelphia Botanical Club, with the exception of that from Milford, New Jersey, which, together with some of my own numbers, is in the herbarium of K. K. Mackenzie. A specimen of the Wawa collection is also to be found at the New York Botanical Garden. All the material cited has been critically examined by Mr. Mackenzie.

ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA

IS FORESTRY A SCIENCE?

BY ROLAND M. HARPER

In an interesting paper entitled "Darwinism in forestry," in the *American Naturalist* for September, 1913, Raphael Zon discusses a few contributions to pure science that have been made by foresters, and makes this statement: "*Forestry as a science is nothing else but the study of the laws which govern the struggle for existence.*" Prof. Henry S. Graves, in an address made before the Washington Academy of Sciences on Dec. 3, 1914,* on "The place of forestry among natural sciences," expresses some of the same views as Zon, and also goes considerably farther in describing the contributions of foresters to science. He points out, as Zon did, that forests are the highest expression of plant life, and states that forestry is tree sociology, or the science of tree societies. He acknowledges the debt of foresters to taxonomists, physicists, chemists, geologists, soil investigators, pathologists, entomologists, etc., but mentions that Darwin's theory of evolution was anticipated by a writer on forestry, and that Warming, Schimper, and other pioneer

* Printed in *Journ. Wash. Acad. Sci.* 5: 41-56. Jan. 19, 1915; *Science* II. 41: 117-127. Jan. 22, 1915; *Monthly Weather Rev.* 42: 671-672. Mar. 16, 1915 (abstract); and in *Smithsonian Report for 1914.* (in ed.)

ecologists borrowed many ideas from the foresters. Among the notable contributions to science enumerated are the significance of the gregarious habit of trees, the relation of different species to light and shade and humus, the death rate of trees, differences in longevity and productivity of different individuals of the same species, the discovery of a constant ratio between certain measurements of a tree and its volume, regardless of the species, investigations of the properties of wood, the value of forests as soil indicators, the influence of trees on each other and on climate, runoff and soil, the classification of forest types, and the study of the laws of distribution.

But whether forestry is a science or not depends on the definition of forestry and of science. The prevailing idea of forestry, as admitted by Graves, and to which perhaps no one can reasonably take exception, is that it is the *art* of utilizing forests to best advantage. There are many more or less different conceptions of science, but apparently the only one that does not confuse it with other things is that science is the study of the laws of nature. The mere fact that some foresters have worked out new laws does not prove forestry to be a science, any more than the discovery of some of the laws of physics and human physiology by engineers and physicians proves engineering and therapeutics to be sciences. (It is the scientist's business to know *why*, and the artist's or artisan's to know *how*.) Most arts, other than the very simplest, are based on one or more sciences, and *every science is distinguished from others by laws peculiar to it*.*

Forestry is based mostly on the botanical sciences, and the supposed laws of forestry really belong to one or the other of these sciences. For example, the physical properties of wood are matters for the taxonomist to take cognizance of in describing trees, the ratio between dimensions and volume is a principle of morphology—even though the morphologists may not have thought of it before—and the relations of forests to soil and climate are matters of ecology, climatology, etc. Forest mensuration, one of the most important parts of a forester's work, is not a science but an art, which however can be made very useful to scientists, as will be explained farther on.

* See Science II. 38: 817. Dec. 5, 1913.

Probably the most important science for the forester is plant sociology, which has hardly been recognized as a distinct science as yet. (In schools of forestry it is commonly taught along with tree physiology and ecology under the name of silvics.) The fact that scientific forestry involves something not adequately provided for in existing classifications of science is doubtless what led the writers referred to to claim recognition for it as a science. As the forest is the highest and most complex expression of social plant life, and consequently the phenomena of plant sociology are best exemplified in a forest, as both Zon and Graves clearly recognized, it is quite natural that many of the laws of this nascent science should have been discovered some time ago by observing foresters in the course of their work. One of the best popular treatises on plant sociology (though it was not called by that name at the time) was published seventeen years ago by a well-known forester.*

But the term "plant sociology" cannot be rejected on the ground that it is merely a later† synonym of one phase of forestry, or of silvics. For forestry deals with trees only, while plant sociology deals with vegetation of all kinds. Neither is it a mere branch of ecology; for although the plants surrounding any given plant may be regarded as part of its environment, vegetation types can be studied and classified regardless of environment. It is not the purpose of this paper to discuss the manifold phenomena and problems of the new science, but it will be appropriate to state that probably the most complete and scholarly work on the subject yet published is Clements's "Development and structure of vegetation," which constitutes the seventh monograph of the Botanical Survey of Nebraska, 1904. (This contains abundant references to the literature of the subject, and sketches its historical development. Most of the same ground is covered in "Research methods in ecology," by the

* Pinchot's *Primer of Forestry*, part 1. Washington, 1899.

† The first use of the term that has come to the writer's notice is by Dr. Charles E. Bessey in *Science* II. 37: 4. Jan. 3, 1913; but he there confused it with ecology. The writer used it in *Science* II. 38: 818. Dec. 5, 1913; *Torrey* 13: 139; 14: 145, 147; *Rep. Fla. Geol. Surv.* 6: 176. Dec. 1914; 7: 181. Sept. 1915; and contributed a brief note on it to the second edition of the *New International Encyclopaedia* (New York) 18: 705. Feb. 1916.

same author, published about a year later,* and "Plant Physiology and Ecology," 1907.)

Although our friends the foresters cannot claim the science of plant sociology as exclusively their own, they certainly deserve much credit for the part they have played in developing it. Their practice of measuring timber and estimating the annual growth ought to be extended to other kinds of vegetation. One finds scarcely a hint of volumetric studies of vegetation in non-economic botanical literature, but a few years from now perhaps no description of natural vegetation will be regarded as complete unless it contains an estimate of the volume or weight of vegetation per acre (or other unit area) and the absolute or relative amount of new growth each year.† The annual increment, or birth and death rate, of vegetation, although by no means easy to determine in a mixed forest, ought to bear a fairly definite relation to the sum of all environmental factors, just as crop yields do, and it would be extremely interesting to know whether or not it increases with the progress of succession, for instance.

COLLEGE POINT, N. Y.

THE ADMIRABLE *POLYPORUS* IN THE FLORA OF THE LAKE GEORGE REGION

BY STEWART H. BURNHAM

The first specimen of *Polyporus admirabilis* Pk., recorded in the Flora, was found by Mrs. R. B. Van Alstyne, of Troy, at Lake George, in 1900, on an apple tree.‡ Dr. Chas. H. Peck afterwards found it in the flora, July 25, 1906, at Friends Lake, Warren county, on an apple tree, which is recorded in his unpublished notes. I have never found it in the Lake George Region growing on apple trees.

The specimens of *Polyporus admirabilis*, which I have found

* For references to reviews of these two books see Ann. N. Y. Acad. Sci. 17: 349. Nov. 1906. Other good reviews, published too late to be cited there, are those by Blackman and Tansley in the New Phytologist, Nov. and Dec. 1905, and by Fernow in the Forestry Quarterly, March, 1906.

† For some data of this kind for herbaceous vegetation in the Great Plains region see Shantz, U. S. Dept. Agr. Bur. Pl. Ind. Bull. 201: 81. 1911.

‡ N. Y. State Mus. Rept. 54: 154. 1901.

growing on an apple tree log, referred to by Dr. B. O. Dodge in his paper "Fungi producing Heart-rot of Apple Trees,"* were collected at Pike pond, Rensselaer county, July 23, 1910. This pond lies a few miles south of Averill Park and Sandlake villages. Part of this collection is preserved in the State Herbarium at Albany, where at least a portion of it bears the name *Polyporus Underwoodii* Murrill, which is of course an error in determination! The other portion of the Pike pond collection is in the Herbarium of the Lloyd Museum at Cincinnati, Ohio. Referring to a letter from Dr. C. G. Lloyd, December 1, 1910, acknowledging the receipt of the specimens sent with the name *Polyporus Underwoodii* attached, he says:

"I think *Polyporus Underwoodii* is correctly named, though in my opinion it is only a synonym for *admirabilis* Pk. The stipe (always short) is almost wanting, in which case it becomes *admirabilis*. This is another instance of the variation of the black markings of the stem, for in almost sessile specimens this character is absent or obscure. I think the plant is very closely allied to *varius* of Europe, in fact a specimen recently sent to Bresadola was referred by him as a variety of *varius* Fr. It has the same indurated context and same spores and is certainly closely allied to *varius*. In this connection, I wish you would please examine the type specimens of *admirabilis* and write me if you find the spores are "globose." I think that must be an error, for the plants of all these allied species, viz., *varius*, *picipes*, *elegans*, *albiceps*, *melanopus*, etc., have very similar spores, about $4 \times 8-10 \mu$, and are cylindrical."

I do not recall ever examining the spores of the type specimens of *Polyporus admirabilis* from Maine. Dr. Lloyd records receipt of my specimens in his printed letter, No. 30: 3. Jan. 1911.

In the vicinity of Vaughns (Hudson Falls), New York, specimens of this showy pure white "calla lily"-like polypore has been recorded on various trees during the past eleven years, viz.,

Butternut (*Juglans cinerea* L.). On a partly fallen trunk, leaning over Glenwood brook. The following dates: Sept. 5, 1904; Oct. 26, 1905; Aug. 18, 1910; Aug. 25, 1911 (part of the

* Mycologia 8: 8-9. Jan. 1916.

specimens in the State Herbarium); and Sept. 24, 1913. I am sure it appeared in 1914; but have no record. In 1915 fine (!) specimens were developing on this trunk: but the cattle in the pasture somehow got to them and practically destroyed the lot. This butternut trunk is yearly becoming more and more decayed.

White Ash (*Fraxinus americana* L.). On a stump, in an open grove, about one mile southeast of the butternut, July 6, 1907. This was a poor deformed specimen, as I remember: and is deposited in the State Herbarium. I have not found it since at this station.

Black Ash (*Fraxinus nigra* Marsh.). On a stump, lower falls of North Beaver creek, Sept. 2, 1912. On a log, some time fallen but quite sound, July 24, 1915. During June, 1915, the fine (!) specimens were discovered developing on this log: but in spite of the fact the log lay under prickly ash bushes; the herd of cattle pastured in the field, broke off most of the plants and partly destroyed the punks, before the specimens were collected.

Black Willow (*Salix nigra* Marsh.). Very old weathered plants were found on a much broken willow trunk, Nov. 12, 1913, on the north bank of the Halfway brook, east of the village of Tripoli.

Glaucous Willow (*Salix discolor* Muhl.). A small specimen found on a fallen trunk of this willow, Aug. 14, 1915, in Vaughns schoolhouse woods.

White Elm (*Ulmus americana* L.). On the crossing log, over Halfway brook, by the "electric power lines," east of Tripoli, Oct. 4, 1914. Also found here on an elm log, July 25, 1915. This station is about one mile north of the black ash station, with several hills and valleys between.

Sugar Maple (*Acer Saccharum* Marsh.). On a stump in open woods, several rods to the northeast of the butternut locality, across an open pasture, Aug. 19, 1915. A portion of the collections from black ash and sugar maple have been deposited in the Herbarium of the New York Botanical Garden.

Whether the plants at these different stations sprang originally from one source is difficult to say. It is quite possible that the

sugar maple stump was infected from the butternut. The black ash log lies about one fourth of a mile north of the butternut, over one hill.

In the north part of the village of Ballston Spa, on the trunk of some cultivated willow, July 20, 1912, was seen from the railroad coach, what appeared to be punks of *Polyporus admirabilis*. Possibly, if this had been examined, it would have been similar to *Polyporus Underwoodii* found by Dr. H. J. Banker, Aug. 27, 1908, at Schaghticoke, Rensselaer county.

HUDSON FALLS, N. Y.

SHORTER NOTES

A NOTE ON PRESERVATIVES FOR ALGAE. In *The Plant World* for August, 1913, is an article by Gilbert Morgan Smith, of the University of Wisconsin, on "The Preservation of Fresh Water Chlorophyceae." Among the preservatives recommended is Amann's lacto-phenol-copper solution, and there are given also the results of tests conducted by himself and others as to plasmolysis and coloration. He also gives suggestions as to the amounts which had produced better results with certain algae.

Finding it necessary to make my collection as stable as possible I made use of this solution, putting various algae into it, using as suggested liberal amounts of the solution. I also made a few tests using copper nitrate instead of copper chloride in the solution. The material in the solutions showed little change during periods of one month, two months, or ten weeks. At the three-months' examination, some of the algae showed signs of plasmolysis. After nine months I find that the following results have attended the use of these preservatives:

Copper-Nitrate-lacto-phenol

- 10 per cent, *Vaucheria*, color good, no plasmolysis
- 5 per cent, *Vaucheria*, color good, some plasmolysis
- 10 per cent, *Spirogyra*, completely plasmolyzed and browned
- 5 per cent, *Spirogyra*, completely plasmolyzed and browned
- 10 per cent, *Tetraspora*, kept well in every case
- 5 per cent, *Tetraspora*, kept well in every case

Diatoms in each strength of preservative were green in color but kept well. Various other algae kept poorly; such as *Zygnema*, *Stigeoclonium*, *Cladophora*, etc.

Copper Chloride-lacto-phenol

In the weaker solutions, but in greater amounts in proportion to the algae, the results were more satisfactory as to plasmolysis, but not so good as to color. In the stronger solutions, the color is fine but the plasmolysis has rendered the algae unusable.

Out of over sixty specimens I have been obliged to throw out more than forty, as I used more of the stronger solution in preserving. Perhaps the difference in water in the two regions might have some effect on the preserving of such material in such media, as in most cases my results tally very indifferently with those of Smith and his associates. To any one making collections of algae I would suggest considerable experimentation before trusting completely in these preservatives.

A. R. HILLARD

EDGEWOOD HIGH SCHOOL,
EDGEWOOD PARK, PENNSYLVANIA

REVIEWS

Piper and Beattie's Flora of the Northwest Coast*

One of the most pleasing local floras, both as to contents and as to appearance, is Piper & Beattie's Flora of the Northwest Coast, which appeared in the latter part of 1915. The area covered by the work is the region west of the summit of the Cascade Mountains in the states of Washington, and the northern half of Oregon. This region together with a small part of British Columbia constitutes a very natural area. The southern part of Oregon west of the Cascades, comprising the Umpqua and Rogue River basins, is left out, as in this region the flora of northern California becomes more and more prevalent. The flora is made up of 1,617 species and subspecies of flowering plants and fernworts, representing 550 genera and 100 families. As the

* Flora of the Northwest Coast, by Charles V. Piper and R. Kent Beattie, published by the authors and issued by the New Era Printing Company, Lancaster, Pennsylvania, November 10, 1915.

authors have both held the chair of botany in the State College of Washington for about a decade each, from 1893-1903 and 1903-1912 respectively, they are well acquainted with the flora, and this is also shown in their book. As is customary nowadays, the book gives a key to families, genera and species, and these keys, as far as can be judged from the limited inspection that could be made, seem to be excellent. The descriptions are in many cases rather short, in fact they average shorter than has been customary in later years, but this fact is by no means any detriment to their use, for the book is intended for the student and the amateur. Long descriptions are always confusing to the student and often exasperating even to the scientist, because in wading through the verbosity of a description of from a quarter of a page to a page and a half, one loses the essential characters of the plant. A short concise description drawn to the point is much better, and this is just one of the good features of the book.

In looking over the treatment of genera and species, one may wonder whether the authors belong to the school of "splitters" or of the "lumpers." We find that such genera as *Juniperus*, *Pinus*, *Brodiaea* (the authors use *Hookera* instead), *Zygadenus*, *Polygonum*, *Saxifraga*, *Tellina*, *Mitella*, *Rubus*, *Hosackia*, *Astragalus*, *Oxalis*, *Cornus*, *Pyrola*, *Rhododendron*, *Lonicera*, *Aplopappus* (the older name *Hoorbeckia* is used), are kept intact and in the same sense as used by the Gray-Watson school, while *Limnorchis*, *Piperia* and *Lysias* are regarded as distinct from *Habenaria*; *Sieversia* from *Geum*; *Dasiphora*, *Argentina* and *Drymocallis* from *Potentilla*; *Sphaerostigma* from *Oenothera*; *Gormannia* from *Sedum*; *Hypopitys* from *Monotropa*; *Harrimanella* from *Cassiope*; *Navarretia* and *Collomia* from *Gilia*; *Cryptanthus* and *Allocarya* from *Eritrichium*; *Orostemma* and *Eucephalus* from *Aster*; and *Euthamia* from *Solidago*. The authors evidently have tried to take the middle road, which is very commendable. However, in a few cases they have not succeeded in doing so. For instance the western *Anticlea* and *Toxicoscordion*, though closely related to each other, are not at all so to the eastern *Zygadenus*; and *Tellina* and *Lithophragma* really belong to two different sections of Saxifragaceae, while on the other hand

Gormannia, *Harrimannella*, *Orostemma*, *Eucephalus* and *Euthamia* are rather weak genera. They have also (following Robinson) included *Oreobroma* in *Lewisia*, which most botanists, including Gray and Watson and Pax, regarded as distinct.

The nomenclature used in the book follows closely the so-called American Code. The most striking diversions from the generic names used by the followers of said code are the following: *Rapuntium Dortmanna* (L.) Presl (1768) is used instead of *Lobelia Dortmanna* L. (1753), when that species evidently is the type of the Linnaean genus *Lobelia*. *Hierochloe* (1810) instead of *Savastana* (1789); *Stellaria* (1753) instead of *Alsine* (1753, page priority); *Oxytropis* (1802) instead of *Aragallus* (1790); *Holodiscus* (1879) instead of *Sericotheca* (1838). Of these, it would be desirable if *Stellaria* and *Oxytropis* could be conserved, as both *Alsine* and *Aragallus* were made up of a mixture of species belonging to different genera and based on characters now not used in characterizing *Stellaria* and *Oxytropis*. To this list should also be added the following: *Carara* (1792) should replace *Coronopus* (Garetn. 1791; not Mill. 1754), and *Cheirinia* should be used instead of *Erysimum*, as the type of the latter genus is *E. officinale* L. (= *Sisymbrium officinale* Scop.).

There is also found another diversion from the American Code, where the authors have at least in some cases followed the so-called Madison amendments to the Rochester Code and let a specific name be supplanted by an older varietal name. The American botanists, after applying these Madison amendments for a couple of years, saw to what difficulties and incongruities these amendments would lead and abolished them. How many such cases are found in the book I do not know, but there appear two in the list of new combinations, viz., *Argentina grandis* (T. & G.) Piper instead of *Argentina pacifica* (Howell) Rydb. and *Juncoides majus* (Hook.) Piper instead of *J. Piperi* Coville.

In those species that really have a common or vernacular name, this name follows the specific one. In other cases where there is none no attempt is made to fabricate a brand new one, which is very sensible.

Page 397 contains a list of new species and subspecies described in the book and of new combinations made in the same.

New species.....	6
New subspecies.....	1
New combinations.....	14
	21

The book contains xiii + 418 pages, including a glossary and an index, is printed on good paper and clear type, bound in cloth, and the printers can be complimented as well as the authors.

The book will be an excellent guide to the flora of the western slopes of the Cascades, and, without doubt, will be greeted with pleasure by all flower-lovers in the region and to anyone who has the opportunity to visit that part of the Pacific slope. It is technical enough to train the student for the use of more elaborate systematic works, and not at all too technical to be used with advantage in the high-schools. Many of the so-called "flower books" written mostly by young ladies are too "popular" in style to give the student any training in science, and usually so inaccurate and erroneous in their statements that they are in many respects more harmful than useful. The book is conservative enough in the better sense of the word but progressive enough to keep up with the development of taxonomy in the last thirty years. It does not contain any new freak notion concerning limitation of species and nomenclature, as some books lately published on western botany have, but is sane in its treatment. While the reviewer's ideas differ in individual cases from the treatment in the new work, the general impression he has received from the book is most pleasing. The same can be said of two other local floras of the Pacific coast, Abram's *Flora of Los Angeles County, California*, and Hall's *Flora of the Yosemite Valley*.

P. A. RYDBERG

Massee's Diseases of Cultivated Plants and Trees*

The first edition of this now well-known textbook of plant diseases was published in 1910. A second edition has recently appeared, printed from the old plates and identical but for the addition of a sixteen-page supplement. In this supplement

* Massee, G. *Diseases of Cultivated Plants and Trees*. Pp. I-XII + 1-618. Figs. 1-173. Macmillan Co., 1915. Price \$2.25.

additional facts of interest are given with reference to diseases previously mentioned in the text, and several diseases not before listed are discussed. Of the latter may be mentioned apple mildew due to *Podosphaera leucotricha* Salmon, black knot of birch caused by *Plowrightia virgullorum* Saccardo, tomato fruit rot due to *Phoma destructiva* Plowright, yellow stripe of hyacinths caused by *Bacterium hyacinthi* Wakker, and mosaic disease of potatoes, tomatoes, and tobacco. No attempt has been made by the author to revise and bring up to date the facts given in the body of the text. Many of these are in consequence incorrect or incomplete.

The present work although prepared along similar lines to the "textbook of plant diseases," the first edition of which was published by the author in 1899 is considerably larger and has a wider scope. It contains, in addition to the remarks upon fungous, bacterial, and slime mould diseases of plants, chapters on injuries due to frost, hail, wind, smoke, gas fumes, mites, nematodes, birds, animals, and man. There are also brief chapters on fungicides, spraying, soil-bacteriology, chlorosis, mycorrhiza, biologic species, phanerogamic parasites, so-called physiological diseases, and injuries due to non-parasitic organisms. The author endeavors to treat not only the diseases of Great Britain and continental Europe but also the important diseases of the tropics, and certain of those occurring in the United States. The discussion of each disease embraces a description of its more characteristic symptoms, certain facts of interest regarding the causal organism, and suggestions on control measures. The number of diseases included is very large, it would seem perhaps unnecessarily so, and uncommon maladies are frequently given more space than better known or more destructive ones. As a compilation of facts bearing upon a large number of plant diseases the book must be given a place among the first two or three manuals available in English. It has however certain limitations and certain faults which render it to a degree unsatisfactory. This is particularly true from the standpoint of the American student of plant pathology.

When the first edition of this text appeared in 1910 it was

evident that the author had given but little attention to the American literature. Many diseases of importance in the United States are not mentioned in the book, and the discussion of those included is in numerous cases inadequate. The citations to American literature are comparatively few. It may be fairly stated that many facts developed within the past ten years which fall rightly within the limits of the subject matter presented are omitted. This is especially noticeable as regards methods of control.

While the book serves a useful purpose as a general reference work in a field on which few good texts have been prepared its usefulness is distinctly limited. It is to be regretted that the author has not been able to thoroughly revise the text and bring the subject matter up to date. The pages are marred by numerous minor inaccuracies which should have been eliminated.

HARRY M. FITZPATRICK

PROCEEDINGS OF THE CLUB

FEBRUARY 23, 1916

The meeting of February 23 was held in the morphological laboratory of the New York Botanical Garden at 3:30 P.M. President Harper presided. Twenty-two persons were present.

The minutes of February 8 were read and approved.

Mr. James H. Jones, 315 E. Fordham Road, N. Y. City, was nominated for membership.

The question of the adoption of the proposed amendments of the Constitution was next considered. A formal vote on the adoption of the amendments was then taken, the result being ten votes in favor of, and eight against the amendments. A two-thirds vote of those present being necessary for their adoption the amendments were declared rejected.

Mr. James H. Jones was then elected to membership.

The announced scientific program consisted of a paper on "The Agriculture of the Punjab," by Mr. R. R. Stewart.

A second paper by Dr. F. W. Pennell on "First Impressions of the Rockies" was postponed.

Meeting adjourned.

MICHAEL LEVINE,
Secretary pro tem.

MARCH 14, 1916

The meeting of March 14, 1916, was held at Schermerhorn Hall, Columbia University, at 8:15 P.M. President Harper presided. Forty persons were present.

The program of the evening consisted of an illustrated lecture on "Reef-building and Land-forming Algae," by Dr. Marshall A. Howe. Reference was made to the recent increase of interest in the lime-secreting algae in connection with an increasing recognition of their geological importance. Photographs were exhibited showing habit, structure, and habitats of various types of calcareous algae, with special reference to the living species of the West Indian region. In addition, photographs illustrating habit and structure of certain fossil Lithothamniece of the Panama Canal Zone and of the Leeward Islands were shown. The main facts and opinions as to the geological significance of the algae have been summarized by the speaker in a paper on "The Building of 'Coral' Reefs," which was published in *Science* in May, 1912.

Adjournment followed.

B. O. DODGE,
Secretary

NEWS ITEMS

Dr. E. D. Ball, director of the experiment station and school of agriculture of the Utah Agricultural College has resigned, to take effect at the end of the present year. Dr. Ball plans to go back into entomological work. Dr. F. S. Harris, professor of agronomy, has been elected director of the experiment station, and Dr. G. R. Hill, professor of botany and plant pathology, director of the school of agriculture.

Thomas Jonathan Burrill, LL.D., Ph.D., etc., connected with the University of Illinois since 1868, died on Friday, April 14, in Urbana, Illinois, in his seventh-eighth year. He was born in Pittsfield, Mass., and, after being graduated from the Illinois State Normal University in 1865, later received honorary degrees from Northwestern University and the University of Chicago. Professor Burrill was formerly professor of natural history, botany, and horticulture at the University of Illinois, from which

he retired as professor emeritus in 1912. For many years he was vice-president, and for four years acting president of the University of Illinois. He was formerly connected with the United States Agricultural Experiment Station.

President M. A. Brannon, of the University of Idaho, addressed the Journal Club of the University of Washington on March 20 on the subject "Neo-botany."

Professor C. A. Davis, for many years connected with the U. S. Bureau of Mines and one of the chief authorities on peat in the United States, died at Washington, D. C., on April 9 at 55 years of age. Dr. Davis was transferred from the U. S. Geological Survey to the Bureau of Mines in 1910 when the latter was organized. One of his most recent contributions was in the work of M. L. Fuller on the "Geology of Long Island," where Dr. Davis made some observations on salt marshes and coastal subsidence.

Mr. W. L. Eikenberry, who for seven years has been teacher of botany in the University High School and summer quarter assistant in the College of Education of the University of Chicago, and editor of botany department in *School Science and Mathematics*, has been appointed assistant professor of the teaching of biological subjects in the University of Kansas. He will begin his work in the University of Kansas in September, 1916. During the coming summer, Mr. Eikenberry will give a two weeks' course of lectures on science teaching in Oregon State Agricultural College, and also in the University of Montana.

Professor A. S. Hitchcock, systematic agrostologist of the U. S. Department of Agriculture, has gone to Honolulu to study and collect the grasses of the Hawaiian Islands. He will be accompanied by his son Albert E. Hitchcock as assistant.

Dr. William S. Cooper, of the University of Minnesota, department of botany, will spend June and July in ecological work upon the chaparral of California, and August in studies of moraine vegetation in southeastern Alaska.

The Torrey Botanical Club

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OTHER PUBLICATIONS

OF THE

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(1) BULLETIN

A monthly journal devoted to general botany, established 1870. Vol. 42 published in 1915, contained 698 pages of text and 33 full-page plates. Price \$3.00 per annum. For Europe, 14 shillings. Dulau & Co., 37 Soho Square, London, are agents for England.

Of former volumes, only 24-42 can be supplied entire; certain numbers of other volumes are available, but the entire stock of some numbers has been reserved for the completion of sets. Vols. 24-27 are furnished at the published price of two dollars each; Vols. 28-42 three dollars each.

Single copies (30 cents) will be furnished only when not breaking complete volumes.

(2) MEMOIRS

The MEMOIRS, established 1889, are published at irregular intervals. Volumes 1-15 are now completed; No. 1 of Vol. 16 has been issued. The subscription price is fixed at \$3.00 per volume in advance. The numbers can also be purchased singly. A list of titles of the individual papers and of prices will be furnished on application.

(3) The Preliminary Catalogue of Anthophyta and Pteridophyta reported as growing within one hundred miles of New York, 1888. Price, \$1.00.

Correspondence relating to the above publications should be addressed to

DR. BERNARD O. DODGE

Columbia University

New York City

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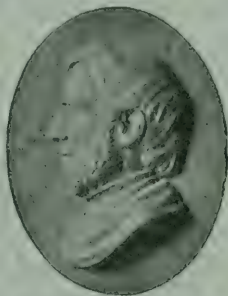
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EDITED FOR

THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR



JOHN TORREY, 1796-1873

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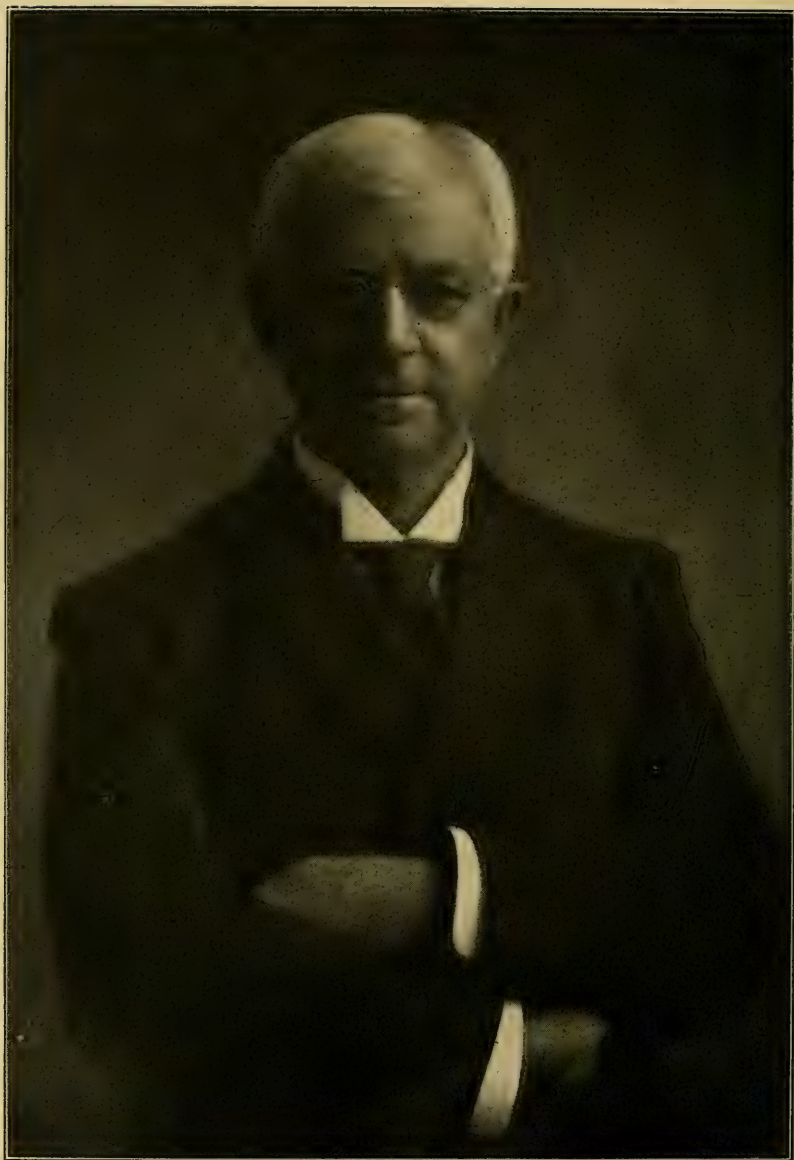
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Brooklyn Botanic Garden

Brooklyn, N. Y.



Edward Lee Greene

BORN, HOPKINTON, R. I., AUGUST 20, 1843
DIED, WASHINGTON, D. C., NOVEMBER 10, 1915

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July, 1916.

Vol. 16

No. 7

THE BOTANICAL WORK OF EDWARD LEE GREENE*

BY HARLEY HARRIS BARTLETT

Edward Lee Greene was born in Hopkinton, Rhode Island, August 20, 1843. His appreciation of the beauty of plants showed itself at a very early age, and was wisely fostered by his mother. At the meeting of this Society which was devoted to the celebration of his seventieth birthday he told us that his earliest vague childhood memories were of the geraniums in his mother's window. By the time he was eight years old he had a neighborhood reputation for his knowledge of the wild flowers.

His first serious botanical work was done after his family moved west. It was probably in 1859 that he came under the influence of an inspiring friend and teacher, who encouraged him to make botany his life work. Dr. Greene has written of this friend: "A purer, nobler type of the naturalist of the reserved and quiet, non-advertising class, there probably was not, in his day, than Thure Ludwig Theodore Kumlien. . . . It was evident, not only from the friendly correspondence which was

*A paper prepared for presentation before the Botanical Society of Washington, of which Society Dr. Greene was in a sense the first President. The present Society was formed in 1901, by the union of the Botanical Seminar, an informal organization without officers, dating from 1893, and the Washington Botanical Club, of which Dr. Greene was the President from the time of its founding in 1898, until the reorganization took place.

For material the writer is under obligations to friends and relatives of Dr. Greene whose contributions will be explicitly acknowledged in a more extended biography which is in preparation. More than to any others, however, the writer is indebted to President John Cavanaugh, C.S.C. and Dr. J. A. Nieuwland, of the University of Notre Dame. The plate for the picture of Dr. Greene appearing with this article has been loaned by the University of Notre Dame through the kindness of Dr. Nieuwland.

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always kept up between them, but also from many a pleasing anecdote which we were wont to hear of life and study and travel in intimate companionship with his revered master, that Mr. Kumlien had been, while at Upsala, a very special favorite among the botanical pupils of Professor Elias Fries. How thoroughly worthy the youth must have been, of the particular attention of the great Swedish botanist of the nineteenth century, was still manifest in Mr. Kumlien when I first made his acquaintance, some sixteen or eighteen years after his arrival in this country. He was then a sort of second and American edition of Fries, in his almost equal familiarity with each of the following great departments of botanical study; phanerogams, ferns and their allies, mosses, lichens and fungi. He had, in 1860, and I know not how long before, so well mastered the extensive and varied flora of southern Wisconsin, that there was no indigenous tree or shrub, flower, grass or sedge, or moss or hepatic, lichen or mushroom, the scientific name of which was not at his tongue's end for you at any moment. I am confident that, notwithstanding our considerable list of worthy names in American botany, no state in our Union has ever had so complete a master of its whole flora, as Wisconsin had in this extraordinary man, whom our eastern botanists seldom heard anything of; whom, with his low stature, muscular frame, rather stooping shoulders, light hair and keen blue eyes, a stranger might have mistaken, as he passed along the country roads, for an ordinary farmer from the Scandinavian settlement; who in the most polished society would have been recognized as an intelligent, refined and almost courtly gentleman; in whom any scholar would have found a finished collegian of the old Swedish school whose pen could indite Ciceronian Latin and whose tongue could address a foreigner in, I believe, any one of the languages of Europe spoken between Spain and Sweden."

Such was the man who passed on to Greene the best traditions of European botany. It may safely be said that his influence and teaching were of much greater value to Greene than the more formal education which he received at Albion Academy, an institution of collegiate standing from which he graduated in 1866, with the degree of Ph.B.

During the Civil War Greene served in the Union army as a private. It is related that he carried in his knapsack a copy of Wood's Classbook of Botany, and that whenever the exigencies of campaigning permitted, he was busy collecting and determining plants. Mr. Tidestrom has told us that the young soldier of nineteen made a collection of plants on the battlefield of Fort Donelson, which was mounted in an album by his mother and exhibited at a fair of the Sanitary Commission in Chicago. It was sold for \$50 and the proceeds used for the relief of sick and wounded soldiers.

After the war his botanical studies were continued earnestly and he entered into correspondence with several prominent botanists. I shall quote from his own manuscript, written, apparently, about 1890.

"My earliest botanical correspondence was with Professor Alphonso Wood and Doctors Asa Gray, George Engelmann and John Torrey. Between the years 1863 and 1867 I addressed several notes of inquiry about plants to Professor Wood, receiving courteous and helpful replies; but these are long since lost. The same fate has befallen two or three kindly communications from Asa Gray with which I was favored in 1869, while studying somewhat carefully and critically the flora of central Illinois. One of these was an unexpected note, along with which there was returned to me, through his hands, a piece of manuscript which I had sent to the American Naturalist for publication. The latter was to inform me that the article, on a proposed new *Tradescantia*, had been submitted to him for approval, and that he disapproved its publication; that in Kunth's Enumeratio more species of *Tradescantia* were credited to the United States than he himself was able to distinguish.

"To this communication I made a brief response, giving further reasons for holding my plant thoroughly distinct from *Tradescantia virginica*, with which he had always confused it. To this he gave a brief answer, advising me, as I well remember, though the letter is lost, to communicate with Doctor Engelmann on the subject of my proposed new *Tradescantia*, adding that this botanist was more skillful than himself in detecting specific characters.

"Being already in correspondence with Doctor Engelmann regarding certain oaks of middle Illinois, I made mention of the *Tradescantia*, receiving the following in reply; and it is the earliest of his letters to me which is still preserved.

" "ST. LOUIS, Jan. 26, 1870.

" 'Dear Sir:—

I have for many years taken an especial interest in Oaks, and wish to obtain specimens of your *Quercus Leana*, but if possible with the fruit on the branch. I collect oaks a little before the fruit is ripe, say in September, and run a pin through the cup so as to attach the base of the acorn firmly. If possible, the specimens ought to show also the young fruit of the same season and the old maturing one of the last (eighteen months old). And when the tree is easily reached the flowers ought to be gathered (about the first week in May).

" 'The tall *Tradescantia* is the only one I have ever seen in cultivation in Europe, where it is the common one, always under Linné's name, *T. virginica*. I can, as you do, always distinguish the low one, but not by any character of flower or fruit. I find that many years ago I even examined the parts microscopically and found the epidermal cells different. I also cultivated them. One might try and hybridize them, if flowering at the same period. As the modern views make species a less definite entity the importance of what is a species and what are varieties lessens wonderfully.

" 'I hope you will have a pleasant and successful trip.

" 'Yours truly,

" 'G. ENGELMANN'

"The concluding sentence of Doctor Engelmann's letter relates to a purpose which I had formed, and which I had mentioned both to him and to Dr. Gray, of spending the season of 1870 in the Rocky Mountains of Colorado. My interest in the vast and then very little known flora of the far-western Territories had been awakened during my early school days, chiefly by occasional readings of the botanical parts of various Pacific Railway Survey Reports. My earliest teacher and companion in botanical studies, Professor Thure Kumlien (I have given a

sketch of the life of this early botanical friend and helper in *Pittonia*), had been in possession of these, and we had often looked over them together, admiring the wealth of those new regions in species and genera to us unknown; he regretting the improbability of his ever travelling so far from his Wisconsin home, but more than once fondly prophesying that his boy friend would go there, and would do much for the development of the botany of those new lands.

"In writing to Dr. Gray, late in 1869, I had expressed my purpose of going, and had asked him what books and papers bearing in Colorado botany were available; and his response, though brief, was most generous. It reads as follows:

" 'BOTANIC GARDEN, CAMBRIDGE, MASS.

" '12 Jan. 1870.

" 'MR. GREENE.

" 'Dear Sir:

" 'Dr. Torrey having come on to visit me, I have hardly had time to attend to anything but him. But I have now put up a parcel containing the Flora of North America and a few smaller things, and it will go to your address tomorrow. Well, in Colorado please send me what you can—notes and collections.

" 'Very truly yours,

" 'A. GRAY'

"The copy of Torrey and Gray's Flora which was thus furnished me by the kindness of its chief author is still in my possession, and is held as one of the best treasures of my library. It has been my companion upon many a thousand miles of western travel, and my surest guide in the study of the plants of Colorado, Wyoming and New Mexico, of Arizona and California, of Oregon and of Washington, Idaho, Montana and Nevada. I have given expression to my appreciation of it somewhat at length, in the first volume of *Pittonia*.

"The 'smaller things' referred to in the above letter were selections from his earlier Contributions, as they were called, published in the *Proceedings of the American Academy of Arts and Sciences*. The paper on New Plants of California and

Nevada, collected by Brewer, and also the monograph of *Astragalus* and *Oxytropis*, were among them, and were documents of great usefulness to one entering upon the study of Colorado botany thirty years ago.

"My departure from Decatur, Illinois, for Colorado Territory, was taken in early April, 1870. By the then new transcontinental railway I was conveyed, by way of Cheyenne, within three days, to Evans, Colorado. The last day's travel was through a snow-storm which concealed the landscape, so that I was at the base of the Rocky Mountains without having seen them. The snowing ceased after night-fall, the sky clearing beautifully before morning, so that on going forth from my hotel lodgings at Evans just after sunrise, I had there my first view of the long dreamed of land of botanical promise. The prospect of early vernal botanizing was less inviting than it might have been; yet the landscape was beautiful beyond description; for not only Long's Peak, so grandly conspicuous from Evans, but also the whole hundred miles' length of outlying foothills, all lay in the dazzling sun-lit whiteness of fresh-fallen snow.

"But how transitory April snows may be in these fair fields I learned before noon of that warm sunny day. The day was chiefly occupied in the passage by stage coach to Denver, fifty miles distant; and before the middle of the afternoon all the snow was gone from the plains and lower foothills.

"On the bright spring morning following the arrival at Denver, I attempted what I supposed would be a mere early morning walk to the nearest foothills. I was naturally eager to see what floral indications of spring the plains and hills had to show. This desire was happily satisfied, and at the same time I learned, incidentally, how deceptive distance is in these regions, when, owing to the elevation and absence of humidity, the air is so thin and transparent. The little line of rounded grassy hills which I had judged to be three or four miles away seemed almost as distant as before when I had been walking directly towards them for an hour. And the long day was consumed in reaching what I had believed would be the easy goal of a not very long morning walk.

"Only a few flowers were observed. It was too early to expect them; but those hardy Umbelliferae, *Cymopteris* and *Peucedanum*, with their leaves and peduncles appressed to the ground, were showing their flowers, and the charming *Townsendia sericea* showed its cushioned tufts, of small narrow leaves, densely covered with its large white daisy-like stalkless heads. These and several more, all so strangely new to me that I did not even know their genus names, made the whole long day of walking a delight.

"Denver in 1870 was but a small country town of perhaps seven thousand inhabitants. The second day's excursion brought me early into the valley of Clear Creek, to a prosperous farming settlement, and at one of the more commodious of the farm houses, that of Mr. Joseph Dudley, a farmer from Maine, I was soon established for the season. The time until late in June was given to the immediate valley of Clear Creek, the plains between them and Denver, and the foothills about Golden City. In July and August I made several excursions to the alpine regions of the more distant mountains; and the autumn months were given to the study of the numerous asteraceous plants of the plains and foothills, many of which were of genera wholly unknown to me.

"The cactus flora of the region was also something new to me, and attracted much attention, besides bringing me into further correspondence with Dr. George Engelmann, at that time the only botanist of the United States who had ever undertaken the study of them, with the exception of Nuttall and Rafinesque, men of an earlier generation, who had done their work and passed from the scene before ever the real cactus region had been opened to exploration.

"In response to some questions as to the best method of preserving for study the flowers of cactaceous plants, I received from Dr. Engelmann the following.

" 'ST. LOUIS, April 15, 1870.

" 'E. L. GREENE, ESQ.

" 'Dear Sir:—

" 'So you are in the mountains! Good!

“ ‘The preservation of cactus flowers is not easy, as they are of a soft juicy tissue and are generally pressed so much that the parts are mashed, glued together and spoiled for further examination. The best method is to press the flowers; but for further examination a withered flower is better than a pressed one, as I see every day, now that I am examining Cactaceae from Nevada, Sonora and Lower California. The withered flowers can be soaked and the parts expanded, which is not possible with hard-pressed ones.

“ ‘To make as complete a specimen as possible, it would be well to slice the top of the plant (say a *Mamillaria*) off, then to get a lateral slice including the youngest areolae or spines, then horizontal sections through the middle, flowers and fruit not to be detached; then press flowers alone in cotton, if possible, and gather fruit; and at last get a flowering specimen and take it along, fresh or drying or dried, just as it chances.

“ ‘Collectors that were not botanists have sometimes done better than botanists because they just wrapped the plants up and packed them away. I am now soaking and developing such, and in several instances have been agreeably surprised by finding that in such condition the flowers had matured their seeds sufficiently at least for the botanist, if not for the horticulturist.

“ ‘Flat-jointed *Opuntiae* may be sliced, as you suggest. Don’t forget the seeds, or rather, the fruits! We want good fruit (to propagate) even of the common *Mamillaria vivipara*, which you will meet abundantly, with its beautiful rose-colored large flowers. But *Echinocactus Simpsonii* is the great desideratum, living or in seed. I believe I have described it to you before. It is much like *M. vivipara* in appearance, but the flowers come out from the top (not from the base) of the tubercles next to the bunch of spines. I have just now before me a very fine form of the same plant from Nevada; but the species, which represents a very curious section of *Echinocactus*, is not yet in cultivation.

“ ‘I am much interested in *Coniferae*, but believe I know all about these plants in Colorado.

“ ‘Write to me, if you think my advice can be of any assistance to you.

“ ‘Yours truly,

“ ‘G. ENGELMANN.

“ ‘P. S. Other plants that interest me considerably are the yuccas. Specimens, notes, ripe fruit and seeds are valuable.’

“ ‘The early spring botanizing about Denver, and among the nearer foothills, yielded quite a number of carices, almost all of which were new to me; and Mr. Stephen T. Olney, of Providence, Rhode Island, being at that time the principal American student of these plants, I addressed to him a request that he examine my specimens of this genus, and report to me their names. It was the beginning of a pleasant correspondence. Here is his first letter.

“ ‘17 BROWN ST.

“ ‘PROVIDENCE.

“ ‘June 11th, 1870.

“ ‘EDWARD L. GREENE, ESQ.

“ ‘DENVER, COLO.

“ ‘*My Dear Sir:*

“ ‘In reply to yours of 4th inst. I will not only do what you ask in regard to *Carex*, but shall consider it a great favour into the bargain, as the sight of all collections in this interesting genus is of great advantage to me in the work I am upon, a monograph of North American *Carex*.

“ ‘Dr. Parry and Hall & Harbour got many interesting species in Colorado Territory. Then I have as well Fendler's New Mexican, Sereno Watson's Utah & Nevada, Bolander's &c. Californian Survey, submitted to me for naming. I have also seen a portion of Hayden's collection in Nebraska, many imperfectly named by good old Dr. Dewey. The Douglas, Drummond and other Rocky Mt. Carices I have seen in Torrey's &c. herbaria.

“ ‘I should not feel it right to trespass upon your kindness in offering to send me from other genera, but should feel it a favour if you could supply me any plants not in Hall & Harbour or Vasey's collections, at usual “rate of compensation,” or perhaps

I might take a complete set if informed of its character and how large it might be.

“ ‘My herbarium is going to Brown University, at least if they have the enterprise soon to provide safe quarters for it.

“ ‘Are you the son of a townsman of mine? If so, I extend to you the greetings of a Rhode Islander and

“ ‘Am truly yours,

“ ‘STEPHEN T. OLNEY.

“ ‘A *Carex* should be collected when its fruit is just so ripe and plump that it will not fall off, and root-stocks are always desirable. No more pressure should be put on them than is needed to keep the leaves flat, not so much as to crush the angles of the culms. Spikes with very ripe fruit in paper bags, if procurable at all, are very desirable, not pressed at all; but these refinements in collecting will hardly do when interruptions may occasionally occur, when one’s scalp may be in danger.’ ”

That the conclusion of Olney’s postscript was by no means altogether fanciful is brought home to us by an anecdote which Dr. Greene told at the memorable seventieth birthday meeting held in his honor by this Society. In 1870 he was collecting in an unsettled region to the west of Denver. His botanizing had led him about a quarter of a mile into an attractive valley, when he looked up and caught sight of an Indian on horseback. It was useless to attempt to retreat, so he continued his work as though quite oblivious of any danger. Indians seemed to appear from nowhere, until he thought there must have been 150 in the valley. Their chief demanded the bag which Greene carried. When he found nothing in it but plants he handed it back with the exclamation “Ugh! Medicine Man.” He asked Dr. Greene’s name, and in return said that he was Colorao. This notorious chief of the Utes was much feared by the settlers, and less than three years after this meeting with Greene he murdered an entire agency.

With the letter from Olney, the autobiographical fragment which we have been following practically ends. Greene appears to have written it originally in 1884, and to have copied and recast it six years later. The few pages of the earlier manuscript

which remain include letters from Dr. Gray (referred to by Greene as his "earliest happy correspondence with this most eminent of American botanists"), together with a list of the plants collected during the first season in Colorado, as determined by Gray and annotated, after the lapse of twenty-five years, by Greene himself. One of the letters is too interesting to omit. Greene writes: "The next letter came toward the close of my first season's work upon the botany of Colorado, and, as will be seen, relates mainly to the method of laying before him the results of the summer's collecting."

"BOTANIC GARDEN, CAMBRIDGE, MASS.

"Aug. 6, 1870.

"*Dear Mr. Greene:*—

Yours of July 27 is just in. Well, I think you would do well to send me, at the end of the season, a full set of all the plants which you do not know as in my Manual. Number the specimens, and I will return names, in as far as I can name them off hand, without special looking up—which may have to be postponed—and also any that strike me as of special interest. Such, of course, I shall be tempted to examine at once.

"If you send nice, or even fair specimens—as I hope—some will go into my herbarium at once, and all the rest will, if I do not care to keep them, go to some foreign correspondent whom I need to oblige, and who will be glad to have them.

"I hope you may find some new things; but you will be sharp if you do.

"Excuse haste, and believe me to be

"Very truly yours,

"ASA GRAY."

In a general review of the development of Rocky Mountain botany which he wrote only a few years ago, Greene alluded to this letter of Gray's as indicating a curiously inadequate idea of the richness of the western flora. "In this year 1870," he wrote, "it was the opinion of the highest authority that by the copious gatherings of Parry, Hall and Harbour, the botanical field of the Rocky Mountains had been well nigh exhausted." How far from the truth this idea was, the later work of Greene himself

attested. Yet it must not be forgotten that the fundamental conceptions of the two men in regard to species were absolutely unlike. Gray was extremely conservative; Greene was from his youth an American Jordan. For fifteen years, however, he deferred to the views of the older botanist, at least as far as publication was concerned. During this period, he tells us, the numerous new species which he collected, "in as far as published at all, had been published in the main by Asa Gray; this also not so much by sending him new types as by indicating the characters of species long in his possession, but wrongly placed by him because of his failure to see the characters."

The restraint imposed upon the younger botanist during this time may not have been wholly unfortunate for the cause of science. If we call to mind the case of his *Tradescantia*, we recognize, on the one hand, Greene's keenness of perception and accuracy of observation in pointing out the distinctness of the plant which is now kept up in our books as *T. brevicaulis* Rafinesque. We must admit, on the other hand, that Gray was quite justified in calling to Greene's attention his lack of knowledge of the literature of the subject. Early repression of his desire to publish only intensified Greene's ambition to possess bibliographical knowledge and facilities which should be second to none. We all know how this ambition was realized, for it was he who really introduced into America ideals of sound scholarship in the historical phases of systematic botany. His erudition in everything that concerned the older botanists was profound. The value of his precept and example in this field it would be hard to overestimate.

Greene wrote in 1910: "I shall never be chargeable with having been premature in making my beginnings at authorship on Rocky Mountain botany. To the study of this flora and other more or less related floras, to the eastward, westward and southward of it, I had devoted sixteen years; and a very considerable part of the knowledge gained so laboriously and devotedly, I had given to another to publish as his own. I was already forty-two years old and more, when, in 1885, I published my own first paragraph of new Colorado botany."

But to resume the thread of our narrative; at the close of his first season's botanizing Greene tells us that he had become enrolled as a regular candidate for Holy Orders in the Episcopal Church. Consequently in early spring he entered the Bishop's Collegiate and Divinity School at Janis Hall, Golden City, Colorado, both as teacher of science and student of divinity. After he became a minister he asked for duty in out-of-the-way places, in order to prosecute the better his chosen avocation. As an itinerant clergyman he acquired such a knowledge of far western botany as no individual had ever before, or probably has ever since, acquired at first hand. Professor Aven Nelson, than whom no one is in better position to know, has said: "The intimate field knowledge of the earlier decades of his career forms the basis for the discriminating work that is now the marvel and the despair of those of us who have drunk less deeply at the Pierian spring."

During his journeyings as a missionary he travelled thousands of miles on foot through dangerous and difficult country, often carrying only his plant press and a few changes of socks. In order to minimize the danger of losing his money, he sent it ahead in post office orders. In 1877 he made a trip on foot from San Diego, California, to Santa Fé, New Mexico. At that time the journey was ordinarily made by stage coach, for there were as yet no railroads in southern California. He encountered Indians, who did not offer, however, to molest him, and made friends on the way with a notorious bandit, "a fair-spoken, likable man, with polished manners," who conversed freely of outlaws and recommended them to Dr. Greene as good fellows to be with. After he passed through Yuma, the local paper published this item:

"Last Saturday evening the Rev. Edward L. Greene reached Yuma on foot from San Diego. On Sunday morning he preached an excellent sermon to a fair congregation, and another in the evening to a large one. On Tuesday morning, refusing all offers of transportation or financial help, he continued his way eastward. This is solid pluck in big chunks. Boys, get acquainted with him. You will like him and will find that he is no chicken-eating bummer."

On one of his excursions he discovered a beautiful valley about forty miles from Silver City. His glowing account of it induced some of his friends to choose it as a camping place, and there they were all murdered by Indians. Obviously, Dr. Greene must have had his narrow escapes; sometimes, perhaps, when he was quite unaware of the risks he was running. There is doubtless much old correspondence extant from which more details of these years of wandering may be gleaned. (His friends are urged to communicate to the writer any material which could fittingly be used in a more extended biographical account which is in preparation.)

A new phase of Greene's career opened in 1885, when he gave up the ministry to become an instructor in botany at the University of California. He was now forty-two years of age. Five years previously he had published his first botanical article, but now, under more favorable conditions for literary work, his development as a botanical author was very rapid. He had laid well the foundations for productive scholarship, and before the end of five years his publications had made him a factor to be reckoned with in the botanical world. His six important papers entitled "Studies in the Botany of California and Parts Adjacent" were the first noteworthy contributions to western botany published in the west by a resident botanist. On account of them the early volumes of the Bulletin of the California Academy of Sciences are prized as records of lasting value. The final paper of this series appeared in 1887, and in the same year was begun the publication of "*Pittonia*, a series of papers relating to botany and botanists." This publication, like several others which followed it in the course of years, was privately printed. Greene never grudged money which went to pay the printer. If anyone bought his volumes, well and good. But if he did not sell them directly, there was another and even more pleasing way to realize upon his investment. Each year the foreign book dealers with whom he dealt would sell a considerable number of his volumes and give him credit, which he would use in the addition of treasures to his library.

Five volumes of *Pittonia* were published, two of them in

California, the last three in Washington. If Greene had remained in California, it is likely that the new serial *Erythea*, which he established at Berkeley, would have permanently superseded *Pittonia*, and that no more than the first two volumes of the latter would have appeared. Aside from these serials, the busy years at the University of California saw the publication of *Flora Franciscana*, which was never completed, and of the *Manual of the Botany of the Region of San Francisco Bay*. He also edited for publication Kellogg's illustrations of West American oaks, for which he wrote the accompanying text.

Prior to beginning his "Studies in the Botany of California," Greene had had twenty short articles in the *American Naturalist*, *Botanical Gazette*, and *Bulletin* of the Torrey Botanical Club. These were of course carefully scrutinized by Gray, who did not attempt to conceal his distrust of the work of the younger man. When the first installments of the "Studies" reached him he reviewed them as follows: "They show a quickness quite equal to the author's well known quickness and acuteness in observation. Besides the interesting new material here elaborated—much of it gathered in an enterprising expedition by boat to the islands of Lower California—there is a good deal of reconstruction of old species, a large number of new ones, and several new or restored genera of plants. Valuable as these contributions to our botany must be, we suppose that more time for elaboration, less confidence as to specific distinctions, and a more restrained judgment about genera might have made them better. Yet opinions will naturally differ in botany as well as upon other subjects."

Gray's reception of "*Pittonia*" was even more curt: "We may infer that *Pittonia* is in reference to the family name of Tournefort, and that the publication may have had for its model the *Adansonia* of Baillon; but the ideas of genera and species are on quite another model. Perhaps the plan may be that of the *Linnaea*; for, as in that occasional rather than serial publication, a portion of the pages is given to reviews of recent botanical literature. Good botanists have followed Decaisne in referring the Big-roots to *Echinocystis*; but we suppose that the

validity of the genus *Megarrhiza* may still be seriously defended. The various new species of *Trifolium*, *Zauschneria*, etc., and the recast of *Krynitzkia*, *Plagiobothrys*, etc., into new forms may be safely left to the final judgment of competent botanists. Professor Greene's judgment and ours are widely divergent."

Long after, when Greene was a professor at the Catholic University of America, he wrote: "It is now more than sixteen years since the first installment was issued of the 'Studies in the Botany of California and Parts Adjacent'; and a retrospect reveals it that these 'Studies' had somewhat more in them of far-reaching consequence than the author of them could have anticipated. This first issue appears to have been the only paper published in our country in the life-time of the then venerable author of the 'Contributions to Botany' which had the effect of awakening in his mind any serious apprehensions as to the future prevalence in American botany of his own rigidly conservative taxonomic principles. Away back, almost at the beginning of his career, he had been confronted with innovators, like Rafinesque and Buckley, and had promptly placed their various propositions under the ban of his disapproval, which ban has now been removed, so that these men now live again, in their works, which are found to contain much in the line of actual, and very valuable, contributions to plant taxonomy. So, also, the 'Studies,' while not proclaiming, formally, any new principles, though implying reformatory doctrines in almost every paragraph, were also promptly, but with a gentleness not always characteristic of that author, anathematized. Two years later, however, the ban was completely removed, when the author of the 'Contributions' adopted precisely the reformed *Escholtzia* and the reformed *Sidalcea* of the 'Studies' which he had condemned, and today it will nowhere be questioned that the taxonomic reform now prevailing everywhere amongst us had its initiative in the first number of the 'Studies in the Botany of California and Parts Adjacent.'"

Greene was one of the last of the old type of self-trained men to attain a high professional position in botany. He entered botany as Nuttall, Torrey and Gray had done before him, with-

out having had a conventional university training in his chosen field. Moreover, at the time he received his appointment at the University of California, he was already in the beginning of middle life, and a training similar to that of the younger men who were elsewhere founding departments of botany in our universities and colleges had not been available to him. Although he held advanced views in taxonomy, and was rapidly acquiring the profound knowledge of the history of botany for which he was famous in later years, he was not trained in the newer phases of the science which were just being introduced, as it were, from Germany.

As we should expect, therefore, the department of botany which he founded at Berkeley bore an old-fashioned stamp. As late as the academic year 1892-'93 the courses offered were the introductory course in "vegetable structure and morphology," in which he was associated with Marshall A. Howe, now of New York. Greene offered three other courses, entitled "Systematic and Economic Botany," "Advanced Systematic Botany," and "Medical Botany." His associate, Howe, gave "Cryptogamic Botany."

Greene ranked as instructor during only one academic year, 1885-'86. The following year he was made assistant professor. Five years later he became associate professor, and the year following he was advanced to a full professorship. In all, he served ten years at Berkeley, during which time he built up a strong department and was held in high esteem for his scholarly attainments. In the report of the president of the University for 1891-'93 we find: "In the department of botany much good work has been done with the students and still more in classification and correspondence. In 1892, at the World's Congress of Botanists held in Genoa, Professor Greene was named as a member of the International Committee on Botanical Nomenclature, one of three members from the United States. He was president of the Botanical Congress held in connection with our Columbian Exposition at Madison, Wisconsin."

In the university librarian's report for the same year we find a lament which cannot fail to bring a smile to those who know

how Dr. Greene loved books: "A new separate department of study like botany or pedagogy is established; and at once it claims its share of whatever money is available for the purchase of books (which income unfortunately does not increase) and the appropriations for older departments, like history, linguistics, or philosophy, are decreased. In this manner, all maintain a wretched existence on famine allowance."

Dr. Greene's propensity for buying books never grew less. Throughout his life he sacrificed even the comforts of living in order to buy books, to pay for the printing of his privately published volumes, and to travel in search of plants. Of his library and herbarium, more will be said later.

Professor Greene had leave of absence the first half of the year 1894-'95, and resigned at the end of the year to accept the professorship of botany in the Catholic University of America at Washington. He left his department in a flourishing condition. Howe and Jepson had taken over the course in structure and morphology; Jepson was associated with him in the courses in systematic and medical botany; Davy, now in South Africa, had taken over the economic botany; and Greene himself had added courses in the "History of Botany" and the "Phanerogamic Natural Orders."

Greene's impress upon the University of California remains to this day. Except at Harvard there is no university where the systematic tradition has been upheld as it has been at Berkeley. To be sure none of Dr. Greene's successors at the University of California are advocates of his methods and beliefs in taxonomy, but the fact remains that Greene was able to establish on the Pacific coast a center of systematic research of such vitality that it has held its own and prospered in competition with the same forces that have elsewhere brought about the decline of systematic botany.

During the ten years at Berkeley, teaching and literary work of course somewhat diminished the time available for collecting. Every vacation, however, was used for a trip to some previously unvisited part of the state. At the time of his removal to Washington, his herbarium had assumed enormous proportions

for a private collection, and its richness in type specimens made it one of the most valuable in America.

Dr. Greene had become a Roman Catholic prior to his departure from California. In 1894 the University of Notre Dame conferred upon him an honorary doctorate, and in 1895 he entered upon his new duties at the Catholic University in Washington. Here he found himself in an entirely new environment. In an institution largely devoted to theological instruction, there were few students in his department. Conditions on the whole were uninspiring and unfavorable to scientific work. He gave up his position in May, 1904, and from that time until a short time before his death he was connected with the United States National Herbarium and the Department of Agriculture.

During the period of his professorship at the Catholic University he continued his systematic and historical work with unremitting perseverance, and published, in addition to numerous miscellaneous papers, the last three volumes of *Pittonia*. He began at once a new serial, "*Leaflets of Botanical Observation and Criticism*," of which two volumes were printed. A few pages of the diary kept by him the summer after he left the Catholic University are preserved among his papers, and give a vivid picture of his activities at that time. The one or two amusing touches might perhaps be more discretely omitted, but to old friends and associates of Dr. Greene they are hardly calculated to give offense.

DIARY. AUGUST, 1904.

"August 1. Ascertained again original of *Eschscholtzia Douglasii*, and worked on the species, drawing up a new diagnosis, from Oregon and Washington specimens by Suksdorf and Cusick.

"From various notes made last week, began writing the Neckerian Genera of Cactaceae.

"At 3:30 p. m., found . . . struggling with an . . . from Georgia, of which a fine printed plate and mounted specimens were before him; a plant with articulated hollow petioles at base of stem, with no blade developed. He had been trying to make

it a *Carum*. My first glance suggested *Sium* and I said so. He pointed to the jointed petioles. I said: does not my *Sium heterophyllum* have below its leaf-blades jointed petioles? A search for my specimens showed such to be the case in that and some other species of *Sium*; and so I wonder what conclusion he will reach as to the genus.

"August 2. Letter to Parish with names of plants identified. Wrote on Necker's Cactaceae, but with little success.

"August 3. Look up Necker's Cact. again; went into a more general study of his system and terminology; rewrote one page of my paper. Gave time to . . . on the subject of type for Linnaean *Cactus*, a name that should not be maintained at all; showed him, out of the Philosophia Botanica that *Cactus* is, with him, merely abbreviated from *Melocactus*, which later is therefore the type of *Cactus* with Linnaeus; which is what . . . wants, and this revelation pleased him. He consulted me also about *Dalea* as a genus name, to be taken up as a synonym from Linn. Sp. Pl., instead of *Parosela* Cav. Of course, *Dalea* is the name for the genus by simple priority, irrespective of its suppression by Linnaeus, as I said; but I also assured him that *Dalea* should be taken up, if need be, as prior by its place in the synonymy of Linn. Sp. Pl.

"Received today a fine copy of Caesalpino from Junk of Berlin; also from Wesley and Son Lindern's two books on Alsatian botany. Ordered more books from Junk. So passed the day, with apparently little done, yet possibly not so little.

"August 4. Day of indisposition. Nothing accomplished but a little manual labor at books and specimens.

"August 5. Succeeded in making an end of the paper on Neckerian Cactaceae; which, when on account of Mr. . . .'s wish to learn what these genera really were he induced me to undertake, I thought I could do in two hours; but it is one thing to ascertain the identity of Necker's groups and quite another to make each case plain to the ordinary every-day botanist who can read or understand nothing without the aid of an actual interpreter. It is the effort to make clear to others of slow apprehension and small learning, what is plain at a glance, that takes up so much time.

"Had a very pleasant letter from Mr. Bicknell; and one demanding a prompt answer, and answered it.

"Responded to a query on the part of Mr. Maxon as to the value of such a character as that of perfectly articulated and therefore deciduous pinnae in the frond of a fern supposed, and commonly accepted, to be of the same genus in which the pinnae are never deciduous, nor furnished with a distinct articulation. My answer was, an opinion somewhat impromptu, that the two kinds of fronds ought not to be embraced within one genus, no matter how much alike in other particulars.

"August 6. Studied Cichoriaceae as to their history in taxonomy; especially as to the long admitted affinity for Campanulaceae, which idea I fail to trace to any earlier original than Jussieu. Such studies consume much time; and this whole day was divided between this work and some correspondence.

"August 8. Worked in the morning at study of the difficult problem of *Eschscholtzia Douglasii*; with conclusion that the Californian plants of that name in my Fl. Franciscana etc., are different from the Oregonian. Spent afternoon at University, searching for manuscript, book-packing, etc. Left some *Leaflets* copy with printer.

"August 9. Finished paper on New Apocynums for *Leaflets*, and made progress on the Affinities of the Cichoriaceae.

"August 10 and 11. Worked on title aforementioned.

"August 12. Worked on *Eschscholtzia*, defining *E. Douglasii* anew, and restricting it to the Oregonian plant. Had a pleasant visit from Mr. O. F. Cook, lately back from Guatemala. At University in the afternoon packing.

"August 13. Further work upon *Eschscholtzia*; establishing a little doubtfully the identity of my unpublished *E. cornuta* with *E. cucullata*.

"Determined Californian *Lupini* for C. F. Baker.

"August 17. Finished affinities of Cichoriaceae and took to printer.

"August 18. Received proofs.

"August 19. Read proofs of '*Leaflets*' and returned them. Determined Calif. plants for C. F. Baker. Worked a little on

Hist. of Goldenrods, a study begun on the 17th, and a highly interesting study.

"August 20. All day engaged upon a study of Gentianaceous genus *Pneumonanthe* or *Dasystephana*; very interesting: hesitant as to which name to take up, that of Renealm or that of Cordus.

"August 22. Finished paper on *Pneumonanthe* or *Dasystephana*. Resumed a long-interrupted study of the fringed gentians. *Spiragyne* now seems to be the name, though it has for months perplexed me. The 'spirally revolute' stigmas hard to account for; but other authors define them as revolute.

"Visited by Knowlton, for help.

"August 23. Studied history of *oides* genus-names, in light of Linnaeus' article in *Philosophia Botanica* and made a good beginning on paper for 'Leaflets.'

"Visited by Tidestrom on account of *Peltandra* species.

"August 24. Indisposed.

"August 25. Indisposed.

"August 26. Worked at C. U. A. all day, moving books, etc.

"August 27. Resumed work on *oides* names, and began an article for 'Leaflets.'

"August 29. Wrote initial three pages of article for 'Leaflets,' the title 'A Neglected Code.'

"August 30. Rewrote two pages of 'Neglected Code.' Worked at packing at C. U. A. in the afternoon. Later studied Paris Code; on which I ought to write a commentary, and maybe shall. Visited by Knowlton in the morning, who wanted an answer for a man who wrote of a Texan shrub like a rosebush, but with parsley-like foliage and fruit with the flavor of grapes. He had applied all around. It was, of course, *Vitis bipinnata*."

When Dr. Greene entered the Smithsonian Institution in May, 1904, an honorary associate in botany, he arranged for the transfer of his library and herbarium from the Catholic University to the National Herbarium.

The terms under which the National Museum assumed the responsibility of housing and caring for the collections were advantageous both to Dr. Greene and the Museum. The collections were to be accessible for study by the museum staff and

other properly qualified persons, and were not to be removed before a period of ten years had elapsed. If, in the meantime, the death of the owner should occur, the collections were to pass into the possession of the museum, and the museum might, at any time within the period, secure absolute title to the library and herbarium upon payment of \$20,000.

The years in the Smithsonian Institution were fruitful ones. They witnessed the completion of the two volumes of "*Leaflets*" and the first volume of the "Landmarks of Botanical History." The latter work met with a very favorable reception. Dr. Greene received letters of commendation from botanists at home and abroad; among many others there were very pleasant letters from Saccardo and Thistleton-Dyer. He hoped to complete "Landmarks," and in 1914 even began, in cooperation with the writer, a new serial, *Cybele Columbiana*.

The arrangement with the National Museum terminated in May, 1914. Dr. Greene was no longer in robust health and no move had been made towards the acquisition of his collections by the museum.

In the fall of 1914, he therefore arranged for the transfer of all his books and specimens to the University of Notre Dame. According to the terms of the transfer the library and the herbarium were to be kept in perpetuity, separate and distinct from all other property of the university, and to neither were any additions ever to be made. "Neither undergraduate students nor any novices in botany" should have free access to this collection at any time. Under no circumstances were specimens from the herbarium to be sent out as a loan from Notre Dame, either to an institution or an individual.

Of course Dr. Greene himself was to be the curator of the collections, as long as his health and strength should permit. The consideration for which these priceless collections were to be given to Notre Dame was a modest annuity. The clause in the agreement concerning the annuity was most characteristic of Dr. Greene: "Such annuity to cease with my death, or, even within my lifetime, in case of my becoming, through age and infirmity, or mortal illness, hopeless of further usefulness, and a charge upon the community."

Dr. Greene removed to Notre Dame late in 1914. It was an occasion of deep regret to many of us. There was not only the personal loss to those of us who were his friends, but also the more general loss to science which was entailed in the removal of his collections from Washington.

During the ten years of his connection with the National Museum, the Library of the Department of Agriculture was being built up, so that there were really not a very large number of books in Dr. Greene's collection at the end of the option period that were not elsewhere available in Washington. It must always, however, be regarded as a great misfortune for the nation and a piece of great good fortune for the University of Notre Dame that the government did not take advantage of its option to secure the herbarium, which contains hundreds, if not thousands, of type specimens.

On the occasion of Dr. Greene's seventieth birthday the Botanical Society of Washington arranged to present him with a book-plate. He had long intended to have one, for his books were marked with an anything but artistic printed slip which had been pasted in them at the time his library was placed on deposit at the Smithsonian Institution. The plate was designed by Mr. Krieger, following Dr. Greene's own ideas. He was very much pleased when it was finally done and turned over to him and expressed his intention of acknowledging it at a meeting of the Society. He wrote out with some care the remarks which he intended to make but I find among his papers only a few preliminary jottings on rough scraps of paper:

"I take great pleasure in saying that in the interval which has passed since our last meeting and this one, I have received the book-plate for my library, which the Society had the kindness to accord me, on the occasion of its most cordial celebration of my septenary last year. I regard the gift as a most beautiful piece of art, and it is all the more prized as being an expression of the appreciation and good will on your part which I had no reason that I know of to look for, and which I wish I had better deserved at your hands. Of the library itself, however, few if any among you know all its merits. It is the pioneer among

all American collections of pre-Linnaean and rare post-Linnaean books. The absolute necessity of this kind of botanical literature to the interpretation of Linnaeus himself was well seen by me fifteen years before such a thought had entered the minds of the botanists of Boston, New York or Washington."

At the time it went to Notre Dame, the library consisted of some 4,000 "most choice volumes" and the herbarium of perhaps 100,000 mounted specimens, many of them priceless types.

In October, 1915, Dr. Greene returned to Washington from Notre Dame in the hope that he would be able to continue work on his "Landmarks." It was obvious to his friends that he was failing rapidly. He endeavored to work as long as he had even a little strength but permitted himself to be taken to Providence Hospital on the 25th of October. He died November 10, 1915, and was buried at Notre Dame.

He had given his life to the cause of science. Some there are who doubted the value of his work and questioned the motives which actuated his caustic criticisms. Of enemies he had many; of friends but a few. During a large part of his career the forces arrayed against him would have daunted a less courageous man. It is not to be wondered at that his tongue and pen were sharp, and that sometimes he gave expression to thoughts that might have been better left unsaid. It is certain that his enemies were for the most part those who did not know him personally; those who had met and talked with him bore no resentment for anything he may have said. And whatever may be said of his words, his deeds were always kind.

To you, his friends, it is not worth while for me to attempt to sum up his character, for he was a many-sided man, and none of us saw exactly the same side. He was even full of contradictions, if you will; "a man of many moods and fancies," one of his biographers has called him. Nor will it be worth while for any of us, for many years to come, to attempt an exact appraisal of his contributions to science. Certain it is, however, that few, if any, exerted a greater influence than he in the development of systematic botany in America.

NEWS ITEMS

Dr. H. A. Gleason has been promoted to an assistant professorship of botany at the University of Michigan.

Dr. George M. Reed of the University of Missouri is spending the summer at the Brooklyn Botanic Garden.

Mr. W. W. Tupper has been given leave of absence from instructorship in botany, and Dr. A. H. Povah has been appointed as his substitute in botany for the year 1916-17, at the University of Michigan.

Mr. H. F. Bergman and Mr. Harvey Stallard of the Department of Botany, University of Minnesota, will spend the summer in studying plant succession in Minnesota. Special study of the nature and development of swamps in Anoka and Pennington counties will be made in coöperation with the Division of Soils.

The University of Michigan greenhouse space will be enlarged during the present summer by addition of two new glass houses, each 20 ft. $\times$ 100 ft.

An arrangement has been worked out under which New York University and the Brooklyn Botanic Garden will coöperate in encouraging botanical investigations. Under the arrangement which was adopted by the University Council, such members of the scientific staff of the Botanic Garden as it may designate with the concurrence of the University authorities will be made officers of instruction in the Graduate School, and will be lecturers in the Department of Biology of that school. Courses of graduate rank offered by the Garden, when approved by the Faculty of the Graduate School, will be listed as courses in the Graduate School and will be given the same credit as other graduate courses. Properly qualified students who take these courses may present them in satisfaction of the requirements for advanced degrees given by New York University. Students of the University are to have all of the privileges of the library, herbarium, laboratory equipment and collections of living plants and other similar material that may be necessary in making their investigations.

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(1) BULLETIN

A monthly journal devoted to general botany, established 1870. Vol. 42 published in 1915, contained 698 pages of text and 33 full-page plates. Price \$3.00 per annum. For Europe, 14 shillings. Dulau & Co., 37 Soho Square, London, are, agents for England.

Of former volumes, only 24-42 can be supplied entire; certain numbers of other volumes are available, but the entire stock of some numbers has been reserved for the completion of sets. Vols. 24-27 are furnished at the published price of two dollars each; Vols. 28-42 three dollars each.

Single copies (30 cents) will be furnished only when not breaking complete volumes.

(2) MEMOIRS

The MEMOIRS, established 1889, are published at irregular intervals. Volumes 1-15 are now completed; No. 1 of Vol. 16 has been issued. The subscription price is fixed at \$3.00 per volume in advance. The numbers can also be purchased singly. A list of titles of the individual papers and of prices will be furnished on application.

(3) The Preliminary Catalogue of Anthophyta and Pteridophyta reported as growing within one hundred miles of New York, 1888. Price, \$1.00.

Correspondence relating to the above publications should be addressed to

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BY

NORMAN TAYLOR



JOHN TORREY, 1796-1873

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A ZAMIA FROM THE LOWER EOCENE

BY EDWARD W. BERRY

Although *Zamia*-like foliage is so common and widespread in Mesozoic deposits the world over and more than thirty species of *Zamia* still exist in tropical and sub-tropical America, including two that occur in our Floridian region, the number of cycads that have thus far been discovered in Tertiary deposits anywhere is extremely limited.

Much interest therefore attaches to the discovery of a small-leaved form of *Zamia* in the sandy clays of the upper Wilcox at Meridian, Mississippi. At this outcrop the plant-bearing clays overlies marine glauconitic sand with mollusca of upper Wilcox age. The cycads are associated with an endless number of leaves and other remains of a large new species of *Nelumbo*, with leaves of a fan palm and with species of *Lygodium*, *Sapindus*, *Nectandra*, *Mespilodaphne*, *Ficus*, *Combretum*, *Dalbergites* and *Aralia*. All of these are members of a coastal flora containing many sub-tropical elements and of wide extent in southeastern North America during the early Tertiary.

The new *Zamia* may be described as follows:

Zamia mississippiensis sp. nov.

Leaves elongate, slender and linear. Rachis stout. Pinnules small, crowded, opposite or sub-opposite, bluntly pointed, constricted proximad to a relatively broad inequilateral base, attached to the sides of the top of the rachis. Length 1.25 cm. to 1.50 cm. Maximum width about 2 mm. Margins entire. Texture coriaceous. Venation consisting of from eight to ten longitudinally sub-parallel veins, occasionally dichotomous proximad (text figures 1-3).

This characteristic *Zamia* is represented in the present collections by three specimens, two of which are figured. In the [No. 7, Vol. 16, of TORREYA, comprising pp. 151-176, was issued 12 July, 1916.]

one, which shows a portion of the pinnule-bearing part of a rachis 4.4 cm. long, the pinnules are slightly larger than in the other figured specimen and are more scattered, but this is due to the loss of the intervening pinnules. In the other figured specimen a similar pinnule-bearing part of the rachis 4.7 cm. long shows traces of fourteen pairs of pinnules. The rachis is somewhat more slender than in the other specimen and the pinnules are slightly smaller. The unfigured specimen shows 5 cm. of pinnule-bearing rachis with traces of twelve pairs of pinnules.

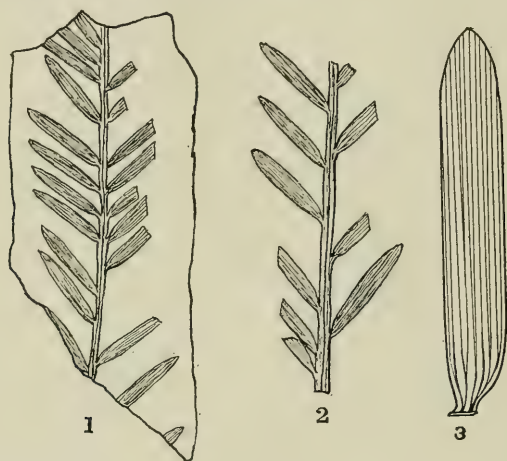


FIG. 1. *Zamia mississippiensis*, for explanation see text.

These evidently represent a *Zamia* with slender graceful leaves and much reduced pinnules somewhat suggestive of the existing *Zamia floridana* DeCandolle which inhabits the so-called flat-woods of the east coast of Florida south of New River.

In my account of the lower Eocene flora of southeastern North America (U. S. Geological Survey, Professional Paper 91) I described as *Zamia* (?) *wilcoxensis* (op. cit., p. 169. pl. 114. f. 2) a single broken pinnule of a cycad which I compared with the existing Floridian *Zamia pumila* Linné. It is interesting to find the remains of a second species somewhat resembling the only other living Florida species at a horizon as old as the lower Eocene. The two, while based on a rather meager amount of

material, are apparently distinct, since *Zamia* (?) *wilcoxensis* has pinnules with more than twice as many veins as have the pinnules of *Zamia mississippiensis*. It is, of course, possible that the two occurrences represent the extremes of variation of a single lower Eocene species, but I do not regard this as probable.

Only five or six other Tertiary species are known and a majority of these are based on not very well preserved or representative material. The only non-European form is an undoubted species of *Zamia* described by Engelhardt* from the Eocene of Coronel, Chile. The oldest known Tertiary species is *Zamites palæocenicus* described by Saporta & Marion† from the Thanetian of Gelinden, Belgium. Meschinelli described a species from the Stampian of Venetia, Italy, which he referred to *Ceratozamia*, and two species have been recorded from the lower Miocene (Aquitanian) of Europe—a *Zamites* from southern France‡ and a well-marked *Encephalartos* from Kumi in Greece.§ Heer recorded a species of *Zamites* from the Helvetian of Switzerland and a species of *Cycadites* from the Tortonian of that country, but both of these are rather doubtful determinations.||

The present species, while based upon a limited amount of material, is sufficient to establish the undoubted relationship of the fossil as the accompanying text figures show, and it is quite possible that future discovery will reveal other members of this interesting family in the later Tertiary deposits of this region since the plants thus far collected from the upper Eocene and lower Oligocene were more tropical in character than those from the lower Eocene.

JOHNS HOPKINS UNIVERSITY,
BALTIMORE

* Engelhardt, H. Abh. Senck. Naturf. Gesell. 16: 646. pl. 2. f. 16. 1891.

† Saporta & Marion, Rev. Fl. Heers, Gelind. 20. pl. 1. f. 4, 5. 1878.

‡ Saporta, Bull. Soc. geol. Fr. (ii) 21: 314-328. pl. 5. 1864.

§ Saporta, Bull. Soc. bot. et hort. Provence, 41-44, 1 pl. 1880.

|| Heer, O. Fl. Tert. Helv. 1: 46. pl. 15; pl. 16. f. 1. 1855.

THE STAMENS OF *ERYTHRONIUM AMERICANUM*

BY PAUL W. GRAFF

Since the subject of genetics and heredity has become a "popular" one with both botanists and naturalists as well as zoölogists, those interested in these branches of science have come to be on the lookout for the unusual in form or color in the common things about us. Last spring while wandering along the banks of a wooded stream in the town of Mansfield, Connecticut, I happened on such a quantity of our common yellow adder's tongue that I picked a large bunch to take home with me. On my return there chanced to be a young botanist, as yet unfamiliar with the use of keys, at the house and we started, with a copy of "Gray's New Manual," to find out what we had.

The start was easy but the end a surprise. Our plant certainly belonged neither to the Commelinaceae nor to the Pontederiaceae and yet the stamens were dissimilar. The only way to get our plant in the Lily Family was for all the stamens to be alike and this was not true of them. Our plants had their stamens in two sets of three, one set being about four fifths the length of the other, and of these the shorter seemed to show a slight tendency toward a later maturing of the pollen.

I next hunted up my copy of "Britton and Brown" with a feeling of assurance that here at least there would be no difficulty. My feeling was fully justified, for we had no difficulty in "running down" our flower with its aid. We found no mention of any difference or a similarity of the stamens in either key or species description. A surprise awaited me, however, when I looked at the illustration accompanying the description for the stamens were clearly shown as being all of one length.

As a result I began immediately to surmise that I had made the discovery of an abnormality. My interest was increased when, on examining the fifty or more blossoms I had brought in, I found them all to be similar. My curiosity being aroused, the next day I returned to the spot and examined a large quantity

of blossoms and found all to be alike. In all I must have examined at least some two hundred as I wandered down the stream. This being at the end of the season for *Erythronium* to be in bloom, I had no chance to make a comparison with plants of other localities. The results were at least interesting and I resolved to explore further the following season.

This spring, being at the New York Botanical Garden at the time these flowers should open, I had a chance to examine plants in a different locality from that of the preceding season. In my searches about the wood at Bronx Park I was rewarded by finding a number of blossoms and these were all identical in structure with the Connecticut specimens of the season before, namely, with stamens of two lengths.

Having access to a number of popular botanical books and with a curiosity to see how many would have this plant illustrated as I had found it, I proceeded to investigate. The first book I picked up was Lounsberry's "Guide to the Wild Flowers" and in the colored plate illustrating our adder's tongue, I found the stamens shown to be all of the same length. The excellent colored plates of Meehan's "Native Flowers and Ferns of the United States" were next examined and here, likewise, they could not be made out other than equal. The result was the same in the "Field Book of American Wild Flowers," by F. Schuyler Mathews. The curious fact should be noted here that while Mathews has drawn *Erythronium americanum* incorrectly as regards the stamens, on the same plate he has illustrated *E. albidum* correctly with two lengths of stamens. The only illustration found which showed the stamens of *E. americanum* to be unequal in length and similar to those I had collected was the plate in Blanchan's "Nature's Garden" which is reproduced from a photograph.

Herbarium material was next examined and this included specimens from Massachusetts south to South Carolina and west to Michigan in considerable quantity. In only one case did there appear any possibility of the stamens being of equal length. This was a specimen collected at New Brunswick, New Jersey in 1888, now in the herbarium of the New York Botanical Garden.

It appears that the usual condition in the case of *Erythronium americanum* is for the stamens to be of two distinct lengths and that a *mutation* has occurred in a number of our texts rather than in nature.

The same characteristic holds true for *Erythronium albidum* and for the two Pacific coast species, *E. citrinum* and *E. giganteum*. On the other hand it appears, as well as can be ascertained from preserved herbarium material, that *E. hendersoni*, collected in Oregon, *E. obtusatum*, collected in Montana and Idaho, and *E. parviflorum*, collected in Utah, Wyoming, Nevada and Colorado, possess stamens all of equal length.

In this case the value of a photograph over an artist's sketch for scientific purposes seems evident. A small amount of "poetic licence" is almost sure to creep in somewhere to spoil the scientific accuracy of the drawing unless a careful checking up system is followed. The continued propagation of an error is also an unfortunate incident. Such a simple fact in regard to one of our very common spring flowers, it seems, should have been recognized before. It is too often true that the common things about us are deemed beneath our attention.

That our common eastern species should differ from at least three western species in the form of their stamens seems interesting as well as the fact that two Pacific coast forms should be similar. The remaining North American species should be checked over for the stamen characters and a comparison made from various localities.

MOUNT VERNON, N. Y.

WILD FLOWER PRESERVATION SOCIETY OF AMERICA

PUBLIC PARKS AS PRESERVERS OF NATIVE PLANTS*

Mr. Jensen has been advocating, for a number of years, the use of native plants for ornamental planting, not only for the purpose of education and pleasure, but for the sake of the native fruits and their value as food for the birds that are so helpful in con-

* By L. P. Jensen, Proc. 17th Annual Convention of the American Assoc. of Park Supts., San Francisco, Cal., 1915.

trolling destructive insects. This paper contains a list of plants which need protection in the vicinity of St. Louis, Missouri and the principal reasons for the destruction and consequent disappearance of native plants. The discussion which followed its presentation was participated in by Mr. Merkel, Supt. of the New York Zoological Park and Mr. Morley, who stated that at San Diego, California, certain portions of the park system will be kept wild and that all park systems should take care of the native flora! This is a hopeful sign of appreciation and help from those who are best able to give it.

In the Conservation number of the Tropic magazine published at Miami, Florida, Charles T. Simpson, a veteran naturalist and traveller, has published an article on "Paradise Key." This is a hammock or island of hardwood trees in the everglades about fifty miles south and west from Miami and about midway to Cape Sable. This interesting tract is over a mile long and includes 60 or more species of trees growing wild, of which nearly a hundred are tall royal palms, rising above the level of the forest. This tract has been acquired as a public park and rechristened Royal Palm State Park. Mr. Charles Mosier has been placed in charge as caretaker and the members of the Florida Federation of Women's Clubs are taking an active interest, not only in its preservation as a wild tract of land but also in the protection of the birds in the Cuthbert Lake Bird Sanctuary. Dr. Small and Mr. Simpson have visited the Royal Palm Hammock and a list of over fifty species of trees have been published. The article is illustrated by photographs.

ELIZABETH G. BRITTON

SHORTER NOTES

BAPTISIA PERFOLIATA IN FLORIDA? The leguminous genus *Baptisia* is noteworthy for containing a considerable number of well-marked species of rather restricted distribution. One of the most striking in appearance is *B. perfoliata* (L.) R. Br., whose recorded range is in the coastal plain from west-central South Carolina to Appling County, Georgia. It is a "tumble-

weed," like other species of the genus, and its perfoliate leaves remain stiffly erect on the spreading branches for several months after the plant dies, so that it is easily recognized any day in the year.*

On Feb. 10, 1915, I found several dead plants indistinguishable from this species in high pine land (dry pine-barrens with *Pinus palustris* and *Quercus Catesbaei*) in the extreme eastern part of the lake region of Florida, about half a mile northwest of Chulota, Seminole County, which is about 220 miles farther south than the nearest known locality in Georgia. I was on a cross-country walking trip at the time, with over thirty pounds of baggage, and could not very well preserve such brittle material for comparison. It is not altogether improbable that when the flowers and fruit of this Florida plant are known it may be found to differ in some particulars from *B. perfoliata*; but whether it is that species or an undescribed one, it is something new to the known flora of Florida.

ROLAND M. HARPER

THE NORTHWESTERN CYTHEREA. I have just had an opportunity to examine good living material of *CytHEREA*, collected by Mr. A. L. Knoke at Duvall, in the State of Washington. It differs in many ways from the Colorado plant,† being larger, with the following floral peculiarities: Sepals and petals whitish, flushed with pink, about 27 mm. long; column 7.5 mm. wide; lip 21 mm. long, 9.5 broad near base, the basal half dark dull red, with longitudinal, more or less interrupted, whitish lines; at the end of opening of lip the patches and hairs are wholly pallid, neither yellow nor red; apical part of lip widely expanded, thin, covered with large suffused pale rust-red spots, the color completely contrasting with the small pink spots on margins of opening; horn-like nectar-sacs divergent, pinkish-white, with irregular dull pinkish longitudinal bands; these horns may extend beyond the lip.

This is presumably the plant which Holzinger described from

* For notes on its morphological peculiarities see Jour. Bot. 10: 84-85. 1872; Bull. Torrey Club 30: 336-337. 1903; Ann. N. Y. Acad. Sci. 17: 225. 1906.

† Botanical Gazette 59 (1915), p. 331.

Idaho, merely stating that the beard in the western plant is white. Heller, in his Catalogue, gave it specific rank, and it really seems possible that this is correct. The type locality of the Linnean species *C. bulbosa* (L.) House is Lapland, and I do not know what the detailed characters of typical specimens may be. Since the Old World plant extends through Russia to Siberia, one would expect to find the west coast form identical with it; but in the absence of proof of this, we must use the name *occidentalis*, given by Holzinger.

The Colorado form, described from Gresham in the place cited in the footnote, certainly differs from the northeastern as well as the northwestern plant in lacking the spots on the apical expansion of the lip; it may take the name *C. bulbosa* var. *coloradensis*.

It is a singular thing that in the excellent new Flora of the Northwest Coast, by Piper and Beattie, the plant of the northeastern states is described, and not the *occidentalis* form at all! Does such a form as this description indicates really exist anywhere in the northwest?

T. D. A. COCKERELL

BOULDER, COLORADO,
May 4, 1916

REVIEWS

Dunham's How to Know the Mosses*

This is a popular guide to the mosses of the Northeastern United States, containing keys to eighty genera and short descriptions of over one hundred and fifty species with special reference to the distinguishing characteristics that are apparent without the aid of a lens.

It is illustrated by line drawings in the text and seven plates, which will be found helpful to the beginner. Two keys based on the leaf and capsule characters and the introduction and first explanatory chapters aim to make it easy to obtain a non-technical acquaintance with the mosses. This book should be very helpful in introducing the mosses to a large circle of admirers.

ELIZABETH G. BRITTON

* By Elizabeth Marie Dunham, pp. 1-287. Houghton, Mifflin Co., 1916. Price \$1.25 net.

"Edible and Poisonous Mushrooms," by W. A. Murrill, appeared June 26, 1916. This work consists of a large colored chart and a handbook containing descriptions of the chief edible and poisonous species in North America, together with a discussion of edible and poisonous fungi in general and methods of preparing and cooking mushrooms. The treatment is brief, requiring only about seventy-five pages, but it covers the ground in a practical and safe way and will enable the intelligent mushroom-loving public to enjoy many of our native wild species without fear of unpleasant consequences. The writer has erred rather on the side of safety, failing to figure and recommend for food the royal agaric, the blushing amanita, the sheathed amanitopsis, and many other species which are excellent and often eaten.

The chart was prepared under the author's direction by a very careful artist and is suitable for hanging on the wall in libraries and schools, as well as in botanical museums. Different backgrounds are used for the edible and poisonous species, which are separated and plainly labeled so that no mistakes can occur. The maximum of safety lies in accurate figures and descriptions not only of species that may be safely eaten but also of all the dangerous species that should be avoided. (From *Mycologia* for July.)

The Principles of Plant Culture*

This volume is one of the Rural Text Book Series edited by L. H. Bailey. It is written primarily for the use of students in agriculture and horticulture and aims at giving the principles underlying the successful culture of farm and garden crops. It is an extremely valuable work not only for students, but also for professional growers and amateurs who would know something of the why and wherefore of farming and gardening operations.

It is impossible in a short review to indicate the wide scope of this work. The book is full of accurate information concerning the underlying principles of plant culture, and deals with the

*A text for beginners in agriculture and horticulture by the late E. S. Goff revised by J. G. Moore and L. R. Jones, of the University of Wisconsin. Pages I-XXIII + 1-295; 177 illustrations. Eighth edition: The Macmillan Company.

functions of the various parts of the plant: environment, plant diseases, the propagation of plants, transplanting, pruning, plant breeding, etc. As an appendix a syllabus of laboratory work is given.

As previously mentioned, the information given is usually reliable, but those who know something of plant relationship and also those who have had experience in grafting plants will question the statement on page 216 that "the fir and linden have been grafted."

The device shown in Fig. 152, intended to help start newly transplanted trees into growth; consisting of a flask containing distilled or rain water, connected by a rubber tube with the cut off end of a root, will hardly commend itself to the practical man.

The numbered paragraphs, with cross references constitute a valuable feature of this work and should be of great assistance in helping the student to come to a good understanding of the subject. The illustrations are generally good, and a full index adds greatly to the value of the book.

MONTAGUE FREE

The review of Piper and Beattie's *Flora of the Northwest Coast* appearing in June *TORREYA* stated that The New Era Printing Co. issued the book. This was an error as "The entire edition is owned and controlled by the State College of Washington," Pullman, Washington, to whom purchasers are referred.

—ED.

PROCEEDINGS OF THE CLUB

MARCH 29, 1916

The meeting of March 29, 1916, was held in the morphological laboratory of the New York Botanical Garden at 3:30 P.M. President Harper presided. Twenty-seven persons were present.

The minutes of February 23 and March 14 were read and approved.

The following persons were nominated for membership: Mr. Paul W. Graff, 1775 North Ave., Bridgeport, Conn., Dr.

James R. Weir, Bureau of Plant Industry, Missoula, Mont., Mr. Robert V. Evans, University of Montana, Missoula, Mont., and Mr. E. C. McCarty, University of Montana, Missoula, Mont.

The resignation of Miss May A. Parker was read and was referred to the Secretary for further correspondence.

The first number on the announced scientific program, "A New Part of the North American Flora," W. A. Merrill, was postponed.

B. O. Dodge read a short paper on "Converse Inoculation Experiments in Gymnosporangium."

Mr. Paul W. Graff followed with a paper on "Plant Diseases in the Philippines." He spoke of the more important diseases attacking crops of economic importance.

"The sugar cane is particularly subject to the attack of the red-rot caused by *Colletotrichum fulcatum*. The "cane smut" and "eye-spot" diseases are also quite common on this host. Bud-rot has been reported as attacking the cocoanut. The leaf spot caused by *Pestalozzia palmarum* may at times become severe enough to materially weaken the host. The raising of coffee has been almost entirely given up in the Islands because of the inroads of *Hemileia vastatrix*. The banana, one of the most important crops to the native, is attacked by the bacterial disease common to the West Indies and Central America. Rice is troubled by the attack of *Ustilaginoides virens* and sterility, the cause of which is unknown.

The growing period is the time of greatest infection, therefore the time to spray for disease prevention to do the greatest amount of good and in the most economical manner would be during the first three weeks of the rainy season and a like period at its close."

Dr. N. L. Britton who had recently returned from a botanical exploration of the Isle of Pines made a preliminary report of the results of his investigations.

Adjournment followed.

B. O. DODGE,
Secretary

APRIL 11, 1916

The meeting of April 11 was held in the lecture room of the department of Botany, Columbia University, at 8:15 P.M. President Harper presided. Thirty-five persons were present.

The lecture of the evening was given by Dr. A. F. Blakeslee on "Sexuality of the Mucors." The lecture was illustrated by lantern slides. The speaker gave a brief account of the life history of some of the common moulds and explained in some detail the meaning of the terms + and - strains and how it is possible to determine the sex of these strains. Specimens showing zygosporic formation and pure cultures of different species were exhibited.

Meeting adjourned.

B. O. DODGE,
Secretary

APRIL 26, 1916

The meeting was held in the Morphological Laboratory of the New York Botanical Garden at 3:30 P.M. President Harper presided. Twenty-one persons were present.

The minutes of the meetings held March 29 and April 11 were read and approved. The treasurer announced a gift of \$100 from Miss Caroline Haynes to be applied to the Underwood Fund. The gift was accepted with a rising vote of thanks to Miss Haynes for this generous contribution.

Miss Sophia Taistra, Garden Street, Hoboken, N. J., Mr. J. T. Beals, 71 West 23d Street, N. Y. City, and Mr. Henry Thurston, New Milford, N. J., were nominated for membership.

A motion by Dr. Barnhart to appropriate the sum of twenty dollars (\$20.00) as a compensation to the chairman of the field committee in consideration of his work in connection with the duties of his committee, was carried.

The first number on the scientific program was a paper on "The Genus *Mycena*," by Dr. William A. Murrill.

The genus *Mycena* has been much neglected because the species are very small fungi and of little economic value. The characteristics of the genus are mostly negative. The margin of the pileus is appressed, the gills are adnate or adnexed. The cap is fleshy, thin, and does not revive. The stipe is carti-

laginous. The relationships of the genus may be seen by comparison with the following genera: *Clitocybe* has a fleshy stipe; *Collybia* has an incurved margin; *Omphalia* has decurrent gills; *Marasmius* has a tough reviving cap; *Galactopus* has a milky juice.

The generic name *Prunulus* has been adopted to include most of the species formerly classified under the genus *Mycena*. Fifty North American species of this genus have heretofore been described. Fifty-five new species have been found and will be described in a forthcoming part of the North American Flora.

Dr. Roland M. Harper followed with a paper on "An Interesting Fern Locality in Florida Threatened with Destruction." The following abstract was furnished by the speaker:

"In the southeastern corner of Citrus County, Florida, there is a small area of limestone cliffs and grottoes where ten or twelve species of ferns grow on a single acre. They are mostly tropical species or near relatives thereof, and most of them are not known elsewhere within many miles. The rocks afford a treacherous footing and some accidents have occurred there, at least one of them fatal. The locality was visited by Curtiss in 1881, Donnell Smith in 1883, Underwood in 1891 and the speaker in 1915. A limestone quarry has recently been opened nearby and the destruction of the vegetation seems to be imminent."

Dr. George E. Stone, of the Agricultural College of Massachusetts, spoke of the nature of the work at the Station, and the great interest in the subject of shade-tree planting throughout the State.

Dr. N. L. Britton spoke of the new journal *Addisonia* founded by the Addison Brown fund and published by the New York Botanical Garden. This journal will be issued quarterly.

Dr. Britton exhibited an interesting specimen of *Carex Fraseri*, now in blossom at the New York Botanical Garden.

Adjournment followed.

B. O. DODGE,
Secretary

NEWS ITEMS

Dr. and Mrs. F. E. Clements have finished work on the Nebraska Bad Lands at Crawford, Harrison and Agate, and left on June 28 for an eight- or ten-day auto trip to the Big Bad Lands of South Dakota and the Little Missouri Bad Lands of North Dakota. From these they go to the Alpine Laboratory at Minnehaha on Pikes Peak for a month's work, chiefly on photometry. They expect to attend the San Diego meeting of the Pacific coast branch, where Professor Clements will give an illustrated paper on "Succession in the Bad Lands." On their return, they will spend a month or more in the Triassic and Cretaceous Bad Lands of Arizona and New Mexico.

At Cornell University, Dr. Lewis Knudson has been promoted from assistant professor to professor of botany.

The Royal Society of Edinburgh at its meeting of July 3, elected Professor D. H. Campbell and Professor Eugene Warming as fellows.

Professor B. E. Livingston and Dr. H. E. Pulling, of the laboratory of plant physiology of the Johns Hopkins University, will spend the months of August and September in the region of Fort Churchill and Port Nelson, Hudson Bay. They will carry out field studies of vegetation as related to soil and climate.

Miss Alice Eastwood, curator of the botanical department of the California Academy of Sciences, spent five days, from June 15 to 20, collecting at the Grand Canyon of the Colorado. The Hermit Trail was traveled to the bottom of the canyon, and the Grand View or Berry Trail for about two miles down. The Bright Angel Trail had been explored previously by Miss Eastwood. About 270 species were collected.

The Stanford Arboretum, comprising approximately 200 acres, and established by Senator Stanford in 1882, has been placed under the control of the department of botany with a view of more fully utilizing it for scientific purposes. An annual appro-

priation is to be made for the acquisition of specimens, that for the current year being \$1,000.

Under the auspices of the Botanical Seminar of the Michigan Agricultural College, Dr. William Crocker, of the University of Chicago, gave a public address recently on the "History of Our Present Knowledge of Plant Nutrition."

At the Michigan Agricultural College, Mr. G. R. Johnstone has resigned his instructorship in botany which he has held for three years, in order to prosecute his studies further. The vacancy has been filled by the appointment of Mr. H. C. Young, who was at the Missouri Botanical Garden last year.

Dr. Raymond J. Pool, who was recently elected head of the department of botany in the University of Nebraska, has spent several weeks in continuing his studies of Rocky Mountain chaparral associations with headquarters at Dr. Clements' cottage at Minnehaha-on-Ruxton, near Manitou, Colorado.

The Torrey Botanical Club

Contributors of accepted articles and reviews who wish six gratuitous copies of the number of *TORREYA* in which their papers appear, will kindly notify the editor when returning proof.

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OTHER PUBLICATIONS

OF THE

TORREY BOTANICAL CLUB

(1) **BULLETIN**

A monthly journal devoted to general botany, established 1870. Vol. 42 published in 1915, contained 698 pages of text and 33 full-page plates. Price \$3.00 per annum. For Europe, 14 shillings. Dulau & Co., 37 Soho Square, London, are, agents for England.

Of former volumes, only 24-42 can be supplied entire; certain numbers of other volumes are available, but the entire stock of some numbers has been reserved for the completion of sets. Vols. 24-27 are furnished at the published price of two dollars each; Vols. 28-42 three dollars each.

Single copies (30 cents) will be furnished only when not breaking complete volumes.

(2) **MEMOIRS**

The MEMOIRS, established 1889, are published at irregular intervals. Volumes 1-15 are now completed; No. 1 of Vol. 16 has been issued. The subscription price is fixed at \$3.00 per volume in advance. The numbers can also be purchased singly. A list of titles of the individual papers and of prices will be furnished on application.

(3) The Preliminary Catalogue of Anthophyta and Pteridophyta reported as growing within one hundred miles of New York, 1888. Price, \$1.00.

Correspondence relating to the above publications should be addressed to

DR. BERNARD O. DODGE

Columbia University

New York City

TORREYA

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EDITED FOR

THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR



JOHN TORREY, 1796-1873

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NORMAN TAYLOR

Brooklyn Botanic Garden

Brooklyn, N. Y.

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MUSHROOM FAIRY RINGS OF *TRICHOLOMA* *PRAEMAGNUM*

BY FRANCIS RAMALEY

During a number of seasons the author has been interested in a large mushroom that forms "fairy rings" in the dry grassland of open mountain parks. The rings were first noticed at Tolland, Colorado, near the mountain laboratory of the University of Colorado. Later they were seen at other points within a radius of 20 miles, namely: at Eldora, Sulphide, Nederland, Rollinsville, Pine Glade, Pactolus, Crescent and Plainview. All of these points lie between 6,000 and 9,000 feet in altitude.

The rings were first noticed and photographed in 1909 but the mushroom was not carefully examined until 1912, when it was recognized as a *Tricholoma*, although no specific determination could be made. On the appearance of Vol. 10, part 1, of the North American Flora* with Murrill's account of that part of the Agaricales to which *Tricholoma* belongs, the plant was identified for me by Dr. L. O. Overholts now of Pennsylvania State College, as *Tricholoma praemagnum* Murrill.† The type cited by the author of the species was "collected on the crumbling walls of an old sod house in Saskatchewan, Canada." The description also notes that specimens were "collected on high land under sagebrush, near Gunnison, Colorado." No mention is made of production of fairy rings or semicircles or crescents.

* North American Flora. Vol. 10, part 1, p. 12, 1914. The plant is described as *Melaneleuca praemagnum*. Murrill has also used the name *Tricholoma praemagnum* in Mycologia, 6: 269. 1914.

† Overholts, L. O. A re-description of *Tricholoma praemagnum* (in this issue of TORREYA).

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The diameter of the fairy rings produced by this mushroom depends, naturally, upon age. One of the smallest seen is shown in Fig. 1. It was 3.3 meters across. Growth is slow, as shown by observations at Tolland. One of the rings, Fig. 2, is cut about 1.5 meters from the periphery by a roadway across which the mycelium does not extend. Evidently this small part thus separated from the main portion of the ring must have been in existence when the road was first used. This is known to be



FIG. 1. Small Fairy Ring (3.3 m. in diameter) of *Tricholoma praemagnum*. The light-colored vegetation within the ring is the Mountain Sage, *Artemisia frigida*.

about 15 years ago. Hence the radial growth of this ring can not have averaged more than 1 dm. yearly. Since the part of the ring now separated off, matches very well the part on the other side of the road there is every reason to believe that it must have been more than a mere fragment at the time the road was first established. It would therefore appear that the growth of the ring is probably much less than 1 dm. per annum. Examination of

points staked out on other rings shows that in some seasons the rings advance only a few centimeters. Growth is much slower than reported by Dr. Bayliss* in England for fairy rings of *Marasmius oreades* and *Clitocybe gigantea*, where radial increase was from 6 to 12 inches annually. No doubt some of the rings produced by *Tricholoma praemagnum* are from one to two centuries old.



FIG. 2. Fairy Ring cut near one edge by a road. Knowing the age of the road the calculation is made that this ring does not increase radially more than 1 dm. a year. The light-colored vegetation in that part of the ring away from the road is *Artemisia frigida*.

The sporophores of the mushroom usually appear abundantly in August or early September following a period of rainy weather, but some may be found after rains in July or June or even May. In many seasons there are so few sporophores produced at any one time that no mushroom rings are apparent. Although, as

* Bayliss, Jessie D., Observations on *Marasmius oreades* and *Clitocybe gigantea* as Parasitic Fungi. *Journal of Economic Biology*, 6: part 4, pp. 111-132, 1911. (A reprint of this article was kindly loaned the writer by Professor George D. Fuller of the University of Chicago.)

noted later, the grasses and other vegetation indicate the presence of the mycelium in the soil as a ring-like or crescent-shaped growth. During eight seasons at the mountain laboratory four years (1909, 1912, 1913, 1914) showed excellent development of sporophores, with many fairy rings easily recognized by even the non-botanist. In each of these years there were heavy rains in August.

Although requiring wet weather for the production of sporophores, *Tricholoma praemagnum* is a distinct xerophyte, or is at least associated with xerophytic plants. It seems to occur only in dry grassland areas. This is strikingly shown in many places by the fairy rings on dry knollsides which are not complete toward the lower part of the slope where they seem unable to invade mesophytic grassland. Thus, instead of a ring, there is frequently produced a semicircle or a crescent with the points extending toward the area of moister soil.

The vegetation at the margin of the fairy rings is always somewhat different from that of the ordinary dry grassland. Usually there is a rather bare zone in which may develop mountain sage (*Artemisia frigida*), or chickweed (*Cerastium occidentale*), or other plants. Figs. 1 and 2 illustrate these facts. The limits of these fairy rings can usually be recognized at all times during the growing season because of the unusual vegetation just within and without the limits of the ring. An ecological study of the disturbances caused by the mycelium of these mushrooms is now under way and will be reported upon after observations have been made during another season.

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A RE-DESCRIPTION OF TRICHOLOMA PRAEMAGNUM, A FAIRY-RING MUSHROOM

BY L. O. OVERHOLTS

While collecting fleshy fungi in the vicinity of the mountain laboratory of the University of Colorado (located at Tolland, Colorado) in 1912, Dr. Francis Ramaley called the writer's attention to a fairy-ring mushroom* that at certain seasons of the year is quite abundant in that vicinity and at other nearby places. The fungus was later identified as *Tricholoma praemagnum*

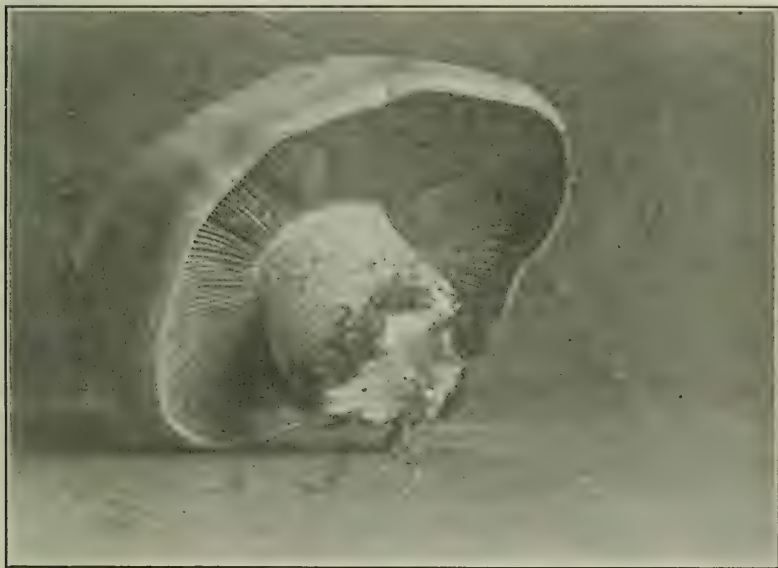


FIG. 3. Young specimen of *Tricholoma praemagnum*.

Murrill. Specimens of one collection were sent to Dr. Murrill for comparison with the types and he verified the determination.

However, certain discrepancies apparently exist in the original description† and the species is here redescribed from abundant field notes and observations made in 1912 and 1913. The lo-

* See Ramaley, Francis. Mushroom fairy rings of *Tricholoma praemagnum* (in this issue of TORREYA).

† North American Flora, 10: 1, 12. 1914.

calities listed for the fungus are those at which the fairy rings have been observed by Dr. Ramaley.

TRICHOLOMA PRAEMAGNUM Murrill, *Mycologia*, 6: 269. 1914
Melanoleuca praemagna Murrill, *North American Flora*, 10: 1, 12. 1914.

Pileus 5-20 cm. broad, hemispheric when young, then broadly convex and in age fully expanded, white or gray, more or less yellowish when dry, smooth at first but often much areolate and sometimes with pyramidal warts in age, glabrous, dry; margin

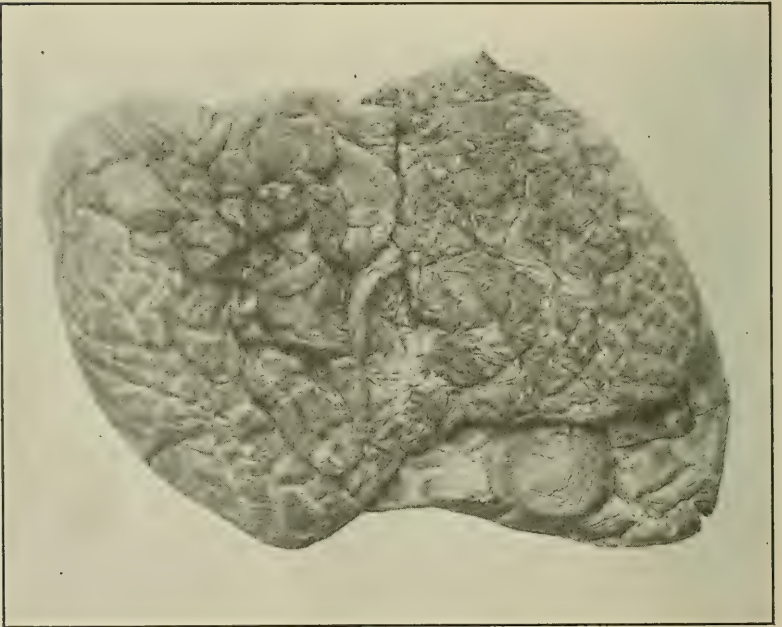


FIG. 4. *Tricholoma praemagnum*. View of upper surface of pileus showing areolate and furrowed condition of old specimens.

even, incurved, tomentose when young; flesh firm, 1-3 cm. thick at the center, pure white, taste none or slightly disagreeable; gills at first adnate or somewhat sinuate, becoming rounded behind and often free with age, close or medium close, 4-7 mm. broad, unequal, sometimes forking, white or whitish, tileul-buff* in age or on drying; stem central, usually enlarged at the base, white or gray, more or less fibrillose or fibrillose-scaly,

firm and solid, 3-7 cm. long, 2.5-5 cm. thick; spores tileal-buff* or pale pinkish buff* in mass, ellipsoid, smooth, $6-8 \times 4.5-5$ microns; cystidia none.

Collected on the ground in dry grassland at Tolland, Eldora, Sulphide, Nederland, Rollinsville, Plainview, Pine Glade, Pactolus, and Crescent, Colorado. Alt. 6,000-9,000 ft. June to September. Edible.

The plant is easily recognized by its size, firmness, and the habit of forming fairy rings.* It is worthy of note that the spores from these specimens are not pure white in mass as stated in the original description.

PENNSYLVANIA STATE COLLEGE

A NEW HYBRID CAREX FROM THE MIDDLE WESTERN STATES

BY IRA W. CLOKEY

While collecting specimens of *Carex impressa* (Wright) Mackenzie in Macon Co., Illinois, in 1915, a clump of a peculiar form of *Carex* was found. On investigation these plants were found to combine characteristics of both *Carex impressa* (Wright) Mackenzie and *Carex lanuginosa* Michx. Owing to this combination of characteristics and to the almost sterile condition of the plants the hybrid origin was indicated. The plants seemed to propagate entirely by numerous very tough rootstocks that were 4-6 inches under ground. Mr. K. K. Mackenzie kindly examined specimens and description of these plants and found them to be an exact match for three specimens from Indiana which he had described but never published. Mr. Mackenzie had reached the same conclusion as to the hybrid origin and had selected the same parents.

***Carex impressa* (Wright) Mackenzie $\times$ *Carex lanuginosa* Michx.
hyb. nov.**

Grows in small clumps from a stout rootstock; the fertile culms from 5-8 dm. tall, stout, erect, sharply angled, smooth or minutely rough on the angles above. Leaves 4-7 mm. wide, flat

* Ridgway, Robert. Color standards and color nomenclature. 1912.

above, long acuminate, minutely rough above, slightly nodulose, those of the fertile culms shorter than the culm, those of the sterile culms much longer than the fertile culms. Lower sheaths overlapping, loose, reddish below, ventral band white or tawny hyaline, easily ruptured, mouth brown. Terminal 2-4 spikes staminate, slender cylindric, sessile or nearly so, 1-5 cm. long, whitish or brownish, scales acute, hyaline. Pistillate spikes 2-3, cylindric, 1.5-6.5 cm. long, 7-10 mm. wide, the upper sessile or nearly so, the lowest short or long peduncled, the lowest rather loosely flowered, attenuate at base, all separated. Bracts of the staminate spikes inconspicuous and almost scalelike to shorter or (the lowest) longer than the spike. Bracts of the pistillate spikes leaflike, shorter or longer than the inflorescence. Perigynia brown, hairy, tough, somewhat inflated, faintly impressed nerved or nerves hidden by the pubescence, sessile, 4.5-5 mm. long, 2 mm. wide, slender ovoid with short bidentate beak, teeth erect or spreading, about $\frac{1}{2}$ mm. long. Achene trigonous, obovoid, 1.75-2 mm. long, 1-1.25 mm. wide, smooth, dull, light brown; style uniform. Scales whitish hyaline or with brown margin and green midrib, cuspidate, usually shorter than the perigynia. Stigmas 3. Though the fertile culms are numerous, few achenes develop so that the plants are almost sterile.

The above description is based primarily on plants found growing in open damp alluvial soil at one locality in Macon Co., Illinois. My number 2338, preserved in my herbarium, is designated as the type. Duplicate specimens have been deposited in a number of the consulting and private herbaria of the country. At the type locality are found both parents, *Carex impressa* (Wright) Mackenzie and *Carex lanuginosa* Michx., *Carex stricta* Lam. var. *angustata* (Boott) Bailey, *Carex lupulina* Muhl. var. *pedunculata* Dewey, *Carex lupuliformis* Sartwell, *Carex crus-corvi* Shuttlw., *Carex stipata* Muhl., *Carex tribuloides* Wahlenb., *Carex tribuloides* Wahlenb. var. *turbata* Bailey, *Carex granularis* Muhl., and *Carex muskingumensis* Schwein.

The following key will serve to separate this hybrid from the parent species:

Perigynia pubescent.

Plants slender, leaves 2-5 mm. broad, heads less than 7 mm. thick, perigynia abruptly contracted to the short beak. *Carex lanuginosa* Michx.

Plants stout, leaves 4-7 mm. wide, heads 7-10 mm. thick, perigynia tapering gradually to the longer beak, faintly impressed nerved, almost sterile.

Carex impressa $\times$ *C. lanuginosa*.

Perigynia glabrous.

Carex impressa (Wright) Mackenzie.

Specimens examined, all from the herbarium of Mr. K. K. Mackenzie.

INDIANA: Wells Co., C. C. Deam, May 22, 1908. Posey Co., C. C. Deam, May 23, 1911. Porter Co., C. C. Deam, June 17, 1911.

A NEW FOSSIL SELAGINELLA FROM THE LOWER TERTIARY OF MONTANA*

BY F. H. KNOWLTON

The remains of lycopodiaceous plants appear to be very rare in Mesozoic and later horizons, and when one is discovered that shows not only the foliar organs, but the fruiting organs as well in a high degree of perfection, it merits immediate description, and this is the warrant for the present publication.

The beautifully preserved specimens here described as *Selaginella* were obtained during the past summer (1915) by Mr. A. J. Collier, of the United States Geological Survey, in the northeast Montana coal field; at a point a few miles south of the international boundary, in sec. 33, T. 37 N., R. 47 E. The material in which they are preserved is a white, very fine-grained clay especially adapted to retaining even the most delicate plant structures. The plants in association with the *Selaginella* indicate that they probably grew in or very close to the body of water in which they were deposited. These comprise an alga, stems and roots of *Equisetum*, leaves and stems of coarse sedges, a fern (*Onoclea sensibilis fossilis*), a leaf apparently of *Potamogeton*, and a stem bearing whorls of leaves of what is known as *Trapa ? microphylla* Lesq. The latter specimen throws much light on the affinity of a plant that has long been imperfectly understood. It will be described and figured on a later occasion.

The *Selaginella* may be known as:

Selaginella Collieri n. sp.

PLATE I, FIGURES 1-6

Stems very slender, weak, evidently erect or suberect, probably from a decumbent base, about 2 centimeters high, pinnate, the branches alternate, close, the lower one or two compound; leaves

* Published with the permission of the Director of the U. S. Geological Survey.

on the stem of two kinds, those of the lower plane alternate, spaced, spreading, apparently rounded at apex; leaves of upper plane small (one-third the length of the others), appressed, oblong, obtuse; branchlets all fertile, apparently square, sporophylls all alike, alternate, close, overlapping, slightly setose-pointed; sporangia large, one in the axil of each bract, circular (now flattened), ornamented with numerous minute, circular elevations.

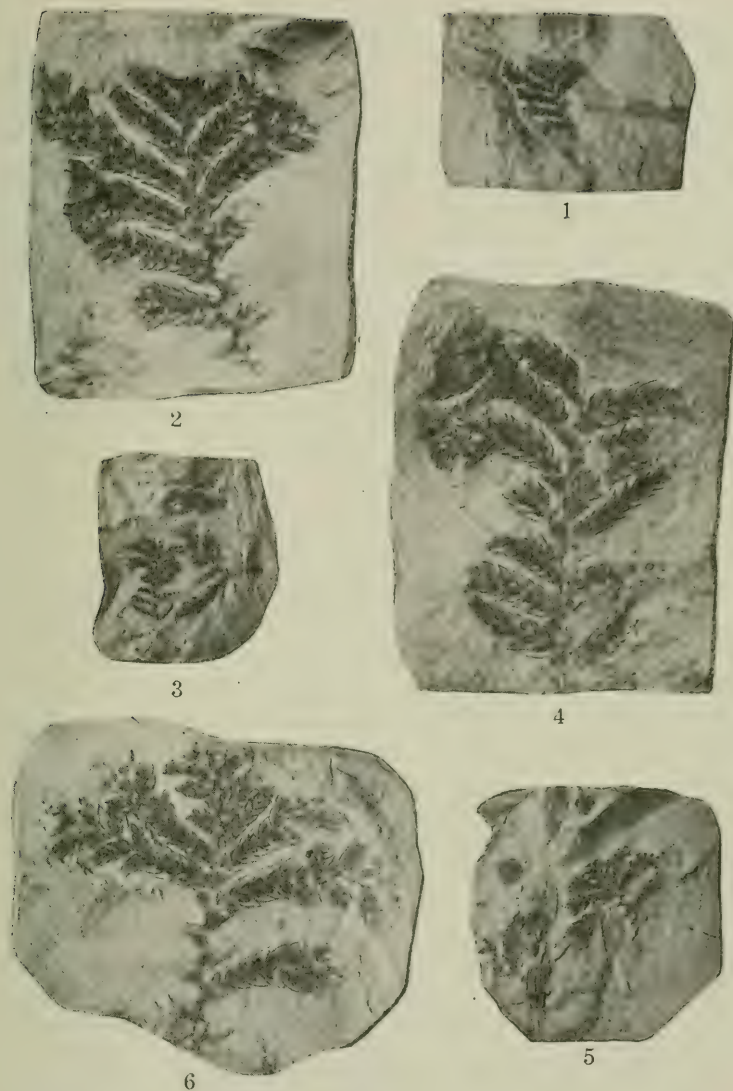
Types.—U. S. National Museum, Nos. 35,009, 35,010, 35,011.

Locality.—Northeast Montana just below international boundary (sec. 33, T. 37 N., R. 47 E.).

Horizon.—Fort Union formation (Eocene), from clay above a large vein of coal and about 40 feet above the base of the formation.

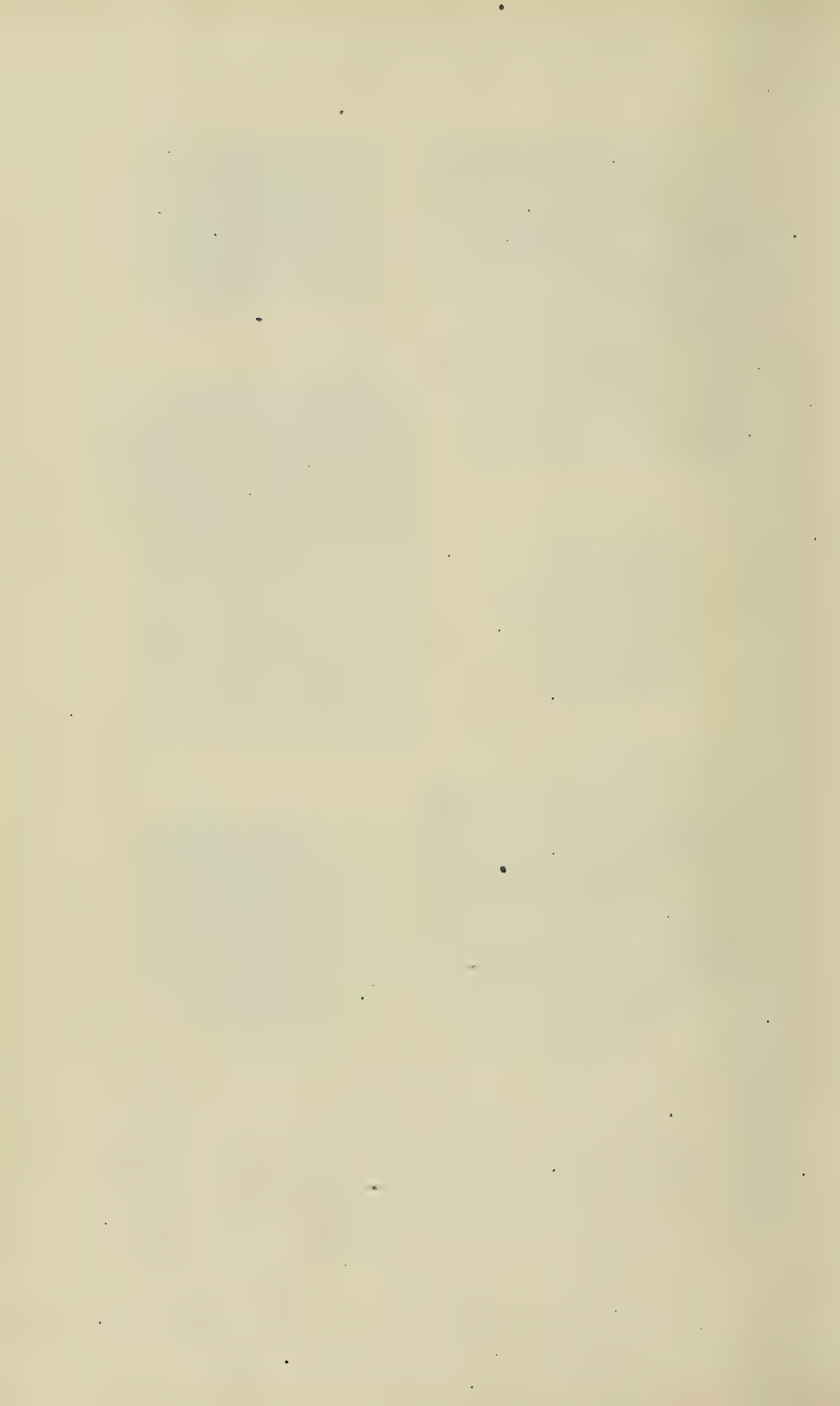
The working out of the probable affinity of *Selaginella Collieri* among the living species is a matter of some difficulty. As is well known, the genus is a vast one, comprising between 500 and 1,000 species, and as many of the species are very close together, and the individual variation often very considerable, an expert knowledge of the genus which the writer cannot lay claim to is really required to stabilize identifications. In the first place it may be pointed out that the fossil species appears to have little or no close relationship with any form now living in the United States or Canada, the nearest species being perhaps *Selaginella apus* (L.) Spring, but this is obviously so remote as to be negligible.

In general *S. Collieri* appears to approach most closely to *S. stenophylla* A. Br. (*S. Lycinchus* Tourn., Fil. Mex., p. 148, non Sprieng), and especially its variety *rigidiuscula* Tourn., a native of Mexico. In some features it also resembles *S. didymostachya* (Desv.) Sprieng, and *S. confusa* Sprieng, both natives of Jamaica. It also suggests in the form of its branching *S. guatemalensis* Baker, from Guatemala. However, its small size, very close, densely fertile spikes and spreading leaves serve to distinguish it at once from any of those mentioned above, and it is probable that its real affinities have not been determined. It is hoped, however, that the excellent figures given may ultimately serve to allocate it.



EXPLANATION OF PLATE I.

- FIG. 1. *Selaginella Collieri* n. sp. Natural size.
 FIG. 2. *Selaginella Collieri* n. sp. Four times enlarged.
 FIG. 3. *Selaginella Collieri* n. sp. Natural size.
 FIG. 4. *Selaginella Collieri* n. sp. Four times enlarged.
 FIG. 5. *Selaginella Collieri* n. sp. Natural size.
 FIG. 6. *Selaginella Collieri* n. sp. Four times enlarged.



So far as now known this is the first fruiting fossil *Selaginella* to be described. Of the four previously named fossil American species *Selaginella marylandica* Fontaine* is from the Lower Cretaceous (Patapsco formation) of Maryland. It is based on fragmentary remains of dichotomously branching stems of sympodial habit with two laterally attached rows of minute leaves. Concerning its status Berry† says: "While the reference of this form to *Selaginella* is not conclusive it is certainly very suggestive of that genus in its superficial appearance."

Two species were described by Lesquereux from the Montana group at Point of Rocks, Wyoming. Of these *S. falcata* Lesq.‡ is based on small branches with two rows of leaves. Its reference to this genus is questioned even by Lesquereux. The other species, *S. laciniata* Lesq.,§ is open to even graver question.

The remaining American species, *S. Berthoudi* Lesq.,|| from the Denver formation (Eocene) at Golden, Colorado, has every appearance of having been correctly placed in this genus, although it bears no trace of fruit.

A review of the literature discloses the fact that there are only three¶ fossil extra-American species referred to the genus *Selaginella*, not one of which, however, is in a fruiting condition. These are *S. arctica* Heer, from the Upper Cretaceous of Atanekrdluk, Greenland; *S. dichotoma* Velenovsky, from the Upper Cretaceous of Bohemia; and *S. gallica* Laurent, from the Pliocene of Cantal.

The genera *Selaginites*, which is confined to the Paleozoic, and *Slaginellites*, which is found in the extreme upper Paleozoic and lower Mesozoic, are provided for forms believed to be more or

* Fontaine, W. M., in Ward, L. F., U. S. Geol. Survey Mon. 48, p. 553, Pl. CXV, figs. 9, 10, 1905.

† Berry, E. W., Geol. Survey Maryland, Lower Cretaceous, p. 307, Pl. XLI, figs. 1, 2, 1911.

‡ Lesquereux, Leo, Tertiary Flora, p. 46, Pl. LXI, figs. 12-15, 1878.

§ Op. cit., p. 47, Pl. LXIV, figs. 12, 12a.

|| Op. cit., p. 46, Pl. V, figs. 12, 12a.

¶ The plant from the Jurassic of Yorkshire, England, described by Lindley and Hutton as *Lycopodites falcatus*, was transferred by Brongniart to *Selaginella*, but later authors, notably Seward (Jurassic flora Yorkshire, p. 68), have returned it to *Lycopodites*. Concerning it Seward says: "There is little doubt that *Lycopodites falcatus* should be regarded as a Lycopodiaceous plant more nearly allied to the genus *Selaginella* than to *Lycopodium*."

less clearly related to the modern *Selaginella*, but they need not be further considered in the present connection.

SHORTER NOTES

IS *CARDUUS UNDULATUS* NUTT. FOUND IN COLORADO? When, a number of years ago, I began collecting botanical specimens in Colorado, and later began collecting thistles, I supposed I would find *Carduus undulatus* Nutt. As time went by and I did considerable collecting, and became somewhat acquainted with the many forms of *Carduus* I began to doubt if it is to be found here.

The habitat of *Carduus undulatus* according to Nuttall is, "On the calcareous islands of Lake Huron and on the plains of Upper Louisiana"; and it was said to be 1 to 2 feet high. A part of Dr. Gray's description is, "principal bracts of the involucre . . . comparatively small and narrow, tipped with an evident spreading prickle." I have specimens of a *Carduus* collected by Dr. J. Lunell at Butte, Benson Co., North Dakota, which answer Dr. Gray's description of *Carduus undulatus* Nutt., and I am supposing they represent the true *C. undulatus*.

On the eastern side of the mountains in Colorado there are three species, some of which have been taken for *C. undulatus*. One of these is now *C. Plattensis* Rydb.; and since it has been described and its specific characters pointed out, it is readily recognized and considered to be distinct from *C. undulatus*. Another species which I suppose has been taken for the latter is *C. megacephalus* (Gray) Smyth. This is somewhat variable, especially in size, but it is characterized by the broader involucre bracts, and stouter spines, and I think may be readily recognized. The third member of the group is *C. Floodmani* Rydb. This is quite common on the plains, and in some respects answers better the description of *C. undulatus* than do the other two, since the involucre bracts may be said to be "comparatively narrow, and tipped with an evident spreading prickle."

Those on the western slope belonging to the group of *C. undulatus*, according to Dr. Rydberg's Flora of Colorado, are: *C. Traceyi* Rydb., *C. oblanceolatus* Rydb., *C. canescens* Nutt., and

C. flocosus Rydb. There seems to be some doubt as to just what *C. canescens* is, nor am I certain just what form is *C. oblanceolatus*. I have collected at Glenwood Springs a form with rather small heads, and small bracts, and having the leaves almost entire, which I have thought may be this; but the leaves of *C. flocosus* are often quite entire and it is possible that the forms I speak of may be referred to that. *C. Traceyi* is not very well known and it is not likely that it has often been referred to *C. undulatus*.

Probably the only one of these which has been generally referred to *C. undulatus*, is *C. flocosus*. This is quite widely distributed in middle elevations, and I have collected it not only at the type locality, Wolcott, Eagle Co., but at Hayden in Routt Co., Glenwood Springs in Garfield Co., Delta in Delta Co., and Ouray in Ouray Co. I should say that it differs quite widely from *C. undulatus* Nutt. Instead of being a foot or two high it is three or even four feet high, and the involucral bracts instead of being comparatively narrow, are comparatively wide, resembling rather those of *C. megacephalus*; and in some of the plants the leaves resemble the latter, and sometimes the heads approach it in size.

I can not say, of course for a certainty, that *Carduus undulatus* Nutt. is not found in Colorado, but after a number of years of collecting, I am quite sure I have not found it.

GEO. E. OSTERHOUT

WINDSOR, COLORADO

REVIEWS

The western guide-books of the U. S. Geological Survey

Last year, when many more Easterners than usual were visiting the Pacific coast on account of the two California expositions, several national conventions, and the liberal concessions made by the transcontinental railroads in the way of rates, routes, stopovers, etc., the U. S. Geological Survey published a "Guidebook of the Western United States" in four parts (A to D), constituting Bulletins 611-614 of the Survey. The set comprises 794 pages, 95 maps, 152 plates, and 113 text-figures. Unlike other bulletins of the same series, which are distributed

gratuitously, these sell for a dollar each, unbound. As in the case of many other important works, the writing and printing took longer than was expected, and they came out too late in the summer to be of service to all the visitors to the expositions and A. A. S. meetings. (The months of publication are not indicated, but Part B was distributed about July 1, Part A in August, and Parts C and D in September.)

Part A deals with the Northern Pacific route, from St. Paul to Seattle, with a side-trip from Livingston, Mont., to Yellowstone Park; Part B with the "Overland Route," from Council Bluffs to San Francisco, with a side-trip from Ogden, Utah, to Yellowstone Park; Part C with the Santa Fe route, from Kansas City to Los Angeles, with a side-trip from Williams, Ariz., to the Grand Canyon; and Part D with the "Shasta Route" and coast line, from Seattle to Los Angeles. (Two very interesting and popular transcontinental routes, the Denver & Rio Grande and the "Sunset Route," which are quite different from either of those described, and two additional routes traversing the same states as the Northern Pacific, are not provided for.)

Each bulletin describes in as simple language as possible what the intelligent traveler who is not a geologist would see from the train if he made the whole journey by daylight. The numerous sectional maps are on a large enough scale so that all important topographic features in sight can be identified. Although the geological treatment is naturally the most complete (no doubt partly because geological features are more conspicuous in the West than in the East, owing to the sparsity of the vegetation in the arid regions), there is abundant information about topography, while forests, crops, and other scenic and economic features are not neglected, and there are many historical, biographical, and paleontological notes, occasional references to climate, and a bibliography in each part. Most of the half-tone illustrations, which are well chosen and executed, give some idea of the prevailing vegetation, and a few are strictly botanical; for example, a scene in the dense forests of Washington, a full-page plate of *Sericotheca* (*Schizonotus*) *discolor*, a handsome rosaceous shrub growing in the same state, and some Arizona desert vegetation.

Besides frequent notes on sage-brush, yellow pine, and other common plants which every traveler would notice, there is some more technical, and apparently quite trustworthy, botanical information, with scientific names mentioned, such as an annotated list of the characteristic trees of the Sierra Nevada, and a sketch of the tree zones on Mount Shasta. Every botanist who is interested in the West as much as \$4 worth, or contemplates traveling on either of the routes named in the near future, would do well to provide himself with a set of these bulletins. (Single parts have been reviewed in more detail by geologists and geographers in *Science* for Aug. 13, 1915, the *Bulletin of the American Geographical Society* for September, and its successor the *Geographical Review* for February, April and May, 1916.)

ROLAND M. HARPER

PROCEEDINGS OF THE CLUB

MAY 9, 1916

The meeting was held at the American Museum of Natural History, at 8:15 P.M., President Harper presiding. There were twenty persons present.

The lecture of the evening was given by Dr. Clifford H. Farr on "Jamaica and its Plants." The lecture was illustrated with slides.

Adjournment followed.

B. O. DODGE,
Secretary

MAY 31, 1916

The meeting was held in the Morphological Laboratory of the New York Botanical Garden at 3:30 P.M., with President Harper in the chair. The meeting was attended by twenty-five persons.

The minutes of the meetings held April 26 and May 9 were read and approved.

Miss Margaret Harrigan, 401 Clinton St., Brooklyn, N. Y., and Miss Abigail O'Brien, 2787 Boulevard, Jersey City, N. J., were nominated for membership. The resignation of Miss May A. Parker was accepted. Miss Harrigan and Miss O'Brien were elected to membership.

The first number on the announced scientific program was a paper by Dr. J. K. Small on "Exploration of Cape Sable, Florida." The speaker gave a brief description of the locality explored and exhibited a large number of photographs of the vegetation of this region.

The second paper was presented by Dr. E. W. Olive on "Porto Rican Rusts." The speaker's abstract follows:

"Professor Arthur's recent list of the 'Uredinales of Porto Rico' (Mycologia, 7: 168, 227, 315; 8: 16) based largely on the collections of F. L. Stevens in 1912-14, and again during the summer of 1915, enumerates a total of 135 from the Island, of which Dr. Stevens collected 122. During a recent collection trip to Porto Rico, lasting from Feb. 23 to April 26, 1916, Professor Whetzel of Cornell and Dr. Olive of the Brooklyn Botanic Garden collected again the majority of the forms found by Stevens, together with a number of species new to Arthur's list as well as some new to science. Among the latter certain *Endophyllum*-like rusts, six or perhaps seven in number, are of special interest. Besides an abundance of dried specimens, considerable fixed material, particularly representatives of the short-cycled rusts, was brought back for microscopic study.

"Attention was called in particular to the relative abundance of the uredo forms; to the strictly localized distribution of certain rusts; to the apparent absence of serious rust epidemics; and to the comparative scarcity of rust fungi in the primeval forests of Porto Rico."

Dr. W. A. Murrill followed with a paper on "A New Poisonous Mushroom." This new species of *Panaeolus* is described in the May number of Mycologia. The speaker exhibited dried specimens of this fungus and of related forms and water color illustrations of fresh specimens of the poisonous species.

Adjournment followed.

B. O. DODGE,
Secretary

NEWS ITEMS

In a recent number of the *Journal of Ecology* is recorded the death of two British botanists, the first to fall in the war. They are Charles Glass Playfair Laidlaw who was wounded at Richebourg l'Avonce on April 2, 1915 and died that night in the hospital, and Ernest Lee who was killed on July 10, 1915.

Volume six of the Memoirs of the New York Botanical Garden, containing most of the papers read at the twentieth anniversary of the Garden a year ago, was issued August 31. It is a volume of 592 pages and a copy has been sent to each contributor.

Dr. Leopold Kny, honorary Professor on the Philosophic Faculty of the Friedrich-Wilhelm University, and Professor in the Landwirtschaftliche Hochschule in Berlin, died on June 26, after a long illness. He had nearly completed his 75th year. He was well known for his contributions on physiology, anatomy, and intercellular protoplasm.

"William Scrugham Lyon, formerly of New York, died on July 20 at St. Paul's Hospital in Manila. Mr. Lyon served at one time as head of the California State Board of Forestry, and while holding this position, at the request of Prof. Asa Gray, of Harvard, he made a complete and valuable collection of the flora of the Catalina Islands. In 1902 he went to the Philippines for the Bureau of Agriculture. In 1905, Mr. Lyon left this Bureau to engage in the business of collecting and exporting orchids, in which he continued until the time of his death. His gardens at Balic-Balic, called the "Gardens of Nagtajan," were widely known among those interested in botanical and horticultural subjects." (*Evening Post.*)

Dr. W. A. Murrill returned August 21 from a vacation of two weeks spent in the Catskills, at Arkville, Delaware Co., New York, where he obtained about 400 numbers of fungi for the New York Botanical Garden herbarium. An account of his trip, with a list of the fungi collected, will appear in *Mycologia*. Arkville is of special interest to botanists in New York City because it is included in the local flora range and furnishes many species found in the Adirondacks.

The Torrey Botanical Club

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OTHER PUBLICATIONS
OF THE
TORREY BOTANICAL CLUB

(1) BULLETIN

A monthly journal devoted to general botany, established 1870. Vol. 42 published in 1915, contained 698 pages of text and 33 full-page plates. Price \$3.00 per annum. For Europe, 14 shillings. Dulau & Co., 37 Soho Square, London, are, agents for England.

Of former volumes, only 24-42 can be supplied entire; certain numbers of other volumes are available, but the entire stock of some numbers has been reserved for the completion of sets. Vols. 24-27 are furnished at the published price of two dollars each; Vols. 28-42 three dollars each.

Single copies (30 cents) will be furnished only when not breaking complete volumes.

(2) MEMOIRS

The MEMOIRS, established 1889, are published at irregular intervals. Volumes 1-15 are now completed; No. 1 of Vol. 16 has been issued. The subscription price is fixed at \$3.00 per volume in advance. The numbers can also be purchased singly. A list of titles of the individual papers and of prices will be furnished on application.

(3) The Preliminary Catalogue of Anthophyta and Pteridophyta reported as growing within one hundred miles of New York, 1888. Price, \$1.00.

Correspondence relating to the above publications should be addressed to

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Columbia University

New York City

TORREYA

A MONTHLY JOURNAL OF BOTANICAL NOTES AND NEWS

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR



JOHN TORREY, 1796-1873

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NORMAN TAYLOR

Brooklyn Botanic Garden

Brooklyn, N. Y.

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No. 10

THE ASCENT OF THE TURQUINO, THE HIGHEST MOUNTAIN IN CUBA

[In TORREYA for December, 1915, brief note was made of the ascent of this mountain by a Scandinavian botanist, Dr. E. L. Ekman, with the observation that he was probably the first botanist to reach the top. But the mountain had been climbed years ago by an Englishman who wrote to his mother the account of the expedition printed below. This was given to Dr. Britton by the late Jennings S. Cox, of Santiago, and permission to print it was received from Charles T. Ramsden, Esq., of Guantanamo, a son of the explorer. The description is printed here as a guide to possible future explorers. At the time of making the ascent Mr. F. W. Ramsden was twenty years old, had been in Cuba only two years, and was employed in Santiago de Cuba.—N. T.]

SANTIAGO DE CUBA, 17th April, 1860.

My dear Mother: On my arriving in Cuba last Wednesday I was very glad to find your letter of 9th ult. waiting me together with a packet of papers.

In my last I believe I told you that I intended starting on an expedition to the top of the Pico Turquino, the highest mountain in Cuba. Here I am back again safe and sound, and I think it has done me a great deal of good, as I feel very strong and well after it.

As I have nothing much to say I may as well fill my letter with an account of my trip, tho' I am not sure it will be very interesting.

A few of us here had been talking for some little time back of trying to make the ascent of the mountain, and to find out at

[No. 9, Vol. 16 of TORREYA, comprising pp. 193-210, was issued 14 Sept., 1916.]

what elevation it is above the level of the sea, as up to the present time no one had been up, and its height was only *supposed* to be 7,000 odd feet.

When we first spoke of it, a great many people said they would go, but as soon as we began to make definite plans, and the affair seemed likely to come to pass, nearly every one drew back under some pretense or other, so that we found our numbers reduced to five, and in consequence of this were unable to go down the coast in the steamer as at first intended, but had to charter a small sailing vessel, as the steamer would have been too expensive.

I did not at all like the idea of a sailing vessel, as my time is not my own, and I knew we were as likely to be ten days as one, on the passage—but sooner than not go at all, I agreed to it.

Everybody then began to discourage the idea, which is another indication of the Creole character—we were either going to die of fever, caught by sleeping out, or fall down a precipice, or get killed by the wild boars or runaway negroes, and it was certain that we should never get to the top, however we paid no attention to what they said, and as the result proved, they were all wrong.

On Saturday evening 31st Mar. at 7 o'clock we all assembled—viz. Enrique and Agustin Sagebien—civil engineers—Ernest Despaigne—Gent.—Carlos Jenneret—a Swiss watchmaker, and myself—the two last very fond of natural history—and three negroes to carry our things. As soon as we arrived at the wharf, where we were to embark on board the “Ygnacia” (a small schooner of about 40 tons) Capt. José de los Santos—it began to rain, so we waited a little in a tienda near. While there Jenneret managed to knock down our instrument for taking the height (a hypometer) and broke it. He and Enrique went back to Cuba* and borrowed another one smaller and not so tender. So that we were not ready for sea before 10.30. Nearly every night here we have a “terral” or wind off land, which enables the vessels to get out of the bay, but that night as if we were doomed to meet with every possible obstacle, there was none,

* Many people still speak of Santiago de Cuba as simply “Cuba,” Mr. Ramsden writes that the older generation of Cubans always did so.—ED.

and we did not arrive at the "Morro Castle," (Santiago Harbor) till just before day-break.

My equipment was as follows—that of the rest being something similar—a coarse blue drill sort of smock frock and trousers, thick shoes and a blue flannel shirt, belt containing hunting knife and revolver—game bag—a small pocket flask of whiskey, and another holding an imperial quart of brandy—butterfly net and box and a lot of little *etceteras*. The negroes had charge of our hammocks, blankets and food—the latter of which consisted chiefly of preserved meats and rice—in the way of liquors we had brandy, gin, beer and coffee.

The first night we stretched ourselves on some boards in the hold of the vessel, and afterwards sometimes on deck and sometimes down below, on starting I slung my hammock, but as soon as the vessel began to roll, I found it was swinging backwards and forwards against the corner of a box, the rope having stretched—so being afraid of wearing it out, I left it, and passed the remainder of the night on an old sail. Sunday, 1st April—at day break we found ourselves almost three miles from the Morro, with no wind, and we continued there till Monday, when we had a very slight breeze ahead and managed to make a few miles by tacking. We breakfasted at nine and dined at four—plenty of Catalan oil and garlic—asleep nearly all day, under an awning just thick enough to keep out some of the breeze but not the sun.

Monday, 2nd. Had the pleasure to find we had made no progress during the night. Towards midday a little wind sprang up, and later freshened into a stiff breeze from the southwest, but it dropped suddenly at sundown. This day we made about 20 miles and with a terral at night, on Tuesday, 3rd we found ourselves about three leagues from the mountain, and at 1 p. m. we succeeded in arriving sufficiently near to lower a boat—by means of this and a canoe, which they sent off from the shore, we disembarked, during the passage having to sit down in the bottom of the canoe so as not to upset it, under a tremendous sun—we landed near a small river, in a very picturesque spot called "Las Cuevas," and made our way to the tienda near.

There are only three houses in the bay—viz. the tienda, where they sell a little of everything and buy the wax from the bee-hunters, and which we made our headquarters, owned by Don Antonio Roig—the house of his overseer, or rather only servant—a free negro named Correa—and that of Roig's brother, who I believe has no occupation—but all three join in cutting firewood and Fustic, as return cargo for a small vessel that brings goods from Cuba for the shop. Mrs. Roig, a very ugly brown woman, and a whole troupe of children of the same color gave us a hearty welcome, and stared at us, as if they had never seen a civilized person before. The establishment consisted of three buildings—to the right the kitchen, in the middle the children's bedroom, in front of which was thatched shed without sides, used as dining room etc. and to the left the tienda, consisting of a very small shop, and the bedroom of Mr. and Mrs. Roig.

They killed a pig for us on arrival, most of which they cut into strips and dried in the sun to make *tasajo*, leaving us some ribs for dinner and the next day—with this and plenty of yams, bananas, and sweet potatoes, we fared very well.

On enquiring for a guide about whom we had previously written, Mr. Roig informed us that he had gone off that morning on business to the Magistrate, a distance of 45 miles, and that we must wait till he came back, as there was no one else—this did not at all suit us, as we had told the patron of the vessel to return for us on the Friday—after questioning for a long time, Mr. Roig at last told us he knew of one man, 9 miles from there, who he thought might do it, and accordingly we sent off to him the same night and in the morning he arrived.

Before dinner I took a stroll with my gun, but I soon came back, having killed a good many pigeons and parrots, literally tired of shooting them, as there were such quantities.

At night Jenneret and I slung our hammocks in the shed, and slept very well, with a nice fresh breeze from the sea, a full moon and no mosquitoes—the other three slept in the shop.

Wednesday, 4th. Up at daybreak and took a bath in the sea, but was afraid to go out of my depth on account of the sharks, of which there are swarms in the bay. I then took my net and

11.01

caught some very good butterflies, and when I came in to breakfast, I found our guide arrived—Don Jose Antonio de Leon—a regular character—an ugly raw-boned Indian, of about 6 feet very thin and a great talker—dressed in a pair of trousers, shirt and hat, with a large knife.

After breakfast Enrique Sagebien took two photographic views, one of the house, family and ourselves—and another of us and the sea beach. The first turned out badly, but the second is a good picture.

At 12:45 we started under a burning sun, leaving behind our hammocks and guns, as they were too much to carry—in all 10 persons—viz. five white—3 negroes—the guide and Correa, whom we asked to come.

After crossing three rivers we began to ascend, and then our hard work commenced—at first I thought I should never get along, being out of practice, but by stopping for a minute now and then, we managed to continue—our way lying thro' splendid woods containing Mahogany, Fustic, Palms and many other trees, of which I do not know the English names—and at 5 p. m. we arrived at a considerable height, among the clouds—and finding here a small pool of very dirty water we encamped for the night.

We constructed a sort of "Rancho," with four uprights, a few cross poles, and some palm leaves thrown on the top, as a precaution against the dew—and on the ground put some pieces of "Yagua" Palm, to keep out the damp.

I dont know what part of the tree this is—it is neither leaf nor bark, but grows around the lower part of the stem of the leaf, and drops off once a month—it is very tough—over $\frac{1}{4}$ of an inch in thickness and in pieces of about 3 feet $\times$ 2—they use it here for storing up the bales of tobacco and many other purposes.

Having made a fire and had our dinner and coffee, we smoked and listened to stories of our guide about the captures of palenques of runaway negroes, and went to bed about 8 p. m. wrapped round with our blankets, and with our shoes and game bags for pillows.

Thursday, 5th. I awoke at daybreak finding myself pretty damp from the dew—and hearing the others saying they had hardly slept all night—strange to say I had been fast asleep from the time I went to bed till then.

After taking coffee we shouldered our traps and were again on the march—our way at first was thro' much the same country as on the previous day, but soon the vegetation began to get thicker and smaller with a great number of tree ferns, whose trunks are covered with thorns. I felt quite fresh today, and went along very well with the help of feet and hands. The only thing that gave us any anxiety was want of water—we found none in our way, and did not wish to drink that which we carried in our canteens, as we did not know how long we might be detained in the mountain—On my mentioning this to Correa, he said just here there is plenty of water, and taking out his knife he cut off a piece of a "parra" or vine that I had noticed in great quantities, and holding it over my little cup, it soon filled it with the sap—which was like the clearest and coolest water I ever tasted.

At 9 we stopped for a few minutes to eat some sardines and biscuit, after which I felt decidedly better. We wanted something to keep us up, for almost immediately afterwards we came up on a very bad pass. Suddenly the trees stopped, and before us there seemed to be no way, but another step brought us in sight of a path leading almost perpendicularly up, and at the same time doubling a sharp corner of the mountain—it seemed to me to have been at one time a mountain torrent, as there were no trees, but large pieces of bare rock fixed pretty firmly, but as this did not last for more than a dozen yards, we succeeded in climbing up. A. Sagebien, who was in front of me turned back, saying he had the vertigo, but afterwards we persuaded him to come on—on looking behind you the rock went straight away down, and stopped only to end in the clouds below—this path brought us to the top of a mountain very near Turquino, and from where we could see our old friend.

Feeling again thirst, I asked Correa if he could get me some water here, as we had left the vines far down below, he said yes,

tho' it would not be very clean—and he took my cup and filled it with dirty water full of insects, but not being over particular, I was glad to drink it, insects and all—he had procured it from a plant that grows on the branches of the trees—very like the top of a pine apple, but larger; the dews and rain fall into and remain in the leaves and on cutting it and turning it upside down, of course the water runs out—I don't remember the Indian name, the only one I ever knew.

At this point the guide said he had been no further and was not at all sure that we could proceed—however by dint of a little cutting we made our way to the side of the mountain opposite, which was the lower peak of the Turquino.

Here we came on a most beautiful part, a deep ravine with some good sized trees in it, and all their trunks, as well as the ground covered with moss; so that every thing was entirely green, which produced a very curious appearance—following this for some minutes we were considerably pleased at finding two pools of deliciously cool water, as cold as ice. We emptied our bottles of the water we had prized so much before, and filled them afresh, and drank to our hearts content—a little further on we found two more pools of water, just like ink—it was not the earth at the bottom that gave it the color, but the water itself was of a bluish black.

Round the first pools we found fresh marks of wild boars and struck upon a trail of these animals, leading upwards, which we followed, and after about half an hour arrived at the first peak of Mt. Turquino at 11.15 a. m.

After cutting down some of the bushes to make a small open space, we halted and had breakfast. We could see the other peak looming up among the clouds, and evidently higher than where we were, and a tremendous ravine between us. Some wanted not to go further, as the guide said it was impossible, but Enrique and myself opposed it, saying it would never do to go back without having been to the very top. While we were talking we heard Correa's voice from down below—this decided us, and leaving behind us the negroes and traps we set off at a run down the hill, tumbling over the fallen trees and crashing

thro' the thorny bushes. We soon found Correa, and then we cut our way along the ridge of the mountain, and after a great deal of trouble succeeded in arriving at the highest point in the island of Cuba at 2 p. m.

We passed one splendid place on our way—there was a large narrow piece of rock, like a low wall, at the side of our path, and bending over it, we could look down on the other side. The sight was awful—the rock was perpendicular as far as we could see, and then seemed to lose itself in the thin white vapoury clouds beneath.

We had brought up the Hypometer, and we immediately set it to work to find out the altitude, by lighting the lamp to make the water boil, after having first ascended a tree to make sure that we were on the highest peak. We could not see very far as there were a great many clouds but the lower peaks were plainly visible all round. I wanted to sleep there in order to see the view in the morning, but the others objected saying it was very cold and damp, which certainly was the case.

We drank a bottle of sauterene, brought up for the purpose—cut our initials on the trees—wrote and signed a piece of paper, stating that we had ascended on 5th April, and put it in a bottle, which we buried, making a small heap of stones round. I cut a very good walking stick and caught two beetles, the only insects I saw, and gathered some moss. We then set fire to a pile of rotten wood and ferns hoping it would spread, but it must have gone out after we left on account of the damp.

Neither the guide nor any of us knew the trees on the top, all were dwarfish, the largest I should say not over 16 feet, and of very hard wood—the soil seemed to be very good—plenty of loam—and the few stones there seemed to be hardened pieces of clay, very like bricks (lava).

At the bottom of the ravine we found the bushes cut here and there—some one had apparently crossed between the two peaks, but on the top it was evident that man had never been. The air was very thin and rarified.

At 3.20 we commenced the descent, as fast as we could go coming down half the way in a sitting position, and wondering

how ever we had managed to get up such a place; and every now and then tearing our hands to pieces against the thorny trunks of the tree ferns.

Night overtook us while still walking, and at 7 p. m. we arrived at our camping place of the night before, near the pool of dirty water, after a day's work of 14 hours—from which deducting 2 for breakfast and time spent on the peak, would leave 12 hours of continuous climbing and descending. On arrival in camp I threw myself down, hardly able to breathe, I was not in the least tired, but the sudden transit from the high elevation to the lower seemed to have taken away my breath. However after some soup and coffee, I felt better, and managed to smoke a pipe before going to bed.

About midnight I had the pleasure to be awakened by feeling the rain pattering down upon me—I looked at the guide to see what he would do, and immediately followed his example—viz. took my two pieces of Yagua from under me and put them over me, holding up the piece over my head with my hunting knife, and pressing the end of it against a tree at my head—but it seems I pressed a little too hard, for my knife slipped out and caught me in the face, entering my cheek from the eye to below the mouth. I instantly tied my handkerchief around the place and stopped the blood, and in half an hour as soon as the rain had passed, I was sound asleep again; and never woke till day-break next morning.

Friday 6th, when we took coffee and continued our descent to Las Cuevas, where we arrived at 9:15 a. m. none the worse from our trip, except as regards our clothes, hands and eyes, which were very much torn by the thorns. After breakfast I bathed and then caught butterflies, the rest went to sleep. We passed another first rate night in the old shed and at sunrise Saturday 7th. had the pleasure to see the tops of the masts of our vessel just above the horizon—at 1 o'clock the Patron was on shore, and we embarked at 2, but having no wind, we anchored the vessel and came on shore to dine, after which we took leave of Roig & Co. and went on board to sleep. During the night we had just enough wind to take us out about 6 miles, but afterwards a

calm and on Sunday morning (8th.) we found ourselves in the same place—calm all day—and night came upon us still in the same pleasant position off Turquino. Just after I had gone to bed, I was startled by feeling a very curious motion of the vessel as if it was bumping on the rocks, I asked the Patron what it meant, and he said it was an earthquake, and must have been very strong on land—Calm and very hot all night.

Monday 9th. Still in sight of the beloved mountain, but a little wind later enabled us at last fairly to start—during the day the wind increased and at evening turned into a regular gale from the North east. I fancied we were going to have it pretty strong, as the sun went down with the sky almost black, at midnight one of the sailors woke me up to say that he was very frightened and that we were going to the bottom, but I told him I considered myself as safe where I was as I should be on deck, and went to sleep again notwithstanding the heavy weather, and turned out of bed, after a pretty good night's rest considering, on Tuesday 10th. to find nothing more than a nice fresh breeze and the vessel still afloat—during the day we made very little way, on account of the currents against us, and at sunset we were still 40 miles from Cuba, but a fresh terral sprung up and continued all night, so that we felt sure of arriving next day. At midday the cook came to me to inform me that he had a most delicious soup for dinner—I told him I was glad to hear it, tho' I half expected what it was, when it came we found it to be one of the vilest concoctions we had ever tasted, no one could touch it—it consisted of stale bread, eggs and Catalan oil (rather worse than train oil).

Wednesday 11th. Instead of finding ourselves entering the bay at day-break, as we had expected, we were 12 miles to the South. The poor old Patron having been up all night, lay down early in the morning, and gave the helm to a sailor, who went to sleep at his post, and left the vessel to go just where the wind chose to drive it. However at 12 we arrived at the Morro, and at 1 p. m. were once more on terra firma in Cuba, where we found all the people anxiously expecting us, and in a great state of mind about the earthquakes, of which they had felt some 10 or

12 shocks. During the whole time I had been away, I had slept perfectly well at night, tho' generally sub frigido—but as soon as I came back to my bed, I could not sleep at all. The bed seemed to be much harder than either the boards of the vessel or mother earth—and then also I had to take off my trousers and shoes etc., which I did not at all like after having slept so long with them on.

Altogether we passed a very agreeable time, and I should much like to go again and spend a month in the mountain, and examine all its productions, which I had not time to do as we went so fast—but I must not ask for any more holidays just at present. I cant tell you the height of the mountain this mail, as Sagbien has not yet had time to work out the calculations, but when I know it I will let you know.

Supposing your patience has held out thus far, I think an apology is due from me for the length of my description, as well as for the writing; but when I once get my thoughts fixed on a subject, of which I have the details clearly in my mind, the pen runs on by itself almost without the will of the writer, and I generally find that when I have wished to give a concise account of anything, I have spun it out into a regular long rambling story, of not much interest to any one but the writer.

18th. April. The general Cuban news is not much—the new Governor Dn. Antonio Detona has arrived—no more earthquakes—rainy season just beginning; yellow Jack flourishing—A Spanish theatrical company arrived, and a circus expected—the Bull ring is demolished.

There is nothing to answer in your letter.

Please give my love to Marian and tell her it is some time since I have heard from her. I am sorry to say I must put off answering Aunt Sarah's letter till the end of the month.

This goes by Nariño, who leaves on the 19th. (tomorrow) with his wife—if he does not go to London he will post it.

Hoping you will not be tired out with this letter and with best love to all

I am,

My dear Mother,

Ever your affec. son

(signed) FRED W. RAMSDEN

[In a letter to his mother of 30th April 1860 Mr. Ramsden reports his observations as showing that the mountain top is at 7,980 ft. while "Humboldt put it at 7,900 feet; pretty near as his observations must have been taken from the sea." The modern Century Atlas gives the peak as at 8,400 ft., while Dr. Ekman determined the altitude as 6,800 ft. Whatever the height, it is quite certain that Pico de Turquino (Spanish, for which an equivalent is "Turquoise"—of a deep blue color, hence blue mountain) is the highest peak in Cuba.

In 1906 B. E. Fernow and Norman Taylor, also starting from Santiago de Cuba and going west to the river known as Guama (figured on the accompanying map), explored the region between the Turquino and the sea and to the eastward. No elevation higher than 3,000 ft. was reached and no attempt to reach the top was made.* Collections made on this expedition were deposited at the New York Botanical Garden, among the first to reach there from the Sierra Maestra, the general name for the range of which the Turquino is the culmination.

In March, 1912, collections were made by Dr. Britton and the late John F. Cowell in the eastern part of the range above El Cuero and in the western part near Ensenada de Moro, at elevations under 2,000 ft.†

Brother Leon, of Colegio de la Salle, at Havana, who has explored much of Cuba, writes that "the best way to ascend the Cusp of the Pico Turquino is by the valley of the River Yara, following the spur of the Magdalena; it is nearer and easier. The Ox River (Rio Buey) is farther and steeper, and it is more difficult to get guides; this information was obtained from the father of one of his students.

"The peak can also be ascended from the sea, and it is from this side that up to the present, most of the ascents of which we have any knowledge have been made. But it takes more than a week to reach the hills of Turquino and after that the ascent takes 2 or 3 days good travelling to go up the peak. By the Valley of the Yara it will hardly take a week from the town of the Yara to the summit." It was also from the north or land side of the range that Dr. Ekman, evidently influenced by Brother Leon's advice, made the ascent in April, 1915. An account of his trip follows:—N. T.]

"An interesting interview of a correspondent of the *Cubano Libre* with Dr. Erik L. Ekman, dated May 1, 1915, gives an

* See Jour. N. Y. Bot. Gard. 7: 256-270. 1906. Forestry Quart. 4: 239-273. 1906. Torreya 7: 49-55. 1907.

† Jour. N. Y. Bot. Gard. 13: 72-74.

account of an ascent of the highest peak of the Sierra Maestra on the southeastern coast, in the Province of Oriente.

"On March 19, 1915, Dr. Ekman reached the town of Bayamo, located on a river of the same name and began the exploration of the river, on the northern slopes of the Sierra Maestra, hoping to get up to its source. This he found impossible, so a week later he went to Yara a short distance west of Manzanillo and from there to Zarzal and then to Nagüa, a small town situated near to the confluence of the two rivers, Yara and Nagüa. This is the best place to start on an excursion toward the region of the Pico Turquino. Dr. Ekman was well received by Don Leonardo Verdecia and his son Regino Verdecia y Magana, who showed great ability as a guide. The plan was to ascend the Pico Turquino by following the ridge between the N. and S. tributaries which flow from the divide into two opposite directions till they reached the spur or Estribo Turquino, a spur of the ridge which projects southward near the highest point of the Sierra Maestra. This they were able to accomplish with much difficulty and suffering!

"On the 4th of April the trip was begun, accompanied by Regino Verdecia and Joaquin Rodriguez from Yara. They followed the course of the Yara River, a picturesque stream, affording many fine views. They passed the first night at the junction of the Arroyo Naranjo, at an altitude of 225 meters (750 ft.). The next day the real climb began on a trail which leads to the junction of the River Yara with the La Plata. The Sierra at this part is 925 meters (3,000 ft.) high. We left this trail to follow the ridge of the Cordillera and could only do this by cutting our way through with a machete. At times they feared they were lost as the range divides repeatedly. Once they were lost and ascended a peak of 1,400 meters (4,660 ft.) called the 'Punta de Palma Mocha' heretofore unscaled. An interesting flora was found there and very fine views were had of the surrounding country. They spent the night under a huge rock, which gave them shelter, and had no water to drink except that obtained from the leaves of various species of *Tillandsia* and Bromeliads.

"The third day they spent fighting the thickets and jungles of the high Sierra without being able to reach the southern spur of the Pico Turquino. On the fourth day they succeeded and found that its altitude is about 1,750 meters (5,933 ft.) a point where there was a sudden descent to the south a veritable precipice. Here they had to turn back on account of scarcity of provisions and lived on the return trip on 'Jutias' and wild honey.

"On returning to Nagüa, Dr. Ekman was joined by his friend Mr. Y. A. Mystroem, of Bayate, and on the 14th of April started again for a second ascent of the peak, with an abundance of provisions. In three days by using the trail they had cut 10 days before, they were able to reach the base of the peak, and the fourth day at 4 P.M. on April 17th they reached the summit.

"The vegetation of the summit is sparse, composed of low bushes and trees, representing few species but a veritable paradise of ferns and mosses. On the southern slopes toward the sea, the vegetation is very dense, with low shrubby plants so interlaced that it is possible to walk over the summit without touching the ground. There is no doubt that the ascent from the south is impossible at this point, on account of this low dense vegetation.

While Dr. Ekman searched for plants, his companions searched for traces of any previous explorers. They found a few old pieces of charcoal well hidden, which may have been made by Enrique Mesa in his flight, because in one of his poems, sings of his adventures among the 'Waters of the Turquino.' Perhaps he ascended the peak in order to look for the ship that was to carry him away.* They found no other signs of human visitation except these few pieces of charcoal. They made a large fire to announce to their friends in the valley that they were on the summit. They slept up there and suffered much from cold. They left their signatures up there in an empty bottle (of Ron Bacardi) which they placed in a pile of stones. They were able to determine the altitude of the Pico Turquino as 6,800 ft., though it had been previously estimated at over 8,000 feet. The barometer recorded 2,040 meters!

"Taking advantage of an unknown and unnamed region, they

* This was in 1898, during the Spanish-American War.

named the peaks to the east of the main one Sweden and the one to the west, Cuba, and the two most prominent hills on the southern spur Loma Regino and Loma Joaquin!

"The botanical results of the excursion were good, although no traces of a boreal flora were found, such as exist on the high sierras of the republic of Santo Domingo.

"They returned to Nagüa in three days and bade goodbye to the good doctor with many thanks for his hospitable welcome!

(Signed) "NICOLAS VALVERDE

Translated by ELIZABETH G. BRITTON.

To summarize the recorded exploration of this region: (1) [In 1844 J. J. Linden spent about 6 months in collecting in the vicinity of Santiago, and explored portions of the Sierra Maestra. Sets of his plants are preserved in several European herbaria and a few of his specimens have come to the New York Botanical Garden. (2) About the time of the Civil War, Charles Wright, during his extensive Cuban explorations, visited the eastern portion of the Sierra Maestra at several points, but apparently reached no great altitudes.* (3) We have Mr. Ramsden's in 1860, Fernow and Taylor's in 1906, both starting from Santiago de Cuba, and going by boat to the foot hills of the Turquino facing the sea. Mr. Ramsden made no collections, but the collections of 1906, numbering over 600 specimens, are preserved in the Herbarium of the New York Botanical Garden. All of them are from 3,000 ft. or below and from the south face of the Sierra Maestra. (4) In 1912 Britton and Cowell collected there as mentioned on page 222.

(5) Dr. Ekman, who attacked the mountain from the northern slope made considerable collections, some of which went to Sweden, but at last accounts the bulk of his material was held in Cuba. Being the only botanist who has reached to top it is unfortunate that Dr. Ekman found it possible to spend only a few days in the region. Collections in considerable number from both the windward and leeward sides of this range, and from the top, perhaps only to be gathered by well-equipped expeditions going from different sides, would be most valuable. As yet only a beginning of this work has been made, but further explorations will surely prove most interesting. The region from a floristic and ecological point of view is perhaps the most significant in all Cuba.—N. T.]

*Underwood, L. M. A summary of Charles Wright's exploration in Cuba. Bull. Torrey Club 32: 291-300. 1905.

TICKLE-GRASS TUMBLERS

BY BYRON D. HALSTEAD

In the wagon paths through the unmowed fields, around Southern Pines, N. C., the brown tops of a grass (*Leptochloa mucronata* Michx.) have accumulated knee-deep, and therefore very noticeable to a wanderer in by-paths for health.

Each tip is composed of from twenty to forty very slender flexible awns, averaging six inches in length, arranged along the main axis. The awns of the basal portion of the head are much deflexed, those at the middle stand out at right angles to the axis, and the upper third of them extend upward, there being a terminal one, that is directly upright and is a counterpart of the main stem, that breaks off about four inches below the lowermost set of awns. This stem is held securely in place upon the plant by the three or four, usually four, leaf-sheaths, and from which, when mature, it is easily pulled. It is straw-colored and in sharp contrast with the other parts of the inflorescence, which are reddish, and when the feathery "ball" is in motion, is easily followed in its gyrations. This ball is about fifteen inches in diameter, of extreme lightness, and is able to remain at rest in almost any position. When the stem end is downward, the axis is usually inclined at nearly forty-five degrees from the perpendicular, due to the fact that the deflexed branches are not stiff, and usually two or three more or less bent ones are opposed to the stiff main stem in making the "feet" upon which the whole "plume" rests. When placed top down, the smooth, straw-colored stem may be perpendicular but is usually tilted somewhat sidewise, while three or more awns make the "tripod" upon which the "airy nothingness" is poised. Perhaps the most stable position is when the main axis is horizontal, about seven inches from the surface of support, and then four to seven legs, like "daddy long-legs," are in commission. In this position the whole ball can sway with the breeze in the direction of its main axis, thus bringing new "legs" into service.

By gathering the "tumblers" before they have become detached from the stalks, they can be carried in considerable

numbers, without interfering with one another. On the other hand it is quite puzzling to handle more than one, after they have become separated from their natural "handle," for, being much larger than a basket ball, one entangles with the others, and tends to make a very unmanageable feathery mass. Such giant unions are frequently met with in groves of small oak trees that border an open place, that has grown this grass as its chief crop. Driven by the wind to these "covers," sometimes the tumblers have accumulated to the depth of four or more feet, and with the upper surface nearly level and suggesting a fairy lake rather than a fairyland. Through such a "pond," far less substantial than feathers, one may pass dryshod, but the movements, that will be induced in the ghost-like surroundings, are not easily described. All the individual "balls" are bound together and yet capable of a wide range of motions.

The favorable places to find detached and independent "tumblers" is a wire fence of the square mesh sort, against which the "spider balls" are held by the prevailing winds.

When taken into the open, as upon a smooth cut lawn, and set loose before a gentle breeze, they start off on their fantastic journey. The direction, of course, in general is determined by the wind, but with a very gentle breeze there is much deviation seemingly dependent upon the way the axis of the ball is related to the line of the moving air. For example, when two tumblers are started in the same direction, they do not necessarily move in parallel lines as also they may not at equal rates of speed. On account of this apparent element of chance (that may be eliminated by proper training and study(?)) these tumblers may become subjects of considerable amusement, possibly leading to a mild form of satisfying the human inborn fondness for taking chances upon subjects that are in motion.

An excellent place for the study of the ways and rules of these grass "migrators" is the golf "green" which by the way, is a level square of bare smooth ground, with the central hole as the only break in the dead uniformity of the surface, and this is of no consequence, for the tumblers' "feet" are too many, and body too big, to be caught by so small a pitfall as a golf cup.

Now, let there be a gentle breeze, and by placing the feathery balls upon the windward side of the "green," the race is off, without scoring, unless the exact rate of speed is to be recorded, when a scratch line must be drawn, and the usual rules of the race course observed.

From the above the reader has gathered between the lines something of the lightness and airy texture of a subject that may engage the attention of a lover of plants when he is away from home and the weightier matters of life are purposely left behind.

While drinking in the balm of the long-leaved pine, with watch in hand one may test the speed of a pet tumbler, and in the excitement—and it will be thrilling at times—he may lose sight of the real meaning of the whole construction of the racer and the marvelous mechanism that serves the end of seed depression.

It is a lofty motherly instinct in plants, if you please, that has caught the attention, and while it provides amusement in this particular expression, yet, in the last analysis it serves to polish an old thought, namely, the debt to the species is final for the physical nature. But—

Upon the world of matter rests an atmosphere of thought .
And in the upper reaches the Head-thinker's home is sought.
From facts to correlations, then these subtle laws combine—
'Tis called by many 'ologies, this lure of the Divine.

NEW BRUNSWICK, N. J.,
June, 1916

MYOSURUS ARISTATUS BENTH.

BY IVAR TIDESTROM

In his catalogue of Geyer's plants* from the Upper Missouri, the Oregon Territory, and the intervening portion of the Rocky Mountains, Sir W. J. Hooker refers all the specimens of *Myosurus* collected on the trip to *Myosurus minimus* L.

On pages 458-459 of the volume cited,* a revision of *Myosurus* is made by Hooker, so far as the Geyer plants are concerned, and another species, *Myosurus aristatus* Benth. is added. Hooker states in part: "Mr. Bentham has kindly pointed out to me an

* London Journal of Botany, 6: 67, 1847.

error into which I have fallen, in the omission of a second species of *Myosurus* in Mr. Geyer's list of plants, given at p. 67 of this volume. Among my eight specimens of *Myosurus* from Mr. Geyer (his No. 332), one is certainly a distinct species; and, as it proves, identical with that recently described by Mr. Gay, from Chili (and which I also possess from Bridges, his last Chilean Collection), under the name of *M. apetalus*. My Chilean specimen, as well as that from North America, does bear petals; the name is therefore inadmissible. That of Mr. Bentham is unexceptionable, and at once indicates the most important specific distinction."

From the foregoing statement it appears that the name of *M. aristatus* was first applied by Bentham to the Geyer plant, the locality of which is given as "Borders of pools in the Gamas's (Camas) Prairie of the Coeur d'Aleine, Rocky Mountains," in Idaho. Mr. Bentham even attributes the species to Geyer in a note under the genus *Myosurus* in *Flora Australiensis* (1: 8. 1863).

Myosurus aristatus ranges from Washington and Montana to California and New Mexico.

Fig. *b*, accompanying this paper, was drawn from a specimen of *Myosurus aristatus* collected on Stansbury Island, Great Salt Lake, Utah, by Sereno Watson, June, 1869 (enlarged 12 diameters).

MYOSURUS APETALUS Gay

Unfortunately there are no specimens in Washington representing this species, so in the identifying of it we are limited to the description and illustration given by Gay.* Fig. 1 of the plate cited illustrates the whole plant, Figs. *b* and *d* the mature fruit and the achenes respectively. The latter figures are enlarged—probably 12 times. The dorsal side of the apparently compressed achene is shown to be keeled with one large tooth in the middle. This is distinctly stated by Gay, who describes the fruit as follows: "El fruto forma una espiga cónica, áspera, ó erizada, con las cápsulas algo apretadas y como empizarradas á manera de escamas: cada una tiene dos líneas escasas de largo,

* *Historia física y política de Chile* (Bot.), 1: 31, pl. 1, f. 1 (*a-d*), 1845.

ovalada, un poco comprimida y carinada, con un diente recio en un costado, y termina el otro una punta gruesa formada por el estilo."

The fruit of the North American plant does not show the

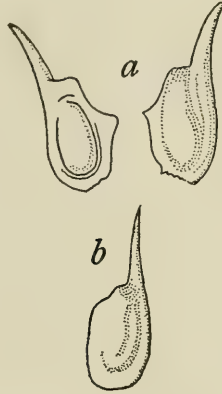


FIG. 1. Achenes of (a) *Myosurus apetalus* and (b) *M. aristatus*.

prominent tooth which characterizes the Chilean plant. This difference has probably been overlooked by all who have referred our species to the latter, a difference which, if constant, should suffice to keep as distinct two forms already separated geographically by thousands of miles.

The accompanying figures and key will serve to elucidate the difference between the two species: Figure *a* is an exact copy of the illustration by Gay* representing the achene of *M. apetalus*.

Achene with prominent keel along the ventral margin, and with a conspicuous tooth-like projection near the middle of the keel.

M. apetalus.

Achene not prominently keeled, nor toothed.

M. aristatus.

WASHINGTON, D. C.

SHORTER NOTES

A NEW FORM OF CORALLORRHIZA.—On June 21, 1916, I found a clump of *Corallorrhiza* near Long's Peak Inn, Larimer Co., Colorado, growing under aspen trees with *Arnica cordifolia* and

* Historia físcia y política de Chile (Bot.), 1: 31, pl. 1, f. 1 (*a-d*), 1845.

Fragaria. The plants were sparingly infested by a pink aphid of the genus *Macrosiphum*. The "spur" is represented by so slight a swelling that it might fairly be said to be absent; but the plant is related to *C. corallorrhiza* (L.) Karst., not at all to *C. striata* Lindl. or *C. virelandii* Rydb. The color of the plant suggests *C. ochroleuca* Rydb., but the structure of the flowers is quite different. Possibly we have to do with a distinct species, but it seems best for the present to regard it as a subspecies or race only.

Corallorrhiza corallorrhiza coloradensis n. subsp.

Flowering stems 15–22 cm. high, with 7 to 14 flowers; whole plant pale yellowish-green, the lip whitish, but not truly white, the sepals pale orange-tinted. Lower sepals long and narrow (length 6.75 mm., width 1 mm.); upper sepals scarcely longer than upper petals; upper petals 5 mm. long and 1.75 broad, briefly subacute or obtuse; lateral lobes of tip small, tooth-like; old capsules of last year subovate, about 6 mm. long.

H. Müller has given enlarged figures of the flowers of the true (European) *C. corallorrhiza*. It has the lateral lobes of the lip larger, and the throat is dotted with dark pigment. I have examined numerous descriptions of *C. corallorrhiza*, but they are mostly very imperfect, and presumably made from dry material; none, however, strictly agree with the Colorado plant, and in any event the typical form of the species is that which occurs in Europe.

A word may be added with reference to the Rocky Mountain plants usually called *C. maculata* Raf. or *C. multiflora* Nutt. In 1903 I separated *C. grabhami* from New Mexico, and essentially the same plant occurs in Colorado, as far north as the vicinity of Long's Peak Inn. In 1906 Suksdorf described *C. leimbachiana* from the northwest. Lindley had long before based a variety *occidentalis* on Californian specimens. It is a question whether all these western plants belong to a single species, and if so, whether that species is distinct from the eastern one. Mr. Oakes Ames (litt., June, 1913) wrote: "I have always been impressed by the fact that eastern and western specimens referred to *C. maculata* are distinguishable in the herbarium, and the difference

has been noted by other observers. . . . Whether we can separate the eastern *C. maculata* from the western is a question for serious consideration. That there is a difference between them, nobody who has made a careful study of the subject will deny, but if a geographical demarcation can be made which will show that the two forms occupy distinct or practically distinct ranges I would favor specific differentiation."

There is a variety, *C. maculata* var. *flavida* (*C. multiflora flavida* Waters, Plant World, Nov., 1903) in which the plant is light yellow and the lip lacks the purple spots. Three years later Suksdorf described an apparently analogous form (*C. multiflora* v. *sulphurea*) from the northwest.

According to the present rules, if the western plant is considered a distinct species it will stand as *C. grabhami*; but if a subspecies only, it will be *C. maculata occidentalis* (*C. multiflora occidentalis* Lindl., Gen. and Sp. Orch., 534; 1840.).

T. D. A. COCKERELL

REVIEWS

Wild Flower Preserves *

Billerica.—This number is called "The North Shore, Illinois Edition," and includes parts of Chicago and its adjacent towns. The title page gives a picture of *Cypripedium hirsutum*, with the statement beneath it that "The yellow lady's slipper is happiest in the wild. Don't dig it or pick it, or you will lose it altogether." With this auspicious introduction, the director states that "the whole tendency of the days that have passed in the development and maintenance of public parks and most private estates, has been to destroy natural conditions and the native wild flowers, and to substitute turf and exotic plants in their place." He also believes that "what we need are more reservations that are not parks from the gardener's point of view, but those in which the existing wild flower, shrub, and tree growth will be saved and helped to develop the greatest beauty by judicious thinning, transplanting, seeding and fertilizing as the nature-lover, with a

* By Warren H. Manning, *Billerica*, 4: 3, No. 6, November, 1915.

full knowledge of all the material with which he is dealing, can undertake."

A very interesting article by Georgia Douglas Clarke in the same number gives an account of the "Wild Flowers of the North Shore" and the sand-dunes below Waukegan on Lake Michigan telling of the charming flora of this region.

Everett L. Millard tells of a "*Municipal Wild Flower Preserve*" in Highland Park, also one of the suburbs of Chicago, stating that "the park commissioners plan not only to encourage the growth of the native flora in this beauty spot, but also to protect it as a wild flower preserve. It is hoped that next spring, when harmful picking would begin again, the experiment will make good, and the region become a sanctuary for the oppressed rarities of the native flora."

E. G. BRITTON

McFarland's *My Growing Garden* *

A very useful book on the making of a garden spot from an old and practically abandoned property has been written by Mr. McFarland, one of the chief horticultural printers and publishers in this country. As a record, largely and confessedly personal, of the joys and sorrow of planting; of breathless expectation and final achievement, the book will delight those who have passed through, or are in the throes of a similar enterprise. Many practical hints and schemes for planting are outlined, but the author does not fail to enlarge on that feeling for gardeners and gardening which has filled English literature with delightful reading from James Thomson to our own time.

N. T.

NEWS ITEMS

Plans for an elaborate rose garden have been outlined in a recent number of the *Journal* of the New York Botanical Garden. Many horticultural forms as well as wild species of roses will be grown in the garden, work on which has already started.

Joseph Rubinger, Assistant State Botanist, has been granted eight months' leave of absence, beginning October 1, which he

* McFarland, J. H. *My Growing Garden*, pp. 1-216, plates 1-36, five in color. The Macmillan Co., 1915. Price \$2.00.

will spend at Cornell University. His place at Albany is being supplied in the interim by Miss Laura A. Polk, a graduate of Wellesley College, 1913.

Cleveland Abbe, who built up the United States Weather Service, and for many years took hourly records of the weather before the days of automatic recording instruments, died recently in Washington. In 1905 Dr. Abbe brought out the "First report on the relations between climates and crops," which was of great interest to the ecologists and plant geographers. In this book he summarized all the information which had accumulated in regard to the influence of the length of the growing season upon living plants; and the methods there outlined have been widely used both in botanical and agricultural works.

Dr. Alban Stewart, of the department of botany, University of Wisconsin, has been elected professor of botany and bacteriology in the Florida State College for Women, Tallahassee, Florida.

The Torrey Botanical Club

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OTHER PUBLICATIONS

OF THE

TORREY BOTANICAL CLUB

(1) BULLETIN

A monthly journal devoted to general botany, established 1870. Vol. 42 published in 1915, contained 698 pages of text and 33 full-page plates. Price \$3.00 per annum. For Europe, 14 shillings. Dulau & Co., 37 Soho Square, London, are, agents for England.

Of former volumes, only 24-42 can be supplied entire ; certain numbers of other volumes are available, but the entire stock of some numbers has been reserved for the completion of sets Vols. 24-27 are furnished at the published price of two dollars each ; Vols. 28-42 three dollars each.

Single copies (30 cents) will be furnished only when not breaking complete volumes.

(2) MEMOIRS

The MEMOIRS, established 1889, are published at irregular intervals. Volumes 1-15 are now completed ; No. 1 of Vol. 16 has been issued. The subscription price is fixed at \$3.00 per volume in advance. The numbers can also be purchased singly. A list of titles of the individual papers and of prices will be furnished on application.

(3) The Preliminary Catalogue of Anthophyta and Pteridophyta reported as growing within one hundred miles of New York, 1888. Price, \$1.00.

Correspondence relating to the above publications should be addressed to

DR. BERNARD O. DODGE

Columbia University

New York City

TORREYA

A MONTHLY JOURNAL OF BOTANICAL NOTES AND NEWS

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR



JOHN TORREY, 1796-1873

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SOME LOCAL NAMES OF PLANTS—2*

BY W. L. MCATEE

Most of the local names recorded for the 82 chiefly specific groups of plants herein listed are not given in botanical manuals and standard glossaries. The few among them that are so included are repeated for definite purposes. As in the previous list localities for all of the names are given.

The citation of places where used adds immensely to the interest and value of a catalog of local cognomens. Among such nicknames some are quaint or amusing, but some also are extremely apt. It would be well were many notoriously bookish names discarded for some of those actually in vernacular use. Among those in the following list, that of patches for *Meibomia*, pickle grass for *Salicornia*, and slink-weed for *Juniperus horizontalis* are particularly fitting.

It is patent that single vernacular names sometimes are applied to more than one botanical species. It is interesting therefore to note that they also err at times in making too fine distinctions. For instance, on Revels Id., Va., the staminate plant of *Baccharis halimifolia* is known as salt water bush, and the pistillate plants with their copious pappus as kinks bushes, and they are regarded as distinct kinds. Again on Matinicus Island, Me., a plant of *Polygonum persicaria* that has dark blotches on the centers of the leaves is heart's-ease, and is recognized in the local pharmacopeia; if the plant does not have dark blotches, then it is not heart's-ease.†

* No. 1 of this series was published in *Torreyia* 13: 225-236. 1913.

† I might add that on this island I heard the fungoid malformation of trees, known as witches' broom, called hoorah's-nest.

[No. 10, Vol. 16 of *TORREYA*, comprising pp. 211-234, was issued 16 Nov., 1916.]

Opportunity for learning the following names came during field work for the U. S. Biological Survey. On a trip for the same office, Mr. C. P. Alexander paid some attention to local plant nomenclature and his results also are incorporated in the following text. The list is indexed so that it may be used as an appendix to other glossaries.

1. *Osmunda cinnamomea* L.—Buckhorn, Matinicus Island, Me.; this name also used elsewhere in New England.

2. *Equisetum arvense* L.—Mare's-tail, Matinicus Id., Me.

3. *Lycopodium clavatum* L.—Evergreen, Matinicus Id., Me.

4. *Pinus virginiana* Mill.—Bastard, spruce or scrub pine, mainland near Wallops Id., Va.

5. *Pinus taeda* L.—Virginia pine, mainland near Wallops Id., Va.; sap pine, Wallops Id., Va.

6. *Picea canadensis* (Mill.) B. S. P.—Cat, skunk or blue spruce, Matinicus Id., Me.

7. *Picea rubra* (Du Roi) Dietr.—Common, white or yellow spruce, Matinicus Id., Me. At this locality I found the names single and double spruce, sometimes said to be specific designations, applied respectively to the less and the more luxuriantly leaved individuals of either this species or the last.

8. *Larix laricina* (Du Roi) Koch.—Juniper, Orono, Me.

9. *Juniperus horizontalis* Moench.—Ground or running cedar, Matinicus Id., Me.; trailing yew, Monhegan Id., Me.; slinkweed, Maine (A. H. Norton).

10. *Ruppia maritima* L.—Zhebes (corruption of des herbes) fines, North Shore, La. (H. H. Kopman).

11. *Sagittaria falcata* Pursh.—Dog-tongue wampee, Cat. Id., S. C. (C. P. Alexander). See Nos. 33 and 37 (pp. 228 and 229) in my 1913 Torreyia list for other applications of the term wampee.

12. *Vallisneria spiralis* L.—Zhebes (corruption of des herbes) plantain, North Shore, La. (H. H. Kopman).

13. *Paspalum boscianum* Flüggé.—Red-shank grass, Kinloch Club, S. C. (C. P. Alexander).

13a. *Echinochloa Crus-galli* (L.) Beauv.—Shank grass, rice cousin, Oakley, S. C.

14. *Hierochloë odorata* (L.) Wahlenb.—Indian or sweet grass, matinicus Id., Me.

15. *Ammophila arenaria* (L.) Link.—Thatch, a name said to be introduced from England, Matinicus Id., Me.

16. *Spartina cynosuroides* (L.) Roth.—Cane grass, Cat Id., S. C., corn grass, Santee Club, S. C. (C. P. Alexander); meadow grass, Revels Id., Va.

17. *Distichlis spicata* (L.) Greene.—Ben (bent) grass, Revels Id., Va.

18. *Elymus virginicus* L.—Wild oats, Matinicus Id., Me.

19. *Scirpus robustus* Pursh.—Nut grass, Santee Club, S. C. (C. P. Alexander).

20. *Rhynchospora corniculata* (Lam.) Gray.—Spear grass, Santee Club, S. C. (C. P. Alexander).

21. *Pontederia cordata* L.—Alligator wampee (see No. 11 above), Santee Club, S. C.; wild gentian, Cat Id., S. C. (C. P. Alexander).

22. *Smilax bona-nox* L.—Bull-brier, Revels Id., Va. The specific name of this *Smilax* is very good as translated into modern slang whether or not Linnaeus meant it in this humorously despairing sense.

23. *Populus tremuloides* Michx.—Popple, Matinicus Id., Me.

24. *Myrica cerifera* L.—Merkle (myrtle) bushes, Wallops and Revels Ids., Va.

25. *Polygonum persicaria* L.—Heart's-ease, Matinicus Id., Me.

26. *Chenopodium anthelminthicum* L.—Fishweed, Revels Id., Va.

27. *Salicornia* spp.—Pickle grass, spear grass, Revels Id., Va.

28. *Cabomba caroliniana* Gray.—Cooter grass, Cat Id., S. C. (C. P. Alexander).

29. *Nymphaea advena* Ait.—Tuckahoe, tucky or tucky lily, Patuxent River, Md.

30. *Berberis trifoliolata* Moricand.—Currants, New Braunfels, Tex. (F. Lindheimer); algeritas, Austin, Tex. (W. H. B.).

31. *Ocotea catesbyana* (Michx.) Sarg. (*Nectandra willdenoviana*).—Sweet Bay, Pine Key, Fla. (F. H. Blodgett).

32. *Umbellularis californica* (Arnott) Nutt.—Coos Bay laurel, northwestern Oregon.

33. *Cakile edentula* (Bigel.) Hook.—Sea kale, Revels Id., Va.; wild pepper grass, Matinicus Id., Me.

34. *Ribes hirtellum* Michx. var. *calcicola* Fern.—Skunk currant, Matinicus Id., Me.
35. *Rubus canadensis* L.—Bear berry, October berry, North Carolina.
36. *Rubus ulmifolius* Schott.—Blackberry rose, Frederick, Md. (A. Commons).
37. *Rosa rugosa* Thunb.—Japanese rose, Muskeget Id., Mass.
38. *Pyrus arbutifolia* (L.) var. *atropurpurea* (Britton) Robinson.—Shore berry, Matinicus Id., Me.
39. *Pyrus americana* (Marsh) D. C.—Roundwood or roundwood tree, Matinicus Id., Me.
40. *Amelanchier oblongifolia* (T. & G.) Roem.—Wild pear, Matinicus Id., Me.
41. *Prunus gracilis* Engelm. & Gray.—Sand plum, Lincoln Co., Okla.; prairie cherry, Games Creek, Ark. (J. W. Blankinship).
42. *Chamaecrista littoralis* Pollard.—Senna, Santee Club, S. C. (C. P. Alexander).
43. *Meibomia* spp.—Patches, Revels Id., Va.
44. *Apios tuberosa* Moench.—Rabbit vine, Cat Id., S. C. (C. P. Alexander).
45. *Trifolium procumbens* L.—Shamrock, Matinicus Id., Me.
46. *Amorpha herbacea* Walt.—Senna, Waccamaw Plantation, S. C. (C. P. Alexander).
47. *Seban macrocarpa* Muhl.—Wild coffee, Cat Id., S. C., Kinloch Club, S. C. (C. P. Alexander).
48. *Zanthoxylum americanum* Mill.—Sperrits pain, Revels Id., Va.
49. *Empetrum nigrum* L.—Pigeon berry, heath, Matinicus Id., Me.
- 49a. *Simmondsia californica*.—Goat-berry, Gila Valley, Ariz. (E. G. Holt).
50. *Rhus vernix* L.—Mercury, Matinicus Id., Me.
51. *Ilex verticillata* (L.) Gray.—Dog Berry, pigeon berry, white alder, Matinicus Id., Me.
52. *Impatiens biflora* Walt.—Celandine, Matinicus Id., Me.
53. *Ampelopsis arborea* (L.) Rusby.—Bird berry, Waccamaw Plantation, S. C. (C. P. Alexander).

54. *Abutilon abutilon* (L.) Rusby.—Wild okra, Cat Id., S. C. (C. P. Alexander).
55. *Sida spinosa* L.—Wire-weed, Waccamaw Plantation, S. C. (C. P. Alexander).
56. *Epilobium angustifolium* L.—Moose-tongue, Matinicus Id., Me.
57. *Oenothera muricata* L.—Scabious, Matinicus Id., Me.
58. *Aralia racemosa* L.—Wild elder, false sarsaparilla, Brown Co., Wis. (J. H. Schuette).
59. *Coelopleurum actaeifolium* (Michx.) Coulter & Rose.—Wild parsnip, Matinicus Id., Me.
60. *Moneses uniflora* (L.) Gray.—Snowdrop, Matinicus Id., Me.
61. *Kalmia angustifolia* L.—Mountain laurel, Matinicus Id., Me.
62. *Chiogenes hispida* (L.) T. & G.—Sugar plum, snowberry, moxie vine, Matinicus Id., Me.
63. *Vaccinium vitis-idaea* L.—Woods or high land cranberry, Matinicus Id., Me.
64. *Vaccinium macrocarpon* Ait.—Bog or marsh cranberry, Matinicus Id., Me.
65. *Vaccinium oxycoccos* L.—Hog cranberry, Matinicus Id., Me.
66. *Lysimachia nummularia* L.—Myrtle, Matinicus Id., Me.
67. *Ehretia elliptica* D. C.—Anama, yara (yarey?) anama, southern Texas (J. L. Berlandier).
68. *Mertensia maritima* (L.) S. F. Gray.—Blue iris, Matinicus Id., Me.
69. *Prunella vulgaris* L.—Blue lucy, Matinicus Id., Me.
70. *Plantago decipiens* Barneoud.—Goose-tongue, Nova Scotia greens, Matinicus Id., Me.
71. *Cephalanthus occidentalis* L.—Button willow, crooked wood, Ballard Co., Ky. (C. P. Alexander).
72. *Linnaea borealis* L.—Cinnamon vine, eglantine, Matinicus Id., Me.
73. *Viburnum cassinoides* L.—Tea berry, Matinicus Id., Me.
74. *Sambucus canadensis* L.—Stinking elder, Matinicus Id., Me.

75. *Leontodon autumnalis* L.—Arnica, Matinicus Id., Me.
 76. *Iva frutescens* L.—Jacko bush, Cat Id., S. C.; jacko, Waccamaw Plantation and Kinloch Club, S. C. (C. P. Alexander).
 77. *Baccharia halimifolia* L.—Staminate plants are called salt-water bush, and the pistillate kinks-bushes, at Revels Id., Va., the latter name is used also at Wallops Id., Va.
 78. *Gnaphalium* sp.—Field balsam, Revels Id., Va.
 79. *Aster novi-belgii* L.—Summer farewell, Matinicus Id., Me.
 80. *Anthemis cotula* L.—Stinking mayweed, Matinicus Id., Me.

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SHORTER NOTES

Allium platyphyllum sp. nov.—Plant 15 cm. high or more; bulb subglobose, the outer coat somewhat reticulate; leaves 2 or 4, flat, about 20 cm. long, 1–1.3 cm. wide, falcate; scapes solitary or in twos, 10–12 cm. long, compressed, winged; bracts 2, ovate, membranous; flowers numerous, rose-purple, borne on slightly winged pedicels about 15 mm. long; perianth segments oblong-ovate, acuminate, 10 mm. long or less; filaments included, membranous, dilated at the base; fruit not seen.

Type in the U. S. National Herbarium (Frederick V. Coville, no. 2362) collected on steep scab-land in the Valley of Peavine Creek on the trail from Chico to Billy Meadows, Wallowa National Forest, Oregon, at an elevation of about 1,200 meters.

This species is readily recognized by its broad, falcate leaves, its compressed winged scapes, the latter appearing singly or in

pairs. It is closely related to *Allium anceps** and *A. falcifolium*. The perianth segments of the former are linear-lanceolate, spreading and in the proposed oblong-ovate, acuminate, erect.

Allium falcifolium has the narrow perianth segments of *A. anceps* and the rather thin curved leaves of the proposed species. *Allium anceps* is also distinguished by its exserted stamens and thick leaves. The width of the leaves of *A. platyphyllum*, however, is nearly double that of *A. falcifolium*.

IVAR TIDESTROM.

STENOPHYLLUS FLORIDANUS IN SOUTH CAROLINA.—In 1894 Mr. G. V. Nash collected in "high pine land" in Lake County, Florida, a small annual sedge which was described the following year in his account of the season's work as *Stenophyllus floridanus* Britton.† For the next few years nothing else was known about it, and it was probably regarded as one of numerous species endemic to the lake region of Florida. But in the years 1900–1908 I found it in many counties in the coastal plain of Georgia,‡ always in unnatural habitats, such as cultivated fields and sandy roadsides, and in 1909–1914 I found it occurring similarly in Middle Florida.§ On Aug. 22, 1913, while waiting for a connecting train at Branchville, Orangeburg County, South Carolina, I found the same plant in sandy cotton fields right in the town; and a little later in the day I saw considerable quantities of it from the train, in fields in Dorchester County.

Although this species was treated as a native when first described, it is known only in habitats modified by civilization, and therefore could hardly have existed in the United States in prehistoric times. The fact that it was not recognized by botanists before 1894, although it is amply distinct from other southeastern species of the genus, and is now known in thirty or forty counties, would seem to indicate that it is a comparatively recent introduction, probably from the tropics. (It is very similar to, if not identical with, *Isolepis barbata* (Rottb.) R. Br.,

* Curtis Bot. Mag. III; 32: t. 6227. 1876.

† Bull. Torrey Club 22: 161. 1895.

‡ See Ann. N. Y. Acad. Sci. 17: 283. 1906.

§ See Ann. Rep. Fla. Geol. Surv. 6: 263, 286, 293. 1914.

a species which seems to be common in India and some other parts of Asia.)

ROLAND M. HARPER.

REVIEWS

Young's Catalogue d' Arbres Arbustes et Plantes Herbacees d' Amerique*

According to Mr. Rhoads this is the "earliest published book written by an American botanist and devoted exclusively to American botany, horticulture and floriculture," and it "has been either purposely ignored or entirely overlooked by scientists, historians and bibliographers." The former statement is more true than significant as Cadwallader Colden (1749-1751) and Peter Kalm (1753-1761), both botanists of note, had previously drawn attention to our flora, while horticulture and floriculture had received a good deal of printed notice as early as 1670 in the writings of Daniel Denton of Hempstead, L. I., and later in the catalogs of Prince's nursery, a collection so valuable that the invading British issued a special order, during their occupation of New York, that the "nurseries of Mr. Prince of Flushing are not to be destroyed" (order of J. Robinson, English officer at New York, 16 June, 1780). That the book which Mr. Rhoads has edited is of unquestioned interest no one can deny, but that it adds anything to our existing knowledge of the botany or horticulture of the latter part of the eighteenth century, the citations above would seem to disprove.

The catalog is most interesting as showing the ideas of our flora as understood at that time. Many common species, apparently under Linnaean names, are scattered through it, but without hazarding a definite prophecy it looks also as though those gifted with a talent for "nailing" earliest publication of names for American species, have been furnished with some highly charged ammunition. The editor evidently tries to wash his

* William Young, Jr. (of Philadelphia), "Botaniste de Pensylvanie," and his long-forgotten book, being a facsimile reprint of his "Catalogue d' Arbres Arbustes et Plantes Herbacees d' Amerique." Published in Paris in 1783. With prefatory account of the author and critical notes by the editor, Samuel N. Rhoads. Pp. i-ix + 1-55. Large paper, 4to, \$4.00. Small paper, 8vo, \$2.75. Privately printed. Philadelphia, 1916.

hands of the whole matter by a statement in the preface that the names are mostly *nomina nuda*, and consequently disdains any responsibility for trying "to shake the very foundations of botanic priority." If *nomina nuda* can be construed to mean names accompanied by from three to six lines of description, Mr. Rhoads is right. But Muhlenberg's catalog pretty effectually disposes of such a claim. On this score the editor has done botanical science either a great service or a great injury in unearthing a book that has almost inflammable possibilities.

N. T.

BOTANICAL SOCIETY OF AMERICA

The Botanical Society of America will hold its eleventh annual meeting at New York City during the week beginning December 25, 1916, in affiliation with the American Association for the Advancement of Science, the American Society of Naturalists, the American Phytopathological Society, and the Ecological Society of America, and under the auspices of Columbia University, New York University, the College of the City of New York, the American Museum of Natural History, the New York Botanical Garden, the Brooklyn Botanic Garden, and the other scientific and educational institutions of the city. Members of the Torrey club are invited to attend any of the meetings scheduled below. The hotel headquarters of the Society will be the Hotel McAlpin, Broadway at 34th St. The hotel headquarters of the Ecological Society of America will be at the Hotel Belmont.

PROGRAM OF MEETINGS

Tuesday, December 26.

8:00 p. m. (Address of the retiring president of the American Association for the Advancement of Science, Dr. Wm. W. Campbell, director of the Lick Observatory. Reception to the members of the A. A. A. S., at the American Museum of Natural History.)

Wednesday, December 27.

10:00 a. m. Simultaneous scientific sessions of the society at large, for papers on cytology, embryology, mor-

phology, etc., Brinckerhoff Theatre, Barnard College, and of the Physiological Section, for papers on the chemical aspects of physiology, 339 Barnard College.

- 2:00 p. m. Joint session of Section G, American Association for Advancement of Science, with the Botanical Society of America and the American Phytopathological Society. Address of the retiring vice-president of Section G, Professor W. A. Setchell, and symposium on relations of chemistry to botany. The speakers will be W. J. V. Osterhout, on "Antagonism and Permeability" and J. Arthur Harris, on "Physical Chemistry in the Service of Phytogeography." The symposium will be followed by a short business meeting of Section G, Auditorium of Horace Mann School, Broadway and 120th St.
- 9:00 p. m. Joint smoker at Columbia University Commons, to which the members of the Botanical Society and affiliated organizations are invited.

Thursday, December 28.

- 10:00 a. m. Simultaneous scientific sessions of the society at large, for papers on genetics and evolution, Brinckerhoff Theatre, and of the Physiological Section for papers on the physical aspects of physiology, 339 Barnard College.
- 2:00 p. m. Joint session of the Botanical Society of America with the American Phytopathological Society, for the reading of the annual invitation papers. The speakers will be Wm. A. Murrill, Erwin F. Smith, and W. A. Orton. Dr. Murrill will speak on his systematic studies of the fleshy fungi, and will illustrate his address with colored lantern slides. Dr. Smith will speak of the important recent developments in his study of plant tumors, and Dr. Orton will discuss the subject of plant breeding for disease resistance. Both will use lantern slides. Members of the organizations affiliated with either

society are especially invited to attend this meeting, Auditorium of Horace Mann School.

- 7:30 p. m. Dinner for all botanists, Hotel McAlpin. Address of Professor J. M. Coulter, retiring president of the Botanical Society of America, "Botany as a National Asset." Tickets may be obtained from the secretary, at \$2.50 each.

Friday, December 29.

- 10:00 a. m. Joint session with the Ecological Society of America, for papers on ecology, phytogeography, and related subjects, Brinckerhoff Theatre.
- 2:00 p. m. Joint session with the American Phytopathological Society, for papers on mycology, plant diseases, etc., Brinckerhoff Theatre.

Further information may be obtained from the Secretary of the Botanical Society of America, Dr. H. H. Bartlett, 335 Packard Street, Ann Arbor, Mich., whose address during the meetings will be Hotel McAlpin.

NEWS ITEMS

It is reported in the daily papers that Governor N. E. Harris of Georgia has signed a bill to make the Cherokee rose the "official floral emblem of Georgia." This rose is *Rosa laevigata*, a native of China.

The complete collection of Mr. S. B. Parish, comprising about 50,000 specimens, has been purchased for the herbarium of Stanford University.

Professor C. R. Orton, of Pennsylvania State College, is on leave of absence for one year and has registered for graduate work at Columbia University. He will spend some time at the New York Botanical Garden in connection with his researches on parasitic fungi.

Amherst College has received a bequest of \$5,000 to be known as the Edward Tuckerman Fund, for work in botany.

Dr. Chas. H. Otis has resigned his position as instructor in botany and assistant-botanist at New Hampshire College and Experiment Station, to accept a position in the biological laboratory at Western Reserve University. Dr. Otis will have charge of the instruction in botany in Adelbert College and the College for Women, taking the place of Dr. Wm. H. Weston, who recently resigned.

Dr. Paul C. Graff has been appointed instructor in botany at the University of Montana.

Dr. William Gilman Thompson, professor of medicine in the Medical College of Cornell University, has resigned, and is succeeded by Dr. Lewis Atterbury Conner, professor of clinical medicine in the college since 1905. Dr. Thompson is president of the board of managers of the New York Botanical Garden.

Dr. V. H. Young, formerly of the botany department of the University of Wisconsin, has been appointed assistant professor of botany in the State University of Iowa. He takes charge of the work in plant physiology and mycology.

Lieutenant-Colonel E. Alexander Mearns, U.S.A., died in Washington, D.C., on November 1, in his sixty-first year. He was one of the founders of the American Ornithologists' Union, and a member of the Roosevelt East African expedition. Dr. Mearns was an indefatigable collector of natural history specimens all his life, and was the author of many contributions to zoology and botany. He will be remembered by the older members of the club as a large collector of native plants in the region of West Point, many of his specimens serving as records of the occurrence of certain species in the Highlands of the Hudson. Most of the collection from this region is at the New York Botanical Garden.

The entire collection of the late C. B. Robinson, from Amboina, approximating 1,500 numbers, made between July 15 and December 3, 1913, was divided into two series, first "Robinson: *Plantae Rumphianae Amboinenses*" to include those specimens

that can definitely be referred to species described or figured by Rumphius, and second "Reliquiae Robinsonianae" to include those species that Rumphius did not describe. The final report has been written up in two parts, one "Reliquiae Robinsonianae" a critical enumeration of the species not described by Rumphius, and the second which has been tentatively called "An interpretation of Rumphius's Herbarium Amboinense." In this part the attempt has been made to account for every species figured, or described by Rumphius, the whole being arranged in accordance with the Engler & Prantl sequence. Under each has been given a critical historical resume of the previous attempts to reduce the Rumphian species, citing the necessary synonyms to explain each case. Wherever the Rumphian species is represented in the Robinson collection, the specimen is cited; the duplicates will be distributed under special labels giving both the accepted binomial name in modern system of classification, and the Rumphian name and reference to the volume page, and plate of the Herbarium Amboinense. To make the work more generally useful there has also been added a list of the species under the Rumphian names, serially arranged as originally published, with their modern equivalents so far as these have been determined. It will perhaps be worthy of note that in the course of the work it has been found that nearly 500 species have been based by various authors wholly on the Rumphian figures or descriptions; these must be interpreted primarily from Rumphius, as no types are extant. The whole work, with the exception of a very few groups, and with the exception of the general introduction, is now ready for the printer. Since Dr. Robinson's death the work has been carried on by Dr. E. D. Merrill who also writes.

"How unfortunate it is that Dr. Robinson could not have lived to complete his field work, for the plan was for him to remain in Amboina until the latter part of May or early part of June, 1914; he was killed early in December, 1913, after four and a half months' field work, in place of a year's field work. Had he remained until June, 1914; or I should say had he lived until then, I am sure that he would have secured the necessary material to clear up nearly all of the "puzzles" as to the identity of the

species based on Rumphius. As it is, his material has enabled me to clear up a very large number of these 'doubtful' species."

Mr. George Gordon Copp, formerly a reporter on the *Sun*, who went with Dr. D. T. MacDougal to deserts in southwestern United States, died in New York on November 20.

The Botanical Society of Washington has elected the following officers for the ensuing year: PRESIDENT, Mr. T. H. Kearney; VICE-PRESIDENT, Mr. Edgar L. Brown; RECORDING SECRETARY, Mr. Charles E. Chambliss; CORRESPONDING SECRETARY, Dr. H. L. Shantz; TREASURER, Mr. F. D. Farrell. Mr. A. S. Hitchcock was nominated by the society for the position of vice-president of the Washington Academy of Sciences.

It is reported in *Science* (24 November) that Stanford University, with the co-operation of Dr. N. L. Britton, has arranged to finance the publication of an Illustrated Flora of the Pacific Coast. Dr. LeRoy Abrams will edit the work, with the assistance of a number of the leading American botanists as collaborators. The flora will comprise four volumes containing illustrations and descriptions of all the ferns and flowering plants on the Pacific Coast.

The Torrey Botanical Club

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OF THE

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A monthly journal devoted to general botany, established 1870. Vol. 42 published in 1915, contained 698 pages of text and 33 full-page plates. Price \$3.00 per annum. For Europe, 14 shillings. Dulau & Co., 37 Soho Square, London, are, agents for England.

Of former volumes, only 24-42 can be supplied entire; certain numbers of other volumes are available, but the entire stock of some numbers has been reserved for the completion of sets. Vols. 24-27 are furnished at the published price of two dollars each; Vols. 28-42 three dollars each.

Single copies (30 cents) will be furnished only when not breaking complete volumes.

(2) MEMOIRS

The MEMOIRS, established 1889, are published at irregular intervals. Volumes 1-15 are now completed; No. 1 of Vol. 16 has been issued. The subscription price is fixed at \$3.00 per volume in advance. The numbers can also be purchased singly. A list of titles of the individual papers and of prices will be furnished on application.

(3) The Preliminary Catalogue of Anthophyta and Pteridophyta reported as growing within one hundred miles of New York, 1888. Price, \$1.00.

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TORREYA

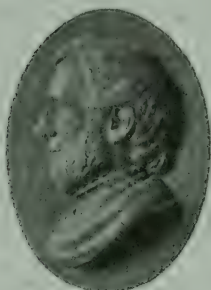
A MONTHLY JOURNAL OF BOTANICAL NOTES AND NEWS

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR



JOHN TORREY, 1796-1873.

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No. 12

A NEW PARADISE FOR BOTANISTS

BY W. A. MURRILL

In October, 1916, I left New York at 9:30 P.M. on the "Memphis Special" and soon after breakfast next morning was gazing with delight on the splendid range of mountains north of Bedford, Virginia, which includes the celebrated Peaks of Otter and was so aptly characterized by the early settlers as the "Blue Ridge."

The inception of the continent was in this region, where the entire uplift of ancient rock has been twenty miles, but as the land appeared above water the tidal wave and other waves wore it away to form the sandstones and shales of the more recent Alleghanies.

My destination this time was not the Peaks, but Apple Orchard Mountain, two hundred feet higher and eight miles further from Bedford. The base of the mountain was easily reached by a good road and I climbed on foot the last four of the eighteen miles, following a lively trout brook to its source near the summit, where Mr. Patterson has established a comfortable camp for the accommodation of those who love mountain air and enjoy following the trails which he has made in all directions.

There is Black Rock, a mile or so to the west, elevation 3,600 feet; the Waterfall, over the ridge and down the north side of the mountain, elevation 2,500 feet; the Summit, over a mile north-east of camp, elevation 4,200 feet; Big Onion, to the southeast, elevation 3,500 feet; and the great Swamp, in the edge of which the log cabins are located, elevation 3,300 feet.

The advantage of this locality over the Peaks and most mountain tops is the number and variety of exposures, all in easy

[No. 11, Vol. 16 of TORREYA, comprising pp. 235-250, was issued 9 December, 1916.]

reach of comfortable quarters. Add to this the fact that Apple Orchard is practically unknown to botanists and that the whole region around the camp is a veritable flower-garden from about May 20 to the end of June, while *Rhododendron catawbiense* and *Kalmia latifolia* are in bloom, and the attraction is well-nigh irresistible.

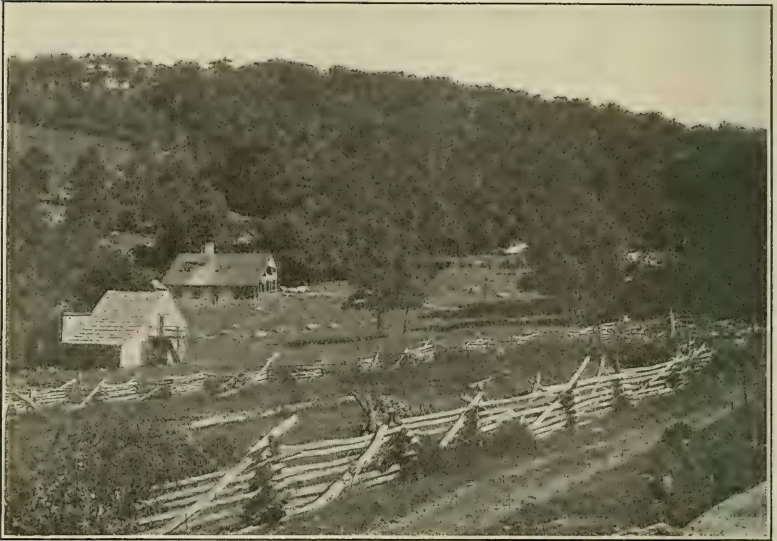


FIG. 1. Apple Orchard Camp, Virginia.

A word about some of the plants found there late in October may be of interest. I heard of lily of the valley, three species of *Cypripedium*, two or more species of *Trillium*, lilies, violets, and other beautiful flowers that are abundant earlier in the season, but I will confine my remarks to plants actually seen, although most of these, with the exception of witch hazel, gentians, asters, goldenrods, and turtlehead had already passed the flowering stage.

The fungi seen were mostly tough and woody species, the fleshy species having appeared in late summer and early autumn. A list of the sixty species collected appears in *Mycologia* for January.

Hepatics, mosses, and ferns were abundant, the last represented by the polypody, the bracken, the maidenhair, *Dicksonia*, *Boltrychium*, *Dryopteris acrostichoides*, *D. marginalis*, *D. spinulosa*, and *D. noveboracensis*.

Some of the herbaceous plants that particularly interested me were three species of blue gentian, two species of aconite, a golden-rod with sessile flowers, the orange triosteum, and the smooth aureola. Neither arbutus nor galax was seen.

PARTIAL LIST OF HERBACEOUS PLANTS

<i>Angelica hirsuta</i>	<i>Gentianella quinquefolia</i>
<i>Aconitum reclinatum</i>	<i>Heuchera villosa</i>
<i>Aconitum uncinatum</i>	<i>Houstonia tenuifolia</i>
<i>Aster cordifolius</i>	<i>Lobelia inflata</i>
<i>Aster undulatus</i>	<i>Lysimachia quadrifolia</i>
<i>Aureola laevigata</i>	<i>Monotropa uniflora</i>
<i>Bicuculla eximia</i>	<i>Oenothera biennis</i>
<i>Bremium ophioides</i>	<i>Pedicularis canadensis</i>
<i>Ceanothus americanus</i>	<i>Pyrola rotundifolia</i>
<i>Chelone glabra</i>	<i>Scutellaria cordata</i>
<i>Chimaphila maculata</i>	<i>Solanum nigrum</i>
<i>Conopholis americana</i>	<i>Solidago caesia</i>
<i>Dasystephana decora</i>	<i>Solidago Curtisii</i>
<i>Dioscorea villosa</i>	<i>Thaspium barbinode</i>
<i>Galium latifolium</i>	<i>Tiarella cordifolia</i>

Triosteum aurantiacum

The shrubs were still more interesting. *Rhododendron catawbiense* often attained tree-like dimensions, reaching fifteen feet or more in height, while *Kalmia* was equally vigorous. *Hydrangea arborescens* showed a fondness for the banks of brooks, while the cool, moist mountain summit was covered with thickets of the two species of hazelnut, a willow, a green-fruited gooseberry, a white-fruited dogwood, and a red-fruited hawthorn. The determination of the hawthorn given below is by Professor Rowlee, to whom fruits were sent for planting.

PARTIAL LIST OF SHRUBS

<i>Azalea nudiflora</i>	<i>Menziesia globularis</i>
<i>Cornus paniculata</i>	<i>Opulaster opulifolia</i>
<i>Corylus americana</i>	<i>Polycodium stamineum</i>
<i>Corylus rostrata</i>	<i>Rhododendron catawbiense</i>
<i>Crataegus neofluvialis</i>	<i>Rosa carolina</i>
<i>Grossularia</i> sp.	<i>Rubus odoratus</i>
<i>Hydrangea arborescens</i>	<i>Salix</i> sp.
<i>Kalmia latifolia</i>	<i>Vaccinium</i> sp.

Viburnum acerifolium

The mountain is covered with trees entirely to its summit, except in some burned-over areas and a few cultivated fields and



FIG. 2. Waterfall, Apple Orchard Mountain, Virginia.

pastures about the camp. The chestnut is the predominant tree and it is still free from canker, although this disease has reached the adjacent valleys. Large chestnut trees, usually heavily loaded with fruit, surround some of the cabins and form a grove to the east which has given the name "Apple Orchard" to the mountain. The red oak comes next in importance, and all the trees seemed to bear an unusually large crop of acorns this year. The white oak and chestnut oak were less common, while the gray oak was confined to the higher elevations.

Pines were almost entirely lacking, but the hemlock was frequent in moist places. Sugar maple and yellow birch were found near the waterfall. The linden, dogwood, and sourwood rarely get above 2,500 feet. No holly was seen except a few trees of mountain holly. The witch hazel was everywhere, resplendent in its autumn dress of yellow flowers.

PARTIAL LIST OF TREES

<i>Acer pennsylvanicum</i>	<i>Liriodendron tulipifera</i>
<i>Acer rubrum</i>	<i>Magnolia acuminata</i>
<i>Acer saccharum</i>	<i>Malus coronaria</i>
<i>Alnus rugosa</i>	<i>Nyssa sylvatica</i>
<i>Betula alleghanensis</i>	<i>Ostrya virginica</i>
<i>Betula lutea</i>	<i>Pinus rigida</i>
<i>Castanea dentata</i>	<i>Quercus alba</i>
<i>Fraxinus americana</i>	<i>Quercus borealis</i>
<i>Ilex monticola</i>	<i>Quercus Prinus</i>
<i>Juglans cinerea</i>	<i>Quercus rubra</i>
<i>Hamamelis virginiana</i>	<i>Prunus serotina</i>
<i>Hickoria alba</i>	<i>Sorbus americana</i>
<i>Tsuga canadensis</i>	

AN IDEA FOR A ROCK GARDEN

It occurred to the writer that the summit of "Apple Orchard" would make an excellent plan for a rock garden in this latitude while also representing geographical botany, ecology, and acclimatization. It might be difficult to grow some of the plants here on account of the peculiar conditions of heat and moisture

on a mountain summit, but these could be renewed from time to time and the garden could be started under trees to shield it from our August sun.



FIG. 3. Chestnut Grove, Apple Orchard Mountain, Virginia.

Here are the principal plants seen on the summit, none of which would seem to present any great cultural difficulties if shade and water were forthcoming. The top of the mountain is not a peak, but a slightly flattened ridge running nearly east and west, with large boulders of granite separated by plats of grass, *Dicksonia*, and shrubby thickets. Stunted red oaks and *Rhododendron catawbiense* grow around and among the rocks, while Alleghany birch and a few trees of mountain ash and mountain holly grow on the north side just beyond the crest of the ridge. Chestnut, white oak, wild cherry, *P. serotina*, and witch hazel are also represented.

Shrubs are more abundant, mostly in dense thickets west of the larger rock masses. The two species of hazelnut, a willow, a gooseberry, *Crataegus neofluvialis*, and *Cornus paniculata* represent most of the species, which should be kept separate.

The common polypody abounds on the larger rocks, especially on their shaded sides, and a few clumps of the marginal shield fern grow at the bases of these rocks. *Solidago Curtisii* and two species of blue gentian were fairly common, and a number of other herbaceous plants might be selected in the spring or early summer, when they are in flower.

SNOW INJURY TO TREES

BY GEORGE B. RIGG

During the winter and spring of 1915-16 the writer has been interested in observing the effects of the unusual climatic conditions on the native trees of the Puget Sound region occurring at or near sea-level, particularly the relative amount of mechanical injury by snow to needle-leaf evergreens and broad-leaf evergreens.

Although the minimum temperatures of this winter were low and the cold spells were prolonged,* there was not a great deal of serious injury to evergreens from this source. A good many individuals of Douglas fir (*Pseudotsuga taxifolia*), Madrona (*Arbutus Menziesii*) and sticky Laurel (*Ceanothus velutinus*) show more than the usual number of dead leaves, but this does not seem to have interfered seriously with their growth although a few dead Madronas have been reported. The following facts indicate that the winter was a time of relatively severe cold. The minimum temperature was +14° F. on January 11 and the same on January 29. A cold spell began on December 29 and lasted with two slight breaks until February 5. The minimum temperature was below 32° F. many of the days, and from 3 A.M. January 10 to 1 P.M. January 15 the temperature never rose to 32° F. The minimum temperatures of other severe winters were as follows: +3° F. on January 31, 1893; +12° F. on February 3, 1899; +13° F. on January 25, 1902; +11° on January 15, 1907; and +12° on January 13, 1909.

The snow fall in the lowlands of the Puget Sound region is usually very slight. During many of the winters there is not

* Weather data furnished by G. N. Salisbury, director of Washington Section, U. S. Weather Bureau.

enough snow to cover the ground at any time. The total snow fall for the winter of 1915-16, however, was 60.9 inches at Seattle. It was equally heavy at many other places near sea-level throughout the region. The snow fall of this winter was the heaviest of any winter since the establishment of the local office of the U. S. Weather Bureau in Seattle (1890). Between 9 A.M. January 31 and 2 A.M. February 3, there fell a total of 33.4 inches of snow. There was some settling of this snow due to melting, so that measurements of the total depth on the level at the close of the snow varied from 26 to 29 inches.

The nearest approach to the snow of 1915-16 in amount was in 1892-3 when a total of 58 inches fell. Thirty inches fell in February, but there is no record of the total depth on the ground at any one time. The only other winters during which the records show a total of more than 16 inches are as follows: 1896-7, 31.2 inches; 1898-9, 37 inches.

The snow of January and February, 1916, was very wet and there was but little wind during its fall, so that it accumulated to a considerable depth on all exposed objects offering any considerable surface for its lodgement.

In general there was much greater mechanical injury to needle-leaf evergreens than there was to broad-leaf evergreens. Snow accumulated in large quantities in the tops of young conifers and in many cases this resulted in either uprooting them or in breaking their trunks a few feet from the ground. In the larger individuals among the conifers the greatest injury was by the breaking of branches. The snow did not accumulate in such large masses on the broad leaf trees. The branches bent down with the weight of the snow, and the snow soon slid off from them, the drooping leaves offering practically no resistance to its sliding. The numerous small leaves of the conifers, on the other hand, seemed to offer a firm lodgement for the snow and to offer considerable resistance to its sliding.

Among the conifers, the Douglas fir was a conspicuous sufferer. The injury to this species was the more conspicuous because it is the commonest conifer in the lowlands of the Puget Sound region. Other conifers that suffered severe injury were western hemlock

(*Tsuga heterophylla*), giant red cedar (*Thuja plicata*) and white fir (*Abies grandis*). The injury to the Douglas fir was most striking in logged-off or burned-over areas where there was an almost pure stand of young trees from 10 to 25 years old. The height of young trees of this species is on the average a little over one foot for each year of their age. Many of these young trees had never before borne any weight of snow at all approximating the weight that rested upon them during this winter. Where they grew in a dense stand the accumulated masses of snow frequently uprooted or broke down a number of trees together. Some of these clusters of trees fell at once to the ground while others remained supported for a time by other vegetation which in many cases they finally broke. The writer has not seen any case of injury to conifers occurring singly in the open. The writer has not found any injury of consequence to younger conifers less than 6 feet high, even where they occurred in dense stands in the open. The species examined under these conditions are Douglas fir, lodge pole pine (*Pinus contorta*) and western white pine (*Pinus monticola*).

The region observed by the writer includes the campus of the University of Washington, other places in Seattle and the immediate vicinity, the Cedar River valley east of Seattle, and various points in Kitsap county, Washington in the vicinity of Silverdale, Seabeck, Crosby and Chico.

Several of the trails on the uncleared portion of the campus of the university were rendered impassable by the fall of young conifers during this snow. The same was true of trails and even of roads in Kitsap county.

Considering the large number of species of broad-leaf evergreens in the regions and the great abundance of individuals of some of these species in certain places it was a matter of surprise to find practically no mechanical injury to them from the snow. The Madrona is the largest of these and is also the most abundant in the regions observed by the writer. The others observed, such as sticky balm and manzanita (*Arctostaphylos tomentosa*) are more in the nature of shrubs.

The most striking fact observed about snow injury to trees

was the large amount of injury to needle-leaf evergreens and the small amount of injury to broad-leaf trees and shrubs.

UNIVERSITY OF WASHINGTON,
SEATTLE

THE GENUS *EUGENIA* IN THE HAWAIIAN ISLANDS

BY VAUGHAN MACCAUGHEY

One of the large and representative myrtaceous genera that is represented in the Hawaiian flora by both indigenous and exotic species is the interesting genus *Eugenia*. Several arborescent species are abundant in the rain forests and upper valley floors of all the islands; a number of horticulturally important forms are common in Hawaii's many tropical gardens and estates. Inasmuch as there is nowhere in the literature a comprehensive statement of the Hawaiian *Eugenias*, it is the purpose of this paper to bring together the salient data concerning this group of valuable plants.

The genus *Eugenia* was named by Linnaeus in honor of Prince Eugene of Savoy. It comprises some 760 species, and is the largest genus of the family Myrtaceae. Like several other large genera of this family, it has two main centers of evolution, namely tropical Asia and tropical South America. There are a few species in Africa, and also in Australia; the latter region is also an evolution-center for important myrtaceous genera. Most of the *Eugenias* are trees or shrubs, and many are valued for their fruit, wood, or ornamental foliage.

The leaves are opposite, usually entire, and finely penninerved. They are often glandular-punctate and fragrant. The flowers are in trichotomous terminal and lateral or axillary cymes or corymbs; in some instances they are single or few (on short spurs or buds), in the axils of the leaves. The flowers are white or creamy; the conspicuous part of the flower, however, is the long, numerous stamens, which are white or scarlet. The arrangement is tetramerous; calyx-tube globose to elongate, 4- or rarely 5-lobed, or produced above the ovary with 4 (rarely 5),

distinct, imbricate lobes. There are four petals (rarely 5), distinct, or cohering in a cap and falling off together. The stamens have capillary filaments and small, versatile anthers. The ovary is 2- rarely 3-loculed, with several ovules in each locule; style filiform; stigma small. The fruit is a drupe-like berry, usually baccate, globular or pyriform, and crowned by the teeth or truncate remains of the calyx. There are one to five seeds, usually one or two; the embryo is straight, with a short radicle; the cotyledons are thick and usually consolidated into a single mass.

The *Eugenia* of first importance in the Hawaiian flora is the *Ohia ai* or "Mountain Apple," *Eugenia malaccensis* L. (the *Jambosa malaccensis* of P.DC. and other authors). This beautiful tree was introduced by the primitive Hawaiians, and is now abundant in the humid valleys and ravines on all the islands. It is distinctively a tree of the lower forest zone, where it forms pure stands, some of which, in the broad valley floors, cover areas of several hundred acres. It occurs throughout the Pacific, and is abundant in many of the South Sea islands. It is thirty to sixty feet in height, usually about thirty-five feet. The trunk is straight and smooth-barked; the crown is particularly handsome because of the dark green, glossy, abundant foliage.

The leaves are elliptico- or obovate-oblong, 6-7 ins. long by $2\frac{1}{2}$ -3 ins. broad, on fleshy petioles $\frac{1}{2}$ inch long; abruptly acuminate, rich dark green, glossy; the sinuate marginal vein is distant from the edge. The flowers are showy clusters of long, spreading, bright red stamens, that contrast charmingly with the rich foliage. During the flowering season, in early summer, the shady interior of the tree seems to be filled with a delicate scarlet haze. The flowers are in axillary cymes, usually cauline, about 2 inches long, the lowest branches three-flowered, the middle or terminal branch racemose. The pedicels are short, gradually enlarging into the calyx. The latter is turbinate, produced beyond the ovary, with four rounded lobes. The petals are minute, obovate, and red; the showy red stamens are three-quarters of an inch long.

The fruits, which constitute the part of greatest interest, are

obovate, about the size and shape of a small pear, 3 inches in diameter, umbilicate at the top and crowned by the truncate scars of the calyx lobes. The very thin, smooth skin is rich crimson, pale pink, or rarely white; the highly colored fruits have a very attractive appearance. The flesh is firm and apple-like, sometimes a trifle fibrous, but filled with a cool, sugary, sub-acid juice, that has a crisp, pleasant flavor. The fruiting season varies greatly, dependent upon the elevation of the tree, but the main season is mid-summer, and at this time the fruits are common in the Honolulu markets.

A rare variety of this tree has white flowers and fruits; this is known to the Hawaiians as *Ohia ai hua keo-keo*. The wood of the *Ohia ai*, like that of the *Ohia ha*, was formerly used by the natives for house and temple timbers, but is not put to commercial use now, save occasionally as firewood. Like other members of the *Eugenia* group, the bark is astringent, and was sometimes used by the natives for medicine.

There are only two indigenous *Eugenia*s in the Hawaiian Islands, *E. sandwicensis* Gray, and *E. rariflora* Benth. The *Ohia ai*, although thoroughly naturalized, cannot be considered indigenous. *Eugenia sandwicensis* (classed as *Syzygium sandwicensis* by Niedenzu in Engler and Prantl) is known to the natives as *Ohia ha*; on the island of Maui it is called *Pa-ihī*. It is a tall tree of 40 to 60 feet, with a trunk of 12 to 18 inches in diameter. The smooth brown bark is readily distinguished from that of the *Ohia lehua* (*Metrosideros polymorpha*). The wood is reddish, hard, fine-grained, and durable; it was formerly used in the construction of native houses and temples. The branches are angular and sharply margined. The leaves are obovate or obovate-oblong, on petioles of $\frac{1}{2}$ inch; obtuse, subcoriaceous, dark green or sometimes yellowish with red venation. Hillebrand records a variety *parvifolia*, with leaves $1\frac{1}{2}$ to 2 ins. long by 1 to $1\frac{1}{4}$ ins. broad.

The cymes are simple or compound in the axils of the upper leaves; the common peduncle is angular and elongate, 1- $1\frac{1}{2}$ ins. long; the pedicels are minute, articulate, and bibracteolate below the calyx; bractlets small, triangular. The calyx is

turbinate, minute, four-lobed, the minute lobes extending down to the disk, imbricate, and early deciduous. The petals are minute, obovate, often emarginate, pinkish, generally discreet, but sometimes united and falling off together. Stamens 20–30, shorter than the petals; style short; ovary two-loculed, with ten or more ovules in each locule.

The fruit is a bright red, turbinate or globose berry, flat at the top, about one-third inch in diameter. The flesh is resinous-astringent and insipid. The berries mature in the latter part of the summer, and are often very abundant. The fruit is eaten by the birds, but is scarcely suitable for human consumption. It was not used by the primitive Hawaiians. There are one or two seeds, with a pale, thin testa; the thick cotyledons are not consolidated.

The *Ohia ha* occurs in the lower rain forests of all the islands in the group, from one- to four-thousand feet elevation. It does not form pure stands, but occurs here and there throughout the forest, reaching its best development at the lower levels, in protected situations. On the exposed summit ridges and slopes it is dwarfed and shrubby. Representative localities where the *Ohia ha* is plentiful are: the Wainiha and Na Pali regions of Kauai'i; Ka-hana and Puna-luu on Oahu; the great valleys of East Molokai'i; the northern slopes of Hale-a-ka-la, and the Kohala forests of Hawai'i.

The second indigenous species, *Eugenia rariflora* Benth., is very rare in the Hawaiian Islands, but is common in the South Seas,—Samoa, Tahiti, and Fiji. It is a tall shrub with terete glabrous branches. The leaves are broad, ovato- to elliptico-oblong; they are quite variable in shape, and are often rhomboidal and acuminate, or obovate and obtuse, or even suborbicular. They are $1\frac{1}{2}$ –3 ins. long by $1-1\frac{3}{4}$ ins. wide, on extremely short petioles; glabrous, pale green, glossy above, chartaceous, with numerous minute oil-glands. The flowers are solitary in the axils, or sometimes two or more near the apex of short foliar axillary buds or spurs; on minute slender pedicels, which are minutely bibracteolate below the calyx. The calyx tube is puberulous, subglobose, minute, not produced, its four lobes

obovate or oblong. The stamens are numerous, as long as the petals, all free. Style short, slightly curved; ovary with two locules, each locule with eight amphitropous ovules. The berry is quite small,—about one third inch,—globose, dryish, and crowned with the calyx lobes. There are one or two globose seeds, ascending, with a thin, membranous testa, and filling the cavity; the thick cotyledons are not consolidated.

This species is confined to the lower portions of the rain forest, and is very rare. It has been collected on both mountain ranges of Oahu, and also from West Maui. Hillebrand states that “Our plant differs from that of the Southern islands in having thicker, more strongly veined, glabrous leaves, and a smaller fruit.” He also records a variety *parvifolia* with narrow elliptic, almost lanceolate leaves, about one inch long.

The most common of the introduced *Eugenias* is the so-called Java Plum, *E. jambolana* L. (*Syzygium jambolana* DC.). It is also known as Jambolan, or Jambolan Plum. It is abundant along many roadsides; in old fields and pastures; in the vicinity of native settlements; and here and there everywhere along the lowlands. The mynah-birds and doves, as well as the children, are very fond of the fruit, and have evidently played an important part in distributing the plant. It is native to the East Indies, but has become widely distributed in warm countries, and was brought to the Hawaiian Islands in early times. It grows as a tall shrub or tree, and often reaches a height of thirty or forty feet. The smooth, light-colored bark, and open crown, are distinctive features.

The leaves are 4–6 ins. long by 2–3 ins. broad, broadly oblong, shortly acuminate, and broad at the summit. The flowering season is from June into August, and during this time the trees are filled with fragrant white blossoms. The abundant nectar and pollen attracts the bees and other insects in great numbers. There is considerable variability in time of fruiting, so that the fruiting season is prolonged over a number of months, from late spring well into the fall. The main crop comes from September to November. The fruit is borne in dense clusters; the individual drupe is oblong, $\frac{1}{2}$ to $1\frac{1}{2}$ ins. long, purplish-black, with a thin,

easily crushed skin, and a quantity of very juicy, purple-black flesh. It contains one large, oblong seed. The unripe fruit is very astringent, so that thorough ripening is necessary to render the fruit edible. The richly colored juice stains the mouth of the eater, and one can easily recognize an urchin who has been feasting on Java Plums. The fruits scatter from the trees in such quantities at the height of the season, that the ground or sidewalk below is conspicuously stained; this has led to a dislike for it as a shade tree in the city.

A small-foliaged variety, with light green, narrow leaves, and small fruit, is said to have been introduced many years ago by Dr. Hillebrand, and is now common in gardens and estates. The astringent bark of the Java Plum is used in other countries in dying, tanning, and medicine; although the tree is abundant in Hawaii, the wood and bark are rarely utilized.

Another very common introduced *Eugenia* is the rose apple, *E. jambos* L. (*Jambosa vulgaris* DC.; *J. jambos* Millsp.). This species is also known as Jamrosade or Jambos. It is native to the West Indies, but was introduced into the Hawaiian Islands many years ago, and is now abundant in the valleys, around native settlements, along streams and old roadways. It is a large shrub or medium sized tree, reaching a height of twenty or thirty feet. The foliage is abundant and attractive, although the crown is often unkempt and scraggling. The leaves are lanceolate, very acuminate, thick and glossy; 5-8 ins. long and 1-2 ins. broad. From January to April, and sometimes later, the crown is filled with the large fluffy flowers; the pompons are creamy white, and contrast pleasingly with the dark foliage. The fruit is pyriform or globular, somewhat compressed, and 1-2 ins. in diameter. The skin is smooth, light creamy yellow in color, and often with a pink flush on one cheek. The flesh is firm, crisp, and tender, with a delightful flavor and odor. The aroma is like that of a delicate perfume. The cavity is relatively large, and contains a single round seed. The fruit requires several months to mature, and the season ends in August and September, depending upon locality. The fruit is much used in the tropics for jelly-making and in confection; the plant as a whole is prized for its rich foliage

and showy flowers. It is readily propagated by either cuttings or seeds. The latter geminate easily, and there is usually a large number of seedlings under any rose apple tree.

The French cherry or pitanga is a fairly common garden shrub in the Hawaiian Islands, particularly in the older gardens and estates. It is also called Surinam cherry, *E. uniflora* L. (*E. Michellii* Lam.). It is a native of tropical Brazil, but may now be found in many warm countries, where its fruit is much esteemed for jellies. It is a shrub varying in height from five to twenty feet; ten feet is an average size. Like the other *Eugenias*, the foliage is attractive; the leaves are glossy dark green, ovate-lanceolate, obtuse at the base, 1-2 ins. long, and exceeding the peduncles. The flowers are small, single, white, and quite fragrant. They are borne in profusion under favorable conditions. The fruit is $\frac{1}{2}$ -1 inch in diameter, the size of a cherry, on short peduncles. It is amber colored, finally becoming rich crimson, and semi-translucent. The conspicuous feature of the fruit is the deep longitudinal ribbing or fluting; the convex surfaces are rounded, the depressions angular. The unripe fruit is decidedly astringent, but when fully mature it possesses a delicious spicy, acid, aromatic flavor. The fruit contains a single large, smooth, globular seed. In Hawaii the fruit is eaten out of hand, and also used for jelly-making. It occurs on all the islands; large bushes occur in Nu'u-anu, Wai-alaie, and at Moana-lua; also in the Hilo district of Hawai'i, and the Lihue region of Kauai'i.

The seventh member of this interesting genus that is prevalent in the islands is *E. brasiliensis* Lam. (*E. dombeyi* Skeels). This is called Brazilian plum or Spanish cherry; in Brazil, its native home, it is known as the Grumixameira. In habit it varies from a shrub to a large tree of fifty feet; in the Hawaiian Islands it is usually about twenty feet high. It requires considerable moisture for its best development, as do all the *Eugenias* in our flora; the largest crops are borne by plants at the lower levels, up to 300 feet. The leaves are obovate-oblong, $2\frac{1}{2}$ -5 ins. long and 1-2 $\frac{1}{2}$ ins. broad, tapering at the base and blunt at the apex, dark green and glossy. The flowers are white, like those of *uniflora*;

flowering and fruiting continues from July until December, the main crop coming in the fall. The peduncles are 1-2 ins. long, and greatly exceed the scales which subtend them. The fruit is the size of a cherry, scarlet or deep purple, sometimes almost black at maturity. It is easily recognized by the conspicuous persistent calyx lobes. The flesh is sweet, juicy, and with an agreeable flavor. The fruits are eaten out of hand, and are also candied or preserved. The first plants in Hawai'i were probably introduced by the Spaniard, Don Francisco de Paula Marin, who came to the islands in 1791, and remained until his death in 1837. He introduced, cultivated, and distributed many useful plants. Fine trees of the Spanish Cherry occur in Pauoa, Ma-kiki, Nu'u-anu, and on old estates in various parts of the islands.

There are several other rare or undetermined exotic *Eugenias* in a few of the old Honolulu gardens, but the seven species that have been enumerated and described represent the bulk of the group in our flora. At one time in the early history of Hawaii's agriculture an endeavor was made to introduce the clove tree (*Eugenia aromatica* Baill), the flowers of which constitute the valuable cloves of commerce, but the enterprise was unsuccessful. Undoubtedly, as interest in Hawaiian horticulture grows and become more thoroughly organized, many of the other interesting members of this large group will find a place in the island flora.

COLLEGE OF HAWAII,
HONOLULU, HAWAII

HABENARIA REPENS AND PIAROPUS CRASSIPES IN LEON COUNTY, FLORIDA

BY ROLAND M. HARPER

Almost every outdoor botanist can recall several pairs of unrelated species that seem to be fond of each other's company, so to speak. In some cases one is evidently dependent on the other, *e. g.*, as parasite or epiphyte, but in most cases perhaps the only explanation is that they both prefer the same combination of environmental factors.*

* See A. A. Eaton, *Fern Bull.* 5: 29. 1897; Harper, *Torreyia* 6: 192-193. 1906.

An interesting case of association, which may have some significance, is that of two aquatic monocotyledons of tropical and subtropical America, *Habenaria repens* Nutt., an orchid, and *Piaropus crassipes* (Mart.) Britton, the water-hyacinth. My

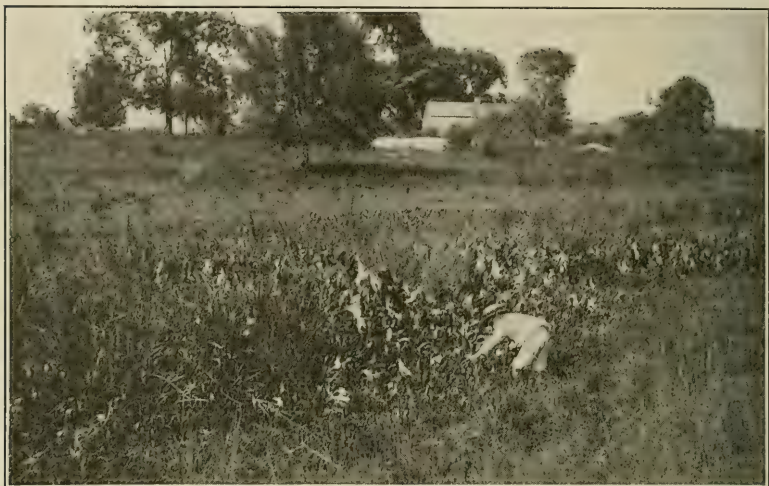


FIG. 1. Locality for *Habenaria repens* and *Piaropus crassipes*. Tallahassee, Fla. Sept. 11, 1914.

first meeting with both of these in a wild state was in Lowndes County, Georgia, in September, 1902.* There the orchid was supported by floating masses of the hyacinth in water several feet deep. About a year later I collected the *Habenaria* at the edge of the estuarine marshes of the Altamaha River just below Darien, Ga., and in 1908-9 I found both plants in marshes, lakes or streams at several places in central Florida, but never together. (Dr. J. K. Small, however, tells me that they associate in Lake Okeechobee. Both are reported from northern South America, but whether as associates or not is not stated.)

In 1914 I found the two plants intimately associated, and blooming at the same time, in a miry meadow near the southeastern corner of Tallahassee, Fla.; not floating, as they usually do elsewhere,† but the water-hyacinth rooting in the mud and the

* See Plant World 6: 164-165. July, 1903.

† In this connection see Ames, Orchidaceae 1: 51-53. 1905; Rusby, Jour. N. Y. Bot. Gard. 7: 112-115. 1906; Harper, Ann. Rep. Fla. Geol. Surv. 3: 293, 340, 342. 1911.

orchid partly supported on it. (See illustrations.) Neither can be indigenous there, because in pre-historic times the spot must have been covered with the hardwood forests that characterize that part of the state.* The whole vegetation of the meadow is of a type not uncommon in the Piedmont region of Georgia and other clayey regions farther north, but almost unknown in Florida, where sand is the prevailing soil component. The following are the characteristic plants of this place, in approximate order of abundance.

SHRUBS
Cephalanthus occidentalis

HERBS
Boehmeria cylindrica
Sagittaria latifolia
Polygonum hydropiperoides
Piaropus crassipes
Panicum gibbum
Juncus effusus
Habenaria repens
Cyperus flavescens
Cyperus strigosus
Mikania scandens
Hypericum mutilum
Aeschynomene Virginica
Hydrocotyle umbellata
Fuirena breviseta
Fimbristylis autumnalis
Echinochloa Crus-Galli

HERBS
Jussiaea leptocarpa
Eupatorium perfoliatum
Apios tuberosa
Conoclinium coelestinum
Monniera Caroliniana
Bidens trichosperma?
Erianthus sp.
Lycopus sp.
Diodia Virginiana
Kyllinga pumila
Cyperus Haspan
Bidens laevis?
Limnobium Spongia
Oldenlandia glomerata
Andropogon glomeratus
Ludwigiantha arcuata
Anastrophus paspaloides
Xyris sp.
Rhexia Mariana

The wettest spots, where the two plants in question grow, probably produce vegetation at the rate of three or four tons (dry) per acre per year, or considerably faster than a typical sandy bog. Most of the species bloom in late summer, like the *Piaropus* and *Habenaria*. Some of them are evidently indigenous in that region and some are not, but there seems to be no way of getting at the history of the vegetation now.† The *Habenaria* was described from Georgia nearly 100 years ago, but

* See Ann. Rep. Fla. Geol. Surv. 6: 271-272. 1914.

† The development of wet meadows in the eastern United States and other temperate regions presents some unsolved problems. Some botanists seem to believe that such meadows are the result of clearing long ago and pasturing or haying ever since, but the fact that in many such places the plants are all or nearly

the *Piaropus* was not known as a wild plant in the United States until about 25 years ago.* From the manner in which they associate in Tallahassee it is not likely that the *Habenaria* was there first, and they both may have been introduced at the same time, perhaps by means of seeds carried on the feet of aquatic

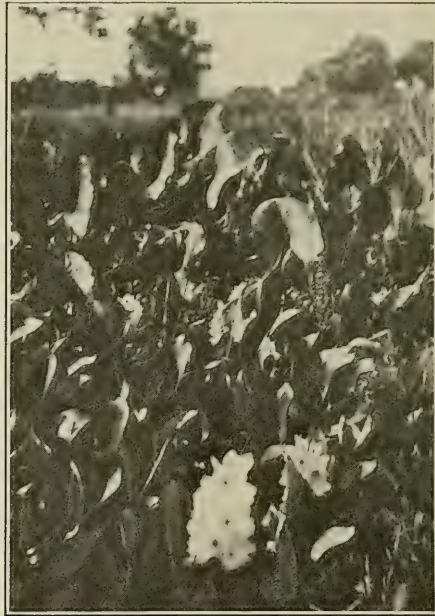


FIG. 2. Near view of the plants. Flowers and foliage of *Piaropus* in foreground and several spikes of *Habenaria* and leaves of *Sagittaria latifolia* a little farther back.

birds. The introduction may have been quite recent, for I made my headquarters in Tallahassee during most of 1909 and 1910, without seeing either plant then, though the water-hyacinth is quite conspicuous when in bloom, and easily visible now from a railroad along which I often rode and walked.

COLLEGE POINT,
LONG ISLAND

all native distinguishes them sharply from most unnatural habitats. For descriptions of more or less similar vegetation in other states see Blankinship, *Rhodora* 5: 131, 132. 1903 (Mass.); Nichols, *Bull. Torrey Club* 42: 192. 1915 (Conn.); Harshberger, *Bull. Torrey Club* 31: 153. 1904 (Pa.); Harper, *Torreya* 10: 63. 1910 (N. C.); *Bull. Torrey Club* 27: 322, 416. 1900 (Ga.).

* See Small, *Bull. Torrey Club* 23: 125. [1896; Webber, U. S. Dept. Agr., Div. Botany, *Bull.* 18. 1897; Curtiss, *Plant World* 3: 38-30. 1900.

REVIEWS

*Plants in health and disease**

While this little book is said by the authors to be nothing more than a summary of a course of lectures given at the University of Manchester in 1915-16, it is certainly a most readable and remarkably compact account of the life of plants. This is a war book, and reveals to us in a small degree the bit which the scientific men of England are doing in their great crisis. The lectures were addressed to an audience of men and women gardeners and "allotment-holders" of Manchester and vicinity. While the abundant illustrations which accompanied the lectures were necessarily omitted from the book, the text is, nevertheless, made very clear and attractive by the copious use of familiar facts and principles underlying gardening and horticulture. Professor Weiss has written the first seven chapters on the general features of plant life; Mr. Robinson the following five chapters on fungous diseases; Mr. Imms four chapters on injurious insects and animals, and one on beneficial animals.

E. W. OLIVE.

PROCEEDINGS OF THE CLUB

OCTOBER 10, 1916

The meeting of October 10 was held in the lecture room of the Department of Botany, Columbia University. The meeting was called to order at 8:15 P.M. by the President. Twenty-eight persons were present.

The minutes of the meeting held May 31 were read and approved. Dr. H. S. Piatt, 561 West 141st St., New York City, and Miss Ruth B. Fisher, St. Marks, New Brighton, N. Y., who had been received as members of the Club by the Field Committee during the summer were formally elected to membership.

Several members responded to the call of the president for an account of some of their botanical experiences during the vacation.

* Weiss, F. E., Imms, A. D., and Robinson, W. *Plants in health and disease*. Pp. i-viii + 1-143. Longmans, Green & Co., 1916. Price 50 cents.

Professor Harper exhibited a number of fine specimens of *Peridermium cerebrum* obtained from *Pinus* at Bedford, Va., in September. They were for the most part of the globoid type found on limbs. Professor Harper called attention to the manner in which the bark of the burl sloughs off after the spores have been shed. The appearance of the cortex at this time of year indicates that the burl has made considerable growth in preparation for next year's crop of spores.

Dr. E. W. Olive spoke of the interesting parasitic fungus that has been found on the birch trees in the vicinity of the Brooklyn Botanic Garden. Prof. G. M. Reed has been conducting an investigation of this fungus and will make a further report later. Dr. Olive also described briefly another parasite which has recently come to his attention. This new fungus appears to have some characteristics of a rust while at the same time possessing features distinctive of the smuts.

Two rather rare and interesting species of *Boletus* were exhibited by Dr. M. Levine, who spoke of the work of his students on this group. *Boletus subsanguineus* is an especially rare form collected only once or twice since it was originally described. Dr. Levine also exhibited water color illustrations of this species and of *B. retipes*.

Mr. Norman Taylor spoke of his experience in burning salt marshes at a time when all of the plants were in a vigorously growing condition. It is unknown what chemical properties of these plants account for their high inflammability.

Prof. T. E. Hazen reported on his observations of the various kinds of insects that visit certain flowers, especially the lilies and pickerel weeds. Prof. Hazen has made a number of photographs of insects at work on the flowers. He expects to publish a paper on this subject in the near future.

Dr. H. B. Douglas favored the Club with a highly interesting account of his summer's experiences as an amateur mycologist, in the Maine woods. Mrs. Douglas and he had collected and identified over seventy species of fungi and were able to testify as to the edible qualities of a number of species not heretofore placed on the desirable list. Their experiences in connection

with two cases of mushroom poisoning will be related at a future meeting.

Mr. Henry Thurston, who had spent the summer at the Illinois Agriculture Station, described the blister canker, *Nummularia*, which is quite prevalent in that region. Mr. Thurston exhibited a specimen to show how the fungus causes the large cankers on apple trees.

Another apple tree canker, one caused by *Bacillus amylovorus*, was described by Mr. E. L. Nixon.

Dr. F. J. Seaver closed the program with an account of his work collecting Discomycetes during the summer.

Adjournment followed.

B. O. DODGE,
Secretary.

NEWS ITEMS

Professor A. S. Hitchcock, systematic agrostologist, U. S. Department of Agriculture, has returned from a five months' tour of the Hawaiian Islands. He explored in considerable detail the islands of Hawaii, Maui, Molokai, Lanai, Oahu, and Kauai, and brought back important collections of plants. He was accompanied by his son Albert E. Hitchcock, as assistant.

The American Museum of Natural History, planning to further forestry education and research, has appointed a forester, Barrington Moore, A.B., M.F., as Associate Curator of Woods and Forestry.

Dr. J. N. Rose has returned from explorations in Venezuela.

ERRATA

Page 136, last line of foot-note, for 1914, read 1915.

Page 204, 8th line from bottom, for *Floodmani*, read *Flodmani*.

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