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Persistence of Exotic Plants Under Forest Conditions

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Most weeds, whether introduced or supposedly native, are confined to places where natural conditions have been greatly modified by civilization, and that indeed is one of the best ways of identifying plants as weeds when their recent history is unknown.[1] When human interference ceases the usual tendency is for native plants to recover the ground from which they have been dispossessed. For example, in a cultivated field in midsummer the only plants visible may be of a single cultivated species, that could not maintain itself in competition with weeds if those were not frequently hoed out or plowed under. In the fall, after the crop is harvested, the ground may become pretty well covered with introduced annual weeds, whose seeds have lain dormant during the summer. If the field should be left uncultivated for several years, the first year after cultivation will see a different set of weeds, with a larger proportion of supposed native species, a few of them perhaps biennials or perennials. If in a forested region, trees gradually come in too, and by the time the trees have grown to average size, casting as much shade as is normal for that type of forest, all introduced weeds may have disappeared, and the forest may not be easily distinguished from a virgin one, except that its flora is likely to be somewhat poorer, lacking some of the rarer species.[2]

Within a mile or two of the locality to be described presently (in Lee County, Georgia), on the day the observations were made (November 9, 1930), the following annual weeds were noticed in fields from which a crop of corn or cotton had recently

[1] See Bull. Torrey Botanical Club **35**: 347–360, 1908; **37**: 117–120, 1910.

[2] It is said that wire-grass (*Aristida stricta*), one of the commonest herbs in long-leaf pine forests in North Carolina, Georgia and Florida (scarcer in South Carolina, Alabama and Mississippi), never comes back on land that has once been cultivated. Though perhaps it would if given time enough.

been harvested (arranging them in approximate order of abundance): *Syntherisma sanguinalis*, *Jacquemontia tamnifolia*, *Heterotheca subaxillaris*, *Richardia scabra*, *Cenchrus echinatus*, *Isopappus divaricatus*, *Cassia Tora*. These were merely jotted down in walking along a road, with no attempt at completeness; and more prolonged observations over a larger area would of course disclose many more. One perennial that is commonly found in southern fields the same year they are cultivated, and was seen along roadsides at this time and place, is the nut-grass, *Cyperus rotundus*. It is able to exist in cultivated fields because it is propagated by corms and runners far enough below the surface to escape shallow plowing.

No special search was made for old fields at this time, but the following plants seen along roadsides in the immediate vicinity are also common in fields that have lain idle for a few years: *Prunus angustifolia*, *Rubus cuneifolius*, *Andropogon scoparius*, *Lespedeza striata*, *Capriola Dactylon*, *Cyperus rotundus*, *Eupatorium compositifolium*, *Andropogon argyraeus*. (There were also a few others which seem to prefer roadsides to old fields.) This list, which could also be greatly extended, includes two shrubs, and most of the herbs are perennial. In old fields nearly throughout the eastern United States, *Andropogon scoparius*, a native perennial grass, is one of the commonest weeds, and it commonly grows densely enough so that fire can sweep through it, and if burned often enough the invasion of trees sensitive to fire may be long delayed.

It is probably a belief widely held, if not often expressed, that if the human race should disappear from the earth or any considerable portion thereof, the original vegetation, consisting of species perfectly adapted to the soil, climate, etc., would restore itself pretty well in a century or two, and the foreign invaders would be suppressed.

The great majority of weeds prefer open situations, so that trees would tend to destroy them by shading them. Another factor that helps native plants in competing with exotics, especially in the southeastern United States, is fire. The long-leaf pine forests have undoubtedly been subject for ages to fires of almost yearly occurrence, while other types of forest in the same part of the country have been burned over at less frequent intervals.[3] Most of our weeds, as well as cultivated plants, come from

[3] See Pop. Sci. Monthly **85**: 338–361, October, 1914.

regions or habitats where fire is a negligible factor of the environment and are chiefly confined to fields, pastures, roadsides, etc. Of course a single fire sweeping a weedy roadside would not exterminate the weeds, but fires repeated every year on the same spot would be likely to prevent the reproduction of some, especially annuals, and those with barbed or fleshy fruits.

We have however a few weeds and other exotics which seem to be able to thrive in forests, either shady forests with abundant humus, or open forests frequently burned over.

In and near New York City *Prunus Avium*, a European fruit tree, can be seen in many forests which appear almost primeval, or as nearly so as could be expected with such a dense population around them, and in such situations one sometimes has to look twice to distinguish it from *Betula lenta*, which is native in the same forests.[4]

Ailanthus altissima (*A. glandulosus*), a coarse and usually crooked Asiatic tree with dry samara-like fruits, commonly cultivated for shade because it grows rapidly (though hardly anything else good can be said about it), often escapes to the woods around New York and farther south, though it is usually found in such unnatural habitats as not to deceive any one. However, on the north side of Bear Swamp, in Autauga County, Alabama, it grows tall and straight among native forest trees, in woods that have been altered a little by pasturing and the washing in of sand from the neighboring uplands.[5] A botanist seeing it there in winter and not suspecting the presence of any exotic trees might have difficulty in identifying it.

Melia Azedarach, the chinaberry, another Asiatic shade-tree common in the South (and westward to Mexico and California), often comes up from seeds dropped by birds along fences and around fields, and occasionally invades rich woods with native vegetation in the southeastern states, much as *Prunus Avium* does farther north. Almost the same could be said of *Albizzia Julibrissin* (commonly known as mimosa), another small Asiatic shade-tree, except that its seeds are in thin flat pods which are doubtless disseminated by the wind.

Lagerstroemia Indica, the crepe myrtle, a small ornamental tree, likewise of Asiatic origin, is commonly cultivated in the South, and may persist for many years after the house near

[4] See Torreya **17**: 135, 138, August, 1917.
[5] See Geol. Surv. Ala. Monog. 9, p. 226, 1928.

which it was planted has fallen down or been burned, and it has been treated as naturalized by Small[6] and by Mohr.[7] Although it produces plenty of seeds, they do not seem to germinate spontaneously, and the tree is propagated chiefly by suckers. It does not seem to stand being crowded by forest trees very well. It is probably sensitive to fire, too, on account of its thin bark. There is some of it at Aspalaga on the Apalachicola River in Gadsden County, Florida, which was a flourishing village a century ago (when Croom discovered *Tumion* and *Croomia* there), but for the last decade or two has been entirely deserted. The crepe myrtles there grow in places that are still rather open, and they may have been planted by some of the last inhabitants.

Lonicera Japonica, the Japanese honeysuckle, an evergreen vine, formerly cultivated for ornament, has become a pest in the South, and is found running wild as far north as New York. Its favorite habitat is roadsides and railroad cuts, in and near cities and towns, but it is also invading forests, especially those protected from fire by their small area or by dampness, and it bids fair to spread still more and persist indefinitely.[8] Wherever it grows it makes a dense tangle, which not only prevents grazing but must also suppress the seedlings of most trees, tending ultimately to destroy the forest.

Vinca major and *V. minor*, trailing evergreen herbaceous vines, or undershrubs, natives of Europe, both called periwinkle in the books, are often found growing in shady places in cemeteries and around old houses in the eastern United States, the former commoner southward and the latter northward (the smaller one being the hardier). They are cultivated for ornament, and possibly do not spread spontaneously at all. Their fruit, as in many other Apocynaceae, is said to be a pair of follicles, but it must be produced but seldom, for I cannot recall ever seeing any on either species. Like the sweet potato, which they resemble in habit, they are propagated by cuttings.

Neither species is mentioned in Mohr's Plant Life of Ala-

[6] Bull. Torrey Botanical Club **21:** 18, 1894; Fl. S.E.U.S. 827, 1903.

[7] Contr. U. S. Nat. Herb. **6:** 136, 632, 835, 1901. (Plant Life of Alabama.) See also Geol. Surv. Ala., Monog. 9, p. 275. 1928.

[8] See E. F. Andrews, Science II. 47: 142–143, February 8, 1918; Torreya **19:** 37–43, 1919; Harper, Geol. Surv. Ala. Monog. 9: 321, 1928; Natural Resources of Georgia, p. 85, February, 1930; Proc. Ga. Hort. Soc. **53:** 47, June, 1930.

bama, even among the cultivated plants, but in Small's Flora of the Southeastern United States *V. minor* is listed as a naturalized plant from Ontario to Georgia. *V. major* should perhaps be entitled to equal recognition, for its grows on the lowest limestone bluff at Aspalaga, Florida, more remote from the site of the last occupied house than the *Lagerstroemia* above mentioned, and it may have been there for many years. A still more remarkable colony of it in the coastal plain of Georgia will now be described.

In the southern edge of Lee County, Georgia, about five miles northwest of Albany, in a region that I formerly included in the lime-sink region but have called in recent geographical literature the red lime lands, there was founded about one hundred years ago a settlement called Palmyra. A railroad station about a mile away still bears the name. It flourished for a few years, and then was gradually abandoned in favor of Albany, which had the advantage of being on a navigable river (and has now become Georgia's tenth city in population). The country around Palmyra is comparatively level, with few streams, and the soil is mainly reddish coarse sandy loam, with limestone not far below the surface.[9]

At or near Palmyra, in a small grove mostly of native oaks, with a road on one side and fields on the other sides, there are the remains of a cemetery, with about a dozen tombstones, dating from 1838 to 1855. There are also many unmarked graves, presumably belonging to the same period. Although no special inquiry was made, it is a reasonable assumption that the cemetery has been entirely neglected since the Civil War; there seem to be no white people living near it now. The oak grove is approximately an acre in extent, and the cemetery covers something like half of it. It is pretty well protected from accidental fires by the road and fields around it, and it is not likely that fire would often be set purposely in such a place. Unlike most of the long-leaf pine country nearer the coast, grazing animals are not allowed to run at large in this region, as shown by the unfenced fields.

Even if a fire should get into the grove occasionally, it would probably stop when it reached a dense tangle of *Vinca major*

[9] Most of the soil in the neighborhood is designated on the government soil survey of Lee County, by J. W. Moon (apparently published in December, 1930), as "Greenville clay loam" and "Greenville sandy loam."

that covers the ground as ivy sometimes does, to the exclusion of all other herbaceous vegetation, over an area perhaps 100 feet square, or the greater part of the cemetery. If the *Vinca* propagated itself by seed, and there were isolated specimens outside of the main mass, those might succumb to any fire that might run through the woods; but the continuous colony, being evergreen, is not very combustible.

Associated with the *Vinca* are several other plants introduced from other places, near and far. The commonest is *Albizzia Julibrissin*, and the next perhaps *Robinia Pseudo-acacia*. Both are normally small or medium-sized trees, with thin wind-disseminated pods, but here they are only large shrubs, though it is possible that some larger specimens may have been cut out. The *Albizzia* is a native of Asia, as already stated. The native home of the *Robinia* is in the Appalachian region, but it has escaped from cultivation in many places outside of its range, at least as far north as New York, and south to northern Florida and southwestern Mississippi.

The upper story of the forest in the cemetery is composed of *Prunus* (*Padus*) *serotina*, which grows about as tall as the native oaks near by, but rather slender. It is undoubtedly native in ravines and on bluffs (it needs protection from fire) in northern Georgia, but whether or not there was any of it in Lee County before the first settlers arrived is a question. A smaller and less abundant tree in the same locality is *Prunus* (*Laurocerasus*) *Caroliniana*, whose habitat preferences are similar to those of *P. serotina*, though it is confined to the coastal plain, or nearly so. It may be native along creeks and rivers near Palmyra, but its seeds, like those of *P. serotina*, are easily carried by birds to places where it did not grow naturally. It may also have been planted in the cemetery, for it is a handsome evergreen.

Juniperus Virginiana is doubtless native on limestone outcrops not far away, but hardly in the oak grove, for it too is sensitive to fire.[10] The cedars in the cemetery may have been planted purposely by man or accidentally by birds. *Ilex vomitoria*, a shrub or small tree, is another evergreen with berries. It is native along the coast, and perhaps at many interior localities where there is sufficient protection from fire; and it may

[10] See Torreya **12**: 145–154, July, 1912.

have come to the Palmyra cemetery in either of the ways suggested for the cedar. The presence of *Melia Azedarach* calls for no special comment. Some other woody plants, which may or may not have been there originally, are *Ulmus fulva*, *Hicoria alba*, *Smilax lanceolata*, and a species of *Celtis*. The seeds of *Albizzia*, *Robinia* and *Ulmus* are distributed by the wind, and those of most of the other species by birds.

Summing up the situation, we have here, in what at the beginning of the 19th century must have been an upland oak grove subject to ground fires (which might be started by lightning in pine woods several miles away) running through the dead leaves perhaps once in ten years, an assemblage of plants, nearly all of them sensitive to fire and foreign to the immediate locality (several of them natives of the Old World), which seem to have been maintaining themselves without any conscious effort to protect them, for about three-quarters of a century. The surrounding road and fields afford pretty good protection from fires originating elsewhere, and the dense mass of *Vinca major*, which must be relatively incombustible, furnishes additional protection for the trees surrounded by it, which would be effective even if the surrounding country was depopulated and reverted to forest. Even if grazing animals should return, they probably would not eat the *Vinca*.

If the test of naturalization is ability to reproduce from seed for several generations without human assistance, *Vinca major* hardly meets that test. (The same might be said of *V. minor*, *Lagerstroemia*, and several other foreign plants treated as naturalized in our manuals.) But its persistence for such a long period is rather remarkable. It would be interesting to watch it for another century or so, if such a thing were possible, and see what happens. Possibly some who read this will know of analogous cases elsewhere.

TALLAHASSEE, FLORIDA

Occurrence of *Pinus pungens* Lamb. on the Atlantic Coastal Plain

ARTHUR PIERSON KELLEY

Scattered trees of Table Mountain pine (*Pinus pungens* Lamb.) grow on the low sandy scarps of Beaver Dam Branch in Prince George's County, Maryland, southeast of Ardwick station on the Pennsylvania Railroad and not far from Washington, D. C. They are apparently native in an extensive pine-oak forest of the sort which is natural to the coastal plain. The trees are seldom over 0.3 meters in diameter at breast height and grow to 15 meters in height; the lower branches are dead and the bark is scorched by fire.

While the tree resembles scrub pine (*Pinus virginiana* Mill.) with which it is associated, its stiff, sharp-pointed needles serve to distinguish an immature tree, while the large persistent cones with heavy apophysis, prominent umbo, and stout spine which is divergent or recurved, immediately betray the mature *Pinus pungens*.

Table Mountain pine may prove not uncommon on the Atlantic coastal plain. Its presence in the neighborhood of Baltimore was reported to the writer early in the year by Dr. Alexander F. Skutch, of the Johns Hopkins University. It was evidently found on the Virginia coastal plain, for Holm[1] records its discovery by William Hunter on Johnny Moore Creek, near Woodlawn, Virginia, in the eighties of last century.

The species is usually considered to be found natively only from the mountainous portions of New Jersey and Pennsylvania to Georgia and Tennessee, although it is reported from the Falls of Potomac in the Piedmont by Ward;[2] the Falls are, of course, not many miles distant from Ardwick. In its home, the tree occurs on sandy soil, as may be observed, e.g. at Mont Alto, Pennsylvania, on a sandstone ridge upon which *Pinus rigida* also flourishes.

MALVERN, PENNSYLVANIA

[1] Holm, Theodore, Third list of additions to the flora of Washington, D. C. Proc. Biol. Soc. Wash. **7**: 130, 1892.

[2] Ward, Lester F. Guide to the flora of Washington and Vicinity. Bull. U. S. Nat. Museum **22**: p. 137.

Chamaecyparis thyoides in Orange County, New York

W. C. MUENSCHER

Two recent notes on the distribution of southern White Cedar, *Chamaecyparis thyoides* (L.) Britt., in New Hampshire[1] and New Jersey[2] recall to mind an inland station for this species in New York which is of interest on account of its elevation and remoteness from the coast.

In June, 1924, while botanizing on the hills north of Port Jervis, the writer, Dr. C. L. Wilson and Dr. A. S. Foster observed *Chamaecyparis* in two swamps of the region.

According to a local woodsman "cedar" was growing in the "swamps up in the hills." After considerable exploring the first "cedar" was found in a small swamp, locally known as "Little Cedar Swamp." Only a few, nearly dead, trees of *Chamaecyparis* were found. About one-half mile southeast of this swamp, *Chamaecyparis* was found in another swamp locally known as "Long Swamp." This swamp, which is about one mile long and one-fourth mile wide, contained many large *Chamaecyparis* trees. In some localities these trees formed almost pure stands. In other places they were intermingled with *Picea mariana* (Mill.) BSP. and *Larix laricina* (DuRoi) Koch. *Rhododendron maximum* L. was a common undershrub. Many of the *Chamaecyparis* trees were between one and two feet in diameter. Along the eastern end of the swamp where the cedar had been out recently the ground cover contained many *Chamaecyparis* seedlings.

"Long Swamp," as indicated (without name) on the United States Geological Survey map (Port Jervis Quadrangle), is located about one mile south of Big Pond. This *Chamaecyparis* station occurs at an elevation of 1,340 feet above sea level about six miles north of Port Jervis, New York, and ten miles north of the *Chamaecyparis* station in Cedar Swamp, High Point State Park, Sussex County, New Jersey. The "Long Swamp" station extends the range of *Chamaecyparis thyoides* about ten miles farther inland than the High Point station, which occurs about seventy miles from the coast at an elevation of 1,650 feet.

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[1] Svenson, H. K. *Chamaecyparis thyoides* in New Hampshire. Rhodora **31**: 96–99, 1929.

[2] Torrey, R. H. Stations for the southern white cedar. Torreya **30**: 134–135, 1930.

Fantastic Frost Crystals on Dried Stems of Dittany

RAYMOND N. TORREY

Frost crystals on certain plants, appearing late in autumn, or in early spring are occasionally reported in botanical literature. The crystals which shoot from the bases of the stems of *Helianthemum canadense* and *majus* have given both of these species the popular name of Frostweed. Probably the same phenomenon appears on other plants, although I have not seen it reported in the manuals. Thoreau, in "Early Spring in Massachusetts," page 279, refers to "frost bodkins," needle like crystals on the roots of Herd's Grass, or Timothy, *Phleum pratense*, observed on March 29, 1859, in Concord.

I noticed an extraordinary example of such frost crystals on Dittany, *Cunila origanoides*, on November 27, on an old wood road on the east side of Kittatiny Mountain, near Mount Vernon, in Warren County, New Jersey. More than twenty of these odd forms were noted, and all were on the dead, dried stems of Dittany. Nothing of the kind was to be seen on other dead stems of herbaceous plants along the road, such as asters, goldenrod, grasses, etc. There appeared to be some reason, possibly in the square structure of the stem, some facility for capillary movement upward from the soil of moisture, which froze into these fantastic crystals, but what it may be would require some study and close observation from the moment of the beginning of the building out of these fragile and beautiful shells of ice.

The crystals appeared to have grown out from the base of the dried stems, an inch or two above the ground. In height, vertically, along the stem, they were 2 or 3 inches. Their width was from 2 to 4 inches; their thickness about 1–32 of an inch. In structure, they suggested the concentric curves of the bracket fungus, built out horizontally by curving lines of cell growth from a base on a dead or diseased tree.

These ice crystals seemed to have grown in similar concentric curves, but vertically, beginning with a band ½ inch to 1 long, where moisture issuing from the stem froze, and then another froze over it and so on. Some of these flat, vertically placed crystals showed a dozen or more such bands, from 1–32 to 1-16 and 1-8 inch wide increasing in width from the stem outward. The outer edge tended to be wavy, fluted or crisped. Sometimes

two or three of the vertical plates of ice were grown together at their outer edges, making an appearance like a clam or mussel shell. Some of them were folded back on each other, like the old-fashioned, ribbon-like, Christmas candy. Some were waved and curled like potato chips.

Frost crystals on Dittany stem.
Two crystals fused at right angles.

It was noticeable that most of them had grown out in the same general direction, toward the downhill slope of the old road, which ran east. Whether this was due to the direction of the wind at the time of freezing, or to some downhill draft in the narrow valley, is a question. The temperature had fallen suddenly during the night from a point above freezing at sunset to about 25° at dawn, and during the day it fell a few degrees lower. The ground had been wet from recent rains, and the dead leaves, recently fallen, and the dried stalks of various herbaceous plants had absorbed a lot of moisture, and were frozen

stiff but none showed any frost crystals but the stems of the colony of Dittany, strung for a hundred feet along the road.

These crystals were quite different in appearance from those which I recall seeing on the base of Frostweed stems, in New England, years ago; those of *Helianthemum* were narrower, curled and twisted; these growths on the Dittany were uniformly flat vertical plates, although varying in width and height and in fluting and waving of their outer edges. They did not appear to have started freezing from any small, central point, such as a break or node in the stem, but along a vertical distance of half an inch or more. Can anyone offer an explanation as to the mechanics of this phenomenon?

HOLLIS, NEW YORK

Some Matters of Nomenclature

T. D. A. Cockerell

In the admirable and exhaustive studies of the Umbelliferae by Mildred E. Mathias, published in the Annals of the Missouri Botanical Garden, there is, (vol. XVII, p. 294) the enunciation of what seems to me a very dangerous doctrine. Dangerous because, as the author can hardly have realized, its general adoption would create great and useless confusion in our nomenclature. The generic name *Lomatium* of Rafinesque was supplanted by *Cogswellia* Sprengel, because Robert Brown had earlier named a genus of Proteaceae *Lomatia*. It is argued that the retention of *Lomatia* "would be a source of permanent confusion". Macbride in 1918 refused to accept this view, and restored *Lomatium*, I think quite correctly. No intelligent person could be so careless as to confuse these names, especially as they refer to totally different kinds of plants, inhabiting totally different regions. I have long been a student of bees and mollusca, but it has never occurred to me to confuse *Ancyla* (in bees) with *Ancylus* (in mollusca), or *Trigona* (in bees) with *Trigonia* (in mollusca). A really difficult case is that of *Ferrissia* (mollusca) and *Ferrisia* (a mealy-bug). These names differ by a letter, but it is impossible to pronounce them differently. There is a botanical example which is rather confusing, that of *Euphorbia peplis* and *E. peplus*. The names are due to Linnaeus, and no one would now think of changing them.

There are two reforms in botanical methods which I believe would be advantageous.

(1) The explicit recognition of subspecies, as distinct from varieties, forms or mutations. While it is not always easy to decide about the rank of a plant, every botanist recognizes the existence of minor types which can be grouped under so-called Linnean species. There is a distinct disadvantage in treating all of these as full species, as is done by some authors. If they are called varieties, they are confused with mutations and forms, the application of the term variety being ambiguous. The recognition of the subspecific category, as in ornithology, appears to be a step toward clarity, and without any disadvantages.

A further consequence in nomenclature follows. In any genus, duplicate names of specific or subspecific rank cannot be permitted. Thus, if a name has been used for a subspecies, it

must not be used for a species, or vice versa. But names of varieties, mutations or forms are not involved, and it should not only be permitted, but strongly advised to use the same term for analogous mutations or forms in congeneric species.

(2) In anything but a very formal paper or list a zoologist will not use the double citation for the authority. That is, he indicates the name of the writer who first proposed the valid specific or other name (in whatever genus), but omits the name of the author of the combination. After nearly half a century of experience, I can testify that this causes no appreciable inconvenience. On the other hand, it saves a lot of printing. There is I think, no valid reason why botanists should not follow the usage of the zoologists in this matter. The old botanical custom, of citing only the author of the combination, can surely have nothing said in its favor. It obliterates the historical facts, and obtrudes information of minor value, especially now that we recognize priority in the same sense as the zoologists.

BOULDER, COLORADO

BOOK REVIEW

Flora of Mount Baker

Local floras are available for altogether too few regions in America. It is, therefore, with considerable interest that the appearance of one more has been noted under the attractive title of "Flora of Mount Baker."[1] The authors are to be commended upon their high aim, "to provide a ready source from which to learn the names and nature of the plants" of this interesting region in the extreme northwestern United States.

The publication contains keys to the families, genera and species, and brief descriptions of 334 species and varieties. Twenty-one species are illustrated with line drawings. Eleven plants, mostly varieties and forms, are described as new.

It is to be regretted that the authors did not make this flora more nearly complete by amplifying their list of species by including more of the records of earlier collectors of the region or or by more intensive field work, especially in the "lower forests," included in the area covered. To one who has made numerous collecting trips on Mount Baker and its surrounding ranges, during the last twenty years, certain plants of this region, as delimited by the authors, appear conspicuous by their absence from the "flora." Users of the flora will probably be disappointed not to find in it such common or striking plants of the region as the following: the braken fern, *Pteridium aquilinum pubescens* Underw., the most common fern in the "lower woods," *Lycopodium annotinum* L., *L. Selago* L., *Erythronium montanum* Wats., *Salix scouleriana* Barr., *Spergularia rubra* (L.) Presl., *Ranunculus bongardi* Greene, *Achlys triphylla* (Smith) DC., *Leptaxis menziesii* (Pursh) Raf., *Physocarpus opulifolius* (L.) Kuntze, *Spiraea lucida* Dougl., *Rosa gymnocarpa* Nutt., *Monotropa uniflora* L., *Moneses uniflora* (L.) Gray, and *Adenocaulon bicolor* Hook. Most of the weeds which have become naturalized in the openings in the lower forests of the region have been omitted, perhaps intentionally.

W. C. MUENSCHER

[1] St. John, Harold and Edith Hardin. Flora of Mt. Baker. Mazama 11: 52–102, 1929.

FIELD TRIPS OF THE CLUB

Two interesting late fall excursions of the club, added to the 1930 schedule, were on Sunday, November 30, in the region of old iron mines between Sterling and Tuxedo Lakes, a joint meeting with the Trail Campers of America; and on Sunday, December 7, on Bellvale Mountain, north of Greenwood Lake, a joint outing with the Warwick, New York, group which maintains the Appalachian Trail in this region.

Mosses were the most important subject for study on the November 30 meeting. A number of species were found in good "fruiting" condition, perhaps the most uncommon, at least the most infrequently noted, being the quaint *Buxbaumia aphylla*. *Webera sessilis*, the other almost stemless species, was common. *Leucobryum glaucum* was very common but was not found in fruit, although the writer found it with plentiful capsules on a later Sunday, on Kittatiny Mountain in western New Jersey a rather rare and beautiful sight. Species with mature or opened but persistent capsules were *Polytrichum Ohioenes*, *Bryum caespiticum*, *Ditrichum tortile*, *Ceratodon purpureus*, *Dicranella heteromalla*, very common, *Dicranum scoparium* (very few capsules observed), *Catharinea undulata*, very common, and handsome with masses of warm brown capsules, *Aulacomnium heterostichum*, *Hylocomnium proliferum*, *Hypnum recurvans*, and *Thelia hirtella*. *Sphagnums*, *Mniums* and *Dicranums* were noted, without capsules, also *Thuidium delicatulum*, and *Climacium Americanum*. *Conocephallum* was the most conspicuous liverwort. This region with its swamps and ledges would be interesting for another excursion for the mosses which mature their capsules in spring and early summer. The iron mines, some dating from before the Revolution, were of interest, particularly the great iron roaster, at the Red Back Mine, used up to sixty years ago to drive the sulphur out of the ore to make it marketable. On the way out to Sloatsburg, in a heavy rain, which began about the middle of the afternoon, the party noticed a new beaver pond, on a brook rising near the south end of Tuxedo Park, another new location of these animals, probably from the original transplantations of them ten years ago, in the Harriman Park.

On the December 7 excursion from Mount Peter, along the Appalachian Trail over Bellvale Mountain to Mombasha High

Point, many of the same mosses were noted, *Thelia hirtella* and *Hypnum recurvans* being especially handsome and in copious fruit, on the bases of white oaks. An unexpected and novel feature led the group into the field of paleobotany. Mr. F. J. Wells, of Greenwood Lake, photographer and student of natural history, showed us specimens of fossil plant impressions, from the Pequanac shales along the motor road from Greenwood Lake over Mount Peter to Warwick, where the rock has been blasted down in widening the highway and fragments are easy to find. They were identified for me by Dr. Arthur Hollick, of the New York Botanical Garden, as *Lepidodendron gaspéanum*, a plant very similar to our modern Lycopodiums, or clubmosses, but much larger, of the Devonian Period. This species, judging from the width of the impressions in the rock, one to two inches in width, was not as large as the great Lepidodendrons, Sigilarias and Calamites of the Pennsylvanian and Mississipian Periods (formerly joined as Carboniferous), which grew to be sixty feet high, but it was obviously a giant compared to our present day, low-growing clubmosses.

Fitzgerald's Falls, on the Appalachian Trail, east of the Greenwood Lake-Monroe Road, is an interesting place, botanically, for mosses and liverworts; and geologically, for the variety of formations nearby. The stream, a branch of Trout Brook, flows down a gully in the pre-Cambrian gneisses and granites, over a wide dike of black basalt, similar to those found in many parts of the Hudson highlands penetrating the pre-Cambrian and younger than it; while a few rods to the west is a ledge of vertically tilted, shaly limestone, one of the basal strata of the Green Pond formation, which makes Bellvale Mountain to the west, and probably of Silurian age. A close study of the plants of this area would be interesting to see if there are ecological differences in species, due to the varying kinds of rock.

Cat Rock, an uptilted ledge of red and white conglomerate, just off the Appalachian Trail, on Bellvale Mountain, was interesting for the dense growth of the Rock Tripe, lichen, mostly *Gyrophora Dilleni*, on the cliffs and talus.

A winter excursion, jointly with the New York section of the Green Mountain Club, on Sunday, December 28, in the Blue Mountain Reservation of the Westchester County Park system, southeast of Peekskill, was interesting chiefly for the variety of

deciduous trees, a blanket of four inches of show covering mosses and ferns. The dead stems of the Purple Loosestrife, *Lythrum Salicaria*, on brooks and small swamps, high up in the preserve, at elevations 400 feet above the Hudson, indicated that this adventive plant, which has spread from whatever coastal point it was established at seventy-five or one hundred years ago, all along the Atlantic seaboard from the Gulf of St. Lawrence to the Potomac, must be spread by other means than tidal or fresh waters, for it could scarcely have been seeded in these high swamps except by birds. It is now well established on many tributaries of the Hudson, miles from their mouths and 200 to 500 feet above the river. One notices red-winged blackbirds feeding on its seeds in the brackish marshes along the Hudson where it is so common, and it seems probable that these or other birds carry it to the streams and swamps back of the river.

The geology of this reservation is interesting, especially the inclusions of schist, limestone and gneiss, in the diorite which invaded and swamped the older rocks, and absorbed all but these small remnants which are to be seen in the glaciated surfaces of the black, weathered diorite. Some of the diorite ledges and some boulders of the same rock which were transported short distances by the ice, and now lie perched in conspicuous places, have a jointed appearance, something like the basalts of the Watchungs in New Jersey, with cracks frequently separating at 120 degree angles so as to make approximately incipent hexagonal columns.

The chairman of the field committee is now making up the field schedule for 1931, and welcomes the aid and suggestions of all members of the club. A number of winter and spring excursions will be held, to be announced in the weekly bulletin of the New York Academy of Sciences. Volunteers are invited for any Saturday, Sunday, holiday or week-end, from now to next December. The printed schedule will appear about May 1. It is desired to make the schedule richer and more varied than ever before, and offers of leadership in any field of botany, especially in mosses, lichens, grasses, sedges and liverworts, in addition to the more common and popularly known forms of vegetable life, will be welcomed.

RAYMOND H. TORREY
Chairman, Field Committee

PROCEEDINGS OF THE CLUB

Meeting of October 15, 1930

The meeting was called to order at the New York Botanical Garden at 3:30 P.M. by President Sinnott. Minutes of the meeting of October 7 were read and approved. Thirty-one members were present.

The following people were unanimously elected to menbership in the club: Miss Minna Koch, Hunter College, New York City; Miss Kathleen Muchemore, 596 East Nineteenth Street, Brooklyn, New York; and Miss Dorothy Meier, Box 59, Johnson Hall, Columbia University, New York City.

Professor Edmund W. Sinnott gave a talk on "Fruit Shape Inheritance in Cucurbita."

He has inbred a large number of strains of *Cucurbita pepo* for the past fifteen years and has about thirty lines which are essentially homozygous. During the past few years he has paid particular attention to the inheritance of fruit shape as shown by the results of crosses between various of these pure lines. The common disc of "scallop" type of fruit, very much wider than long, has been crossed with several types of spherical fruits. In every case, the disc type is dominant in the F_1. The F_2 shows approximately 3/4 disc to 1/4 sphere, thus indicating that the difference between these two fruit shapes is due to a single mendelian factor.

In crosses between two spherical fruited lines of different ancestry, the F_1 was found to be all disc fruited, and in the F_2 there appeared 9/16 disc, 6/16 sphere and 1/16 elongate fruit. This was explained as due to the operation of two flattening factors, each of which when alone produced a spherical fruit. When both were present together in a plant, their effect was accumulated, resulting in a disc shape. When both were absent, the double recessive elongate type appeared. Further evidence was presented showing that in addition to these and other flattening factors, there are operative factors which tend to elongate the fruit, thus acting in an exactly opposite direction to the flatteners. The concept is developed that fruit shape is determined by the balance or equilibrium between factors for flattening and factors for elongation. All of these seem to be inherited in a simple mendel-

ian fashion, and probably operate in some way to control growth correlations.

Meeting adjourned at 4:45 P.M.

Respectfully submitted,
FORMAN T. MCLEAN
Secretary

NOVEMBER 19, 1930

The meeting was called to order at the New York Botanical Garden at 3:30 P.M, by President Sinnott. Minutes of the meeting of October 15 were read and approved. Thirty members were present.

The resignations of Miss Rebecca Ornstein and Miss Laura B. Broomall were accepted with regret.

Brief reports by members on the International Botanical Congress were as follows:

Dr. Elmer D. Merrill stated:

The Fifth International Botanical Congress at Cambridge, England, under the presidency of Professor A. C. Steward of Combridge University, August 16-23, 1930, was initiated by a formal reception to delegates and members of their families at the Imperial Institute in London on Friday evening, August 13. The following morning a special train took the delegates to Cambridge, where the Congress officially convened on Monday morning, August 16.

The Congress was organized as follows: Bacteriology, Prof. R. E. Buchanan, Iowa State College, president; Phytogeography and Ecology, Prof. H. C. Cowles, University of Chicago, president; Genetics and Cytology, Prof. O. Rosenberg, Botaniska Institutet, Stockholm, president; Morphology and Anatomy, Prof. J. C. Schoute, Gröningen, president; Mycology and Plant Pathology, Prof. L. R. Jones, University of Wisconsin, president; Plant Physiology, Dr. F. F. Blackman, Cambridge University, president; Paleobotany, Dr. D. H. Scott, Basingstoke, president; Taxonomy and Nomenclature, Prof. L. Diels, Berlin, president.

The scope of this paper does not permit a detailed consideration of the numerous and important papers that were presented before the various sections of the Congress. Abstracts of these communications were published in advance of the Congress,

forming a book of 327 pages, copies of which were supplied to all delegates. Provision was made for the ultimate publication of the full proceedings, and the papers presented at the Congress are now in the hands of the editorial committee.

The executive committe of British botanists, charged with making detailed arrangements for the Congress, is to be congratulated on the excellence of their program, and the manner in which the numerous items were handled. The efficiency of this committee added greatly to the pleasure and convenience of the numerous overseas delegates.

All meetings were held in the lecture rooms and laboratories of Cambridge University; and the majority of the delegates were housed in the various colleges of the University. Because of the most attractive surrounding, the ample space for conferences, exhibits, etc., and the close proximity of the various buildings, the numerous delegates who were fortunately able to attend the Congress will long remember the pleasant associations there formed; and all keenly appreciated the whole-hearted hospitality and the numerous courtesies extended to them during their stay in Cambridge and in England.

Various important excursions were arranged for visiting delegates, before, during, and after the Congress. These included a pilgrimage to Halesworth Church to attend the dedication ceremonies of a memorial tablet to Sir Joseph Dalton Hooker, born at Halesworth, and Sir William Joseph Hooker; to the English beech woods in West Sussex, Cheltern Hills, Cotswold Hills, and the Wye Valley; to Blakeney Point and Scolt Head to inspect their maritime vegetation; to Wicken Fen to examine the swamp vegetation; special field excursions for plant pathologists; excursions to the Rothamsted Experiment Station, Harpenden; the John Innes Horticultural Institution, Weston; Messrs. Sutton and Sons Seed Establishment and Trial Grounds, Reading and Slough; Messrs. James Carter and Company Seed Establishment and Trial Grounds, Raynes Park. Through the courtesy of the President and Council of the Royal Horticultural Society, the Garden of this society at Wisley was open to delegates; the same courteous arrangement was made by the trustees of the Chelsea Physic Garden. A special exhibit of material of historic interest was arranged in the Department of Botany, British Museum (Natural History). At Kew a personally con-

ducted tour through the Royal Botanic Gardens was provided, with an *al fresco* luncheon for visiting delegates. A special exhibition of Linneana was arranged at the rooms of the Linnean Society, Burlington House, London.

The Fourth International Botanical Congress held at Cornell University, Ithaca, New York, in 1925 had charged the 1930 Congress with the difficult and complicated task of revising the International Code of Botanical Nomenclature. This was unquestionably the most important single project that came before the Congress. The International committee, under the leadership of Dr. John Briquet of Geneva, had carefully assembled and collated the data that were to be presented for discussions, these data being supplemented bv a 200 page document consisting of proposals by British botanists. The "*Recueil synoptique*" and "*Avis prealable*," prepared by Dr. Briquet and his colleagues, contained all of the suggested modifications of the International Code that had been submitted by botanists from all countries; in parallel columns were given the original text of the 1905 and 1910 rules, together with the suggested changes, and with the recommendation of the international committee.

With these carefully and critically prepared documents, the Section on Nomenclature, under the chairmanship of E. D. Merrill, proceeded to a consideration of details. Practically all of the recommendations of the central committee were approved there being at times a very lively discussion from the floor. As discussions, amendments, motions etc., were in English, French, and German it was by no means an easy task to follow all details, although important items were interpreted by the several secretaries, Dr. Harms of Berlin in German and Dr. Briquet of Geneva in French. During the first two days progress was relatively slow; but real progress was made on the third day by disposing of all the minor matters on a single motion, thus leaving time to consider the few really important, and more or less controversial items. The proposed amendments of the International Code had to do largely with unifying, as far as possible, the divergencies in this code and the so-called American Code.

Few formal votes were taken, most of the motions, after discussion, being disposed of by show of hands. In reference to important controversial matters the proportions of the vote as

between yes and no were impressive. Thus, in reference to required Latin diagnoses for new species proposed from January 1932, the formal vote was yes, 371; no, 24; the original spelling of generic and specific names was maintained by a vote of 342 to 21. An adoption of the rule, the contention of many American botanists, that a validly published homonym invalidates the use of the same specific name for another species, was carried by yes, 261; no, 111; the adoption of the principle of types of standard species for genera; and the confirmation and extension of the principle of *nomina generica conservanda* were carried by equally impressive majorities, the latter being practically unanimous. A proposition to make the year 1753 the beginning date for binomials in all groups of plants was lost, the vote being 158, yes; 239, no.

One of the final actions of the section was to appoint a large international committee, having in its membership one or more representatives in each country, to consider interim problems in relation to the international rules, the details to be handled by a small executive committee. In addition to the appointment of the international committee to consider problems of nomenclature, other important committees were appointed, including one to standardize the terminology used in ecology; one to compile and publish an international botanical address book; and one to standardize descriptive terms used in systematic botany.

At the final plenary session of the Congress, the invitation of the Netherlands to hold the next congress at Amsterdam in 1935 was accepted.

The Fifth International Botanical Congress, was unquestionably, the largest and most important gathering of its kind yet held. In excess of fifty countries were represented by about 1,200 official delegates. Naturally, Great Britain was particularly well represented; but there were about 300 delegates in attendance from the United States. Other important countries had large contingents; and most of the smaller commonwealths had representatives present. The Congress was truly international in all respects, its attendance including many of the outstanding botanists of the entire world. The entire Congress was pervaded by a pronounced spirit of international good will, which was particularly noticeable in the long and complicated

discussions appertaining to the problems of nomenclature; here many divergent opinions were held; yet all present were inspired by the desire to facilitate the proceedings; each was willing to give and take; and all who took part in the discussions, or who merely attended in order to familiarize themselves with the complicated questions under discussion, were impressed with the desirability of coming to an understanding that would be truly international as well as acceptable to the majority of botanists in all fields of endeavor.

Dr. F. E. Denny, Dr. R. P. Wodehouse and Dr. A. L. Gunderson also gave short talks on their stay at the International Botanical Congress.

Meeting adjourned at 4:45 P.M.

Respectfully submitted,
FORMAN T. MCLEAN
Secretary

MEETING OF DECEMBER 2, 1930

The meeting was called to order at The American Museum of Natural History at 8:15 P.M. by President Sinnott. Forty-five members were present.

Dr. Henry Knute Svenson of the Brooklyn Botanic Garden gave a talk on the "Vegetation of the Galapagos Islands and Cocos Island." An account of his talk is published in the Brooklyn Botanic Garden Record, Volume 19, No. 6, November, 1930.

Meeting adjourned at 9:45 P.M. for refreshments which were served by the refreshment committee.

Respectfully submitted,
FORMAN T. MCLEAN
Secretary

NEWS NOTES

R. Kent Beattie, a plant explorer who for two and one-half years has been searching the domains of the Formosa head-hunters and the forests of Korea and Japan for blight-resistant chestnuts to plant in American forests has returned to Washington. He collected about 250 bushels of chestnuts of native strains, and scions of about ninety cultivated varieties. He shipped these nuts and scions to Washington as fast as he collected them and the Department of Agriculture planted them in its forest mursery at Glendale, Maryland, to test their resistance to blight and their adaption to the climate and soil of a new homeland. These plantings produced about 250,000 seed lings.

Last spring the department placed 73,000 seedlings grown from Mr. Beattie's 1928 collections with foresters and experiment stations from Massachusetts, and Michigan to Alabama and Louisiana.

Japan is carrying out a wonderful reforestation program, says Mr. Beattie. The Japanese have been tree-lovers for generations and are great tree planters. All untillable areas in the Empire where trees will grow are kept in well-ordered forests. Trees, grow row on row, bank behind bank, on the steep mountain-sides, presenting an inspiring sight. The Japanese value the chestnut especially for its nuts, which are an important item in their diet. The same chestnut blight organism that is rapidly depleting America's chestnuts exists in Japan also but does not injure trees there seriously.

The Koreans are not tree-lovers, partly because tigers infest their forests, Mr. Beattie believes. For many years Koreans have cut down the trees and dug up the roots. But during the eighteen years of Japanese control a program of systematic reforestation has restored many of Korea's wasted hillsides.

A conference to review the plant pest situation, with respect to Narcissus bulbs and to consider the advisability of modifying the present restrictions on the entry from foreign countries and interstate movement of narcissus bulbs, met at Washington on January 29.

Since January 1, 1926, the importation of Narcissus bulbs has been restricted to those imported for propagation or for

educational or scientific purposes, with the object of preventing the further introduction of the greater bulb fly (*Merodon equestris* Fab.), the lesser bulb fly (*Eumerus strigatus* Fallen), and the bulb eelworm (*Tylenchus dipsaci* Kuehn).

To prevent the further spread of such pests from the points at which they were then known to be established, a domestic quarantine on Narcissus bulbs and plants was placed on the entire continental United States, effective July 15, 1926, prohibiting interstate movement unless they had been inspected and certified as apparently free from infestation.

The conference was called for the purpose of reviewing the entire situation with a view to determining whether the present restrictions are necessary for the protection of American agriculture and horticulture from pests.

The Fragrant Gladiolus, is the title of an article by Dr. Forman T. McLean in the February number of The American Home. The "Sweet-glads" as they are called are a cross between *Gladiolus tristis* and a nameless wild parent. The new form is tall and vigorous, early blossoming, with flowers like giant Freesias. They have a sweet perfume during both day and night.

The Secretary of Agriculture has announced a revision of the regulations regarding the quarentine for the European Corn Borer. The regulated area includes some parts of New York State, New Jersey, Connecticut, and Massachusetts that were not formerly included. The quarentine affects not only the movement of ear corn but also includes broom corn, chrysanthemums, asters, gladioli, and dahlias. The corn borer occurs in two different strains, one producing two broods of moths a year the other only one. The first strain is the one that causes most injury.

At the meeting of the American Association for the Advancement of Science at Cleveland the following officers of the Botanical Society of America were elected: president, C. J. Chamberlain; vice-president, E. W. Sinnott; treasurer, G. E. Nichols; editor, H. C. Cowles.

Dr. Calvin H. Kaufman, professor of botany and director of the University of Michigan herbarium, retires with the title of professor emeritus of botany and director emeritus of the uni-

versity herbarium, at the end of the academic year. He will be succeeded by Dr. Edwin B. Mains beginning with the second semester.—*Science.*

Doctor A. J. Grout will be at the Biological Laboratory at Cold Spring Harbor, Long Island, for six weeks each summer (in 1931, from July 31 to September 10, inclusive) to take charge of such students and investigators as may wish to take up any problems connected with bryophytes: ecology, morphology, physiology, or taxonomy. Inquiries should be addressed to the director of the biological Laboratory at Cold Spring Harbor, Long Island, New York, or to Doctor A. J. Grout, 1 Vine Street, New Brighton, Staten Island, New York.

The state experiment stations expended for agricultural research in the fiscal year 1930 about $17,000,000, of which $4,320,000 came from federal sources, says Walter H. Evans, acting chief of the office of experiment stations, in his annual report.

The report shows that the stations engaged during the year in more than 7,000 lines of research dealing with problems in agricultural production, distribution, marketing, and homemaking.

Technical Bulletin 219–T on laurel poisoning, just issued by the U. S. Department of Agriculture, reports a study of the poisonous properties of the plants and tells how to treat poisoned animals. Toxic properties of mountain-laurel and sheep laurel have been recognized for nearly two hundred years. In each the poisonous principle is andromedotoxin. Dr. C. Dwight Marsh and A. B. Clawson, physiologists of the Bureau of Animal Industry fed leaves and flowers of mountain-laurel to sheep. Tests with cattle and goats showed much the same results as with sheep, the animals first showing depression, then weakness, nausea, and sometimes prostration. Effects of sheep laurel were similar to those of mountain-laurel, although symptoms developed more quickly from sheep laurel. Deer found dead in Pennsylvania forests in recent years were thought to have died from laurel poisoning, but no direct evidence as to the exact cause of death could be found, and experiments by Pennsylvania State officials in feeding deer exclusively on laurel leaves did not cause poisoning excepting when they were forced to eat large quantities of mountain-laurel. Cattle, sheep, and goats are suscep-

tible, but as a rule the danger is relatively slight, because animals rarely eat laurel in quantity if other feed is available. The most serious losses occur usually in spring before the grass has time to grow.

The Editor of Torreya will be away for the coming six months and all work connected with the magazine will be taken charge of by Dr. Arthur H. Graves. All communications for Torreya should be sent to Dr. Graves at the Brooklyn Botanic Garden, Brooklyn, N.Y.

TORREYA

Vol. 31 March-April, 1931 No. 2

Interesting Plant Collections from Somerset County, New Jersey

HAROLD N. MOLDENKE

The famous and picturesque Washington Valley is situated between the so-called First and Second ranges of the Watchung Mountains in Somerset Co., N.J. It was through this valley that George Washington passed in his memorable retreat through New Jersey, and many spots rich in historic associations—some marked by official bronze tablets—are still pointed out to the visitor by local citizens.

From a botanical standpoint this valley is extremely interesting, being exceptionally rich in species of both flowering and flowerless plants. Since Somerset County has never been thoroughly botanized I was asked to collect in this valley last summer (1930) so as to make up for this deficiency in the Local Herbarium of the New York Botanical Garden. While engaged in this work a number of noteworthy collections were made and a series of very interesting observations which are perhaps worth recording.

In one dark and shady evergreen grove on the slope of the Second Mountain, a grove which had been set out here on this mountainside twenty-five or more years ago by my grandfather and grandmother, who were among the earliest settlers in Washington Valley, I located an extensive colony of over five hundred plants of the Pink Ladyslipper or Moccasin-flower *(Cypripedium acaule)*[1] This colony had its beginning here some fifteen years ago, after the evergreens had become large enough to produce a dense shade and a thick carpet of needles over the rich forest floor, and then a few plants were noticed. Every succeeding year has seen the colony spreading in area and increasing in number of individual members, until now the sight of over five hundred of these glorious pink orchids in bloom at once every spring is one never to be forgotten! The spot is seldom disturbed

[1] Specimens of the various plants mentioned in this article have been deposited in the Local Herbarium of the New York Botanical Garden.

by vandals, and although forest fires have swept by a number of times, the progress of the colony has not been checked. Nowhere else in the surrounding deciduous woods is there a colony comparable to this. It is an excellent example of how a species will flourish and spread if it somehow happens to find a suitable environment.

The Cardinal-flower *(Lobelia cardinalis)* was found along a brook slightly over the crest of the Second Mountain and in company with it a number of plants of Green Hellebore *(Veratrum viride)*. Lousewort *(Pedicularis canadensis)* is abundant in several localities, and the quaint saprophytic Indian-pipe *(Monotropa uniflora)* is frequently met. The Carrion-flower *(Smilax herbacea)* was found in several places, but the discovery of an extensive grove of large Sweet Gums *(Liquidambar styraciflua)* at the edge of a marshy spot over the crest of the Second Mountain was somewhat of a surprise. Eight or nine species of violets can easily be collected during the course of a few hours' walk in May.

But perhaps the most noteworthy discoveries were in the line of naturalizations and escapes. The Japanese Barberry *(Berberis Thunbergii)* is to be found throughout the woods on both the First and Second Mountains in the vicinity of Watchung and also in thickets between fields and in copses along roadsides. This species has apparently become naturalized extensively through seeds carried from cultivated bushes by birds. In the wild state it seldom attains the proportions seen in cultivated plants, but is conspicuous because of its arching branches, sharp slender spines, and red leaves and fruit in the autumn. The fruits remain on the stems far into the winter and are very attractive to winter birds, especially when the ground is covered with snow. *Elaeagnus umbellata* is similarly to be found in widely scattered localities at the edges of the woods on both sides of the valley, and also in the woods themselves, especially on the eastern slope of the Second Mountain. In a number of fields and pastures this shrub has become so abundant that it is a nuisance and has to be cut down continually. It refuses to be exterminated. In one spot a shrub was found which had attained a height of fully nine feet and a trunk diameter of several inches. With its beautiful silvery-scurfy branchlets, leaves, and flowers this plant produces a striking effect on the landscape when gently swayed by the passing

breezes. The flowers are fragrant and the fruit is relished by birds, which fact, again, probably accounts for its rapid naturalization.

Along the peaceful little brooklet which flows through Washington Valley and later joins the Green Brook which divides Somerset from Union County, were found several large bushes of *Deutzia scabra*. This species is extensively cultivated in the valley and very often persists a long time after cultivation. But the two bushes to which reference is here made were completely wild. They bloom profusely every year, although the stems are not quite as densely flowered nor the bushes as well shaped as in the cultivated plants from which they originated. The same species was observed many years ago by the writer growing in a wild state in a very desolate portion of Center County, Pennsylvania.

Three species of privet were found as escapes. *Ligustrum vulgare* and *L. ovalifolium* were found abundantly persistent after cultivation, with a marked tendency to spread, especially in hedges and along old tumble-down fences and roadsides. *L. ibota*, a very recent addition to the cultivated flora of this region, was found a number of times as a waif along the roadside, often half a mile or more removed from the nearest cultivated plant of the same species. Several plants were likewise found in the woods on the First Mountain. Again, the distribution of this species can be directly traced to winter birds which feed on its fleshy fruits.

One of the most interesting of all these finds, however, was the discovery of the very extensive naturalization of *Azalea japonica* in one section of the valley. Arising apparently from a dozen plants of this species set out twenty years ago in a nearby garden, the species has spread with prodigious rapidity. It is now to be found throughout the fields and meadows, pastures and evergreen woods on both the eastern slope of the Second Mountain and the western slope of the First Mountain, and even in some places extends up into the woods a slight distance on both sides of the valley. It seems to have found its most suitable location, however, in the dry, open, sunny fields and at the very edge of the woods on the western slope of the First Mountain. In May the fields here are resplendent with the gorgeous blooms of this species, which vary from yellow and orange to pink, salmon, and red. The plants do not grow more than about 24 or 30 inches tall and the flowering stems are practically leafless. If vandals can be

restrained from picking the flowers and especially from digging out these plants every spring, it is very probable that in a short time this lovely Japanese species will have spread even farther up and down the valley. It makes a very handsome addition to our naturalized flora.

In one place a considerable colony of Dame's Rocket *(Hesperis matronalis)* was discovered, apparently escaped and naturalized from a garden which had existed near there many years ago, but of which hardly any other traces are at present discernible. *Phlox paniculata* has been found in a great many localities both in the valley itself and along the edges of the woods on both mountains. Half way up the eastern slope of the Second Mountain where the old tumble-down remains of a stone wall are practically the only relics of what used to be an isolated hermitage in the woods, that good old-fashioned favorite, the Periwinkle *(Vinca minor)*, has spread and is flourishing, attempting to hide with its dark shiny-green leaves and handsome blue flowers the desolation which lies about it. The Sweet Cherry *(Prunus avium)* and Japanese Honeysuckle *(Lonicera japonica)* are, of course, abundant everywhere.

A strange, typically southern form of *Coreopsis grandiflora* is rapidly spreading through the fields in a number of localities, and a near relative, *C. tinctoria,* is occasionally found escaped on waste ground and trash piles. *Polygonum zuccarinii* has established itself firmly in several spots and is spreading. Its extremely dense and abundant masses of white flowers every summer make it a gorgeous sight. *Spiraea billiardii,* though nowhere in all the valley to be found in cultivation, as far as I am aware, has been discovered along a ditch in one locality, probably as the persistent escape of a very old garden somewhere near by. It is not, however, thriving and the indications seem to be that it will soon be choked out of existence by the coarser native vegetation all around it. The differences in stems, leaves, and flower-clusters between this species and the native *S. tomentosa,* which every year makes a grand display in the moist meadows close by, are very noticeable to the close observer and extremely interesting.

Another very interesting discovery was that of a colony of *Achillea asplenifolia* growing in a moist field alongside of Valley Road. It is quite abundant in this one particular spot and is growing in company with a large colony of *A. millefolium.* No one in

the valley, as far as I have been able to ascertain, has ever had any plants of this species in cultivation or has ever seen any in cultivation in this vicinity. The ray-flowers are a beautiful pink, varying sometimes to lavender or even whitish. The plants are more slender, the inflorescence smaller and not as flattened, and the foliage somewhat different than in *A. millefolium*. The indications seem to point to a mutational origin of the colony from the latter common species. Occasionally plants are found which seem to show intermediate characters, and often the flowers while pink at the beginning of anthesis will fade out to a dirty white later on.

On the crest of the Second Mountain, in a grassy overgrown clearing in the forest, there was discovered an extensive stand of *Robinia viscosa*. The trees are dense—so dense, in fact, that in some places one can only with great difficulty force one's way through—but never attain a height of more than about 6 or 7 feet. Thorns are practically obsolete, and the branchlets and petioles are extremely viscid. In the middle of June the flowers appear and make a gorgeous sight. Although not noticeably fragrant they are of a beautiful pink color. No one in the valley has ever had any of these trees in cultivation and the nearest cultivated tree of this species with which I am acquainted is in North Plainfield—beyond the valley, and a good five miles away. About five years ago another southern species of locust, *R. hispida*, was discovered by the writer in a sandy woods southeast of Mt. Holly in the southern portion of the State, but was never again rediscovered on later trips to that general vicinity.

At the base of an old spruce tree near the long-deserted and overgrown remains of what used to be one of the oldest houses in the valley, was discovered a large colony of *Hieracium murorum*, a European species only recorded from three or four other localities in the United States and never before from New Jersey. The plants bloom profusely during the first week in June and for a considerable time thereafter, making a very handsome appearance in the dense shade beneath the branches of the towering old evergreen. The colony is fully ten feet in diameter and contains over a hundred well-developed plants. The very peculiar shape of the basal leaves is characteristic of the species. The scapes are about 12 inches tall and naked or with but a single leaf. The basal leaves are subcordate or subtruncate and strangely angulate-

dentate. The colony is apparently flourishing in this situation where the dense shade prevents any great competition by other species in the struggle for existence. It does not, however, advance beyond the protecting shade of the evergreen, for immediately outside this area it is replaced by the more common *H. pratense* and *H. aurantiacum,* while in the woods close by are to be found *H. venosum, H. paniculatum,* and *H. scabrum.* It is probable that this very rare and interesting little European species will never spread beyond the sheltering confines of the spruce tree under which it in some manner became established and that when the tree dies, as it inevitably must, and the surrounding vegetation overruns the area now too shady for it, another station in America for *Hieracium murorum* will have been wiped out.

The Parsnip *(Pastinaca sativa)* from Europe, and the Tree-of-heaven *(Ailanthus altissima)* from China have become established in a great many localities through the valley and give great "promise" of spreading rapidly. The Devils-walking-stick *(Aralia spinosa)* has escaped in two localities and is becoming naturalized, much to the sorrow of some of the inhabitants thereabouts, for a sudden unexpected encounter with one of these shrubs in the dark can hardly be described as a pleasant experience!

As stated at the outset of this article, Washington Valley is especially rich in native species and also in the more common naturalizations which are so disparagingly termed "weeds" by the local citizens. *Angelica villosa* is abundant and likewise *Ceanothus americanus, Cornus paniculata,* and *Myrica carolinensis.* A form of *Rudbeckia hirta* with a deep orange band near the base of each ray-flower, forming an orange circle about the black central cone, is especially beautiful and has been observed regularly by the writer for six consecutive years. Two relatives, *R. triloba* and *R. laciniata,* are found locally in wet ground along the brook, where also the pretty little Monkey-flower *(Mimulus ringens),* the Seedbox *(Ludwigia alternifolia),* and the Lanceleaf Loosestrife *(Steironema lanceolatum)* are to be found in abundance.

A very robust and floriferous form of blackberry was found which is said by Dr. P. A. Rydberg of the New York Botanical Garden to be probably a natural hybrid between *Rubus nigrobaccus* and *R. argutus.* Seven species of milkweed are abundant: *Acerates viridiflora, Asclepias syriaca, A. purpurascens, A. rubra, A. pulchra, A. quadrifolia,* and *A. tuberosa.* The last-named

species is becoming rather rare because its extremely vivid orange flowers make it greatly desired by passing vandals. Yet several spots were found by the writer where this species is still growing in profusion and makes a most glorious sight to behold. In some places three species of bush-clover were found growing almost side by side—*Lespedeza capitata, L. stuvei,* and *L. virginica.*

Along the brook are to be found *Penthorum sedoides, Myosotis palustris, Isnardia palustris, Acorus calamus, Iris pseudacorus, Chelone glabra, Tovara virginiana, Agrimonia gryposepala, Impatiens biflora, Tracaulon sagittatum, Epilobium coloratum, Sparganium androcladum, Alsima subcordatum, Hemerocallis fulva, Carex crinita,* and in some places *Geum canadense.* In the adjoining moist meadows one finds a most glorious display of *Leptandra virginica, Vernonia noveboracensis, Eupatorium purpureum, E. perfoliatum, Senecio aureus, Aster novae-angliae, A. puniceus, Solidago canadensis,* and *S. altissima,* with here and there patches of *Ibidium cernuum, Blephariglottis lacera* and *Dasytephana andrewsii.* In the drier and more elevated fields and pastures one finds *Anaphalis margaritacea, Solidago juncea, Doellingeria umbellata, Castilleja coccinea, Monarda fistulosa, Cynthia virginica, Xolisma ligustrina, Erigeron pulchellus, Pentstemon laevigatus, Crotalaria sagittalis, Dianthus armeria, Parsonsia petiolata, Agalinis purpurea, Polygala verticillata, Sabatia angularis, Aster lateriflorus, A. ericoides, A. laevis,* and *Sarothra gentianoides.* Along roadsides and waste ground there are *Berteroa incana, Lepidium campestre, Tiniaria scandens, T. convolvulus, Ranunculus acris, R. repens, Abutilon avicennae, Linaria vulgaris, Verbascum thapsus, V. blattaria,* and a veritable host of other more common species. In the darker woods one finds *Rosa carolina, Lilium philadelphicum, Hydrangea arborescens, Athyrium filix-foemina, Phryma leptostachya, Collinsonia canadensis, Circaea lutetiana, Clematis virginiana, Lacinaria spicata, Menispermum canadense, Eupatorium urticaefolium, Anemone cylindrica, Hepatica americana, Syndesmon thalictroides, Sanguinaria canadensis, Benzoin aestivale, Deringa canadensis, Geum strictum, Thalesia uniflora, Nabalus trifoliolatus, Sanicula canadensis, S. trifoliata, Scutellaria integrifolia, S. pilosa, Pyrola rotundifolia, Mitchella repens, Gaultheria procumbens, Steironema ciliatum, Lysimachia quadrifolia, Azalea nudiflora, Aster undulatus, A. lowrieanus, A. cordifolius, Solidago caesia, S. rugosa, S. bicolor, Uvularia ses-*

silifolia and a great many others too numerous to mention here. In a number of portions of the woods the Trailing Christmas-green *(Lycopodium complanatum)* is still very abundant, not having been as yet discovered by hunters for Christmas decorations, and in one grassy clearing on the top of the Second Mountain there is a colony of over a hundred Fringed Gentians *(Gentiana crinita)*, a view of whose glorious sky-blue flowers is well worth the arduous climb! Nature is indeed bountiful and beautiful in Washington Valley! Would that it were possible to preserve this bounty and beauty for future generations!

NEW YORK BOTANICAL GARDEN

Notes on Magnolia and Other Woody Plants

W. W. Ashe

Magnolia pyramidata Pursh. In 1929 two well developed trees of this species were noticed near Midway, Gadsden County, Florida, about 30 miles southeast of River Junction, previously regarded as the southeastern point of distribution. Later the same site was visited in company with Dr. H. Kurz of Tallahassee. Although *Magnolia fraseri* has been credited both to Louisiana and to Mississippi, it seems doubtful whether it actually occurs in either state. The pale lower surface of the leaves regarded as peculiar to *M. fraseri* sometimes certainly occurs also on *M. pyramidata*. Positive identification without the characteristic fruit is uncertain, but it seems probable that all of the specimens which have been collected in Mississippi and Louisiana and referred to *M. fraseri* should be considered as *M. pyramidata*.

Magnolia foetida forma **margaretta** f. nov. A number of cultivated varieties have been credited to this species. None of these, however, seems to exist in a natural state. In the stream-head region of western Florida and extending southeast into middle peninsular Florida and westward into the adjacent part of Alabama there is found what seems to be a well marked form which might almost be regarded as a variety of this species. It is the most common form which occurs in the "stream-head" region but in its distribution beyond this region it becomes less common. The common form of *M. foetida* on both the Atlantic and Gulf Coast has oblong strongly revolute leaves. The proposed new form is characterized by having leaves elliptic or somewhat obovate, obtuse or rounded at the ends, complanate, flowers vase-shaped, the sepals retuse. Type from Juniper Head Creek, Okaloosa County, Florida, W.W.A., May, 1928, and June, 1929.

Magnolia foetida forma **parvifolia** f. nov. Throughout its distribution occasional trees of this species occur with fairly small leaves. In southern Louisiana a very common form has small oblong ovate leaves 15 to 20 cm. long, prevailingly complanate. In the middle part of this state and to the east of Pearl River this form is uncommon.

Magnolia acuminata var. **alabamensis** var. nov. Specimens of a *Magnolia* were collected in 1926 in Choctaw and Tuscaloosa counties, Alabama, which were referred to *M. cordata* Michx. It was noted in the reference to these collections that many of these Alabama trees reached a height of 25 m. thus greatly exceeding in height *M. cordata* as it grows in northeastern Georgia where it seldom exceeds 10 m. Since 1926 this same form has been collected at a number of other localities in Alabama and many

trees with pubescent twigs examined growing in Greene and Pickens counties in the same state. These counties lie between Choctaw and Tuscaloosa counties, the counties within which this form was first noticed.

It is believed after an examination of additional material that this form has been wrongly referred to *Magnolia cordata* Michx. Not only does *M. cordata* differ from it in habit, but in shape and pubescence of foliage as well. It approaches *M. cordata* in the often soft pubescence of the lower surface of the leaves and in its pubescent twigs but the flowers in place of being canary yellow as are those of *M. cordata* are green or rarely yellowish green. The proposed variety may be characterized as follows: Flowers large, 7.5 to 9 cm. long, green or yellowish green; leaves especially on vigorous shoots sometimes broadly ovate or broadly obovate and cordate, subcordate, rounded or obtuse at base, soft pubescent and sometimes barely pale beneath; twigs of the season pubescent at least when young and often remaining so until the spring of the second season, becoming dark red brown the first winter. These trees, 18 to 25 m. high are not uncommon in hollows growing with the oaks, hickories and tulip poplar in Alabama in the region between Tuscaloosa and Choctaw counties.

The relationship of *Magnolia acuminata* and its varieties is shown by the following key.

Key to Varieties of *Magnolia acuminata*

Sun leaves pubescent and pale beneath; no leaves on vigorous sheets of a broadly ovate or broadly obovate type; flowers less than 7 cm. long; twigs glabrous
  Flowers yellow — var. **aurea**[1]
  Flowers green or yellowish green — M. acuminata typica
Sun leaves pubescent beneath; leaves on vigorous shoots often of a broadly ovate or broadly obovate type; flowers green, 7 cm. or more long, petals broad
  Twigs pubescent; leaves soft pubescent beneath; flowers about 7.5 cm. long — var. **alabamensis**
  Twigs glabrous; leaves pubescent beneath; flowers 8 to 10 cm. long — var. ludoviciana[2]
Sun leaves glabrate and green beneath; twigs glabrous; flowers less than 6.5 cm. long, green or purplish, petals narrow — var. ozarkensis[3]

The variety *alabamensis* Ashe is at one extreme in respect to copiousness of pubescence. The variety *ozarkensis* Ashe, essen-

[1] **Magnolia acuminata aurea** comb. nov. *Tulipastrum acuminatum aureum* Ashe, Bull. Charleston Mus. **13**: 28. 1917.

[2] Sargent in Bot Gaz. **67**: 232. 1919.

[3] Ashe in Jour. Elisha Mitchell Soc. **41**: 269. 1926.

tially glabrous, is at the other extreme. The varieties *aurea* and *ludoviciana* and *M. acuminata* typica are intermediate. The varieties *ludoviciana* and *alabamensis* have the largest flowers.

Magnolia australis sp. nov. No forms intermediate in pubescence on the peduncles seem to connect the broad leaved northern tree, *Magnolia virginiana L.*, with its glabrous peduncles, and the southern tree with relatively narrower leaves and tomentose peduncles. The tree with the glabrous peduncles occurs as far south as Kingsland, Telfair County, Georgia (W.W.A., May 19, 1928), within a few miles of the Florida state line. The two forms overlap in their distribution throughout South Carolina and eastern Georgia and do not seem to intergrade.

The type of the proposed species is from Natchitoches Parish, Louisiana. It has silky tomentose-peduncles, canescent twigs, large flowers, the petals 8 to 9 cm. long and relatively long leaves.

The common form in western and southern Florida which has prevailingly lanceolate leaves and small flowers, petals often less than 6 cm. long is **Magnolia australis** var. **parva** comb. nov. (*Magnolia virginiana* var. *parva* Ashe, Bull. Tor. Bot. Club. **55**: 464. 1928.) It is possible that *M. glauca B. pumila* Nutt (in Am. J. Sci. **5**: 295. 1822) belongs here. It is described as "leaves elliptic, acute; a dwarf variety not exceeding 3 feet, growing in east Florida, where collected by A. Ware."

Tilia caroliniana var. **lata**[4] comb. nov. *Tilia caroliniana* in its typical form is unknown between western Florida and eastern Louisiana. The tree described as *Tilia lata* constitutes an isolated colony in the mountains of Alabama between the eastern and western ranges of this species. It is clearly allied to *T. caroliniana* and it seems preferable to regard it as a variety of that species.

Tilia leucocarpa var. **cocksii** comb. nov.[5] The chief character presented by Dr. Sargent for the separation of *T. cocksii* from *T. leucocarpa* Ashe (*T. nuda* Sarg.) is the pubescent summer shoots of the former species. It is now known, however, that *T. leucocarpa* also develops pubescent summer shoots. The only other evident difference between these trees seems to be that the leaves of *T. leucocarpa* are sharply serrate and those of *T. cocksii* are finely and distantly denticulate.

Quercus Mississippiensis sp. nov. A slender tree 22 to 25 m. high, with a diameter of 4 to 7 dm., a gradually tapering trunk and short, spreading branches, forming an oval or oblong crown. Twigs dull tan, slender, about 2 mm. thick or on vigorous shoots

[4] *Tilia lata* Ashe, Bull. Torr. Bot. Club. **53**: 30. 1926.
[5] *Tilia Cocksii* Sarg., Bot. Gaz. **66**: 437. 1918.

up to 4 mm. thick, stellate pubescent, often becoming glabrate or glabrous. Leaves above sparingly stellate pubescent, dark green and lucid; beneath, dull green, or pale and more or less densely close-stellate pubescent; dimorphous: those on young trees and *the lower leaves* on old trees relatively thin, broadly obovate, 6 by 8 cm. to 10 by 13 cm., broadly cuneate or gradually contracted to the narrow rounded base, with 1 to 3 pairs of short spreading lobes, if more than one pair one pair usually dilated or notched at the apex, the others less prominent and rarely dilated, the prominent lateral veins as a rule deliquescent before reaching the margin; the *upper leaves* thick, 11 to 18 cm. long, 4 to 8 cm. wide, with 1 to 3 pairs—often only 1 pair—of short usually rounded ascending lobes mostly above the middle of the blade, and an equal number of pairs of prominent veins which extend to the often retuse tips of the lobes, and other less prominent lateral veins which deliquesce before reaching the thickened white margin; midrib prominent, often arcuate; petiole 1.1 to 2.2 cm. long, sparingly stellate pubescent. Aments short, 2-2.5 cm. long, pubescent. Fruit in clusters of 2 to 4 on rather stout, closely gray-canescent peduncles 2 to 14 mm. long: cup 11 to 14 mm. wide, 8 to 12 mm. long, turbinate or somewhat contracted at the base, covered with many rows of ovate, gray-canescent, tightly appressed scales with truncate tips and slightly tubercled bases; within, pale gray satiny canescent, with a small pale yellow hylum mark: nut ovate or oblong, 13 to 17 mm. long, 10 to 13 mm. thick, about one-third enclosed in the cup, strongly beaked, pale gray-canescent above the middle, dark brown when fresh, becoming tan upon drying, germinating soon after falling in October and early November. Buds ovate, obtuse or acutish, 2.5 to 4 mm. long, with 20 to 25 bright red-brown obtuse pubescent scales.

Chico County, Arkansas, southward in the Mississippi River valley to St. Landry Parish, La. Specimens examined, all W.W.A.

Arkansas:

Chico Co., north of Lake Village; Apr. and Nov., 1930. East of Portland; Apr. and Nov., 1930.

Louisiana:

Richland Parish; Nov. 27, 1930 (type).
Alluvial lands of Ouachita River, Ouachita Parish, Nov. 28, 1930.
Near Palmetto, St. Landry Parish, Nov. 29, 1930.
Near Ritto, Ouachita Parish, La., Nov. 28, 1930.
Near Oak Ridge, Morehouse Parish, Nov. 27, 1930.
West of Forest, West Carroll Parish, Nov. 27, 1930.
Near Columbia, Caldwell Parish, Nov. 28, 1930.
This is one of the common oaks on the intermediate or better

drained classes of alluvial lands of the lower Mississippi River Valley proper, occurring in association with *Quercus Nuttallii, Q. obtusa, Q. rubra leucophylla, Q. nigra* and *Ulmus crassifolia.* It is a timber tree of importance, its lumber not being separated in marketing from that of upland white oak. This species must not be confused with *Q. similis* Ashe, likewise a tree of the lower Mississippi River Valley, but which grows on the edges of salt flats, on the alluvials of small streams and on the margins of prairies and the distribution of which extends from eastern Texas to Mississippi. *Q. Mississippiensis* may be the same as *Q. stellata attenuata* Sargent (Bot. Gaz. **65**: 437. 1918. Not *Q. attenuata* Skan in Jour. Linn. Soc. **26**: 506. 1899), reported from alluvial lands of White River, Arkansas Co., Ark.

Malachodendron pentagynum grandiflorum comb. nov. *Malachodendron pentagynum* Small, Flora S.E.U.S., Ed. I, 793. 1903. *Stewartia pentagyna grandiflora* Bean (Trees and Shrubs Hardy in the British Isles **2**:555. 1914). This showy variety seems to be confined to Rabun and the adjoining counties of northeastern Georgia.

Hicoria ovalis mollis comb. nov. *Carya ovalis mollis* Ashe, Rhod. **25**: 180. 1923. This pubescent variety originally described from Ohio has been recently found in middle North Carolina.

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Ecological Observations on Colorado Myxomycetes

Ernest C. Smith

Five years of intensive collecting of myxomycetes in northeastern Colorado have impressed upon the writer certain features of the distribution and behavior of these interesting organisms. Here, as elsewhere, the factors limiting occurrence are the available supply of water and of decaying vegetable matter, but these factors have certain peculiar features in the region considered and affect not only the distribution but also the behavior.

While Colorado is described as "semi-arid" and the reported occurrence of one hundred and twenty-five species of Myxomycetes may cause initial surprise, this is dissipated when local conditions are known. While the plains just outside the foothills, with an average elevation of 5,000 feet, have an annual rainfall of approximately fifteen inches, a station in Estes Park at an elevation of 8,000 feet has an annual rainfall of twenty-three inches, while Palisade Lake, elevation 10,000 feet, has forty-eight inches. Even more significant is the fact that in a given locality more than 50 percent of the annual precipitation frequently occurs within a period of three months.

But adequate rainfall does not necessarily furnish the right conditions for the growth of myxomycetes, this being only one of the factors concerned. The supply of moisture must be continuous through a considerable period of time, and decaying vegetable matter must be present. In the mountains, where the rainfall is greatest, the ability of the soil to retain moisture is determined by the slope of the ground, the exposure, and the forest cover. The optimum conditions are found in this district at scattered stations at elevations from 8,000 feet to 9,000 feet on old glacial melting plains where beaver-dams have helped to create wooded swamps, or on wooded hillsides kept moist by seepage from springs, beaver-ponds or melting snows. Precisely these locations also provide the decaying vegetable matter which is the second desideratum. This is an important point, for even in the mountains, acres of down timber frequently fail to yield a single log with the type of decay favorable to the presence of myxomycetes.

Again, these mountain districts support a limited number of tree species—three pines, two spruces, Douglas and subalpine firs, aspens, cottonwoods, box elders and alders. This affects both the

distribution and the kinds of slime-molds which occur. Some species are very adaptable, while others are found only on a few species of wood. In general, certain species are found on conifers, and certain other species on the broad-leaved trees. Badhamias show a distinct preference for aspens and cottonwoods, while the cribrarias are found mostly on conifers.

Certain species occur on decaying logs on steep, relatively dry hillsides. Several species of *Cribraria* and *Arcyria,* and *Stemonitis fusca* and *Comatricha nigra* are frequently found in such places. These forms secure their moisture from melting snow, and apparently thrive at a lower temperature than most species. In these locations the sporangia appear in connection with a definite type and stage of decay. They have usually been found on logs of some size, where fungi have destroyed the lignin of the cell walls. So far no sporophores of these fungi have been observed and the causative organism is still in doubt.

Certain aethalial forms—*Lycogala flavo-fuscum* and *Mucilago spongiosa* var. *solida*—have been found in situations which require a different explanation. These occurred on the trunks of street trees in Fort Collins, the former on living, the latter on dead, but still standing trunks of cottonwoods. These aethalia were from two to ten feet above the ground. In both the dead and living trees heart-rot had made considerable progress. Observation showed conclusively that the plasmodium found both its food and the necessary supply of moisture in this heart-rot, emerging from cracks in the bark to form the aethalia.

Evaporation from all exposed moist surfaces is very rapid throughout the district. This results in a further limitation of occurrence, and in frequent arrested development at various stages of the cycle. In most cases the length of the plasmodial stage is shortened and the colonies in all but exceptional cases are small. The exceptions noted were largely colonies of *Badhamia magna* and *Trichia decipiens,* in a season when almost daily rains in a particular locality continued for several weeks, checking the evaporation in a marked degree. This shortening of the plasmodial stage is also evidenced by the frequent occurrence of small sclerotia and the very rare occurrence of larger ones. Rather frequently one meets with half-formed sporangia and aethalia. These sporangia have the usual shape for the species, but are still connected by plasmodial strands, the whole complex retaining the color of the plasmodium, but having the texture of

sclerotia. The aethalia likewise retain the color of the plasmodium, but have the texture of dried glue and are somewhat wrinkled, like dried prunes. And when the sporangia are fully formed, occasionally one finds evidence of arrest in the presence of small immature spores and giant spores, four or five times the size of normal spores.

Besides these arrested developments, the rapid evaporation seems to be responsible for the unusual position of the sporangia of many species. Except for the aethalial species already mentioned and one collection of *Physarum didermoides* var. *lividum*, all specimens collected, representing some eighty species, were found on the under side of the support to which they were attached. While this is a normal position for some species, it is quite unusual for others. This position, often in actual contact with the soil, makes the organisms peculiarly liable to attack by molds. This is noted in superficial growths upon the sporangia at the time of collection and in the appearance of mold spores carried up into the sporangium by the rising plasmodium. When sclerotia are reänimated in the laboratory, these molds, which are peculiar to the forest and are not the forms usually seen in the laboratory, often get the start of the plasmodium and prevent further development.

SUMMARY.—In the district investigated the occurrence of myxomycetes is strictly limited by the continuance of an available supply of water through a definite minimum period. The optimum conditions for their occurrence are found in mountain valleys and wet wooded hillsides at elevations of 8,000 to 9,000 ft.

There is some restriction in the occurrence of species due to the limited number of tree species in the area.

Certain species are found in drier locations where a definite type and degree of decay is present in fallen logs of conifers. Certain aethalial species found in dry locations get their food and moisture from dead or living trees affected by heart-rot.

The rapid evaporation from all exposed moist surfaces leads to arrested development at various stages of the life cycle, to unusual position of sporangia and consequent extreme susceptibility to attack by molds at various stages of their development.

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Water Glass as a Medium for Permanently Mounting Dissections of Herbarium Material

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During the past four years I have given some attention to the problem of selecting a simple, permanent, and satisfactory method of preserving dissections of flowers in the herbarium in connection with taxonomic work. The methods generally used are more or less unsatisfactory, partly because of the involved technique in mounting material in the media commonly used, such as Canada balsam, Venetian turpentine, glycerine, glycerine jelly, etc., and partly because of the unsatisfactory nature of the mounting medium, particularly glycerine and glycerine jelly, as to permanency.

The common herbarium practice is to boil the flowers or fruits selected for dissection in water, or in water with a little glycerine added. After dissection and examination the fragments are normally placed in small packets attached to the sheets. This involves considerable breakage, more or less loss of material, and furthermore, if reëxamination of the dissections is necessary, as is frequently the case, the material must be softened again; in the majority of cases the taxonomist will remove and dissect additional flowers or fruits rather than take the trouble to soften the original dissections. Frequently, where scanty material is available, this results in the ultimate destruction of essential parts, and one will find important historical specimens from which all or most of the flowers have thus been detached, leaving little or nothing for reëxamination. In those cases where but scanty material is available it is essential that every effort be made to preserve the parts used for dissection.

In some herbaria the dissections are attached in a smear of gum arabic, or some other adhesive, either to the herbarium sheet itself, or to small pieces of stiff paper or cardboard, which in turn are attached to the sheet or placed in a packet. This method is distinctly unsatisfactory for several reasons. In many cases the adhesive cracks; in humid climates it is apt to mold; sometimes insects are attracted by the paste and occasionally destroy both the paste and dissections; and there is frequently breakage or loss of dissections. Material so mounted is distinctly unsatisfactory for reëxamination unless again moistened, and moistening is often difficult. The greatest objection is that the opaque-

ness of the mounts renders reëxamination under the microscope distinctly unsatisfactory and in some cases impossible.

The technique of the Canada balsam, Venetian turpentine, glycerine and glycerine jelly methods of mounting is so well known that discussion is hardly necessary. With Canada balsam the material must be dehydrated and then passed through different grades of xylol before mounting, involving a distinct time element. Another objection, other than the time involved, is that very delicate thin structures frequently contract and curl. With Venetian turpentine there is less curling and little shrinkage, the chief objection here being the tedious technique. Glycerine and glycerine jelly preparations are particularly unsatisfactory, as they cannot be filed with the herbarium specimens, and moreover they cannot be considered as permanent mounts.

For all ordinary purposes in connection with herbarium practice the best medium so far tested is ordinary water glass (sodium silicate). The manipulation of this medium is simple in the extreme. Sodium silicate can be used direct with either boiled or fresh material and either in the field or in the laboratory. The parts of dried specimens selected for examination are boiled in water until they are soft and can be readily dissected without breaking. After dissection and study the extra water on the slide is removed by applying the edge of a piece of blotting paper. The dissections are then properly arranged and allowed to dry slightly in the air, after which a little sodium silicate is dropped on the slide, the amount being in proportion to the dissected material to be preserved. Sodium silicate solidifies quickly, hence it is essential that the cover glass be added with little delay. In practice, ordinary glass slides have been found to be most satisfactory, but mica, isinglass, or thin celluloid may also be used. The great advantage of this method is that the finished slide may be placed almost at once in a packet attached to the sheet, which is distinctly advantageous as compared with the more common method of preserving them in cabinets, remote from the herbarium specimens with which they logically belong. The prepared slides are permanent, dry, easy to use, and there is comparatively little shrinkage or distortion of the dissectons. While the method is not adapted to finer phases of microscopic technique, it is admirably adapted to ordinary herbarium purposes.

With fresh material the technique is much the same as with

softened parts taken from the herbarium sheets. It is only necessary to remove the excess moisture before adding the sodium silicate.

In rare cases where it is desirable to reëxamine the mounted dissections in a soft state, the entire mount, if glass or mica slides be used, may be boiled in water for an hour or so and then left in an evaporating dish in water for a longer period. In due time the cover glass can be easily raised, leaving the mounted material in a soft state and ready for further dissection and manipulation. However, it is seldom necessary to remove the cover glass as the slide is always in condition for immediate examination.

This simple method has been found in practice to be eminently satisfactory and is recommended to herbarium workers generally. This medium was suggested to me by Director Merrill of the New York Botanical Garden when I was associated with him at the University of California. He informs me that it has been used during the past year in the herbarium of The New York Botanical Garden with eminently satisfactory results.

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Exotic Plants in Forests: Supplementary Note

ROLAND M. HARPER

While my paper on this subject in the preceding number of TORREYA (**31**: 1-7) was in press, there appeared a monograph by Paul C. Standley on the Flora of the Lancetilla Valley, Honduras (Field Museum Publication 283—Bot. Series, vol. 10—418 pp., 68 pl., Jan 15, 1931), which contains some interesting observations on a similar problem in a tropical environment. Second-growth vegetation and weeds (including a few of the same species I listed from Lee County, Georgia) are discussed on pages 16-19, 35-38, 45, 88, and elsewhere; and on pages 27, 41-43, 281, and 316 the possibility of some of the plants found in dense forests and other apparently natural habitats being relicts from long-forgotten clearings is indicated.

The author states that fruit trees planted by the natives in their small clearings often persist for many years after the place is abandoned and grown up to jungle again, and then have the appearance of accidental introductions, though most of them (like the species mentioned in the last paragraph of my article) are unable to reproduce themselves. Three important fruit trees which are cultivated throughout Central America, namely, *Theobroma, Persea* and *Calocarpum,* grow in dense and apparently primeval forests on steep hillsides; but in such forests can be found many much-weathered fragments of pottery, which may indicate that the land was cultivated centuries ago.

Some of Mr. Standley's comments on this are worth quoting verbatim. On page 43 he says: "Is it unreasonable to suppose that hundreds of years ago these hills may have been cleared and planted with corn, just as they are being cleared today by the descendants of those aborigines? If these transient clearings are surrounded by virgin forest, will not the native plants at some time, after the clearings have been occupied by guamil [second-growth thickets], reseed them with forest species? Is it not possible that these cacao bushes and sapote and avocado trees are remnants of plantations of long ago?" He does not seem to mention fire, and very likely it is a negligible factor in the environment of that region, as in dense hardwood forests generally. But pine forests and savannas in the tropics, from all accounts, must be burned over about as frequently as those in temperate regions,

thus eliminating most weeds and cultivated plants from such habitats.

A study of the reversion of forests in New England, which touches on the same problem, was made by Dr. G. E. Stone about thirty years ago.[1]

The most abundant plant in the Palmyra cemetery, mentioned in my article, is the larger European periwinkle, *Vinca major.* It is rather a curious coincidence that another plant formerly put in the same genus, the so-called Madagascar periwinkle, *V. rosea* (now called *Ammocallis* by Small and *Lochnera* by Standley), is said by Standley (pp. 321-322) to be abundant in the cemetery at Tela, Honduras, and found in most cemeteries in Central America. That is a widely distributed tropical plant whose native country is unknown, and it is a common weed in southern Florida, but in northern Florida and southern Georgia it exists only in cultivation, especially in cemeteries; not in rich shady places like *V. major* and *V. minor,* but in sandy soils well exposed to the sun. Another favorite cemetery plant in Central America, according to Standley (p. 393), commonly cultivated in the United States also, is the African marigold, *Tagetes erecta,* which is called *"flor del muerto"* in Honduras.

TALLAHASSEE, FLORIDA

[1] Stone, G. E. Past and Present Floral conditions in Central Massachusetts. Rhodora 1: 143-148. 1899.

William Cashman Ferguson
19 November 1861—3 June 1930

Norman Taylor

In the summer of 1917 a man already distinguished in one science took the first step towards becoming the most distinguished amateur on Long Island in a second. From a casual inquiry as to the identity of some weeds he found on the grounds of the Garden City Golf Club there ripened an interest that led Mr. Ferguson to gather the finest amateur herbarium in existence of Long Island plants.

It was my privilege to guide him in his early botanical studies, and ultimately to be guided by him in the determination of difficult Long Island specimens in such genera as *Salix, Panicum,* the sedges, and many other groups in which he became quite extraordinarily proficient. Entering botany late in life, he brought to it a trained mind, finely polished by years of work in analytical chemistry. For he was a leading authority in copper smelting, chief chemist of the Nichols Copper Company, and later consulting chemist for the General Chemical Company.

By inclination an investigator, he early rebelled against the commercial sphere into which his father had started him, entered Columbia University at 22 and graduated in 1887. During these years he came in touch with Doctor Britton, who was then dividing his time at Columbia between geology and botany. Years later as Mr. Ferguson's interest in botany grew, that friendship was renewed.

He opened a wide correspondence with various botanists and institutions, and, as his herbarium increased, generously deposited duplicate specimens of his rarer finds. Hundreds of them naturally were given to the Brooklyn Botanic Garden, but large collections were sent to the Gray Herbarium, to Albany, and to the New York Botanical Garden. He took a keen interest in my work on the flora of Long Island, spending many hours checking records for it, collecting specimens, and doing all his ample leisure in the later years would permit.

His carefully prepared herbarium, notebooks, lists, etc., he left to the New York Botanical Garden, together with a sum of money for their care. He had published several critical articles on the specimens he found on Long Island, and other lists were in prepa-

ration at his death. No adequate Flora of Long Island can ever be written without a careful checking of the Ferguson herbarium, and of his catalog notes on it.

It is almost impossible to speak with restraint of the personal characteristics of the man. Quite apart from his chemical and botanical knowledge he had wide interests. His library was rich in Victorian literature, and, more especially, in books on big game hunting, mountain climbing, and biographies of explorers.

I often thought of him as a modern, thoroughly successful Colonel Newcome. Like his prototype he had almost fierce loyalties, a punctilious sense of honor, distinguished consideration for his inferiors, and a good deal of impatience with pretense.

Brooklyn, New York

BOOK REVIEWS

Illustrations of Flowering Plants[1]

Dr. Alfred Gundersen, Curator of Plants at the Brooklyn Botanic Garden, assumed the task of having these illustrations reprinted, and has the following to say in the preface: "A 'Guide to the Flowering Plants of Northeastern United States, except Grasses and Sedges,' was published by the late Dr. George T. Stevens in 1910. Through the courtesy of his son, Dr. Charles Stevens of New York, 300 copies of the plates of this work, illustrating about 1,500 species, are now reprinted.

"We believe that the many excellent drawings of common plants justify their reprinting, chiefly with a view to outdoor use. We have in mind the making of brief notes by amateurs and beginning students in field courses. For this purpose forty blank pages, one for every five plates, have been inserted.

"For a few critical groups such as *Juncus, Potamogeton, Rubus,* and others, the illustrations are not always accurate."

Dr. Gundersen states that the book may be obtained by applying to him at the Brooklyn Botanic Garden.

[1] Illustrations of flowering plants of the Middle Atlantic and New England States. 199 plates. George T. Stevens, M.D. Flatbush Printing Company, Brooklyn, N.Y. 1930. By Mail, $1.00.

Additions to the Flora of Connecticut[1]

In the preface of this bulletin it is stated that it "Is intended to include all information, whether previously published or not, which has come to hand since the publication of the Catalogue of Flowering Plants and Ferns of Connecticut (Bulletin No. 14, 1910) and which modifies significantly its statements. New stations which merely multiply the known localities for species without extending their range in Connecticut, are usually not given.... So far as practicable the results of recent revisions which affect the classification of Connecticut plants have been incorporated, and since most of them have not found their way into current

[1] Harger, E. B., C. B. Graves, E. H. Eames, C. A. Weatherby, R. W. Woodward, and G. H. Bartlett. Additions to the Flora of Connecticut. (First Supplement to Bulletin No. 14) Bull. 48. Pp. 94+vii. Conn. State Geological and Natural History Survey. Published by the State: Hartford, Conn., 1930.

manuals, more or less descriptive matter in regard to them is included for the convenience of readers who may not have access to the original publications. Mere changes of name, however, are not recorded here."

This supplement will be welcomed by those who are interested in the Connecticut flora or who have had occasion to use the original Bulletin 14,[2] which is a model of its kind. Two of the authors of the original catalogue, which was published in 1910, are now deceased, namely Luman Andrews and Charles H. Bissell. Messrs. Harger, Graves, and Eames of the present committee were the other co-authors of the original catalog.

ARTHUR H. GRAVES

[2] Reviewed in TORREYA 10: 128-131. 1910.

FIELD TRIPS OF THE CLUB

The 1931 Field Program

The program of field meetings of the Torrey Botanical Club, which will appear in the usual printed booklet form not later than May 1, promises to be fuller and richer than ever before, thanks to increased coöperation of old and new leaders. These excursions will be announced, in case they are prior to the mailing of the booklet, in the weekly bulletin of the New York Academy of Sciences.

High lights of the program will be an excursion on the Palisades, for liverworts, led by Dr. Marshall A. Howe, Assistant Director of the New York Botanical Garden, Saturday, May 16; the annual Branchville, N.J., joint gathering with the Sussex Nature Club and others, led by Mr. and Mrs. William Gavin Taylor of Arlington, N.J., May 23-24; a trip to the southern Catskills over the Memorial Day week-end; joint trips at High Hill Beach, L.I., June 20-21 and August 22-23, with the Reptile Study Society, led by Miss Nellie L. Condon; a Fourth-of-July week-end at Dr. Will S. Monroe's farm, at North Duxbury, Vt., led by Mr. and Mrs. W. G. Taylor; a study of the botany of beaver dams, in the Harriman State Park, July 12, led by William H. Carr, curator of the Nature Museum at Bear Mountain; a trip to Sandy Hook, led by Prof. M. A. Chrysler of Rutgers University, July 19; a week in the northern Catskills, August 24-30, led by Dr. Alfred Gundersen, of the Brooklyn Botanic Garden; two trips at Mineola, L.I., June 28, and September 27, for myxomycetes, led by Robert Hagelstein; and three excursions for the study of fungi, June 14 and October 4, at Grassy Sprain, Westchester County, led by Dr. Michael Levine; and September 20, at Franklin Lake, New Jersey, led by Dr. William S. Thomas; besides many others, filling nearly every Saturday afternoon and Sunday until December 1. Volunteers for an alternative Fourth-of-July week-end nearer New York City and for a Columbus Day week-end are desired.

Raymond H. Torrey
Chairman Field Committee

Field Trip of Sunday, February 1

A brisk northwest wind and a temperature of 16°F. did not discourage 18 members and guests of the Torrey Botanical Club

from attending the field meeting on February 1, at the New York Botanical Garden.

The topics of the day were the study of the Gymnospermae with special reference to the pines, cycads and the maidenhair tree, *Ginkgo biloba,* winter aspects of trees, potholes, and the diversion of the Bronx River at a point about a half mile north of the boulder bridge.

The route started along the low ridge east of the conservatories—the section reserved for the pines. The pines reviewed were *Pinus Banksiana, P. rigida, P. pungens, P. virginiana,* the last being often mistaken for *P. Banksiana,* perhaps on account of the similarity of the common names (northern scrub pine for *P. Banksiana* and Jersey scrub pine for *P. virginiana*). The needles of *P. Banksiana* are divergent and about one inch long; the cones are usually curved, with pointless, almost smooth scales, and adhere to the branches, unopened, for a number of years. *P. virginiana* has needles about two inches long and the cones are also larger than those of *P. Banksiana,* while the scales are tipped with a prickle. The cones open after maturity in the second year.

Foreign pines growing here are the Scotch pine, *P. sylvestris,* from Europe and Asia, and *P. nigra,* the Austrian pine. The latter is considered to be the best ornamental pine for our climate of all the imported pines.

Descending the ridge to the eastward we passed *P. Thunbergii* from Japan, *P. ponderosa,* the western yellow pine, *P. densiflora,* the Japanese red pine, covered with a multitude of small cones, and *P. edulis* from the Rocky Mountains. After crossing the central driveway we came next to several white pines, *P. Strobus,* and close to them the decorative pyramidal variety, *P. Strobus* var. *fastigiata.* Turning toward the Alpinetum (rock garden) we saw *Quercus macrocarpa, Prunus virginiana, Ulmus americana, Nyssa sylvatica,* the last opposite a large group of *Corylus (avellana?).* On the eastern edge of a rocky ledge we came to a well preserved small pothole, whose walls are intact. This same ledge shows glacial striae running northwest-southeast. Several plants of the Hercules club, *Aralia spinosa,* grow in the fissures of the rock, and nearby were several specimens of *Pinus Cembra,* a very attractive tree of the European Alps. A few yards from this group we noted several young trees of the maiden hair tree, *Ginkgo biloba.* At the next fork of our path a natural

graft of two trunks of the American elm caused considerable interest.

Finally we reached the Alpinetum, on top of which we inspected a deep and wide gouge, carved out from very hard rock of Precambrian age during the glaciation periods in early Quaternary time. We continued to the Bronx River, passing *Acer rubrum, A. saccharum, Quercus alba, rubra, palustris,* and *velutina, Liriodendron Tulipifera, Liquidambar Styraciflua, Cornus florida, Carpinus caroliniana, Betula lenta,* and others.

We now entered the hemlock grove with its fine stand of *Tsuga canadensis,* probably the southernmost stand of any considerable size near the seacoast. Proceeding north on the western bank of the gorge toward the boulder bridge, we came upon a solitary *Kalmia latifolia* which had escaped destruction by so-called nature lovers. Here and there the trailing shoots of *Mitchella repens* spread over the ground along the path.

About sixty feet south from the boulder bridge on our left, and about twenty-five feet from the path, we came upon the remains of a pothole about fourteen feet deep, with its eastern wall broken. Higher up on the same ledge there is another pothole. A large boulder of diabase from the Palisades was found lying at the bottom of the pothole beside a tree of considerable size. Only a few feet from this pothole is another, much smaller example. At this point the leader explained the diversion of the Bronx River from its former course along the present road-bed of the New York Central Railroad, emptying into the Harlem River at about the Third Avenue Railroad bridge, to its present course across the plain (now occupied by the Salicetum) to the gorge, emptying its waters into Long Island Sound.

Passing *Cryptomeria japonica, Sciadopitys verticillata,* the umbrella pine from Japan, *Cedrus atlantica* from the Atlas Mountains of North Africa, and *Diospyros virginiana,* the persimmon tree, the party now turned toward the Museum, where fossil prints and literature on fossils were inspected and discussed.

MAX A. ELWERT

SUNDAY, FEBRUARY 15

Twenty-nine members and guests made the Kreischerville, Staten Island trip, which was favored by crisp, bracing, clear weather. Nature study enthusiasts secured several large cocoons

of Cecropia moths and many large egg masses of the praying mantis. The latter spells its first name with an "a" or an "e" according to whether it is in a religious or a voracious mood. One enterprising member of the club hopes to transplant it to Inwood Park, where it may prey upon any unwary Japanese bettles dwelling therein.[1]

A halt was made for lunch on a hillside near a swamp which was frozen tight. Here, besides the customary high bush blueberry, *Vaccinium corymbosum,* buttonbush, *Cephalanthus occidentalis,* and *swamp azalea, Rhododendron viscosum,* members of the party found the dead fruiting stalks of what appeared to be *Hypericum virginicum,* the marsh St. John's-wort, an herb with opposite branching and fruit pods dehiscent into three parts.

About twenty-five trees of the Virginia pine, *Pinus virginiana,* were counted near Kreischerville—the largest apparently about sixty years of age. One tree of pitch pine, *P. rigida,* of about the same age, was found among them. No young trees or seedlings of the Virginia or of the pitch pine were found, perhaps on account of the repeated forest fires here. The fire of last year had charred the outer bark of many of the trees upwards for many feet, but the inner bark in most cases seemed sound. One tree was seen which had been entirely killed by the fire. This seems to be the last stand and generation of this species on Staten Island, unless the fires can be prevented for a sufficiently long period to insure the development of a new generation.

Part of the sandy plain to the north of this little grove was traversed, and several fairly large stumps, one showing eighty annual rings, testified to a former well-forested condition. Several promising young chestnut trees were found, one about two inches in diameter at the base and apparently free from the blight.

ARTHUR H. GRAVES

[1] For a valuable article on the praying mantis, see Engelhardt, George P. Japanese praying mantis reported from the Brooklyn Botanic Garden. Brooklyn Bot. Gard. Record **15**: 149-153. 1926.

PROCEEDINGS OF THE CLUB

Meeting of January 6, 1931

The meeting was called to order at the American Museum of Natural History at 8.30 P.M. by President Sinnott with forty-five members present. Minutes of the meeting of December 17, 1930, were read and approved.

The following people were unanimously elected to membership in the club: Mr. Max A. Elwert, Horticulturist, Care of Chas. Eulert, 317 East 90th Street, New York City; Mr. W. G. Watkins, Botany Department, Columbia University, New York City, and Mr. John W. Thompson, Cleveland High School, Seattle, Washington.

The resignations of Dr. Albert R. Sweetser, Dorothy S. Francis and Mr. John Thompson were accepted with regret.

Officers for the ensuing year were elected as follows:

President—Dr. Edmund W. Sinnott

Vice-Presidents—Dr. C. Stuart Gager and Dr. Marshall A. Howe

Secretary—Dr. Forman T. McLean

Treasurer—Mrs. Helen H. Trelease

Editor—Dr. T. E. Hazen

Business Manager—Dr. Michael Levine

Associate Editors—Albert Francis Blakeslee, Cornelia Lee Carey, Frank Earl Denny, Alexander William Evans, Henry Allan Gleason, Alfred Gundersen, George Tracy Hastings, Marshall Avery Howe, Louis Otto Kunkel, Michael Levine, Arlow Burdette Stout and Sam F. Trelease

Bibliographer—Mrs. B. O. Dodge

Delegate to the Council of the New York Academy of Sciences—Dr. M. A. Howe

Representatives on the Council of the A.A.A.S.—Dr. D. T. MacDougal and Dr. B. O. Dodge.

Under miscellaneous business Mr. Torrey spoke of the press reports of "improvements" about to be initiated in the central valley of Van Cortlandt Park and moved the appointment of a committee to discuss the matter with the Park Commissioner of the Bronx. Mr. Torrey's plea for preservation of the natural condition of this tract was warmly supported by Dr. Karling and Dr. Gager, and the motion was unanimously carried. Presi-

dent Sinnott later appointed on this committee Dr. Merrill, Mr. Torrey and Dr. Howe.

Professor W. G. Waterman of Northwestern University gave an illustrated talk on "Flowers and Native Vegetation."

Meeting adjourned at 9:50 P.M. for refreshments.

Respectfully submitted,

FORMAN T. MCLEAN, *Secretary*

MEETING OF JANUARY 21, 1931

The meeting was called to order at the New York Botanical Garden at 3:30 P.M. by President Sinnott, with thirty-five members present. Minutes of the meeting of January 6 were read and approved.

Miss Marjorie Cotton, the Croydon, 12 East 86th Street, New York City, was unanimously elected to membership in the club.

The resignations of Miss Emily P. Cohen, Mr. H. M. Romanoff, and Mr. R. W. Woodward were accepted with regret.

Mrs. Arabella McKee, whose name was presented by Dr. Hazen, was elected to life membership in the club.

Reports were read by Dr. Barnhart for the Budget Committee; the Secretary's report and the Treasurer's report by Dr. McLean; and the Editor's report by Dr. Hazen.

Dr. A. H. Graves brought up the subject of welcoming new members into the club and making them feel at home.

On the motion of Dr. Hazen, Dr. Graves was unanimously elected a member of the board of Associate Editors of the club, with the understanding that he serve as acting editor of TORREYA during the absence of Mr. Hastings.

A motion was made and seconded that the reports of the other officers be left until a later meeting.

Dr. George F. Avery, Jr., National Research Council Fellow in Botany at Columbia University, gave an interesting talk on the "Structure of Embryos and Seedlings of Grasses," an abstract of which, kindly furnished by Dr. Avery, follows.

The grasses form a very natural and distinctive family of flowering plants, with about 480 genera and nearly 6,000 species. They differ in character from all other families, particularly in structure of embryos, seeds and fruits.

A study of embryos, and the seedling types into which they develop, indicates three general classes of seedling anatomy in the grasses:

1. Those in which early elongation of the axis takes place between the level of the cotyledon and that of the coleoptile ("leaf sheath"), the interval in cross-section showing only a central vascular cylinder—as in *maize*.
2. Same, with the interval in cross-section showing an additional small vascular bundle on one side of the central cylinder—as in *oats*.
3. Those in which there is little or no elongation in this part of the axis, the principal elongation taking place above the coleoptile, as in *wheat*.

In the first two cases (maize and oats) the interval has long been referred to as the "mesocotyl," a term which is shown to be entirely erroneous from evidence which establishes the coleoptile as the first independent leaf above the cotyledon—this interval is then the *first internode*. In the case of wheat, the first internode does not elongate to any extent, the second internode (sheathed by the coleoptile) being the principal region of elongation in the seedling axis. This interpretation makes the grasses homologous in structure with other plants.

Of the approximately 480 genera of grasses, nearly 100 have been investigated by various workers, and all appear to fall in one of the three classes mention. Interesting correlations appear to exist between seedling anatomy, geographical distribution, and chromosome number and size—and these in turn agree rather well with the taxonomic groups already established.

The meeting adjourned at 5:00 P.M.

Respectfully submitted,

FORMAN T. MCLEAN, *Secretary*

MEETING OF FEBRUARY 3, 1931

The meeting was called to order by President Sinnott at 8:15 P.M. at the American Museum of Natural History.

In the absence of the Secretary the President asked Dr. Hazen to act as Secretary *pro tem.*

Mr. Torrey presented an interesting report of the activities of the field committee for the season of 1930 and outlined the plans for the season of 1931.

The following persons were unanimously elected to membership in the Club:

Miss A. Johanson, and Miss Irene Hackett, Columbia University, proposed by Dr. Illo Hein; Miss Sylvia O. Segall, Mr. William C. Meyer, and Mr. John T. Perry, of Columbia University, proposed by Dr. J. S. Karling.

The scientific program consisted of an illustrated lecture by Mr. George T. Hastings on "Our Native Ferns." The lecture was followed by general comment and discussion by several members. The interest elicited by the speaker and the subject was manifest in the attendance of over 100 members and friends.

The Club adjourned at 9:30 for tea served in the Hall of Birds.

Respectfully submitted,
TRACY E. HAZEN, *Secretary pro tem*

MEETING OF FEBRUARY 18, 1931

The meeting was called to order by President Sinnott at 3:30 P.M. at the New York Botanical Garden with 29 members present.

The minutes of the meetings of January 21 and February 3 were read and approved.

Dr. Merrill gave a brief report on the action taken on improvement of the region about Tippett's Brook, Van Cortlandt Park.

The following persons were unanimously elected to membership in the Club:

Dr. Earl L. Core, West Virginia University, Morgantown, W.Va.; Wanda K. Farr, Boyce Thompson Institute, Yonkers, New York; Dr. R. Kent Beattie, 2032 Belmont Road, Washington, D.C.; Dr. J. W. C. Goethart, Rijks Herbarium, Nonnensteeg, Leiden, Holland.

The resignations of Mr. William J. Downer and Mr. M. French Gilman were accepted with regret.

The scientific program consisted of a talk by Dr. Marshall A. Howe "On Some Travertine-forming Algae" and by Mr. William J. Bonisteel on "Phytochemical Problems in Aconites." The talks were followed by general comment and discussion by several members.

The Club adjourned at 5 P.M.

Respectfully submitted,
FORMAN T. MCLEAN, *Secretary*

NEWS NOTES

We learn from *Science* that Professor H. S. Jackson, head of the department of botany in the Purdue Agricultural Experiment Station, resigned on January 1 in order to accept the position of professor of mycology and cryptogamic botany in the University of Toronto.

Through Dr. Forman T. McLean, President, the Metropolitan Gladiolus Society announces its annual gladiolus show, to be held August 25 and 26, on the main floor of the Grand Central Palace, Manhattan. Exhibits will be set up on the previous day, August 24. Entries are open to all.

Miss Marie Reimer, Professor of Chemistry at Barnard College, lectured on March 20 before the Barnard Botanical Club of Columbia University on "A Visit to the Botanical Garden at Buitenzorg, Java." In the course of her remarks Miss Reimer stated that the Treub Laboratory at the Garden is set apart for the use of foreign scientists, who desire to engage in independent research. The Garden authorities would welcome American botanists with such qualifications.

Miss Eliza Frances Andrews, of Rome, Georgia, died on January 22, at the age of ninety years. Miss Andrews was for a time a member of the Club, and was a writer of fiction besides being the author of "Botany All the Year Round" (1903) and "A Practical Course in Botany" (1911).[1] She was an occasional contributor to Torreya. Another Georgia woman botanist, Mrs. Augustus P. Taylor (Elfleda Bennett Taylor) died at Thomasville, Ga. on March 12, at the age of sixty-five. Mrs. Taylor was a contributor to one of the early numbers of Torreya and also to the *Plant World* and the *Fern Bulletin*.

"The Flowers of Woody Plants" is the title of a leaflet issued in the series "Cornell Rural School Leaflets"—Vol. 23, No. 4, as long ago as March, 1930, but of so much interest and value to many of our Club members, especially to those who are teachers of biology, botany, or nature study, that it can not be too late to mention it here. The leaflet is written by Eva L. Gordon and Paul Kellogg, for boys and girls, and is a pamphlet of 48 pages containing illustrations of flowers of many of our trees

[1] Reviewed in Torreya **13**: 64-66.

and shrubs with accompanying attractively written text. At the end of the leaflet are eight pages devoted to drawings of the flowers and details of 128 kinds of woody plants and eight pages to a tabulation of the important facts about thirty-two common species.

THE NEW YORK BOTANICAL GARDEN reported the Chinese and Japanese witch hazels as well as the vernal witch hazel (*H. vernalis*) in flower on February 15, and the Brooklyn Botanic Garden reported snowdrops (*Galanthus Elwesii*) in bloom on February 14. According to past records, these first appearances were somewhat belated, and in view of the unusually mild winter just past one wonders why. It has already been noted at the Arnold Arboretum that the oriental witch hazels bloom later in mild winters than in exceptionally severe ones—but the cause thereof seems to be a mystery. As for the snowdrops, the answer may be that there was no warm period of sufficient length to thaw the ground deep enough.

A SERIES of free lectures, arranged particularly for pupils of high schools and teachers, training schools, is being delivered this spring at the Brooklyn Botanic Garden. Topics have been selected which coincide as nearly as possible in time and subject matter with those of the Advanced Biology Syllabus for New York High Schools. The schedule is as follows:

1. March 19.	Reproduction in Flowering Plants.	Miss Hester M. Rusk
2. April 23.	Forestry.	Dr. A. H. Graves
3. May 7.	Types of Plant Nutrition.	Dr. A. H. Graves
4. May 14.	The Breeding of Plants.	Dr. G. M. Reed
5. May 22.	The Growth of the Idea of Evolution.	Dr. R. C. Benedict

The lectures are given in the Auditorium of the Laboratory Building, and commence at 4:10 P.M.

THE ALLEGANY SCHOOL OF NATURAL HISTORY announces its fifth season, to be held July 8 to August 27. This "School in the Forest" is conducted by the Buffalo Museum of Science in cooperation with the New York State Museum and in affiliation with the University of Buffalo. It is located in Allegany State Park

in western New York, seventy-five miles south of Buffalo, and close to the Pennsylvania border. The main entrance is at Salamanca on the Erie Railroad. Courses will be given in Field Zoology, Field Geology, Field Botany, Natural History of Birds, and Nature Study. The faculty is composed of Dr. R. E. Coker, Director, (Ph.D. Johns Hopkins); Aretas A. Saunders (Ph.B. Yale); William P. Alexander (B.Sc. Cornell) and L. E. Hicks (Ohio State University). The instructor in Field Geology will be named later. For further information, address the Buffalo Museum of Science or Dr. R. E. Coker, Box 950, Chapel Hill, North Carolina, until June 15.

TORREYA

Vol. 31 May-June, 1931 No. 3

Inheritance and Chromosome Number in the Gladiolus

FORMAN T. MCLEAN

The garden hybrid gladiolus has probably a greater capacity for variation in its inheritance than any other cultivated plant. This would be expected from its ancestry, for it is derived from at least ten, probably more, entirely distinct species. Both cytological studies and breeding experiments give ample evidence of capacity for wide variability.

Observations of groups of seedlings of known and controlled parentage show that the following characteristics can be independently inherited: hooded or open bloom; with or without yellow, or red, violet or white color respectively in any combination; the color clear, or veined; or dark-flaked; throat yellow; blotched; lined; or dotted in any combination; with or without a pale zone around the throat; segments ruffled or plain; pointed or rounded tips; flower spikes stout or slender; with opposite or secund arrangement; close or wide spacing of blooms; few or many open at once; branched or simple; leaves bright or grayish green; and so forth through many other traits.

All of these varied traits can be directly traced to the different parent species: red-and-yellow flaked *G. psittacinus* with yellow throat; opposite-flowered white *G. oppositiflorus* with dark lined throat; purple-throated yellow *G. purpureo-auratus;* violet-tinted, dark-throated *G. papilio;* wide-open, white, dark lined *G. floribundus,* often somewhat ruffled; reflexed, wide-flowered scarlet *G. Saundersii* with red-spotted white throat; wide-open, rounded *G. cruentus,* blood red with dark blotch and white outer surrounding zone to the throat; *G. dracocephalus,* small hooded purple-spotted greenish yellow; deeply hooded yellow drooping *G. primulinus,* with its slender growth and long-stalked, soft-shelled cormels; and yellow-throated red *G. quartinianus,* very tall and late-flowering. Some authorities claim still other species as parents of the garden gladiolus, such as *G. cardinalis, G. blandus, G. tristis,* etc. The characters of any one species seem to be somewhat linked in the hybrids, so that one can frequently pre-

dict the growth habits from an observation of the flower form and coloring, but few cases have been observed of close linkage, to form definite races.

According to the chromosome theory of inheritance, most if not all of the inherited traits of a plant are transmitted by the chromosomes—tiny, dark-staining bodies evident in the cell nucleus during cell division. Usually the number of these formed in each cell by any kind of plant is constant, and each one seems to carry its own burden of the total inheritance of the plant. Detailed studies of Drosophila flies, daturas, and other organisms go to prove the soundness of this theory. Accordingly, chromosome studies of the gladiolus were undertaken, with the hope of learning more about its mode of inheritance, and of possibly finding an explanation of certain sterilities observed in some interspecific crosses.

For this study, pollen mother cells from the anthers of flower buds were used. Each mother cell nucleus divides into four nuclei, each of which then develops into the nucleus of a pollen grain. In the gladiolus this nuclear division takes place when the flower stalk is just emerging from the leaves, and there are really two steps in the process; first a division into two, then into four nuclei. During this process, the number of chromosomes in each nucleus is reduced from the number in the usual vegetative cells, to half that number in each pollen grain. The pollen mother cells at this stage are free in the cavity of the anther sac, and are easily squeezed out on a microscopic slide, stained and studied. The chromosomes stain black with aceto-carmine, but are very small; and in the early part of the telophase, after they are drawn away from the equatorial plate, they are short and bent nearly double, so that they are rather hard to count accurately. Counts were made after the first, and after the second division, when the chromosomes were in two or in four groups, and in each case the resulting count was the same, indicating that reduction division took place at the first division within the pollen mother cell. The results of these counts are as shown in table 1, page 67.

"Priority" is a hybrid derived from *G. primulinus* crossed with a garden variety of hybrid gladiolus. "Halloween" is a seedling of a cross of *G. quartinianus* with a Primulinus hybrid, and the remaining two are botanical species. The chromosome numbers were uniformly the same in all of these forms belonging to widely dif-

TABLE 1

Haploid Chromosome Numbers in Pollen Mother Cells of Gladioli.

		Number
Variety "Priority"[1]	10 observations	14
Variety "Halloween"	4 observations	14
Gladiolus *quartinianus*	2 observations	14
Gladiolus *tristis*	2 observations	14

ferent sections of the genus, and fourteen is assumed to be the haploid number for gladiolus, despite the fact that the only previously reported count, for the variety "La Muerthe," was recorded as 30.[2]

As has already been stated, there are many heritable traits of gladiolus, which are transmitted independently of one another. These may be assumed to be transmitted by different chromosomes. Since there have been fully 14 or more such independent characters observed among garden gladiolus hybrids, which can be freely interbred, we are free to assume, for purposes of study of the possibilities of different inheritance, that these independent characters are distributed over all of the 14 chromosomes. By many geneticists, each chromosome is regarded as a parcel, carrying its particular load of inheritable units, which are normally carried together, so that they are usually linked together in inheritance. Since the gladiolus has 14 chromosomes in each pollen grain and 14 in the egg cell of each ovule, the fertilized egg will have 28 chromosomes, 14 from the pollen parent and 14 from the seed parent. These 28 will be carried through the plant during its growth, each cell having thus 14 pairs of them, one of each of which will enter into its pollen grains or ovules. Each chromosome is assumed to be carried along intact from parent to offspring, except in such cases as may arise when chromosomes get tangled up during cell division, and portions of one pair may be exchanged. This is assumed to take place when there is crossing over, and severing of characteristics which are normally linked together. There are also numbers of other complications that occur in inheritance.

[1] Previously reported by me in THE GLADIOLUS REVIEW **4**: 17. 1927.

[2] Vilmorin, R. De, and M. Simonet. Nombre des chromosomes dans les genres *Lobelia, Linum* et chez quelques autres espèces végétales. C. R. Soc. Biol. Paris **96**: 166-8. Cited by Gaiser, L. O. Chromosome numbers in angiosperms II. Bibliographica Genetica **6**: 462. 1930.

All of these tend to add to rather than to subtract from the variability in inheritance. The simplest situation may be assumed to be that in which each character is determined by a single chromosome. So let us study the possibilities in the gladiolus on that basis.

If we take two strains or two species of gladiolus such that each breeds true for one of a pair of alternative characters, such as ruffled and plain petalled, and cross them, then the first generation will have in its constitution the tendencies for both characters. If, further, this trait is determined by a single factor, or gene, carried in one pair of chromosomes, then the hybrid will have the gene for ruffled in one chromosome, for plain-petalled in its mate. But when this hybrid produces pollen grains and ovules, and reduction takes place, only one of these chromosomes can enter into the male nucleus of each pollen grain or the egg cell of the ovule, so that each such reproductive cell can carry either the gene for plain-petalled or the gene for ruffled, not both. And so, if this hybrid is self-fertilized (or two sister hybrid plants are crossed, for hybrid gladioli are frequently self-incompatible), the offspring of the second generation may have each two chromosomes each carrying ruffled, or one ruffled and one plain-petalled or two plain-petalled. So there are three possibilities: ruffled, half-ruffled and plain-petalled.

If we now assume that the above two strains differ further in two other independent traits, as hooded and open flowered, then considering both these traits, the possibilities in the second generation are: Ruffled hooded, ruffled open, ruffled half-hooded, half-ruffled hooded, half-ruffled open, half-ruffled half-hooded, plain hooded, plain open and plain half-hooded. Thus there are 9 possibilities for two independent characters, or 3^2. Similarly, for three independent pairs of characters, there are 27, or 3^3 possibilities.

Since there are 14 pairs of chromosomes in the gladiolus we may assume that our two strains may differ by as many as 14 independent pairs of characters.

Of course, there can be only a limited number of combinations possible with twenty-eight different chromosomes, in fourteen pairs. If we designate the first pair of chromosomes as a and A, the second pair as b and B, and so forth, then we get the following set of chromosome units in the first generation hybrids:

hybrid X { a b c d e f g h i j k l m n / A B C D E F G H I J K L M N

Since either a or A can enter into any pollen grain or ovule, combined with b or B, c or C, and so forth to n or N, as already stated, the possible kinds of reproductive cells possible in this first generation hybrid X are $2^{14} = 16{,}384$. But when two such reproductive cells unite, in fertilization, then the twenty-eight resulting chromosomes entering into the seed, and so carried into the second generation, may consist of a and a (aa), a and A (aA), A and a (Aa), or A and A (AA). Since aA and Aa are made up of the same constituents, they will be the same in result, so there are really three possibilities for the first or a chromosomes: aa, aA and AA. Similarly for the second or b chromosomes there are three possibilities, bb, bB, and BB, and so on for all of the others. So the number of possibilities of different combinations of twenty-eight chromosomes made up from two each of the fourteen sets of two, is $(3)^{14}$, or 4,792,869.

This means there are 4,792,869 possible different seedlings that might arise in the second generation from a cross between two different gladiolus species, if the two species differ from each other in at least fourteen characters, at least one of which is carried by each of the fourteen chromosomes. Whether any two species differ from one another to this degree is not easily proven, but garden hybrids seem to, so the 4,792,869 different progeny from a single cross are entirely reasonable.

If we go one step further, and, instead of intercrossing the seedlings of one interspecific cross among themselves, we cross two interspecific hybrids, each from entirely distinct species, so that in all, four distinct species enter into the heritage of the second generation, then the situation may be depicted by representing the chromosomes of the first second interspecific hybrid by letters and by numerals thus:

hybrid X { a b c d e f g h i j k l m n / A B C D E F G H I J K L M N

hybrid Y { 1 2 3 4 5 6 7 8 9 10 11 12 13 14 / I II III IV V VI VII VIII IX X XI XII XIII XIV

In this case, the 16,384 possible reproductive cells (pollen grains or ovules) of hybrid X may be assumed to differ from each of the 16,384 possible reproductive cells in hybrid Y. This would make the case more complicated, for then in the cross between X and Y the possible combinations would be for the first chromosome aa, aA, AA, al, Al, aI, AI, ll, lI, II, or a total of ten, the same number of combinations for the second, and so forth, making the possible number of different kinds of seedlings resulting from a hybrid made up from four such species 10^{14} or 100,000,000,000,000. Whether we would ever find four gladioli as radically different as is here assumed, and still find it possible to intercross them is not sure. So this is a purely hypothetical case—but even so the calculated results seem rather astounding—and just show what surprising possibilities there are along these lines. This computation takes account only of the different seedlings that might arise with a normal segregation of chromosomes. If chromosomes split abnormally, causing "crossing over" of characters normally linked on one chromosome then the numbers of possible combinations might be indefinitely increased. Of course, in genetical studies of gladioli or other plants nobody has attempted thus far to follow through as many as fourteen independent heritable characters in the manner indicated; no one garden or force of scientific workers would be large enough to make it practicable. At most, breeders work with two, three, or four characters of their plants, and even so they must grow thousands of seedlings before they can establish the manner of inheritance of these few traits.

The possibilities of different kinds of gladioli among seedlings, though, are so numerous that the tens of thousands of different seedlings raised each year by breeders are only a small fraction of the variations that may be expected among the modern hybrid strains, descended, not from four different species, but from at least ten. Nor is that the end; there are fully one hundred more gladiolus species that certainly have not yet been used in breeding. There may not be as many as 100,000,000,000,000 possibilities from any one set of hybrids, involving four species, because the species may be more nearly alike than was assumed in this calculation. But with so many different species that will readily intercross, the possibilities in hybrids are far greater than have yet been attained.

New York Botanical Garden

Vaccinium Ashei sp. nov.

J. M. Reade

Description.—Frutex *V. fuscato* valde affinis, differt tamen floribus albis minoribusque, foliis serratis et baccis saepe pruinosis. Ramuli villosiusculi vel glabri, parum compressi vel teretes. Folia alterna, lato-ovata vel ovata, 3.4-5.7 cm. longa, 2-4.3 cm. lata, supra glabra aut ad medio-nervum pubescentes, subtus circa venas villosiuscula, tenuissime serrulata. Racemi ad ultimo ramo plures, multiflori, pedicellis glaberrimis. Corolla alba, oblongo-urceolata, angusta, constricto ore, 8-10 mm. longa, diametro circiter 4.5 mm., calyce 5-fido triplo longior. Bacca glabra, nigra aut glauca, diametro 11-16 mm., suaviter edulis. In paludosis Floridae et Georgiae ad Mississippi.

A slender shrub 2-6 m. high, usually several stems to the clump and the branches often in irregular whorls; bark brown and stringy. Twigs flattened or terete, at first more or less pubescent in lines but at length glabrous or glabrate. Leaves dark green, when mature, glabrous above except for a slight pubescence along the midrib, pale beneath and sometimes quite and persistently pubescent especially on the midrib, 3.4-5.7 cm. long, 2-4.3 cm. wide, broadly ovate, elliptic, or even somewhat obovate in outline, rounded at the base, or narrowed at both ends, or sometimes rounded at the apex, finely and sharply serrulate, especially above the middle, the teeth with gland-tipped, inturned points, often finely ciliate toward the base, petioles short, puberulent, 1-3 mm. long. Flowers appearing in February to April, before the leaves or when the leaves are half grown, in short 4-10 flowered glabrous clusters which are often racemose on the twigs. Corolla white or rarely striped with red, oblong-urceolate, narrow, more than twice as long as thick, 8-10 mm. long, rarely 4.5 mm. thick, much constricted at the mouth. Calyx glabrous, about a third the length of the corolla, with acute or obtuse entire appressed lobes which on the distended mature fruit become mere margins. Young fruit and calyx often slightly glaucous. Fruit subglobose, 11-16 mm., purplish black, often with a slight bloom, sweet, ripening irregularly from the end of May to the middle of July. Seeds 20-30, chestnut brown, pitted, about 1.5 by 1 mm.

The proposed species is common in western Florida and the adjacent portions of Georgia, especially near the coast, and extends west to Pearl River County, Mississippi, and as far east as Baker County, Florida. It grows in sandy or mucky soiled swamps, especially swamps of clear-water streams usually associated with water gum of small size, with slash pine, white bay, holly, titi, wax myrtle and azaleas. Near Pensacola it is being cultivated un-

der the name of "rabbit-eye huckleberry." On account of the large size of the fruit and its fine flavor it seems to be a most desirable sort for cultivation on the sandy soils of the coastal plains region. The fruit ripens somewhat irregularly, however.

This plant is most closely related to *Vaccinium fuscatum,* Ait. (Hort. Kew. I, 2:11. 1789) of the same general region, from which it may be separated when in flower by the white corolla with narrower tube much constricted at the mouth, and when in foliage by the serrulate leaves usually less pubescent, while in winter the flattened twigs nearly or quite glabrous are distinctive. The flowers of *V. fuscatum* are decidedly red or reddish; its leaves are essentially entire and as a rule much more pubescent. Its fruit is acid. In West Florida it is known as sourberry.

The type material collected by W. W. Ashe near Niceville, Okaloosa County, Fla., consisting of both flowers, March 26, 1927, and fruit, June 2, 1929, from the same plant, is in the Ashe herbarium. Co-type specimens in fruit are being deposited in the herbarium of the University of Georgia and in the National herbarium.

We are indebted to Mr. W. W. Ashe for the recognition and delineation of this species. His well preserved specimens and careful field notes are made from abundant material. Additional specimens examined—all collected by him—are as follows:

Florida—Niceville, Juniper Bayou, June 10, 1929; Lightwood-knot Ck., Okaloosa Co., June 8, 1929; Rocky Run, Walton Co., March 23, 1927 and June 7, 1929; Walton Co., March 26, 1927 and June 7, 1929; Camp Walton, Okaloosa Co., March 25, 1927 and June 8, 1929; Hollyhead, Santa Rosa Co., June 8, 1929; near Valparaiso, Okaloosa Co., 1927; Alaqua Ck., Walton Co., March 26, 1927 and June 7, 1929; near Pensacola, Escambia Co., March 27, 1927; near Taylor, Baker Co., February 19, 1929 and May 11, 1929.

Mississippi—McNeill, May 8, 1930; near Poplarville, Pearl River County, May 8, 1930.

ATHENS, GEORGIA

A New Variety of Koeberlinia

E. R. Bogusch

Field studies of *Koeberlinia spinosa* Zuccarini have revealed variations unmentioned in literature. The author's attention has repeatedly been drawn to a decidedly slender form that differs from the species by its more diffuse habit and greater ramification of branchlets. Numerous intergradations have been encountered, and because of ecologic as well as taxonomic considerations these variations seem justly to be considered as stable.

Dr. Asa Gray was evidently acquainted with a few of these forms. Although he does not specifically mention these variations in his Synoptical Flora when he describes Zuccarini's species, the description is, nevertheless, broad enough to be inclusive of some variability. To a certain extent this is also true of Small's description in the Flora of the Southeastern United States.

The botanist in the field, working in the region in which this species occurs, may be surprised that such active collectors as Wright, Nealley, Palmer, and Rose failed to account for these odd forms. However, the wide geographical range of the species, the seasonal differences in time of flowering, the lack of comparative herbarium material, and the physical difficulties involved in such field work serve to satisfactorily explain this apparent discrepancy.

The plant upon which Zuccarini evidently based his species is widely distributed through western and southern Texas, New Mexico, and Mexico. It flowers uniformly from June to August, the period being locally dependent upon summer rainfall.

The variety here proposed as new, seems to flower only in March and April and then very sparingly. It has been the writer's good fortune to be able to actually cover much of the natural range of the species. However, until the fall of 1930, he was unaware of the existence of flowering material, for usually the field work was undertaken after the end of May. In the course of working over a collection made by Mr. Fred Warren along the Rio Grande River while he was with the U. S. Biological Survey, a mature flowering specimen was discovered.

This new variety cannot be considered as a mere ecad. Its independence of environmental factors is too pronounced; also it may be found on open hills as well as in dense chaparral, freely mingling with the species. Likewise, it is not a distinct species, for with a little diligent search every intergradation between the

two extremes may be found. The frequency of occurrence seems to justify an individual name.

FIGURE 1. The specimen on the left represents the average form, while that on the right is apparently the extreme limit of variability.

Koeberlinia spinosa Zuccarini var. **verniflora** Bogusch, var. nov. A thorny leafless shrub up to 2 meters high; branches bright green, *attenuated,* 3-5 cm. long, sometimes only 1.5 cm. long in extreme cases, *tapering gradually* to the apical thorn; vesture of unicellular puberulence, more common near inflorescence; flowers in *open fascicles,* rarely umbellate; fruit as in the species. *Flowers in March and April.*

Frutices, aphylli, subglandulosi, ramosissimi, graciles; rami teretes, ramuli spinosi, viriduli, 1.5-5 cm. longi. Flores albi, parvi, fasciculati sub ramulorum apicibus. Pedunculi fructiferi subglandulosi.

Co-type: Fred Warren 1049, "Dry gravelly soil, Rio Grande City, Texas."

Type: Bogusch & Molby 4365, "Pasture near Weslaco, Texas."

STATE COLLEGE OF WASHINGTON
PULLMAN, WASHINGTON

A Wild Flower Pilgrimage

GEORGE T. HASTINGS

The early spring flowers of the desert and semi-desert regions of southern California make a remarkable display. Equally remarkable is the interest they arouse in the residents of the region. From the middle of March to the middle of April thousands of people make auto trips of from one hundred and fifty to two hundred and fifty miles just to see the flowers. This spring on several consecutive Sundays as many as five thousand cars were estimated to have gone over the Ridge Route from Los Angeles and Pasadena to the San Joaquin Valley to see the lupines. It is certainly no exaggeration to say that one hundred thousand people came from various directions during the three weeks that the flowers were at their best. For some weeks previously the newspapers carried articles as to the outlook for a good show of flowers and directions as to where and when to go. The Automobile Association of Southern California did much to arouse interest. Filling stations on the roads to the valley hung out signs "Wild Flower Information" and sometimes had bunches of the different flowers in bottles to show what could be looked for. In some stations the flowers were named, in others the proprietors had but the haziest idea as to what the flowers were, but all could direct autoists to the best fields of bloom.

When we stopped at a little plateau on the Grapevine, the last section of the Ridge Route as it leads down into the valley, we looked out over an inspiring sight. Possibly five hundred feet below and a mile away was a lake of brilliant blue and violet extending along the base of the mountain in a belt of from half a mile to over a mile wide. Scores of other cars were parked by us with hundreds of people enjoying the sight. Descending to the valley floor we found the ground so thickly carpeted with lupines, mostly *Lupinus nanus,* that one could not step among them without crushing some flowers. The dense covering of blue stretched for miles in both directions. Close at hand other flowers could be found with the lupines. A yellow evening primrose, *Oenothera dentata campestris,* only four or five inches high, formed a stratum below the taller lupines. Blue and white flowers of a gilia, *Gilia tricolor,* pink heads of owl clover, *Orthocarpus purpurascens,* and dainty cream cups, *Platystemon californicus,* were abundant but largely hidden by the taller plants. Blue dicks, *Brodiaea capitata,* with a cluster of purple-blue flowers on a slender stalk, were scat-

tered through the fields. As we traveled further out into the valley the lupines became less numerous and the fields took on a yellow tinge from the primroses. Still further the lupines and yellow evening primroses were left behind and the ground was flecked with patches of white or pale pink from a large flowered Oenothera, *O. caespitosa,* the flowers two to two and a half inches in diameter, spread flat on the ground. With it there were a few wiry grasses and dwarfed plants of crane's bill, *Erodium cicutarium,* probably the commonest weed in this part of the state. These plants did not cover the ground completely, but let the soil show between everywhere. As we drove along somewhat parallel to the base of the mountains we found an area dominated by a peculiar plant that strongly resembled a very woolly thistle. From a rosette of white, spiny-toothed leaves grew a stem a foot to a foot and a half high, bearing from two to four globular flower clusters each surrounded by a circle of spiny bracts. The two-lipped flowers were violet or light blue, an inch long, with the lower lip delicately fringed. The odor of sage at once suggested the common name—thistle sage—which in the scientific form becomes *Salvia carduacea.* Further along the lupines became abundant again but with them were two composites of the Cichoriaceae with attractive large flower heads. One of these, *Malacothrix californica,* frequently grew in such quantities as to form large yellow blotches in the sea of blue.

All the flowers mentioned, except the *Brodiaea,* which grows from bulbs, are annuals. If there are sufficient rains in January and February they develop and cover the ground with the dense carpet of blue, violet, yellow or pink as we had seen it. In a few weeks seeds mature, the plants die and the region is a desert until the following spring. If rainfall has been scanty, but few plants develop and they flower and set seed when only a few inches high.

In the notices in the papers it had been suggested that flowers should be picked in moderation. Most of the people we met had picked flowers, but none had large bunches, and though the total number picked must have run into hundreds of thousands on a single Sunday, no thinning of the masses was noticeable.

A few weeks later in other regions there were equally beautiful displays of California poppies that other thousands from the cities visited. It is inspiring to find such interest in and love for the flowers and note that the idea of conservation has such a strong hold on the people.

BOOK REVIEW

Johnson's Taxonomy of Flowering Plants

No matter what may be said to the contrary, a knowledge of the names of plants and of their proper place in classification remains a basic essential of botanical knowledge and botanical research. The few who might deny this fail to realize that their own use of names permeates all their botanical study and that they rely on the work of others in this line even though they do not contribute to it themselves. Of late years, actual instruction in systematic botany in America has been considerably reduced, until there has become a pretty well developed appreciation of the deficiency and a desire often expressed for more and better teaching of the subject. One hindrance to this has been the lack of a suitable textbook, another the lack of experienced teachers. We can not expect a teacher without experience in systematics to be the best teacher of the subject, nor to teach it at all without a textbook to serve as a guide, while a person who has a personal knowledge of the subject can teach it without a text. Experience with plant classification usually begins with acquiring a knowledge of the local flora, and our modern Ph.D. mills neglect that phase of education to a lamentable extent. So the desire to extend the knowledge of systematic botany through the younger generation has largely failed for lack of suitable teachers and suitable texts.

In the past three years three textbooks of systematic botany have appeared in this country, and it is with the latest of these that we are now concerned.[1]

Dr. Johnson brought to his task of preparing this large volume the experiences gleaned through several years of teaching the subject. During this time he learned to distinguish between one body of facts which are of direct use to the student in acquiring a general knowledge of the subject and another body which represents the end to be attained. The first includes the principles on which classification is based, the preliminary information, mostly morphological, necessary to its comprehension, and the methods by which a plant may be placed in its proper category in the general scheme. The second includes the morphological characteristics

[1] Johnson, Arthur Monrad. Taxonomy of the flowering plants. pp. xxi + 864. 478 figures. The Century Company: New York and London, 1931. $7.50.

of the various groups and the more important plants contained in them. The first represents information which the successful student should carry with him permanently; the second a mass of statistics which are best carried in a conveniently available book of reference rather than in the student's memory. We all realize that it is beyond the power of any person to know all the hundred and fifty thousand species of flowering plants, or the thousands of genera, and we doubt if even such men as Hooker or Engler could place any plant into its proper family at sight. With most of us, lack of contact with possibly half of the three hundred families soon dims them in our memory, but every botanist should recognize at sight at least twenty-five of the larger families, excepting of course the aberrant members, which often baffle even the specialist. But if he has the general principles well in mind, and has access to a proper reference book, he should soon be able to locate any other plant in its proper group. This seems to be the goal which Dr. Johnson would reach in his teaching, and with it we are heartily in accord.

We have no doubt that one of his students will recognize without difficulty a composite, an umbellifer, a crucifer, or members of many other families at sight, no matter where he finds them, but we wonder whether that recognition will come as a result of the application of the general principles presented in the book, or by comparison of the flower with the recollection of other flowers which he has seen in his field or laboratory work in Dr. Johnson's class. For example, if a student traveling in South Africa is attracted by a handsome tree with silvery foliage, will an examination of the flower convince him that he is dealing with the Proteaceae, having a specimen of *Leucodendron* before him? As a still more difficult case, consider the family Flacourtiaceae, which contains a remarkably diverse assemblage of plants. According to Dr. Johnson, the flowers may be hypogynous, perigynous, or epigynous; the sepals 2 to 15; the petals none to 10 or more; the stamens few to many, free or united in bundles; the carpels 2 to 10. We wonder if a student can place a plant in this family accurately, or even in the order to which it belongs, and if he should guess the family, whether he can verify his guess by reference to any information about it which Dr. Johnson gives. Reference to his chart on page 150 indicates that the Parietales, to which the Flacourtiaceae belong, have sepals and separate petals. How can

the student be expected to place into this order an apetalous flacourt, of which there are many?

However, the proof of the pudding is in the eating, and we trust that a study of the textbook will give a student a more general familiarity with plant families than we have indicated by these two possible exceptions, although there are many more of the same sort which might be enumerated.

More than half of the book, 537 pages, to be exact, is devoted to a general description of the groups of angiosperms. A condensed description is given of each order, followed by a list of the families and a key to the more important ones which an American student is likely to meet. Then each family is discussed in turn, with a statement of its characters, the number of genera and species, mention of the more important genera, and often special mention of particular species. The amount of space assigned to each family is in general proportionate to its importance, measured by its size, its representation among the economic plants of the world, and its development in America. This assignment is largely a matter of opinion and deserves no criticism: personally we should not have devoted half a page to the three genera *Didiplis, Rotala,* and *Decodon* and the same amount to such an important family as the Dipterocarpaceae.

There is no doubt that the use of such a book will be chiefly in the United States, and that there is good reason for discussing the native families in more detail than those exclusively tropical. The mere fact, however, that many tropical families will be known to the average student only through the printed description is an excellent reason for demanding absolute accuracy of statement about them. Let us take for example the large and important family Malpighiaceae, which is very properly included in the author's "Key to the principal families" under the order Geraniales on page 322. There the family is keyed out as having regular flowers and carpels splitting apart at maturity; it is spelled "Malphigiaceae", which scarcely does credit to the book. Now a great many plants of the family have irregular flowers and two of the large genera (*Byrsonima* and *Bunchosia)* as well as many smaller ones have fruits which do not separate at maturity. The matter is stated correctly, to be sure, in the discussion of the family on page 335, but the key is invalidated by such an error and the student should not be required to check the accuracy of each statement by reference

to another part of the book. Turning next to page 410 and 411, we find that the Melastomataceae are very properly placed in two sections of the key, but in the latter citation are said to have usually a corona between the petals and stamens. We have dissected flowers of some hundreds of species of this family, representing practically all American genera, and do not know of a single one with a corona. Possibly the author has good authority for his statement, but a greater familiarity with the group would not have encouraged him to use the word *usually*, to say the least. We turn on to page 610, where a key to the orders of monocotyledons is presented. Such a key may serve either or both of two purposes, to give a general conspectus of the orders, or to aid the student in placing a plant. In both cases it fails. The orders Helobiae and Triuridales are placed together at the end of the dichotomy and characterized as follows: "Stamens and carpels numerous to one. *Helobieae.*" "Stamens 3-6. Carpels indefinite. Perianth of 3-8 segments. *Triuridales.*" On the same page two other important orders are separated in this wise: "Stamens varying from one to six. Carpels 1, 2, 3, or several. *Farinosae.*" "Stamens 6 or 3. Carpels 3, rarely fewer or more. *Liliiflorae.*" These certainly impress one as a distinction without a difference. In the latter case, the orders are actually separated chiefly by the nature of the endosperm, and I doubt if any one character which is not more or less recondite in nature can be found to divide the two. The Farinosae are keyed out on page 654, where four families are characterized by having 3 carpels and contrasted with two others which have carpels 2 or 3. Such a statement does not show why the families are distinguished by taxonomists nor can it help the student in locating a plant. Such examples could be multiplied considerably, but there is no use in mentioning others.

No less than 55 pages are assigned to a bibliography, including probably nearly a thousand titles, and divided into several sections according to subject. Full of errors in citation, omitting many important works, including many unimportant ones, this part of the book is certainly fearfully and wonderfully made. In the first place, it is unbalanced. A list which includes such books as Eaton's *Manual*, now of historical importance only, should certainly include other books of equal importance but now similarly antiquated. Some such works can be found but by no means all of the most important. If Ledebour's *Flora Altaica* and *Flora*

Rossica are included, why not such a monumental work as Boissier's *Flora Orientalis*? And if the *Prodromus* is mentioned, why not its continuation as the *Monographiae?* Then there is the matter of omissions. We fail to find any of Small's minor works on the flora of Florida, nor even the *North American Flora,* except an individual reference to a portion of one number, by Rydberg. The remainder of that one part was filled by a contribution of the reviewer; possibly that is a reason why we criticize the whole bibliography, but we still believe Ascherson and Graebner's *Synopsis* should have been at least mentioned. Neither do we find any mention of the *Index Kewensis,* except a citation of the fifth supplement alone, nor of the *Index Londinensis.* Furthermore, the list is simply brimming with errors, although every botanist is or should be taught that correctness of citation is always essential. Thus we find Leroy Abrams, instead of LeRoy; N. J. Anderson instead of Andersson; W. P. O. Barton, instead of W. P. C. Barton (credited with the authorship of the *Flora Cestrica*!), Walter Dean instead of Deane; Stephen Elliot instead of Elliott; W. U. Fawcett instead of W. Fawcett; S. F. Gray's Natural Arrangement of British Plants published in 1921 instead of 1821; G. J. Hooker instead of W. J. Hooker; Micheaux instead of Michaux; F. S. Milspaugh instead of C. F. Millspaugh; P. O. Standley instead of P. C. Standley; J. T. Buckholtz instead of Buchholz; Marong instead of Morong; C. C. Dean instead of Deam; Marriam instead of Merriam; even the senior botanist of the author's own university will find his name misspelled Setchel. The reader of this review must not understand that these are all the errors: anyone can find more, some exasperating, some merely amusing. H. S. Pepoon is given the authorship of *Synopsis Plantarum* in 1805, and possibly the climax is reached when we find that *Species Plantarum* was written by L. Linnaeus!

Who is to blame for such an extraordinary series of errors? One would think that every botanist could give Linnaeus the proper initial and therefore would wish to put the responsibility on the printer. But surely someone read proof and let these errors go through. Even my friend Robert W. Hegner, editor of the series, can not entirely escape responsibility. One sighs for the pen of a Fernald, to give these evidences of carelessness proper attention.

The actual information which the student needs to grasp the

classification of plants is brought together on pages 19 to 147, which read much like the old *Structural Botany* of Gray, which many botanists will still remember from their youth. It includes the external morphology and terminology of the flower, the fruit, the inflorescence, and the various vegetative organs. If these structures and organs are the sole basis of classification, then systematic botany becomes an elementary subject, adapted to freshmen, while the experience of the reviewer is that it is an advanced subject which requires considerable previous botanical training for its appreciation. Identification of plants and recognition of families or species are the elementary parts of the science and may be learned in high school, while an understanding of the whys and wherefores of classification demand much more preparation. One finds in this book nothing about the discoveries in paleobotany which throw light on modern classification, nothing about the general nature of evolution, nothing about the contribution of plant anatomy to an understanding of plant relationships.

This is not derogatory to the inclusion of so much text on gross morphology. That subject is now seldom or poorly taught in secondary schools and usually neglected completely in college; it must be presented somewhere to the student in taxonomy. Armed with such information a student can identify a plant and can understand the great number of terms used in describing it. But he can not appreciate classification unless the rudiments, at least, of all the diverse body of botanical knowledge used in developing our modern classification are known to him. He may properly acquire such information in other courses, but its application to taxonomy should be presented in the taxonomy course itself. That the author is fully aware of this situation may be seen at once from his statements on page 17.

Chapter II presents in five pages all that the author considers necessary on such important subjects as nomenclature, the concept of the genus and species, and phylogeny, and Chapter I in eleven pages sketches the historical development of classification. Both of these chapters might be considerably extended with benefit to the student.

Lastly, we come to the introduction, which goes far toward explaining the general motive of the author. Laboratory drawing, he says, is generally vastly overdone in college work. We agree with him. The field-trip should be a dignified part of the course.

We agree thoroughly. The technical terminology of taxonomy can not be eliminated. That is correct. But "phylogeny should not be made a fetish." There, in our opinion, lies the fundamental difference between an elementary course in taxonomy, suitable for students without previous botanical experience, and an advanced course. Since 1859, phylogeny has been the sole basis of every system of classification proposed. Every system is intended to represent its author's idea of the course of evolution in plants. Every person who describes a new species or a new genus does so because he wishes to express an idea of plant relationships and hence of their phylogeny. Every botanist who changes the location of a family to a new position in the general scheme does so to demonstrate his idea of its phylogeny. When Engler began his system with the Pandanaceae and Typhaceae, he did so because he thought those families stood nearest the bottom of the phylogenetic tree, and said so definitely in his summary of general principles. The whole subject consists of just two parts: first, the extension of knowledge by the discovery of hitherto unrecognized forms of plants, the "new species" of the world's flora, and second, the arrangement of all plants into an orderly sequence. The first subject is not discussed by the author at all; the second is clearly recognized by him on page 3. Theophrastus' classification into trees, shrubs, and herbs was orderly; Linnaeus' sexual system was very orderly, but neither of them is satisfactory today. The order which we seek is an expression of evolution, of phylogeny. This the author also recognizes on page 6, even though he previously deprecates it on page xi.

The system of classification which he accepts is that of Engler, with the comparatively few changes introduced by Engler and Gilg in the last edition of the *Syllabus*. He summarizes the scheme for the Dicotyledons on page 150. Turning back to page 31, we find that he also presents in tabular form the "direction of evolution in flowers" followed by the "characters of a primitive flower." Neither he nor anyone else can reconcile the position of the Piperales at the bottom of the classification with these statements; that is, he deliberately rejects a scheme based on his own ideas of phylogeny in favor of one which is not phylogenetic according to his own standards. His system is of course orderly and therefore satisfies his own definition, but as far as being phylogenetic is concerned, he might almost as well have followed Linnaeus.

It is not a question of a difference in opinion between the author and the reviewer on the course of angiospermous evolution, in which we seem to agree. It is merely a question of the importance of phylogeny in teaching. The author says that phylogeny is overdone (p. xi), that the system which begins with the Magnolias and their relatives, standing at the bottom of the series according to the author's own statements, "has the disadvantage of being rather involved and rendering it difficult to place quickly in its proper category any plant that may be in hand" (p. 11), and that "we shall find little difficulty in placing a flower" in the categories which he adopts (p. 151). The reviewer says, after teaching nineteen classes in taxonomy, that phylogeny is the ultimate end of all classification, that emphasis on phylogeny furnishes a motive to the course and lends zeal to the student, and that the principles of the Besseyan system are so easily grasped by the student that he finds relatively little difficulty in placing a plant in its proper category.

We admit that a plant can be identified with some degree of completeness by any system of classification. If that is the sole aim of a textbook, let us use the Linnaean sexual system. We maintain that phylogeny is the aim of a course in taxonomy and the basis of classification. If our contention is true, then the book before us has failed in its purpose.

H. A. GLEASON

FIELD TRIPS OF THE CLUB

Field Trip of Sunday, March 15

Snow lingered on the northern slopes of the hillsides in the Ramapo Section of the Harriman State Park, on the field excursion of Sunday, March 15, and although the elm and maple buds were swelling, the alder catkins turning a lighter hue, and the willow twigs bright yellow, floral signs of spring were lacking. Not even a skunk cabbage spathe could be found. Spring comes a week or two later in these hills, a thousand feet above the sea level, than on Long Island. So botanizing turned to the mosses and liverworts, some of which displayed plenty of persistent capsules, ripened the previous autumn, and some showed the beginnings of new growth, especially on the brooks on southern slopes. *Georgia pellucida, Brachythecium plumosum, Pogonatum brevicaule* and *Webera sessilis* showed plenty of capsules. An interesting species, without capsules, but identifiable by the leaves, was *Fissidens taxifolius,* a tiny member of this genus, with leaves under the hand lens quite suggestive of the yew. Two liverworts, *Conocephalum* and *Plagiochilia,* though submerged by the brooks high with melting snow, showed bright new growth. A dozen members of the Torrey Botanical Club were joined, for part of the walk, by twenty members of the Trail Campers of America, from their camp on Stony Brook, near Sloatsburg.

Raymond H. Torrey

Field Trip of Sunday, March 22

Spring was obviously nearer, but not quite definitely declared, on the excursion on Sunday, March 22, to Cushetunk Mountain, in Hunterdon County, New Jersey, led by Mrs. Gladys P. Anderson. A few green things, grasses along the brooks, chickweed in the plowed fields, and red maple buds soon to blossom, gave promise of spring, in spite of the raw, cloudy day. But, as the excursion was primarily for lichens, it did not matter: they were easy to observe, on rocks, trees and earth. Mrs. Anderson, who is one of the most expert members of the Club in this interesting class of symbiotic cryptogams, had taken a great deal of pains to make her explanations effective. She had prepared a two-page typewritten list, giving about fifty species which she expected to find, and distributed the lists among the group. Many of the

species were found readily, especially various cladonias, with differing forms of apothecia; physcias, with their tiny black spore disks, on tree bark; peltigeras, and others. She explained the characteristics of the lichens, which, to her, seem particularly interesting, because they are so primitive, and yet adaptive to various environments; flexible and plastic and not so fixed in their habits as the higher, flowering plants, which have adopted definite forms and keep to them; the lichens are still experimenting in their methods of subsistence and reproduction, and are capable of renewal by cell divisions, or by casting off parts of their thalli (soredia) which grow into new individuals when conditions may not encourage, even for many years, the production of spore bearing organs. Mrs. Anderson pointed out that certain species favor one kind of rocks, and others another, and as the region around Cushetunk Mountain is remarkably varied in geological formations, quite different species are found sometimes exclusively on one kind of rock and not on the others. Cushetunk Mountain is a horse-shoe shaped ridge of basalt rock, similar in nature to that of the Palisades, enclosing a sandstone valley (Brunswick shale phase of the Newark formation). The same sandstone is found on the south flank of the horseshoe, then another narrow ridge of basalt, and to the west, are successively, limestone, gneiss, limestone, quartzite and sandstone (Stockton formation), each sustaining characteristic lichen forms. The region would be interesting to study to see if the higher plants show differences based on the differing rocks. Two large limestone quarries were interesting, and a solitary plant of the lime-loving maidenhair spleenwort had established itself in a crevice left when one of the openings was abandoned, at least fifty years ago.

Extraordinarily large and long branched plants of the nightshade, *Solanum Dulcamara,* grew on the walls. Another Solanum, *S. carolinense,* was found with persistent yellow berries from the previous fall, in abandoned plowland, underlaid by the Kittatiny limestone, north of the quarries. (Does this genus prefer limestone soils?) Some algae and lichens had become established on the raw limerock. Notable mineral features were incipient stalactitic formations, deposited by water creeping down an overhanging wall, into oddly lobed and fluted buff-colored smooth-surfaced masses; and a bright bluish coloring on some of the rock, possibly due to a small amount of manganese. On the farmhouse on

the quarry property were several large and ancient box shrubs, at least a century old. The party crossed the various formations rather sharply defined on the surface by fault boundaries, one of which, between the gneiss and sandstone and limestone, is the great fault, the Logan Line, which crosses New Jersey at the eastern border of the older rocks, but noted no apparent differences in tree flora, although it was obvious that the farmers had chosen the limestone areas for their plowlands, and left the forest on the gneiss and quartzite; or else that the trees had retaken the older rocks while the limestone areas remained in fields and pasture. Mrs. Anderson promises a field excursion for the club sometime to be devoted to ecological effects of geological formations on the occurrence of lichen species. The party made the trip, which was held jointly with the New York section of the Green Mountain Club, in automobiles, ten cars, with about forty persons, ten members of the Torrey Botanical Club, seventeen of the Green Mountain Club and the rest guests of both. One interesting and beautiful moss was noted, *Bartramia pomiformis,* with capsules persistent from the previous season, dry and withered, but still showing the pretty fluted urn shape.

RAYMOND H. TORREY

FIELD TRIP OF SUNDAY, MARCH 29

The special quest of this early spring outing into the heart of the New Jersey Pine Barrens was to find Conrad's broom crowberry in blossom. The particular location chosen to find this rare plant was the place discovered by Dr. John Torrey about ninety years ago. Subsequently the stand was lost, and rediscovered by Dr. N. L. Britton and Witmer Stone fifty years later. In an article published in the N. Y. *Evening Post,* describing this crowberry, Mr. Raymond H. Torrey states "A strange location for such a sub-arctic plant, a relic of the last ice period, thriving in these hot sands 40,000 years after the glaciers that drove it south melted away. Not beautiful, except under the hand lens, but a sturdy survivor of ancient plant associations, many of the former elements of which have migrated northward and no longer exist in the region."

The crowberry was not in general flower, the season being about one week later than usual, but a few sprays were found in flower. Arbutus and the characteristic Pine Barrens plant pyxie

(Pyxidanthera barbulata) were abundantly found in bud, but not in open flower. Other plants found which are abundant in the region were:

Cassandra *(Chamaedaphne calyculata)*
Bearberry *(Arctostaphylos uva-ursi)*
Pine barrens Heather *(Hudsonia ericoides)*
Inkberry *(Ilex glabra)*
Mountain Laurel *(Kalmia latifolia)*
Sheep Laurel *(Kalmia angustifolia)*
Sweet Pepperbush *(Clethra alnifolia)*
Pitch Pine *(Pinus rigida)*
White Cedar *(Chamaecyparis thyoides)*
Red Cedar *(Juniperus virginiana)*
Pitcher Plant *(Sarracenia purpurea)*
Cranberry *(Oxycoccus macrocarpon)*

Forty members and guests made the West Plains Pine Barrens trip, motoring from Newark and New York.

Wm. Gavin Taylor

Field Trip of Sunday, April 5

Forty members and guests of the club visited the region on the east side of the Hudson River, opposite Bear Mountain Park, including Anthony's Nose, Sunday, April 5. Spring flowers were delayed in bloom, owing to cool weather, only a few hepatica blossoms appearing, while arbutus was still in bud. Spring fruiting mosses were in good condition, with plentiful fresh capsules, on *Pohlia nutans, Ceratodon purpureus* and *Mnium cuspidatum.* A few spears of *Veratrum viride* showed along the brooks. After visiting the Nature Trails at Bear Mountain the party crossed the bridge and first inspected the stand of southern bald cypress, *Taxodium distichum,* at the edge of the cattail swamp, east of Manitou station on the New York Central Railroad. This occurrence, the farthest north outside of cultivation known to the writer, awaits explanation, as to whether it was established as a pioneer northern stand, possibly seeded by migrating birds; or by branchlets dropped from trees somewhere nearby in cultivation and carried to the spot by the waters of the Hudson, and into this backwater by some extremely high tide through an opening in the railroad tracks one mile south of the spot, which drains the swamp. No cultivated Taxodium is to be found about the houses on the

slope above, and the nearest one known to the writer stands on a street in Highland Falls, three miles up the Hudson and on the opposite bank, far from the river.

There are seven trees in the stand; two probably about thirty or forty years old; three about twenty years old, and two ten years old or younger; the younger ones evidently the progeny of some of the older of the group. One of the older trees is in an unhealthy state, with a long bark wound, possibly due to a lightning stroke. The others are apparently quite healthy. No seedlings, or specimens younger than the ten year olds were seen. They grow along a brook descending from the upland and entering the cattail swamp. The older ones stand among a group of gray birches; the younger are more in the open, among willows and cattails. The brackish water from the Hudson reaches them rarely if at all, as the location is two or three feet above high tide level. There is no sign of knees about them, but the butts of the older ones have the characteristic pyramidal swelling and fluting.

Lemna was found in plentiful development at this early date in a pool near the old abandoned mine in a pyrrhotite deposit which was worked years ago for its sulphur content. An interesting feature of the regions south of Anthony's Nose, in the northern part of the territory of Camp Smith, was the system of trails marked by Colonel William R. Wright, Chief of Staff of the New York National Guard, named, in part, for places in Belgium and northern France, where the Twenty-seventh New York Division fought under British general command, in the breaking of the Hindenburg Line in the autumn of 1918. The pond dammed at the head of Broccy Kill, and the rills entering it, are good places for the study of wet woods flora.

RAYMOND H. TORREY

FIELD TRIP OF SUNDAY, APRIL 12

A party of fifty, consisting of members and guests of the Torrey Botanical Club, and the Westchester Trails Association, rambled over Dunderberg Mountain, on Sunday, April 12, going from Tomkins Cove to Timp Pass, up the Six Chins Trail and over Bockberg, Baldberg and Dunderberg and down the old railroad grade to the river. *Hepatica triloba* was in abundant bloom in many shades; but there seems to be no rule about this variation in coloration from white to deep purple, as to degrees of light and shade.

Arbutus was in bloom, and fairly frequent in occurrence. Poison poke, *Veratrum viride,* was plentiful and well advanced. The deep red pistillate flowers of the beaked hazel, *Corylus rostrata,* were admired under the hand lens. The mosses found on April 5 were plentiful and farther advanced, and in addition was found the quaintly beautiful apple moss, *Bartramia pomiformis,* with its globular capsules. Some attention was paid to the lichens of the genus *Cladonia,* the species *pyxidata, cristatella,* and *fimbriata* being common. Fresh beaver workings were observed in a swamp south of the Timp. They obviously prefer the aspen, *Populus tremuloides,* for food and building material where they can get it, but in one case had felled a blue beech, *Carpinus caroliniana,* four inches in diameter, which must have been tough going even for their strong teeth. The purple early leaves of the wood betony, *Pedicularis canadensis,* were striking in hue. It was noted that some of the capsules of mosses which fruit in autumn and which persisted through the winter, were still holding spores, which were discharged by brushing them lightly; this was true of *Catharinea,* and *Dicranella.* Another pretty moss was *Polytrichum piliferum,* with its narrow capsules, distinctly lance-like at this season.

RAYMOND H. TORREY

FIELD TRIP OF SUNDAY, APRIL 19

On April 19 a joint excursion of the Torrey Club and the Metropolitan Council of Geography Teachers was led by the writer and R. C. Geist, members of the respective associations. Thirty-two members and guests were present.

The day was ideal, and the route lay along Pelham Road until just beyond the City Island cross road, where a by-path was followed, detouring around the very considerable auto traffic on the main road. Here were found the yellow adder's tongue or fawn lily, the grape hyacinth, which Gray says is a garden escape, and the crinkle-root or toothwort, *Dentaria diphylla.*

ZAIDA NICHOLSON

PROCEEDINGS OF THE CLUB

Meeting of March 3, 1931

The meeting was called to order by President Sinnott at 8:15 P.M. at Columbia University, Schermerhorn Extension, with 125 members present.

An invitation was extended to the Torrey Club to meet at the Brooklyn Botanic Garden on Wednesday afternoon, March 18. The invitation was accepted by the club.

A special program of exhibits of educational material and demonstrations of research work in progress had been arranged by Dr. R. C. Benedict and others in the various laboratories of Schermerhorn Extension and in the Greenhouse. For the sake of a record, as well as to show the great latitude of subjects presented, the list is given herewith in full.

Exhibits and Demonstrations

1. Teaching devices and helps:
   A. A laboratory study of variation. R. C. Benedict.
   B. Common vegetables in the classroom. R. C. Benedict.
   C. Models made by pupils. Frances Schiller.
   D. Diagrams for testing and drilling. Gertrude R. Twomey.
   E. Collections of cereals. G. M. Reed.
   F. Exhibit of a model of mitosis. Olga Hingsburg.
2. Experiments with the cabbage group. R. C. Benedict.
3. Histological differentiation among species. J. E. Adams.
4. Demonstration of some brine-loving algae. T. E. Hazen.
5. Forcing pitcher plants for class work. T. E. Hazen.
6. Demonstration of the importance of oxygen for plant growth. Barnard College Department of Botany.
7. *Bryophyllum crenatum* for study of vegetative reproduction. Barnard College Department of Botany.
8. Grafting *Coleus* as a laboratory exercise. Barnard College, Department of Botany.
9. Opening fern sporangia by means of glycerine. S. C. Bausor.
10. Stone cells in fruits. S. C. Bausor.
11. Thallus variations in *Marchantia*. Irene Hackett.
12. Growth and bud formation in moss protonema. Mildred McAusland.
13. Theoretical considerations of cell shapes. E. B. Matzke.
14. Flower variations in the chickweed, *Stellaria*. E. B. Matzke.
15. Demonstrations in general elementary botany. E. B. Matzke.
    A. Slime mould sporangia.
    B. *Pilobolus* and its light response.

C. *Aspergillus*—cultures differing in color.
D. *Monilia sitophila*—habit and spore formation.
E. Rusts—demonstrations and models.
F. Root pressure in *Fuchsia.*

16. Wood and leaf specimens of *Haematoxylon campechianum* from which haematoxylin was formerly obtained. W. C. Meyer.
17. Seedlings of *Achras zapota* from which chicle is obtained, blocks of chicle, machetes and gouges employed in tapping in British Honduras, together with *Pestalozzia* diseases. J. S. Karling and Estelle M. Hazard.
18. Demonstration of chemically simulated organisms. Illo Hein.
19. Demonstration of various smuts of cereal grains. Laura Kolk.
20. Demonstration of mosaic disease of tobacco. Bessie Goldstein.
21. Cryptogamic Laboratory: frieze of the Fox paintings of mushrooms with the Gibson collection of original drawings hanging beneath; also, a simple Wardian case for laboratory plants and an algal aquarium.
22. Exhibit of fungi parasitic on man. Laboratory of Medical Mycology and Department of Dermatology, College of Physicians and Surgeons.
23. Variations in *Pediastrum.* R. A. Harper.
24. Microprojection as applied to high school teaching. C. A. Gramet.
25. Cultures of the fungus *Colletotrichum* which parasitizes orchids in the tropics. Sylvia O. Segall.
26. Cultures of bacteria which cause black rot of cabbage and infected cabbage specimens. Dorothy Meier.
27. Demonstrations of fixed and stained plant preparations by the members of the Cytology Class. G. M. Watkins.
28. Dissected conifer embryos. G. M. Watkins.
29. Formation of starch grains from body of chloroplast in *Pellionia.* G. S. Avery.
30. Anatomy of the tobacco stem. G. S. Avery.
31. Anatomy of grain seedlings. G. S. Avery.
32. Demonstration of fern prothallia. J. T. Perry.
33. Exhibit of Polygonaceae. J. T. Perry.
34. Battery of water stills with quartz condensers. Mary L. Mann.
35. Zinc stimulation of *Aspergillus.* Mary L. Mann.
36. Calcium unessential for growth of *Aspergillus.* Mary L. Mann.
37. Fluctuation of leaf temperature with changing light intensity. Harold H. Clum.
38. Relative effects of red and blue light on phototropic bending. Robertson Pratt.
39. Antagonism between calcium and potassium nitrates. Robertson Pratt.

40. Influence of calcium on root-hair production. Robertson Pratt.
41. Protoplasmic streaming in cells of *Elodea*. Jennie Glazer.
42. Separation of chlorophyll *a* and chlorophyll *b*. Dora E. Marcy.
43. Sorghum seedlings as material for the demonstration of Mendel's law of heredity. Dora E. Marcy.
44. Spectroscope: absorption spectrum of chlorophyll. Ronald Bamford.
45. Bloodred fluorescence of chlorophyll. Ronald Bamford.
46. Growth of wheat as influenced by boron. Helen S. Morris.
47. Growth of wheat roots in relation to hydrogen-ion concentration of culture solution. Helen S. Morris.
48. Incubator for germination of seeds. Helen S. Morris.
49. Culture chamber with rotating table and thermostatic control. Helen S. Morris.
50. Conduction of stimulus in sensitive plant. Marjorie Cotton.
51. Anesthesia of sensitive plant. Alan Martin and E. A. Weiss.
52. Clinostat for equalizing stimulus of gravity. Marjorie Cotton.
53. Upward movement of dyes through xylem vessels. S. F. Trelease.
54. Auto-irrigators. E. H. Fulling.
55. Bud variation in *Coleus*. A. B. Stout.
56. Photosynthesis and respiration of aquatic plants. J. J. Copeland.
57. Effect of temperature on locomotion of Beggiatoa. J. J. Copeland.
58. Some hot spring sulphur bacteria from Wyoming. J. J. Copeland.
59. Cytological modifications resulting from culture solutions. Ronald Bamford.
60. Germination of wheat seeds for solution culture experiments. Ronald Bamford.
61. Corn seedlings in solution culture. S. F. Trelease.
62. Magnesium injury of wheat. S. F. Trelease.
63. Soil points for measuring water-supplying power of soils.
64. Porous cup atmometer for measuring evaporation as a climatic factor.
65. Synchronous motor time switch.
66. Rotating tables for assuring equal exposure of cultures to environmental conditions.
67. Steam operated Barnstead Still.
68. Leaf variation in Boston fern. R. C. Benedict.
69. Difference in dormancy between royal ferns collected in New Jersey and in Florida. R. A. Harper.
70. *Abutilon Thompsoni:* variegated and healthy forms.

At 10 o'clock refreshments were served by the entertainment committee.

Respectfully submitted,

FORMAN T. MCLEAN, *Secretary*

Meeting of March 18, 1931

The meeting was called to order by President Sinnott at 3:30 P.M. at the Brooklyn Botanic Garden with 20 members present. In the absence of Dr. McLean the president appointed Dr. Graves secretary *pro tem.* The minutes of the meetings of February 18 and March 3 were read and approved.

The following candidates were unanimously elected to membership in the Club:

Dr. Anne H. Blinks, 447 E. 65th St., New York, N.Y.; Prof. William S. Cooper, University of Minnesota, Minneapolis, Minn.; Dr. George B. Cummins, Agric. Expt. Sta., Purdue University, Lafayette, Indiana; Miss Evelyn I. Fernald, Boyce Thompson Institute, Yonkers, N.Y.; Miss Sarah E. Hawthorne, 1021 Trinity Ave., New York, N.Y.; Dr. Wm. A. Kuntz, Citrus Experiment Station, Box 6, Lake Alfred, Florida; Miss Mildred C. McAusland, 114-35 148th Street, Jamaica, L.I., N.Y.; Dr. Fredda Doris Reed, Mount Holyoke College, South Hadley, Mass.; Dr. R. E. Stone, Ontario Agric. College, Guelph, Ont.; Dr. Alexander V. Tolstoouhov, 24 Arden Street, New York, N.Y.; Dr. Winona N. Welch, Dept. of Botany, DePauw University, 25 South Vine Street, Greencastle, Indiana; Prof. Wm. H. Weston, Jr., Farlow Herbarium, 20 Divinity Avenue, Cambridge, Mass.

For the scientific part of the meeting Mr. R. Bamford of Columbia University presented a paper entitled "Cytological Studies of Sterile Violet Hybrids." An abstract, kindly furnished by Mr. Bamford, follows.

A detailed description was given of morphological characters, pollen, chromosome numbers, and meiotic divisions preceding microspore formation of four sterile F_1 violet hybrids produced by cross pollinations. The hybrids are as follows:

V. incognita Brainerd, x *lanceolata* L.
V. pallens (Banks) Brainerd x *cucullata* Ait.
V. silvatica Fries x *striata* Ait.
V. elatior Fries x *striata* Ait.

(female parent given first in each case)

The results indicate that chromosome numbers *per se* are merely an accompanying feature of the phenomena of fertility and sterility. The cell as the fundamental, vital unit is stressed,

rather than the conception of homologous chromosomes, as being the solution to the incompatibility problem.

Respectfully submitted,
ARTHUR H. GRAVES, *Secretary pro tem*

MEETING OF APRIL 7, 1931

The meeting was called to order by President Sinnott at 8:30 P.M. at the American Museum of Natural History with fifty members present.

The following candidates were unanimously elected to membership in the club: Mr. Hubert Vecchierello, O.F.M., St. Bonaventure's College, St. Bonaventure, N.Y.; Dr. Paul M. Patterson, University of South Carolina, Columbia, South Carolina; Dr. Flora A. Haas, A.S.T.C., Normal Station, Conway, Arkansas; Mr. Robert Stratton, 320 Hester Street, Stillwater, Oklahoma; Dr. Grace L. Clapp, Milwaukee Downer College, Milwaukee, Wisconsin.

Dr. William Crocker of the Boyce Thompson Institute gave an interesting talk on "Gas Injury To Plants," an abstract of which follows.

For a long time the citrus industry in California had been developing the proper color in their citrus fruits, especially lemons, by burning oil stoves at first in the storage houses and later at a distance from the storage houses, piping the gas into the houses. This industry insisted on the Bureau of Chemistry determining what gas was produced by these stoves that hastened the proper coloring of the lemons. In 1923, Dr. Denny made a study of this problem and found ethylene very highly effective in the coloring of the citrus fruit and that this hastened coloring was accompanied by 3-fold increases in respiration. He could apply it in the low concentrations ranging from one part in 5,000 of air to one part in a million with almost equally good results. Ethylene is now in general use in the citrus industry. Ethylene has been shown effective in hastening the coloring or ripening of many other fruits and has promise of considerable commercial application. Amongst the superstimulants found by Denny for dormant plant buds, a derivative of ethylene, ethylene chlorhydrin, is one of the best, if not the best.

All of the work, both on plants and animals, indicates that ethylene is an anaesthetic par excellence and has a very low degree of toxicity. In plants, in general, it acts as a stimulant, inducing growth in certain regions of the plant or accelerating it in other regions where growth is already occurring. It also hastens

respiration and accelerates the decomposition of chlorophyll in some fruits and leaves. Ethylene injury to plants can be distinguished from the injury caused by such toxic gases as sulphur dioxide, hydrogen sulphide, and ammonia. The latter gases cause the rapid killing of tissue, while ethylene causes injury largely by stimulating growth, or metabolism, and never shows quick killing or burning of the tissue. It stimulates growth of the abscission layers which produce the fall of petals or leaves or the extra growth on the upper side of the petioles of many plants which leads to epinastic response. It causes the development of intumescent growth on some stems and roots. In the rose, gardenia, and other leaves it causes the decomposition of chlorophyll along the midrib and the main veins. The chlorosis thus produced is just opposite to that produced by old age or by iron deficiency. In the latter cases the chlorophyll disappears between the veins rather than at the veins.

Since amounts of ethylene in the air that are far beyond chemical detection produce marked injuries in plants, a number of plants may be used as detectors of ethylene. Such test plants must be very sensitive to ethylene and must respond very quickly in order to be sure that they will detect any amount that will do serious injury to the most sensitive greenhouse plants and detect it before such injury can occur. In the work to date, a vigorously growing tomato plant has proved to be the simplest and best ethylene detector for this work. It will respond by epinastic growth of the leaves to about one part of ethylene in three millions of air and the response becomes visible to the eye within six hours. This is fully as sensitive as any other plant commonly grown in the greenhouse and the response is more rapid than the response in most other plants.

Doctors Zimmerman, Hitchcock and Crocker have made a study of more than 100 species and varieties of plants commonly grown in greenhouses. For these the critical concentration, the necessary time, and the nature of the response have been recorded.

Some plants are extremely resistant to illuminating gas. This is especially true of the ferns. Various varieties of the Boston fern endure concentrations up to 25 per cent of the atmosphere for many days without injury. The cyclamen is also very resistant, including both the flowers and the foliage. The cyclamen will withstand one per cent for three days without any apparent injury to flowers or foliage. Some greenhouse plants are extremely sensitive to illuminating gas. One part of ethylene in three millions of air will cause the yellowing of all of the leaves of Jerusalem cherry with three days' treatment followed by two or three days in pure air. It will also stimulate the fall of the cherry in a peculiar way, that is, by developing an abscission layer in the peduncle which causes the peduncle to fall with the cherry. Falling of

the cherry due to old age leaves the peduncle on the plant. With long exposure (3 to 6 days) to illuminating gas, the rose is also sensitive to relatively low concentrations. The leaves are more sensitive than the flower buds and in low concentrations show the gradual yellowing of the leaflets along the main rib and the side veins, finally leading to leaf and leaflet fall. This response will take place in dilutions of ethylene as high as one part in one million to one part in two millions of air with sufficient time of exposure. The lilies are somewhat less sensitive and show a killing of the bud but no injury to the foliage, especially in the higher dilutions. It has often been claimed for lilies, tulips, narcissi, and other liliaceous forms that the gas causes a distortion of the leaves. This is not true in any liliaceous forms studied except the paper white narcissus. In concentrations of ethylene of one part in 400,000 of air or greater, the end of the younger leaves of this plant rolls up into a coil, forming several complete circles. In higher dilutions of the gas only the buds are injured. In low concentrations of ethylene the vegetative growth is inhibited in most of the liliaceous forms during the time that they are in the gas but the growth proceeds again as soon as the plants are removed from the gas. If buds are already developed they are killed. The tulip is considerably more resistant to gas than other liliaceous plants but here, too, the bud is the most sensitive part and there is no injury to the foliage except reduction in its rate of growth. There is considerable varietal difference in the sensitiveness of tulips. These are only a few of the many plants that have been studied as to the effect of ethylene upon them.

From this knowledge of the symptoms produced by illuminating gas, along with the relative sensitiveness of various greenhouse plants, one can inspect a greenhouse during the time of injury and determine whether it is illuminating gas injury or other injury. Such a diagnosis can be further confirmed by placing tomato plants in the greenhouse as gas detectors.

Considerable damage has been claimed by various florists from illuminating gas. This work puts into the hands of the florist the best way of determining whether gas is present in the greenhouse at any time and thereby protects him against a continual period of injury from gas. It has also emphasized to the gas companies the extreme danger of injury to greenhouses from leaks in their mains in the neighborhood of greenhouses and is leading them to adopt precautionary measures commensurate with the danger.

The meeting adjourned for refreshments at 9:45 P.M.

Respectfully submitted,

FORMAN T. MCLEAN, *Secretary*

NEWS NOTES

DR. RALPH C. BENEDICT, at present chairman of the department of sciences at Haaren High School, New York City, has accepted the appointment of Associate Professor of Biology at Brooklyn College. Dr. Benedict will enter upon his new duties with the beginning of the fall term. He will continue to serve as Resident Investigator at the Brooklyn Botanic Garden, a position he has held since 1916.

DR. L. O. KUNKEL, pathologist at the Boyce Thompson Institute at Yonkers, has accepted an appointment by the Rockefeller Institute for Medical Research to head a new division of plant pathology to be established in connection with its department of animal pathology located near Princeton, New Jersey. The combined laboratories will hereafter be known as the Department of Animal and Plant Pathology of the Rockefeller Institute.

DR. R. H. CHENEY, Professor of Biology at Long Island University, has been appointed Resident Investigator at the Brooklyn Botanic Garden. This appointment is in line with the reciprocal relations recently established between the Brooklyn Botanic Garden and Long Island University, whereby students registered in accepted courses at the Brooklyn Botanic Garden and meeting the admission requirements of the University can receive undergraduate credit at the University.

A TRUST fund for botanical research has been established at the University of Minnesota as the result of a request made by the late Dr. J. Arthur Harris a year ago on his deathbed. He asked that nothing be spent on flowers for his funeral, but that the money be put into a trust fund for research in botany. The fund, contributed by university staff members and others, now totals $1,066.21. Dr. Harris was head of the Botany Department at Minnesota and was also connected with the Agricultural Experiment Station at the University. He was an authority on biometrics, and one of the four authors of "The Measurement of Man," a study in that field adopted by the Scientific Book Club last summer. From *The University of Minnesota Press,* Minneapolis, Minn.

Dr. J. S. Karling, Professor of Botany at Columbia University and physiologist of the Tropical Plant Research Foundation, Washington, D.C., sailed on May 21 for British Honduras to continue his studies and tapping experiments on *Achras zapota* and other gum yielding species. This is the fifth expedition to the tropics undertaken jointly by the Tropical Plant Research Foundation and the Botany Department of Columbia University for American gum companies, to investigate the source of chicle and the possibility of plantation culture. An experiment station and plantation consisting of approximately 45,000 acres has been established at Honey Camp in the Orange Walk District.

At the University of Michigan, Professor C. H. Kauffman has been made Professor Emeritus of Botany and Emeritus Director of the University Herbarium. Professor Kauffman has not recovered from the stroke of paralysis which he suffered in February, 1930. Although he has shown some improvement he is still an invalid confined to his bed. Professor E. B. Mains, formerly of Purdue University, was appointed last September Professor of Botany and Acting Director of the University Herbarium. He became Director on Professor Kauffman's retirement in February of this year. Dr. William Randolph Taylor came to the University last October as Professor of Botany and Curator of Algae in the University Herbarium. The staff of the Herbarium have been busy this past winter working over the collections made on Isle Royal, in Lake Superior, last summer. About 2600 cryptogams were collected by Dr. A. H. Povah and J. L. Lowe, and 1100 phanerogams and ferns by C. A. Brown and J. B. McFarlin. The last named has spent the winter in central Florida making a study of the flora of that region. Since January, Professor H. H. Bartlett has been in British Honduras and Guatemala as the botanist of the party from the University Museum working in coöperation with the Carnegie Institution of Washington with headquarters at Uaxactun.

TORREYA

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Some notes on vegetational change

ROBERT R. HUMPHREY

During the winter of 1928, while looking through "The Plant Life of Maryland," (1) I ran across a statement by Dr. Forrest Shreve in which he says, "Where extensive clearings exist and scarcely any areas of virgin forest remain, as is the case in Maryland, it is extremely difficult to reconstruct a picture of the virgin vegetation, and equally difficult to draw wholly satisfactory conclusions as to the relation between natural vegetation and the physical conditions. Particularly is the character of the forests changed by clearing." The statements did not seem to me to be entirely justified, so at my first opportunity, which happened to be the following summer, I spent some little time unearthing what records I could find at the Library of Congress which bore any references to the early vegetation of Maryland or adjacent territory. While there is undoubtedly some literature there which I did not find, and some elsewhere which was not available to me at the time, I was able to uncover a number of references to the flora of that region at approximately the time of the first European settlements there. While these writings do not entirely fulfill my original purpose in making the study, they do throw some light on the vegetation of the region at an early date. It has been necessary to cut the quotations down to include only those which give the most information on the points in question, a proceeding which has eliminated many of the most interesting passages.

Among the passages which follow will be found some concerning the country as far north as the New England States and as far south as the Carolinas: these have been included because they fall within the same vegetational area as Maryland and Virginia, and because the entire eastern portion of the country has been subjected to much the same processes of lumbering and cultivation. The numbers in black type refer to the literature citations at the end of the paper.

2: 218–219. "The products of Virginia and Maryland differ

considerably from those of Pennsylvania, from their nearer neighborhood to the sun. As to timber and wood, they have all the sorts that are found upon the continent; many sorts of oaks, cedars, firs, cyprus, elm, ash and wallnut; some of their oaks are said to measure two feet square and sixty feet in height. They have also, beech, poplar, hazel, besides sassafras, sarsaparilla, and other dying woods. The unsettled country is all a forest of these trees, without underwood, and not standing so close but they may anywhere be rode through. Near the coast the lowlands are all swamps from which grow cedars, pines, and cypresses."

2: 270–271. "There is the greatest reason to suppose that vineyards would thrive here advantageously, from the uncommon plenty of wild vines found in the woods, through all the back country."

3: 50–56. "Filberd, both with hairy husks upon the Nuts, and setting hollow from the Nut, and filled with a kind of water of an astringent taste . . . The Kernals are seldom without magots in them. Walnut; the nuts differ much from ours in Europe, they being smooth, much like a nutmeg in shape, and not much bigger; some three cornered; all of them but thinly replenished with kernels.

"Chestnuts; very sweet in taste and may be (as they usually are) eaten raw; the Indians sell them to the English for twelve pence the bushel.

"Beech, Ash, Quick-beam or wild ash. Birch, white and black, . . . Poplar, but differing in leaf. Plumb Tree, several kinds, bearing some long, round, white, yellow, red, and black Plums; all differing in their fruit from those in England."

3: 30. "Oak of Hierusalem. Oak of Cappadocia. Wild cherry, they grow in clusters like grapes, of the same bigness, blackish, red when ripe, and of harsh taste.

"Board Pine, is a very large tree two or three fadom about. It yields a very sovereign turpentine for the curing of desperate wounds.

"Firr tree or Pitch tree . . . .

"The Larch Tree, which is the only Tree of all the Pines, that sheds its leaves before winter.

"Spruce is a goodly tree of which they make masts for ships, and Sail Yards . . . , many of them (trees) being three fathom about and of great length.

". . . Green Spruce . . . . Hemlock tree, a kind of Spruce. "Sassafras, or ague tree."

4: 30. "*Ulmus* . . . ."

4: 41. "*Acer*, leaves angular palmate, flowers almost apetalous, sessile, fruit peduncled corymbose.

"*Acer virginianum*, leaves large, silvery beneath, shiny green above.

"*Acer*, red flowered, leaves large, green above, shining silvery beneath.

"Plantano, exudes an odoriferous gum. (Sweet gum.)"

4: 58. "*Tilia*—leaves large, mucronate."

4: 60. "*Liriodendron*. Tulipifera arbor virginiana."

4: 115. "*Alnus communis* Clayt. *Betula* . . . twigs pliant, lenticels. *Quercus* . . . , leaves lanceolate, entire, (Willow oak). *Quercus alba* (White oak). *Quercus*—cuneate trilobate, deciduous (Water oak). *Quercus*—with chestnut leaves, (Chestnut oak). *Quercus*—(Red oak). *Juglans nigra. Juglans alba. Fagus* with leaves lanceolate to acute ovate, serrate . . . . *Castanea pumila* (chinquapin bush). *Fagus vulgaris* Clayt. *Corylus* with a round and hard kernel, Clayt. *Castanea* with a sweet fruit Clayt. *Carpinus* . . . . *Platanus occidentalis.*"

4: 119. "*Pinus*, with cones arising in clusters, leaves long, three from each sheath. Clayt. (Cluster pine). *Pinus* . . . with smaller cones less clustered together Clayt. (Spruce pine). *Cupressus virginiana.*"

4: 121. "*Nyssa* with a many flowered peduncle. *Nyssa* with a one flowered peduncle. *Morus* with small leaves. *Fraxinus* with entire leaflets."

5: 5. "It is an excellent country for Dying-Stuff and curious simples, as also for several other curious woods used in wainscoating and cabinet, such as cedar, cypress, sassafras, blackwalnut etc."

6[1]: 11. "*Cupressus americana*. The cypress, (except the tulip tree) is the tallest and largest in these parts of the world. Near the ground some of 'em measure 30 foot in circumference, rising pyramidally six foot, where it is about two thirds less; from which to the limbs, is usually 60 or 70 foot, it grows in proportion of other trees."

6[1]: 18. "The Chestnut Oak. This oak grows only in low and very good land, and is the tallest and largest of the oaks in these parts of the world . . . ."

6[1]: 19. "*Quercus* (forte) *marylandica*. The Black Oak. Usually grows on the poorest land and is small."

6[1]: 21. "*Quercus Alba Virginiana* Park. The white oak. This nearest resembles our common English Oak in the shape of it's leaves, acorns and manner of growing; . . . . It grows on all kinds of land, but most on high barren ground amongst Pine trees.

"There is another kind of white oak which in Virginia is called the Scaly White Oak . . . . They grow on rich land both high and low:

"*Quercus caroliniensis*. The White Oak with Pointed Notches. The leaves of this oak are notched, and have sharp points."

6[1]: 23. "*Quercus* . . . . The Red Oak. The leaves of this oak retain no certain form . . . . They grow on high land."

6[1]: 34. "*Populus nigra* leaves large . . . . The Black Poplar of Carolina. They are large and very tall."

6[1]: 38. "Nux *Juglans alba virginiensis* Park. The Hiccory tree. This is usually a tall tree and usually grows to a large bulk, the Body usually being from two to three feet diameter. Nux *Juglans Caroliniensis* with a small fruit . . . . The Pignut. The White Walnut. Another walnut remains to be observed which I never saw but in Virginia and is there called the white walnut. The tree is usually small . . . ."

6[1]: 41. "A tree growing in water, leaves wide accuminate and not dentate. Fruit smaller than the *Eleagnus*. The Tupelo Tree. This tree usually grows large and spreading . . . . The grain of the wood is curled and very tough. They grow usually in moist places, in Virginia, Maryland, and Carolina."

6[1]: 48. *Arbor Tulipifera Virginiana* with three parted maple shaped leaves. This tree grows to a very large size, some of them being thirty foot in circumference . . . . These trees are found in most parts of the northern continent of America, and generally on very good land."

6[1]: 56. "*Platanus occidentalis*. The Western Plane Tree. This tree usually grows very large and tall . . . . In Virginia they are plentifully found in all the lower parts of the country, but in Carolina there are few except in the hilly parts, particularly on the banks of Savanna River."

6[1]: 60. "A tree growing in water wide accuminate dentate leaves fruit larger than the *Eleagnus*. The Water Tupelo. This tree has a large trunk, especially near the ground, and grows

very tall. These trees always grow in wet places and usually in the shallow parts of rivers and in swamps."

6[1]: 62. "*Acer virginianum*, large leaves, silvery beneath, strongly shining above. The Red Flowering Maple. These trees grow to a considerable height, but their truncs are not very large."

6[1]: 67. "Nux *Juglans nigra Virginiensis* Park. The Black walnut. Most parts of the Northern Continent of America abound with these trees, particularly Virginia and Maryland, toward the Heads of the Rivers where in rich low Land they grow in great Plenty and to a vast size."

6[1]: 63. "*Amelanchier virginiana* . . . . The fringe tree. On banks of Rivulets and running Streams this Shrub is most commonly found."

6[2]: 65. "Liquid-Amber Tree. The Sweet Gum Tree."

6[2]: 76. "Guajacona. These trees grow plentifully in Carolina, Virginia and most of the Northern Colonies in America." (Evidently persimmon.)

6[2]: XXII. "There are in Carolina, four kinds of Pine trees which are there distinguished by the names of Pitch Pine, Rich land Pine, Short leav'd Pine, Swamp Pine. The Pitch Pine is the largest of all the Pine trees and mounts to greater height than any of them . . . . These trees grow mostly on the poorest land. The Rich land Pine is not so large a tree; . . . they grow in better land than the Pitch Pine. The Short leav'd Pine is usually a small tree with short leaves and small cones. It delights in middling land and usually grow mixed with oaks. Swamp Pine grows on barren wet land; they are generally tall and large . . . . There is also in Carolina a fir which is called Spruce-Pine."

7: 11. "There is near Cumberland and within ten or twelve miles of the river (Potomac) a tract of country that abounds with very large white pine trees, suitable for masts of ships; some of these trees are from five to six feet in diametre and run up one hundred feet without a branch."

8: 16. "The woods for the most part are free from underwood, so that a man may travel on horsebacke, almost anywhere, or hunt for his recreation."

8: 18. "The timber of these parts is very good and in aboundance . . . ; the white Oake is good for pipe staves, the red Oake for wainsot. There is also Walnut, Cedar, Pine, and Cypresse, Chestnut, Elme, Ashe, and Poplar, all of which are

for building and Husbandry. Also there are divers sorts of fruit trees, as Mulberries, Persimmons, with several other kind of Plummes, and Vines in great aboundance."

9: 22. "To goe yet a little further, I know no one countree yielding without art or industry so manie fruites sure I am England doth not; wild grapes in abundance all the woods over, their juice sweet and pleasant in taste, some of them wee haue replanted in a vineyard adioyning to Henrico, the quantity of three or four Akres which were this year very plentifully laden . . . . Cherries little inferior to ours, which if we planted may prooue as much better as now they are worse. Pissmienplums in bygnes and fashion like a Medlar like to a slipticke quality, other sorts of plums like to our wheat plums and in goodness answerable: great fields and woods abounding with strawberries much fairer and more sweet than ours, Mulberries of much bignesse, and about the Bermuda Cittie Hundirds thereunto belonging great store thereof, Moricocks of the fashion of a Lemmon whose blossome may admit comparisome with our most delightsome and bewtifull flowers, and the fruit exceedingly pleasant and tasteful; chestnut-trees towards the fals as many as oakes, and as fertile, many goodly groves of Chincomen Trees with a huske like unto a chesnut, raw or boyled, luscious and harty meate; walnuts of three or four sorts; . . . some filberds have I seen; crabbes great store, lesse but not so sower as ours."

10: 35. "The whole country is a perfect forest except where the woods are cleared for Plantations, and old fields, and where have been formerly Indian towns, and Poisoned fields and Meadows where the Timber has been burnt down in Fire-Hunting or otherwise; and about the creeks and rivers are large rank morasses or marshes and up the country are poor Savannahs."

10: 38. "As for timber they abound with excellent good; having about eight sorts of oak, several kinds of walnut trees and Hickory and Pignut, Pine, Cedar, Cypress for shingles . . . ."

10: 128. "Then as for oak, no country has finer or more plenty; . . . and I question if Gottenburgh or any other port of Europe can afford us better pines for Masts and Yards . . . than what grow in Virginia in several places in very great plenty; . . . ."

10: 141. "Thus suppose we should have more of the following things than our own use requires . . . , such as timber for Ship and House Carpenters, and Cabinet makers, Joyners etc,

such as Oak, Deal, Walnut, Hickory, Cedar, Cypress, Locust and the like . . . ."

11: 27–28. "Whereas that part of America or North Virginia lying about 39 degrees on Delaware Bay called the Province of New Albion, . . . and replenished with the goodliest woods of oaks . . . , mulberries, sweet cypress, cedars, pines and firres, 4 sorts of grapes for wine and raisons."

11: 28–30. ". . . and the woods bestrewed many moneths with chestnuts, wall-nuts and mast of several sorts to feed them (sheep). There the barren grounds have four kinds of grapes and many mulberries with ash elms and the tallest and greatest pines and pitch trees that I have seen. There are cedars, cypresse and sassafras with wilde fruits, pears, wilde cherries, Pineapples and the dainty Parsemenas."

12: 3. "The names of those streets (of Philadelphia) are mostly taken from the things that spontaneously grow in the country, as Vine-Street, Mullberry-Street, Chesnut-Street, Wallnut-Street, Strawberry-Street, Cranberry-Street, Plumb-Street, Hickory-Street, Pine-Street, Oake-Street, Beech-Street, Poplar-Street and the like."

13: 73. "Thee need not collect any more Tulip Cones, Swamp Laurel Cones, Hickory, Black Walnut, Sassafras or Dogwood, Sweet gum, White Oak Acorns, Swamp Spanish Oak, nor Red Cedar berries; but all other sorts of acorns, Firs, Pines, Black Gum, or Black Haw, Judas Tree, Persimmon, Cherries, Plums, Services, Hop Tree, Benjamin, or allspice; All the sorts of Ash, Sugar Tree, Wild Roses, Black Beech, or Hornbeam; all sorts of flowering and berry bearing shrubs, Honey Locust, Lime Tree, Arrow Wood, a particular Locust, Guelder Rose, not anything can come amiss to thy friend and in particular to thy true friend.—P. Collinson."

13: 75. "I am informed that the Jerseys is noted for producing abundance of Firs and Pines."

13: 79. "Friend John, June 17, 1736.

I have now a very curious account before me, sent by Paul Dudley from his house in Roxbury, New England, Oct. 24, 1735, who very ingeniously describes the evergreens of New England, in two sheets of paper. This is his catalogue—

'White Pine. Pitch Pine. Saplin or Pople Pine. Apple Pine. Hemlock, a small fir. Spruce tree, distinguished into white,

black and red, from the color of the bark and leaf. White Cedar, Red Cedar. Savin. Juniper. Ivy, a shrub. Box.' "

13: 82. "We have raised a pretty many fine plants from the tree in the Jerseys. It is a real Lotus or Nettle Tree (*Celtis occidentalis* L.), and is a native of your part of the world; is found in Virginia and in other parts."

13: 110. "I had the pleasure of thine from Maryland. . . . the Laurels are perfectly fine. That and the white cedar are very acceptable."

13: 194. "A journey to the Katskill Mountains, 1753. We set out on the first of September, and travelled forty miles; the next day we travelled near fifty and the next day crossed the South Chains, being three ridges of our Blue Mountains, on Jersey side, where we stayed . . . to rest ourselves, and observe the vegetables that grew thereon; which were Mountain Chestnut oak, Mountain or Champagne Red Oak, and some Spanish Oak, Sassafras, Chestnut and Maple; Ash, black and white, Wild Cherry, Persimmon, and three leaved pine. Shrubs, sweet fern, and in swampy places, Prinos; and very good Fox Grapes. . . . (*Alnus incana*) which is plentiful in this part of the country."

13: 232. "I have sent thee seeds of almost every tree and shrub from Nova Scotia to Carolina; very few are wanting, and from the sea across the continent to the lakes. J. Bartram."

Resumé

While the quotations just given do not give us a complete picture of the former vegetation, they do enable one to draw some conclusions as to its character. The woods were apparently freer from underbrush than is the case at present, a condition which may be attributed directly to the absence of man and his improvements via the axe, plow and fire. The large size attained by many of the trees is further evidence that there was little or no disturbance and the forests consequently largely closed. In undisturbed stands of timber at the present time this condition is sometimes met with, though it is by no means common.

In a number of the references there seems to be some confusion as to certain of the species of conifers, a condition which may probably be corrected by substituting Hemlock for Spruce and Fir where these are given occurring south of their present

range. The stand of white pine described near Cumberland, Maryland is, however, quite possibly correct, since the present range of the white pine includes that region. According to Dr. Shreve, however, there is no such forest near there at the present time.

Conclusions

From the evidence given, we may say with reasonable certainty:

1. That the woods were once much more open and many of the trees a great deal larger than they are at present.

2. That the composition of the forests may have been different from that of today, but if it was, we have no evidence for assuming that the difference was very pronounced.

I wish to thank Dr. Forrest Shreve for his reading and criticism of this paper.

Desert Laboratory
Tucson, Arizona

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Extension of range of downy poplar

FRED R. CLARK

The writer wishes to report an extension of the range of the downy poplar, *Populus heterophylla* L. A good sized specimen of this tree was found growing in a swamp about three miles southwest of the city of Ann Arbor, Michigan. This specimen was approximately thirty-five feet in height and measured about eight inches in diameter, breast high. It was well developed in every way as far as could be observed. Attention was first called to it by one of the writer's students who was attracted by the large, downy leaves scattered over the ground. After careful examination the species was determined to be *Populus heterophylla* L. As far as the writer can find out from a search of the literature this tree has been reported from the state only once before, namely from Cass County by J. H. Roy.* Gray's Manual gives the range as "Borders of river swamps, Ct. to Ga.; also from O. to Ark. and La." It is not listed in Otis' "Michigan Trees," but is recorded in Deam's "Trees of Indiana" as growing in swamps in the northern counties of Indiana. It is likely that the tree could be found growing in other parts of Michigan if careful search were made for it.

SOUTHEASTERN TEACHERS COLLEGE
DURANT, OKLAHOMA

* Beal, W. J., Michigan Flora. Rept. Mich. Acad. Sci. **5**: 68. 1903.

Further anent "frost flowers"

An explanation of frost crystals on dried plant stems

H. M. Jennison

In Mr. Raymond H. Torrey's article published in Torreya, for Jan.-Feb., 1931, we found a very interesting and accurate account of a phenomenon not uncommonly observed in the vicinity of Knoxville, Tennessee. At least six of my colleagues and students have seen and speculated on the formation of similar ice ribbons. With us, such ice ribbons have been observed on the lower internodes of the main stem of such coarse herbs as *Verbesina occidentalis*, *V. virginica*, and *Pluchea petiolata*. Mr. Torrey concludes with the intriguing question, "Can anyone offer an explanation as to the mechanics of this phenomenon?"

The following explanation of the phenomenon in question has developed as a result of the observations made at times during the past three years. No opportunity has been available for experiments, and I do not suppose that this offering can withstand the critical gaze of a physico-mechanical engineer. Perhaps, however, it may be sufficiently reasonable to satisfy the average naturalist-observer.

In the first place, it is important to note that phenomena similar to the one described by Mr. Torrey, as seen by us, occur during the late fall and mid-winter months. By that time successive frosts have defoliated the vegetation and cut down the tender twigs. When and wherever we have found these fantastic ice-crystal ribbons they were of considerable size and occurred near the base of the stem. We have observed them in actual process of development. With few exceptions the phenomena have been noted early in the day, or if later, only on north slopes where the plants were shaded until late in the afternoon. Up to the dates of observation, the temperature had not been low enough to cut down the stout stems of such coarse herbs as those named above, much less kill the roots. Nor was the ground frozen. In fact, except in the surface layers the soil was moist and warm enough for biological activity. Under the existing environmental conditions, the root systems of these plants were still functioning quite vigorously and a considerable "root-

pressure" was forcing water through the larger branches of the root and up the stems. No leaves, and few if any living cells, remained above ground to utilize the water being carried up in the essentially uninjured vessels of the outermost layers of the xylem. The ascending stream of considerable volume was rather quickly chilled and the water frozen soon after it reached a point in the stem slightly above ground. The water, upon being frozen, expanded and ruptured the cortical tissues appearing as the beginning of a short ribbon of ice. The first-formed ice is forced on by the transpiration stream, which freezes as it comes to the surface and is exposed to sub-freezing temperatures.

The ice masses are thin, fragile, and quite flexible, so that extensive ribbons or bands, result. We have observed three-inch wide ice ribbon bands developing to become four or five inches long. Also, I have observed that the ribbons were faintly corrugated and take this as an indication of the fact that the water was frozen and was crystallized somewhat before it had emerged from the tissues of the stem.

UNIVERSITY OF TENNESSEE
KNOXVILLE, TENNESSEE.

"Frost flowers" in Florida

ROLAND M. HARPER

Mr. Raymond H. Torrey's note on frost crystals on *Cunila* in northern New Jersey, in the Jan.-Feb. number of TORREYA, reminds me of a similar phenomenon that I observed on the same day about eleven degrees farther south. On the morning of Nov. 27, 1930 (Thanksgiving Day), I went with Dr. John K. Small and Dr. Herman Kurz to Wakulla County, Florida, to show Dr. Small a certain plant he was looking for. In Tallahassee, 18 miles north of the locality to be cited, the weather had been cloudy and rainy most of the month (much more than usual for November), but that day was clear, and there had been a killing frost the night before.

In flat pine woods underlaid by limestone, in the Gulf Hammock region, about half way between Wakulla and St. Mark's, we noticed around a cypress pond, on many dead stems of *Pluchea foetida* (formerly known as *P. bifrons*), a few inches from the ground, delicate excrescences of ice almost exactly like that figured by Mr. Torrey; something that none of us had ever seen

in Florida before, though it may not be infrequent when the right combination of weather conditions occurs.

That this phenomenon is comparatively rare is suggested by the fact that it has been considered worth writing up by several different people in the past, some of whom seem to have just encountered it for the first time. None of the papers on the subject is accessible to me at this writing, but I believe some are earlier than the reference cited by Mr. Torrey. Some of the best accounts are by MacDougal.[1]

My last previous experience with "frost flowers," as nearly as I can remember, was nearly 25 years before, in Tuscaloosa County, Alabama. There I found the same sort of crystals, though somewhat differently shaped, exuding from the stems of *Verbesina occidentalis*, on December 5, 1905, a day when there was frost in shady places all day.[2]

TALLAHASSEE, FLORIDA

[1] MacDougal, D. T., Science **22**: 351–352. 1893. Bot. Gaz. **19**: 120–121. 1894. Bot. Gaz. **27**: 69–71. 1899. References supplied by Editor.

[2] Harper, R. M. Plant World **9**: 1906.

Additional notes

For the benefit of our readers and to give evidence of the ancient lineage of this question we quote in part herewith the short article in the *Botanical Gazette* (**19**: 120–121) by Dr. MacDougal referred to by Dr. Harper. It appears from this that the observations of this phenomenon go back over 100 years.

"Frost Plants.—Prof. Lester F. Ward's observations on the 'frost freaks of the dittany,' in the GAZETTE for April, 1893, occasioned much interest, since the phenomena illustrate one form of the movement of water in the plant stem. I have elsewhere[3] made a lengthy review of the literature of the frost plants and take occasion to call attention to the following references which may be accessible to the readers of the GAZETTE.

Prof. Ward called my attention to the fact that the frost crystals of *Cunila* and *Helianthemum* were noted by Dr. Darlington.[4] The first observation of frost phenomena recorded is that of Stephen Elliot on the stem of *Conyza bifrons* (now *Pluchea bifrons*).[5] Sir John Herschel noticed a similar formation on the

[3] Quarterly Bulletin of the University of Minnesota **2**: 30. 1894.

[4] Flora Cestrica p. 350. 1837.

[5] Sketch of the botany of South Carolina and Georgia. p. 322. 1824.

stalks of heliotrope and thistle.[6] Prof. John Leconte made an extended study of the frost crystals of *Pluchea camphorata* and *P. bifrons*, in 1848, along the coast of South Carolina and Georgia.[7] Prillieux in his investigations on freezing in intercellular spaces described the formation of radial ice plates by herbaceous plants.[8] These observations were duplicated by Trecul at the same time, and Sachs has given some matter bearing upon this point.[9] In a recent number of this journal Professor Atkinson gave a note recording the fact that these phenomena were seen by him in 1885–86,[10] while Professor Ward has found that the frost freaks of the dittany are a matter of common information in the locality in which his observations were made."

In these accounts there are two points which seem significant. First, the occurrence of the phenomenon was either in the late fall when it is quite possible that the lower or root portions were not entirely dead; or, if later in the winter, they were reported from the southern states, where there is still a chance that the roots might be living. The second point (if we refer to the *broad* plates) is the remarkable restriction of the phenomenon to only a few kinds of plants. *Cunila*, *Pluchea*, and *Verbesina*, in whatever part of the country they may be, are almost the unanimous choice of the "frost flowers." It is certainly significant that with the thousands of herbaceous plants available these should be the ones selected.

In view of these facts one would think that, as Professor Jennison says, the roots are still alive and functioning (a matter that could be easily verified by microscopical examination) and secondly, that these particular genera, in addition to possessing roots tenacious of their vitality, have stems which are peculiarly brittle, splitting easily in a vertical or length-wise direction, perhaps coincident with some corresponding arrangement of the xylem, so that the water forced up the stem, on reaching the outer portions, freezes and splits the bark, the ice thus formed being pushed out by newer ice layers formed within, essentially as Prof. Jennison explains it. Anatomical and microscopic studies could doubtless clear up the whole question, if indeed this has not already been done.

A. H. GRAVES

[6] London and Edinburgh Phil. Mag. —: 110. 1833.
[7] Proc. A. A. A. S. 1850.
[8] Compt. Rend. **70**: 405. 1870.
[9] Lehrbuch. 2 Aufl. p. 614.
[10] Bot. Gaz. **19**: 40. 1894.

BOOK REVIEWS

Nature rambles—spring[1]

Those members of the Torrey Botanical Club who have had the good fortune to listen to the lectures of Professor Medsger, who is, by the way, a member of the club of long standing, have doubtless been impressed by the peculiarly unique way in which he weaves in little interesting bits of information and deductions he has made from his observations of natural objects—plants, birds, trees, insects, stones, etc. For more than twenty-five years he has taught natural history in high school and college and for some fifteen years he was a nature leader in summer camps. This book, which was written at the request of the publishers, has, throughout, the same quality, and, moreover, is written in plain, straightforward language, easily understood by boys and girls. It is also pervaded throughout by an enthusiasm for and a poetic appreciation of the out-of-doors which is irresistible and contagious.

Looking it over brought back the days of my boyhood. What a joy it would have been to have owned such book then! But it is written also, as Dr. Fisher says in the foreword, "for adults who have not stopped learning." Professor Medsger writes me that three other volumes are to follow—one for each season, and we shall look forward to the pleasure of seeing them.

ARTHUR H. GRAVES

A field key to the genera of wild and cultivated trees[2]

Miss Barrett, another well known member of the club, and formerly a teacher at the State Normal School and the State Teachers' College at Montclair, New Jersey, has prepared this excellent key for those who wish to identify trees when they are in leaf. A page of drawings in explanation of the most important characters is added, as well as several pages of explanation of

[1] Medsger, Oliver Perry. Nature rambles—spring. An introduction to country lore. With foreword by Clyde Fisher. x+160 pp. 16 col. pl., 15 halftone pl., and 40 text ill. Frederick Warne & Co: New York and London, 1931. Price, $2.00.

[2] Barrett, Mary Franklin. A field key to the genera of the wild and cultivated hardy trees of the Northeastern States and Canada., 40 pp. Published by the author: 64 Park Avenue, Bloomfield, N. J. 1931. Price, $.35.

terms used, and an index. We say it is an excellent key, because we have tried it for several genera, and have found that it "works." An especially valuable feature is the inclusion of cultivated genera such as *Buxus, Torreya, Cercidiphyllum, Shepherdia, Acanthopanax, Eucommia, Gordonia, Buddleia, Corylopsis, Maackia, Koelreuteria,* and many others, which to a beginner are insurmountable stumbling blocks, since they are not included in most keys; and yet they do occur, some of them very commonly, in the parks and estates of the Northeast.

ARTHUR H. GRAVES

FIELD TRIPS OF THE CLUB

FIELD TRIP OF SUNDAY, MAY 17

Our party of ten left the shores of Greenwood Lake at Lakeside, which lies at 620 feet elevation, the objective being Surprise Lake nestling above, to the westward, in a steep-sided depression, slightly over 1300 feet above sea level. Ascending the trail up the mountainside by easy stages, we paused halfway at the never-failing spring presided over by the three tupelos (*Nyssa sylvatica*) and then headed for Lookout Rock. An ideal day gave fine visibility from this vantage point, and the extended panorama of rolling hills in all directions was indeed an inspiring sight. It was possible to discern several of the Catskill mountains far to the north, and in this way to orient the members of our group, most of whom were visiting the region for the first time.

The forest rang with bird songs, the peak of the spring migration having been reached by this date. Many of the birds are, however, permanent residents of the region, notably the golden-winged warbler and the pileated woodpecker. Along the trail and in bloom were such members of the spring flower troupe as one commonly encounters over these hills—viz:—*Pedicularis canadensis, Zizia aurea, Polygala paucifolia, Panax trifolium, Arisaema triphyllum, Aralia nudicaulis, Aquilegia canadensis, Trientalis americana, Smilacina racemosa,* and also the much rarer *Smilacina stellata.*

It is gratifying to note the steady increase of *Cypripedium acaule* over the Bearfort, although but a few plants were actu-

ally in full bloom, another week being needed for the perfection of their rich and showy beauty. Along the same rocky ledges with the moccasin flower was also found in bloom the sturdy though fragile-looking *Corydalis sempervirens*, and this plant was of fairly common occurrence throughout the day. On the summit of the long, rocky ridges was much of the black chokeberry, *Pyrus melanocarpa*. In full bloom, it arrested attention

FIGURE 1. *Trillium undulatum* Willd. Painted Trillium. Found on trip to "The Unknown Pond," Bearfort Mountain, N. J. May 17, 1931. Photo by Louis W. Anderson.

and was cause for comment, both for its delicate beauty and manner of thriving in the interstices of the rocks.

Everywhere as we progressed over the tops of the ridges, the showy, full blown, though small trees of *Prunus pennsylvanica* were much in evidence. Upon reaching Surprise Lake, we came upon a large colony of *Woodwardia virginica*, while bordering the lake was *Chamaedaphne calyculata* in full bloom.

Springing up over a good-sized area was *Aralia hispida*, which was interesting to note, being of uncommon occurrence in this part of the country. But the most interesting find of the Surprise Lake section was one plant of the rare *Clematis verticillaris* bearing two full blown flowers.

Striking out through somewhat rough country we finally reached, at an altitude of about 1280 feet, the Unknown Pond, or the "Unnamed Pond" as it is termed in "The New York Walk Book." Hereabouts was found another station of the somewhat rare Virginia chain fern; and *Ilex laevigata*, the smooth winterberry, was another interesting addition to our list.

The "high spot" of the day, however, was the discovery of the painted trillium, *Trillium undulatum:* five perfect flowers were counted. We believe this to be a new locality for the species, although it has long been recorded from Passaic County, and from Sussex and Orange Counties. In his column in the New York *Evening Post* of May 22, Mr. Torrey suggests re-naming the Unknown Pond "Painted Trillium Pond" in honor of this unusual and beautiful species. (Figure 1.)

We recommend this somewhat inaccessible spot, hemmed in by rhododendron jungles and hidden by black spruce, for further and more intensive study.

HELENE LUNT

BRANCHVILLE NATURE CONFERENCE

May 22–24

The annual outing for nature students, sponsored by the Torrey Botanical Club, and led by Mr. and Mrs. William Gavin Taylor, was held at "The Pines," Branchville, New Jersey, May 22–24 inclusive. Ninety-eight members and friends from various clubs attended. A large number of the party reached the inn Friday afternoon in time to do justice to an excellent dinner, and enjoy a reunion and bird concert. In the evening we gathered in the recreation hall and listened to an illustrated talk by Dr. Henry S. Kümmel, State Geologist of New Jersey, who outlined some geological features of the surrounding country, which he planned to visit with a group the following day.

Mrs. A. Tennyson Beals explained the process of banding and recording birds, as carried out by licensed co-operators with the U. S. Biological Survey. She showed unique and interesting

lantern slides, and also exhibited and explained the apparatus used. Mrs. Beals has the only official bird-banding station in New York City.

Mr. C. H. Curran of the Department of Entomology, American Museum of Natural History, gave an illuminating talk on insect life, stressing the point that a very small percentage of insects is harmful, and that many species are beneficial to man. He also explained that one often could not get any nearer than the family in identifying this large division of life, and that any student might expect to find unrecorded forms.

Very early Saturday morning bird study groups were led by Dr. and Mrs. Chubb, Mr. and Mrs. Leon Nichols, Miss Helen Saunders and Miss Ellen Steele. Later, Dr. Kümmel led an excursion by automobile to points of particular geological interest in northwestern New Jersey, with the last objective at Hamburg, where he pointed out the base of the Cambrian resting on eroded gneiss, a land surface about 700,000,000 years old. This group returned to the inn for luncheon. In the afternoon they took a trip through Sussex to High Point, the highest spot in the state, where many structural features were pointed out—thence to Port Jervis and Culver's Gap, with several stops for instruction and observation. Between High Point and Port Jervis a very interesting fossil deposit was visited.

Mr. Curran led a group in the morning and another in the afternoon, pointing out the varied and fascinating insect life to be found near the inn. Bird study groups were formed for further study in the morning and again in the late afternoon.

On Saturday evening in the recreation hall three very instructive and entertaining talks were given. The first was by Dr. Chubb on "Nesting Fish Hawks," with amusing and educational slides made by the speaker in Southern New Jersey and at Gardiner's Island. Mr. Raymond H. Torrey told of the history and development of the Appalachian Trail, with special reference to its plant life. Mr. A. Tennyson Beals spoke on mosses, showing many slides depicting the mosses highly magnified, and explaining their elaborate structure, their habitats and the distinctions between the various groups. He also showed a fine collection of mosses gathered in the vicinity. Miss Margaret McKenny, author of a recent book on mushrooms, exhibited a generous number of her original photographs of mushrooms.

On Sunday morning, despite a cold drizzle, the zealous sought birds again. Another leader, Mr. H. C. Hasbrouck, who arrived Saturday evening, led one of the groups. The rain dwindled to occasional slight showers. While the insects refused to come and be observed, various students found birds, flowers, ferns, mosses and lichens in the neighborhood of the inn. A group led by Raymond H. Torrey took cars to High Point and hiked over a section of the Appalachian Trail, returning for dinner.

Mrs. Chubb reported 56 species of birds, seen or heard by authorized observers in the various parties.

Regarding the mosses Mr. Beals makes the following statement: "No new or unusual mosses were observed at Branchville this year, either about the hotel or on the trip to Pine Swamp, except the *Thelia* which was noted on the base of oak trees in woods along the old wood road that we travelled just before reaching Pine Swamp. Sixty-five species were listed, but this number could probably be increased to at least 200 with careful work, in three or four days, within five miles of Pine Hill. Perhaps the most frequent moss seen along the rocks back of the hotel is *Ammonodon rostratus*, of a yellow-green color: it forms a mat of yellow-green velvet on moist limestone rocks and about bases of trees in limestone regions. In the pasture to the north there were great beds of *Polytrichum commune* L. and *P. juniperinum* Willd., while in nearby woods there was an occasional small patch of *P. ohioense* Ren. and Gard.—all three in fine immature fruit. These are all common mosses and are found in New Jersey wherever suitable conditions exist in the hill country."

The fern and flowering plant life in this region is very rich. A few of the more interesting species are reported by Mr. Raymond H. Torrey:

The most interesting plant discovery of the Branchville week-end was that made by Mr. Beals in the swamp north of Mashipicong Pond, namely, *Arceuthobium pusillum*, the dwarf mistletoe, parasitic on spruces and larches. It occurred on the Black Spruce, *Picea mariana*, of which there is a considerable stand about this pond. Although *Arceuthobium* is found in many spruce bogs in New England, this was the first station reported in New Jersey. This tiny plant, only an inch tall, discloses itself, as Mr. Beals explained, by the 'witches' brooms' which it

causes on the spruce boughs. Other interesting species in this swamp were *Kalmia polifolia*, rare in northern New Jersey; *Smilacina trifolia*, equally uncommon in this latitude; and *Trillium undulatum*, one of probably not more than half a dozen stands in the New Jersey highlands.

A striking plant, which seems locally common on the western slope of the Kittatinys, and is also found in the cemetery near the hotel, but does not occur in eastern New Jersey or the lower Hudson valley, was the Painted Cup, *Castilleja coccinea*, a splendid thing with the scarlet leaves at the top of the stem, below the small and inconspicuous flowers.

Another handsome display in mass was afforded by dense colonies of *Corydalis semervirens* on open ledges on the Appalachian Trail, in the Stokes State Forest, their pink-purple bloom being extraordinarily copious. *Cypripedium acaule, pubescens* and *parviflorum* were found on this trail. *Krigia virginica* made pretty little colonies of orange bloom on the thin soil on ledges.

Immense colonies of May-apple, *Podophyllum peltatum*, covered old pastures on both east and west slopes of Kittatiny Mountain. Hound's Tongue, *Cynoglossum officinale*, in old pastures, and a somewhat unusual geranium, *Geranium carolinianum*, were interesting species.

The sole stand in New Jersey of the Three Toothed Cinquefoil, *Potentilla tridentata*, on the summit of High Point, was visited, and if there is no further disturbance of the natural conditions incident to the construction of the war monument and the parking space, the colony seems likely to survive. Fortunately its flowers are so inconspicuous that it is not likely to be plucked excessively by visitors.

The rich fern flora on the limestone ledges about The Pines, including *Pellaea atropurpurea*, *Asplenium Ruta-muraria*, *Camptosorus rhizophyllus*, *Aspidium cristatum*, var. *Clintonianum*, *Aspidium Goldianum*, and *Asplenium Trichomanes*, were again enjoyed by the party.

MARY P. TAYLOR

CATSKILL TRIP, MAY 30–31

A climb of Balsam Cap, 3700 feet, one of the summits in the line running south from Wittenberg and Cornell, between the Esopus and Rondout Valleys, from the head of Maltby Hollow, on Memorial Day, disclosed the succession backward, from early summer flowers in the lowlands to early spring blooms above 3500 feet, which is always an interesting phenomenon about the end of May in the Catskills. White daisies and the king devil, *Hieracium florentinum*, were in bloom in the fields west of the Ashokan Reservoir. As the climb was started from

the Moon Haw Club, three miles west of West Shokan, *Tiarella cordifolia* was conspicuous. *Trillium erectum* was in fruit at 1200 feet, but at 2500 feet it was just coming into bloom and there was joined by *Trillium undulatum*, in fine flower. *Streptopus*, both *roseus* and *amplexifolius*, with their dainty, nodding, concealed flowers, were numerous at from about 1500 to 3500 feet. *Clintonia borealis* was past bloom at 1500 feet, but in prime flowering condition at 3000. *Viburnum alnifolium* had likewise passed blooming at lower levels but the showy outside flowers were handsome at 3000 feet. A curious phenomenon was noted in this shrub. Several showed only one pair of leaves, at the end of the stems, and they were abnormally large, ten inches in diameter, whereas the usual size is about half that. Examination showed that the winter leaf- and flower-buds, which are fat and juicy, had been nipped off by deer, and that the pair of leaves at the ends of the stems or branches had developed from auxiliary buds which had appeared just back of the terminal ones. All of the energy of the rising sap had poured into the two leaves at the end, accounting for their extraordinary size.

An interesting find was a single plant of *Habenaria Hookeri*, with great round leaves flat on the ground, not yet in bloom. No *Cypripediums* were found in the beech and maple woods above 1500 feet, but *Cypripedium acaule* was numerous in oak woods on the south side of High Point, at about 800 feet. Near the top of Balsam Cap, a large slide, 1400 feet long and 100 feet wide, which occurred in 1930, showed a great scar in the forest cover. Spruces and yellow birches of large size were overwhelmed in the slide, which was apparently due to saturation of the loose rocks and earth by a three days' storm, on a slope where the cover was barely in repose, and was partly held in place by the roots of the trees. Nature was starting to cover the raw scar, with one or two mosses, a fern that looked like *Woodsia obtusa*, and seedling beeches and maples. A handsome colony of the orange aethalia of the slim mold *Lycogala epidendrum*, in early maturity, on a dead hemlock, was an interesting display of this organism.

An interesting immigrant from the West, found along the highway from Ashokan Dam to Stone Ridge, was *Agoseris cuspidata*, with large, solitary heads, with bell shaped involucres, and narrowly lanceolate leaves tapering to an elongated point. Its range, as reported in manuals of twenty years ago, is from Wisconsin and northern Illinois westward, but here

it was at the foot of the Catskills. It is suggested that it may have been established there as an immigrant, the seeds of which were brought east mixed with grass seed or perhaps in the great quantities of baled hay, food for the horses used in the construction of the Ashokan Reservoir and dam, before the days of automobile tractors.

A large and handsome colony of the oak fern, *Phegopteris Dryopteris*, was found at the top of Wagon Wheel Gap, on the east slope of High Point, the course of a glacial stream with large "fossil" cataracts, which drained the Esopus Valley, when the eastern opening was blocked by thick ice. The deeply piled rock fragments in this cool, shaded notch keep the winter ice from melting until midsummer; and the low temperature, a sharp contrast to that outside, was apparently favorable to the oak fern, a species common farther north.

On the way up, a splendid purple display in a grass field east of Middletown proved to be the ragged robin, *Lychnis Flos-cuculli*, covering acres, the largest assemblage of the plant I have ever seen. *Silene noctiflora* was also numerous and conspicuous in the twilight along the roads in western Orange and southern Ulster counties.

RAYMOND H. TORREY

PROCEEDINGS OF THE CLUB

Meeting of April 15, 1931

The meeting was called to order by President Sinnott at 3:30 P.M. at the New York Botanical Garden with twenty-four members present. Minutes of the meetings of March 18 and April 7 were read and approved.

Correspondence between Dr. Jamestown of the University of Tennessee and Mr. R. H. Torrey was presented and discussed, proposing the establishment of a southern branch of the Torrey Botanical Club at Knoxville, Tennessee. Dr. Sinnott appointed a committee of three to consider this matter.

Dr. M. Demerec of the Carnegie Institution of Washington at Cold Spring Harbor, N. Y. gave an interesting talk on "Variegation Studies with *Delphinium Ajacis*," an abstract of which follows:

By using for illustration chlorophyll variegation of *Delphinium* and unstable characters of *Drosophila virilis*, evidence was presented which indicates that unstability of genes is responsible for the type of behavior observed in these characters. In the case of rose flowers with purple variegations in *Delphinium* it is assumed that the gene determining rose color is unstable and changes frequently into the gene determining purple color. Every purple spot on rose flowers, therefore, was caused by an independent reversion of the rose gene which occurred during the development of the flower. It is evident that reversions occurring late in the development of the flower will produce small purple spots and those occurring early in the development will produce large purple spots. The size of the spots, therefore, can be used as an indication of the time when the mutation occurred; and by assuming that on the average each cell generation doubles the size of a spot, it is possible to determine the frequency of mutability of the gene during several cell generations. Data were presented which indicate that the rose gene reverted with an equal rate during twelve generations of the development of the flower. This observation served as a basis for the conclusion that unstability of this gene was not caused by the gene being composed of smaller independent units (genomeres) but that it was probably a result of chemical unstability of the gene.

Attention was called to the fact that variegations follow cell lineage and could therefore be used to advantage in studying the development of organs on which they are visible.

The meeting adjourned at 5 P.M.

Respectfully submitted,
FORMAN T. MCLEAN, *Secretary*

Meeting of May 5, 1931

The meeting was called to order by President Sinnott at 8:30 P.M. at the American Museum of Natural History with fifty-nine members present.

Mr. Carl E. Bliss, 55 Randolph Place, South Orange, N. J., was unanimously elected to membership in the Club.

A vote of thanks was given to Dr. S. Fosdick Jones for his contribution of twenty-five dollars to the Lucien Marcus Underwood Fund.

Dr. Clyde Fisher gave a most interesting talk on his recent trip to Iceland and to Arctic Lapland, illustrated by a fine collection of colored lantern slides showing both the people, the country and the plant life. The interest was considerably increased by the presence of three young ladies dressed in Lappish costumes and fully equipped with the average Laplander's utensils.

The meeting adjourned at 9:45, after which refreshments were served by the entertainment committee in the Hall of Birds.

Respectfully submitted,
FORMAN T. MCLEAN, *Secretary*

Meeting of May 20, 1931

The meeting was called to order by President Sinnott at 3:30 P.M. at The New York Botanical Garden with thirty members present. Minutes of the meetings of April 15 and May 5 were read by Dr. Dodge who acted as Secretary in Dr. McLean's absence.

Prof. J. J. Copeland, City College, New York, N. Y. and Mr. Samuel Hirschberg, 359 Lenox Road, Brooklyn, N. Y. were unanimously elected to membership in the club.

The request of the Permanent Secretary of the American Association for the Advancement of Science that the Torrey Botanical Club express the preference as to the places of meeting of the Association for the years from 1931 to 1940 was read and the President was empowered to act with the Executive Committee in selecting places favored by the club.

For the committee appointed to consider the establishment of local chapters, Professer Harper reported the following resolution:

Resolved: That the Torrey Botanical Club welcomes the suggestion that local chapters be established in various parts of the United States outside the limits of the New York local flora region. The club authorizes President Sinnott to open negotiations with Professor Jennison on the following general basis. (1) Chapters are to bear the name of the locality where organized. (2) Membership is to consist of at least three regular members of the parent society. (3) Other members of the chapter are to receive TORREYA on the payment of $1.00 per year to the parent society. (4) The chapter may have one representative on the editorial board, to be nominated by the chapter. It is understood that the pages of TORREYA are open to the members of the chapter with such limitations as to space as now exist. (5) These relations may be terminated after one year's notice by either organization.

Dr. B. O. Dodge addressed the club on "A Further Study of the Morphology and Life History of Rose Black Spot Fungus," as follows.

It is a common experience of rose growers to find that certain varieties are more subject to black spot than others. Even the most susceptible varieties can be kept free from this disease if a fine grade of dusting sulphur is applied lightly about once a week beginning as soon as the leaves come out in the spring. There is on the market a sulphur preparation called "pomogreen" which has been dyed the color of the average rose leaf. This preparation contains 10 percent arsenate of lead. The same grade of dusting-sulphur dyed green can be obtained without the arsenate of lead. If either of these preparations is applied lightly when the rose leaves are dry, no unsightly residue will show and both black spot and mildew will be kept well under control.

The plants in one half of each of several beds of roses were dusted during the growing season, while the plants in the other half were left without protection. Both mildew and black spot were prevalent on the untreated plants during the summer, and they showed a great deal of defoliation during September and October. The protected plants bloomed freely until November and showed no defoliation from disease. Furthermore, the after-effects of dusting with sulphur were clearly reflected in the amounts of growth made by the plants during the following spring and summer, when the treated plants showed at least a third more growth. The apparent resistance of the variety Red Radiance in the field was proved not to be maintained when the plants were grown in the greenhouse, for it is found that the leaves of this variety could be very readily infected artificially.

Wolf has worked on the life history of the black spot fungus, *Diplocarpon rosae*, and has stated that there are two kinds of mycelium. The first kind is more or less superficial, lying just beneath the cuticle, and from this mycelium subcuticular acervuli develop. The second kind is more deep-seated and lies within the mesophyll tissues. Connecting the two sorts are hyphal strands which pass down not only between the epidermal cells and between the palisade cells but also directly through them, so that we have intracellular as well as intercellular hyphae.

Cytological studies made by the speaker seem to prove that there are not truly intracellular hyphae to be found, at least during the time when the leaves are in the living condition. Instead the epidermal cells especially in the region of the black spot show from one to a half dozen very chracteristic haustoria. Palisade cells beneath the acervuli quite generally also show long haustoria extending down within the cells.

Leaves showing black spot were overwintered out doors in wire cages. The spots were examined several times during the spring months but no ascocarps were found. In nearly all cases, however, numerous spermogonium-like bodies developed on the old black spots. These structures contained very small bodies which ordinarily would be called spermatia or microconidia. They were borne on two-celled stalks. Furthermore, subepidermal fruit bodies, which in their origin and method of development correspond very well with what Wolf described as ascocarps, were found on the black spots during the month of April. These bodies are really subepidermal acervuli which produce two-celled conidia having the same shape and measurements as the ascospores which Wolf found in similar structures. Inoculations were made with spores from these deep-seated fruit bodies and typical black spot with subcuticular mycelia and subcuticular acervuli followed within a few days. No explanation was offered to account for the failure for these subepidermal structures formed on overwintered leaves to develop asci and ascospores.

In absence of Dr. Arthur Hollick, who was scheduled to speak, Miss Marjorie Swift, Assistant Pathologist of the New York Botanical Garden, gave a talk on "Penicillium and Aspergillus in Odd Situations." This talk is published in full in the July, 1931 number of the Journal of The New York Botanical Garden. The meeting adjourned at 5:00 P.M.

Respectfully submitted,
FORMAN T. MCLEAN, *Secretary*

NEWS NOTES

DR. C. H. KAUFFMAN, Emeritus Professor of Botany and Emeritus Director of the University Herbarium of the University of Michigan, died at his home in Ann Arbor, Michigan, on the morning of June 14 after an illness of sixteen months as a result of a paralytic stroke in February, 1930. He was sixty-two years of age.

DR. PER AXEL RYDBERG, Curator of the Herbarium of the New York Botanical Garden, died at the age of seventy-one years, on July 25th, at his home in the Bronx, New York City. Although an American citizen, Dr. Rydberg was a native of Sweden. He had been a member of the club for many years.

DR. GEORGE SHERMAN AVERY JR., who during the past year has been on leave from Duke University and has held a National Research Fellowship in botany at Columbia University, has resigned his position as Assistant Professor of Botany at Duke and accepted the appointment to a professorship of botany at Connecticut College, New London, Conn. Miss Julia Best, Barnard College, 1931, has been appointed instructor in botany at the same institution.

ACCORDING to a recent ruling of the Board of Examiners for the New York City schools, those who wish to obtain teaching licenses in biology in the New York City schools must give evidence of an acquaintance with the common trees, shrubs, herbs, birds and other animals of the region about New York. A list of the common trees and shrubs of Greater New York has been prepared by Dr. A. H. Graves, and a list of the common herbaceous plants by Dr. H. K. Svenson—each list appearing as an issue of the Brooklyn Botanic Garden LEAFLETS. These lists may be obtained on application to the Secretary, Brooklyn Botanic Garden, 1000 Washington Avenue, Brooklyn, and are mailed free to teachers in Greater New York.

TORREYA

Vol. 31 September-October No. 5

Modelling the orthic tetrakaidecahedron

EDWIN B. MATZKE

One of the most fascinating pages in the history of science is that which relates the discovery of the planet Neptune. After long and involved mathematical computations, Adams in England and Leverrier in France explained the movement of Uranus by the existence of a previously unknown planet, and they determined its approximate position. On the basis of Leverrier's calculations, Galle, in Berlin, was able almost immediately to locate the new planet.

Less spectacular, perhaps, less heralded, but no less scientific has been the investigation of cell shapes in the organic world by Kelvin and Lewis. As far back as 1887 Kelvin published an essay "On the division of space with minimum partitional area," in which he described a fourteen-sided figure that he called a tetrakaidecahedron. A similar figure had been known to the crystallographers even before Kelvin's publication. In contrast to the search for Neptune, which went on with almost feverish haste after the supposed orbit had been approximately determined, Kelvin's suggestion lay fallow for thirty-six years; it was only in 1923 that Lewis showed that cells of elder pith tend to be fourteen-sided, and at times show an alternation of hexagonal and square faces suggestive of Kelvin's figure. Lewis (1925, 1928) has since extended his observations, and gives data showing the primarily tetrakaidecahedral form of such diverse tissues as the stellate cells of *Juncus*, cells of human adipose and oral epithelial tissues, and cork cells, while Hein (1930 a, b) comes to similar conclusions in studying sclerotial tissue of the fungi. From a mathematical standpoint the orthic tetrakaidecahedron has been considered in a previous publication (Matzke 1927).

Kelvin apparently arrived at his tetrakaidecahedron from studying the cubic skeleton frame of Plateau (1873). This is reproduced in figure 1—the frame being shown by the heavy lines.

If this frame is dipped into a soap solution and then withdrawn, the soap films form a quadrilateral face in the center, and each of the four sides of the quadrilateral also forms a side of a half-hexagon. This relationship is similar to a quadrilateral face of Kelvin's tetrakaidecahedron, which is surrounded by four hexagonal faces (as shown in figure 3). The limits of the three half-hexagons of figure 1 are represented by dotted lines in figure 3. The region enclosed by the dotted lines in figure 3 thus corresponds to the dotted portion of figure 1. Kelvin objected to the rhombic dodecahedron as a form for the partitioning of space

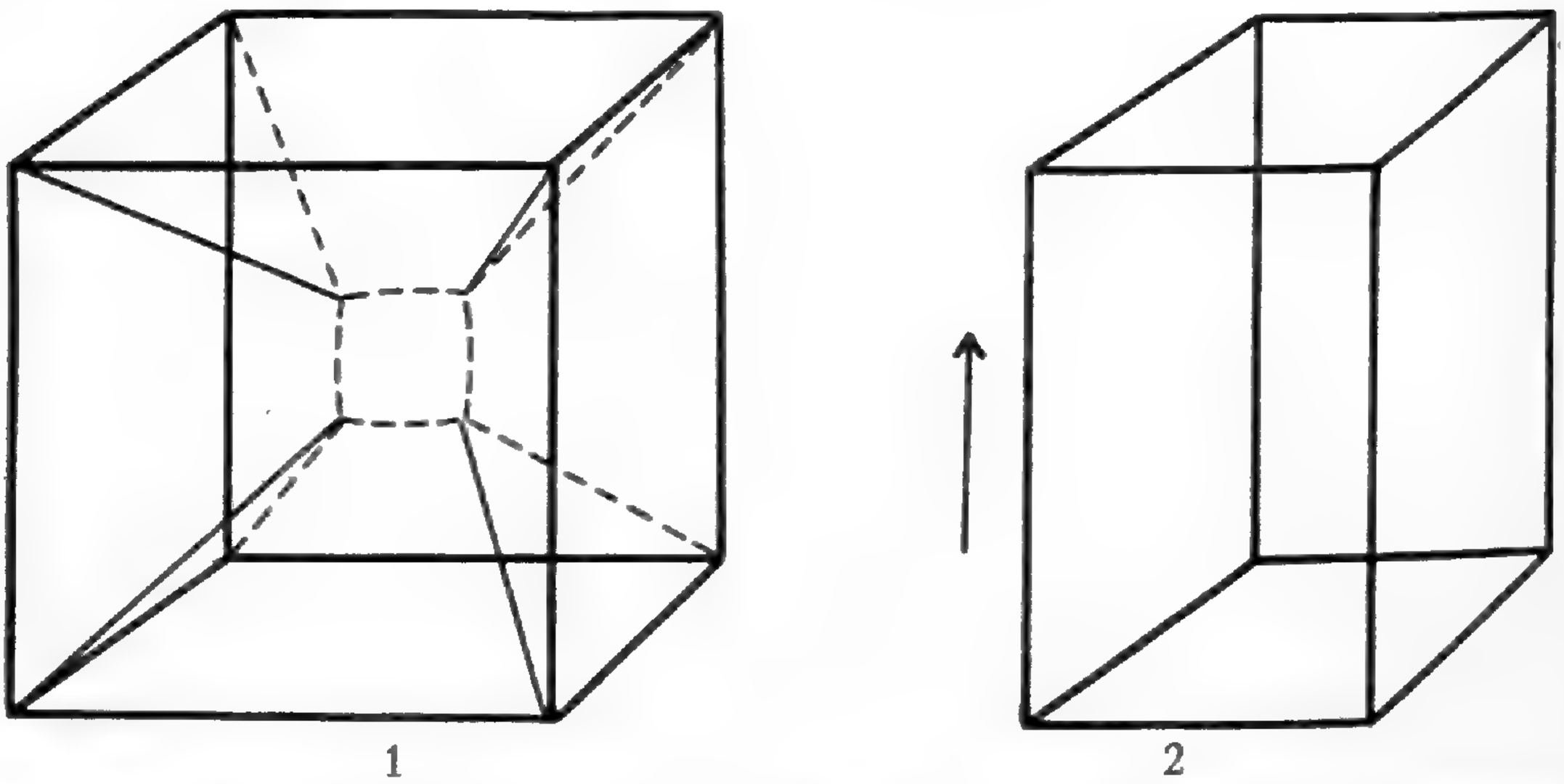

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FIGURE 1. Cubic skeleton frame of Plateau with soap films, a quadrilateral face and four half-hexagonal faces of Figure 3 shown by dotted lines.

FIGURE 2. Skeleton frame of a rectangular prism, to show the slipping of the soap films; it should be removed from the soap solution as indicated by the arrow.

because of its tetrahedral angles which, as he said, are essentially unstable. By blowing gently on the edge of the quadrilateral face in figure 1, that is by blowing parallel with its surface, that face will decrease in size, one side of the half-hexagonal faces (which are also quadrilaterals) thus becoming smaller and smaller. However, as Kelvin pointed out, this quadrilateral face cannot be made to disappear completely, for just as it approaches the vanishing point there is a readjustment of the soap films, and a new quadrilateral face is formed, its surface being perpendicular to the surface of the first.

A similar slipping or readjustment of the soap films can be demonstrated by using instead of the cubic skeleton frame, the

frame of a rectangular prism (figure 2). If this is dipped into a thick soap solution, and then removed, the direction of removal being parallel to the long axis of the frame (as indicated by the arrow in figure 2), there will be a quadrilateral face in the center which grows smaller and smaller; just as it vanishes a new face appears at right angles to the original one. This is easily demonstrable, the films slipping slowly, if the solution is dense enough. As known to Plateau and others, a soap solution to which glycerine has been added gives satisfactory results.

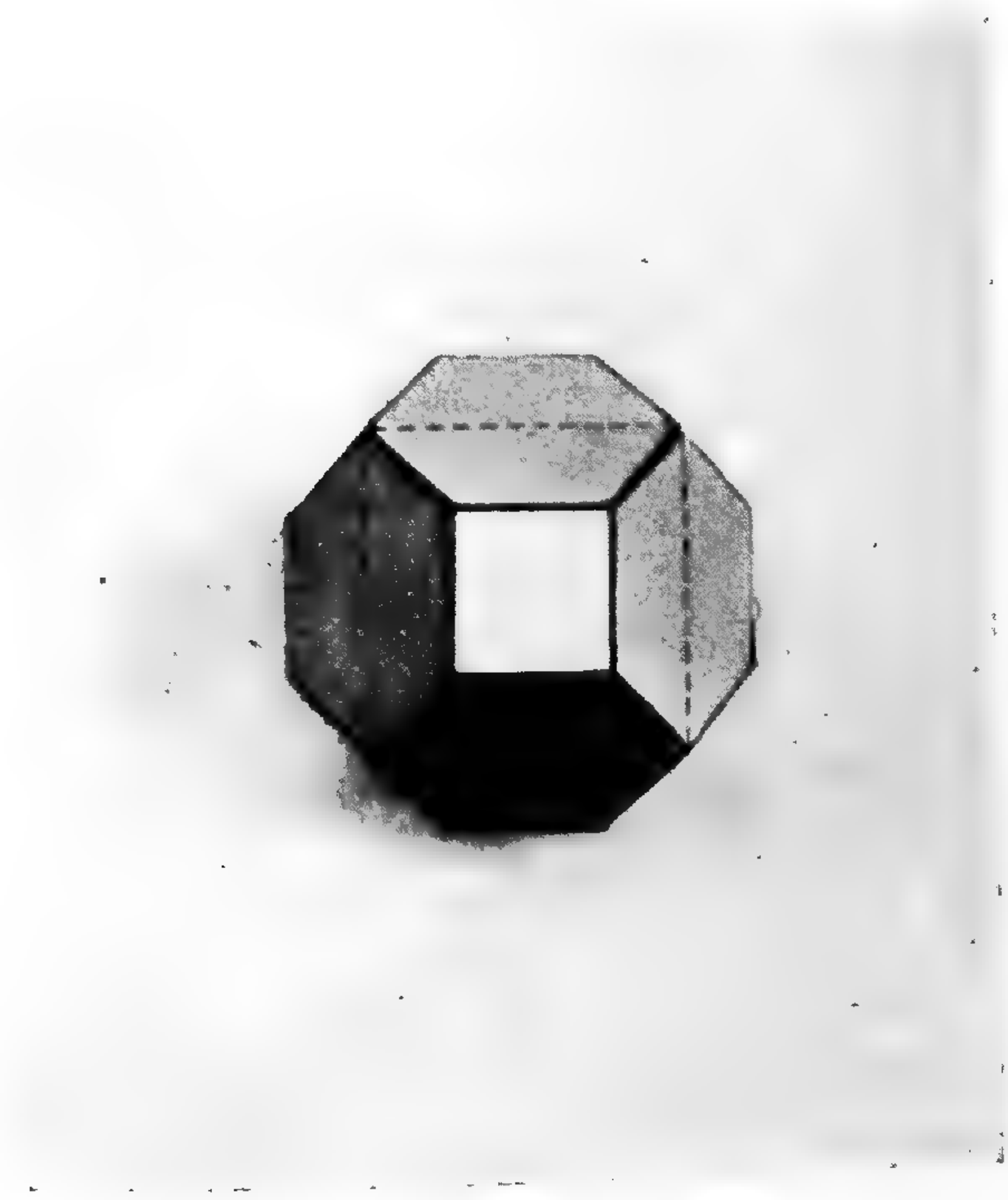

FIGURE 3. Photograph of an orthic tetrakaidecahedron, showing a square face bordered by four hexagonal faces. The four half-hexagonal faces of Figure 1 are limited by the dotted lines.

The orthic tetrakaidecahedron may be modelled in various ways. Kelvin (1894) suggested soldering together thirty-six pieces of wire. Figure 4 shows a layout for a paper model; this, printed on stiff paper, can be cut out, and folded on the heavy lines and glued by means of the flaps. It can be enlarged by means of the photostat. It is obvious that this is by no means the only arrangement possible for a paper model, but it is the most convenient. By using thin sheet metal instead of paper, and making the model in two parts, as indicated in figure 5, a mold can be made; then by soldering the edges of each half of this

mold, and temporarily fastening the two halves together, a form in which wax models can be poured is obtained.

The study of cell shapes in three dimensions is still in its infancy; only a few tissues have been investigated—largely, without doubt, because of the difficulty of making accurate determinations. In addition to the form of the mature cells, the Strasburgers of the future will unfold, step by step, the changes that the cells undergo, from the time of their origin, usually at the growing apex, to the time that they are fully differentiated. Is it too sanguine to hope that this process will not merely be traced, but understood in terms of the mechanics by which it is underlain?

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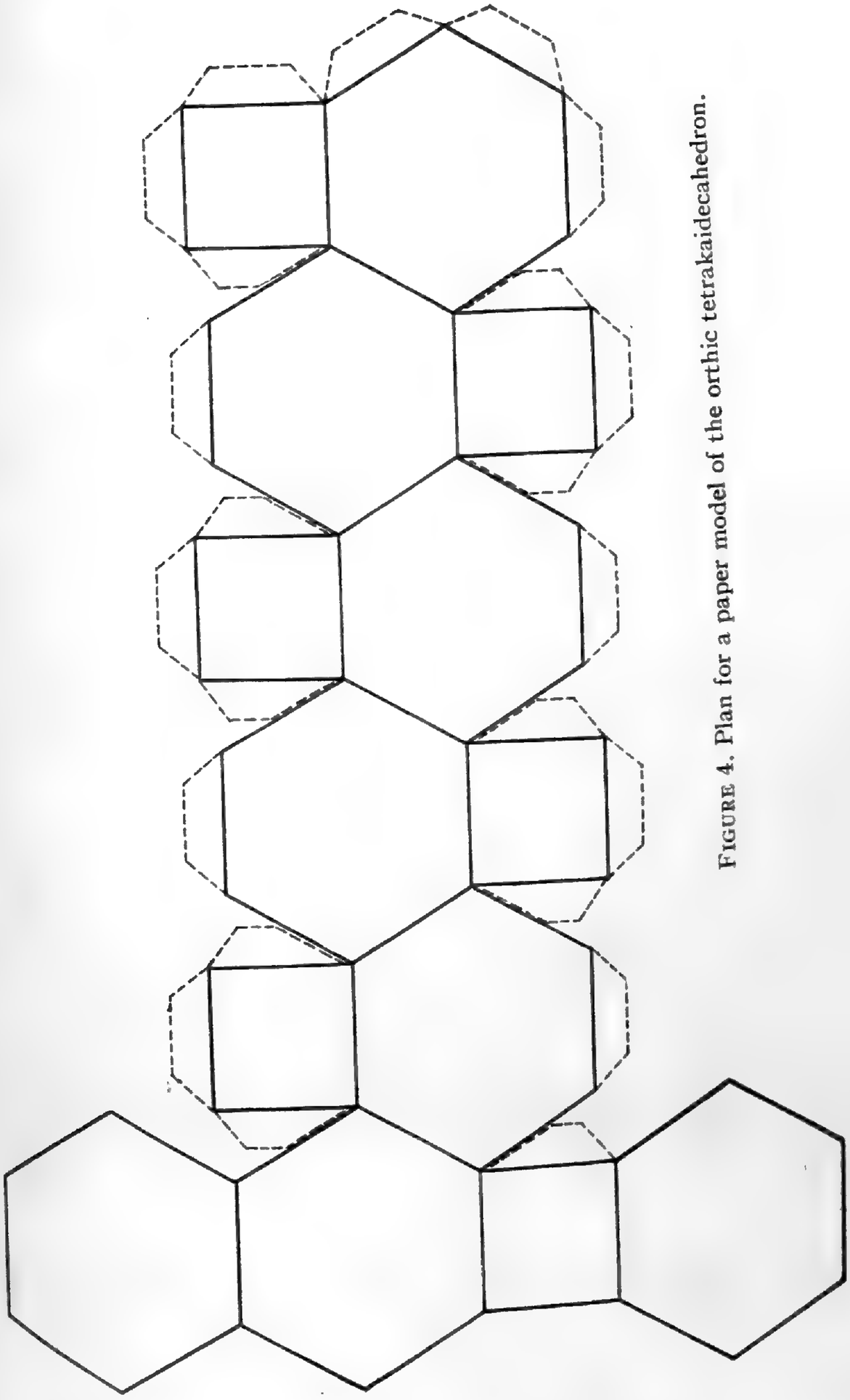

FIGURE 4. Plan for a paper model of the orthic tetrakaidecahedron.

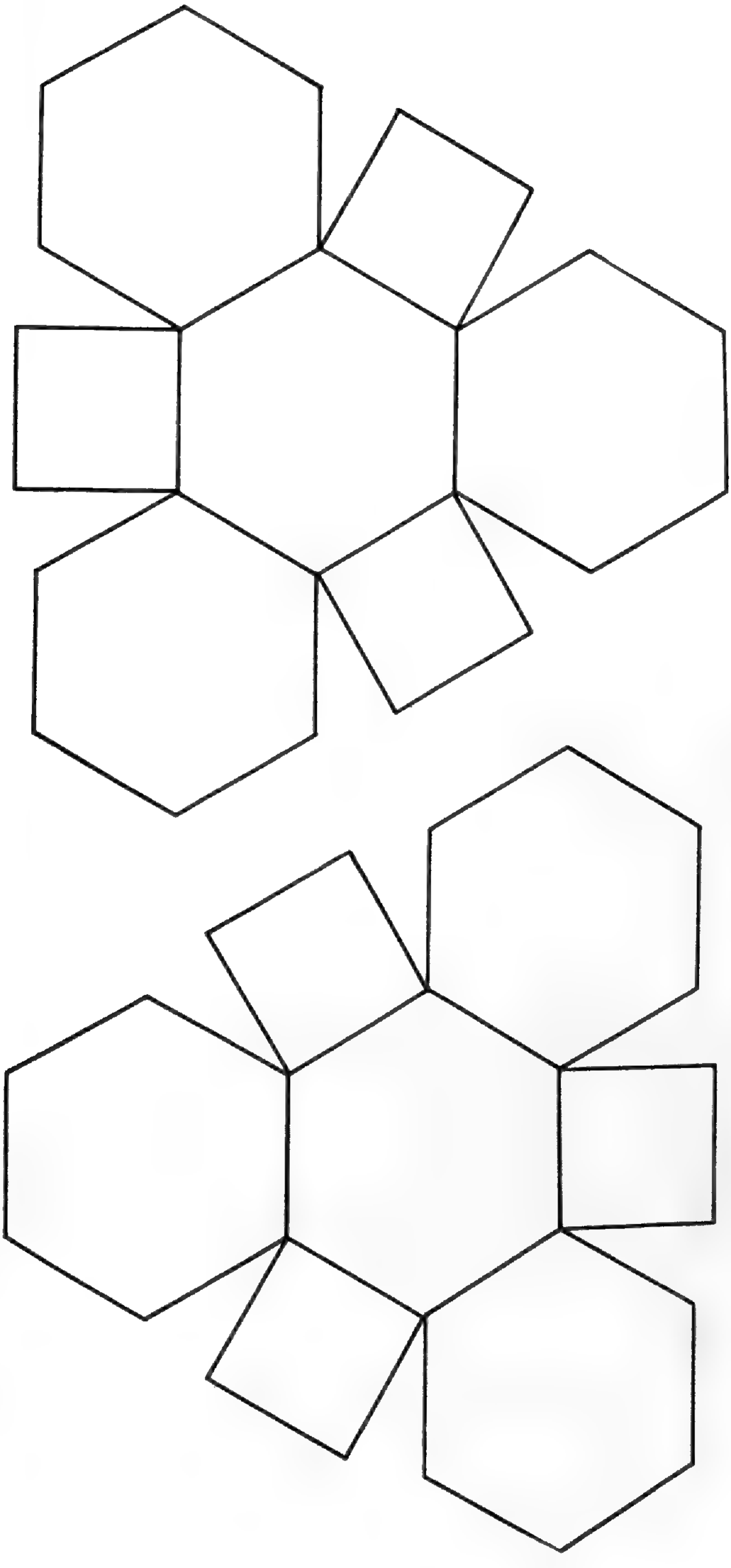

FIGURE 5. Plan for a metal mold of the orthic tetrakaidecahedron.

"Right Angle" Trees

Grace Coit Meleney

The Island of Martha's Vineyard, off the coast of Massachusetts, presents many features of interest to scientific observers. A state road runs east and west the length of the island for about twenty-five miles. It is along this much travelled highway that rows of strange trees are to be seen. For many years we have called them "right angle" trees, for they are bent over parallel to the ground and later take a new lease of life, apparently, and straighten up again. Some appear to have grown that way naturally, and at first thought it would seem that the main shoot had died and a branch had taken its place, but along this highway there are too many such trees to lend probability to this hypothesis. Furthermore, their trunks or branches are usually bent in the direction in which the road runs. In fact, many of the more modern wire fences have become embedded in the trunks.

Next, it was supposed that the prevailing wind might have been the cause of the malformation. However, these trees are surrounded by others that are straight, and they are well protected from the wind except in one locality. At West Chop, the northwest point of Vineyard Haven Harbor and directly across from Woods Hole, the winds sweep across Vineyard Sound so fiercely at times that by continued blasts for many years, the famous wind-blown cedars have been produced. Near these trees are "right angle" oaks, but here again, the bent trunks are more often parallel with the road than with the direction of the wind.

There are always city people in a summer colony who are so endowed with imagination that Indians play a prominent part in their ideas of the country. Indians, we were told, bent these trees over to mark their trails. But this idea had to be discarded because some of these bent trees almost touch their bent neighbors.

Some of the great whalers of the world have been natives of Martha's Vineyard. Consequently, another explanation was set forth from the mariner's point of view: these trees were bent over by the early settlers to produce natural right angle joints

to be used in making "ships' knees." These are the parts of a boat where the deck beams are fastened to the ribs of the hull, and, again, where the keel is attached to the ribs. This idea seemed plausible enough until it was noticed that the bent trees along the state road to Gay Head were on the north side almost exclusively. If they had been bent to produce "ships' knees" they could have been grown on either side of the road equally well or in wide groups rather than in rows so often parallel to the road.

It was not until we consulted an all-year-round resident of the island that we learned the true history of these trees. They are the remains of the old "lop fences" which he had seen his grandfather make. These fences were to mark ownership of cleared land or woodlot or to keep sheep in a pasture. This latter use accounts for the fact that in a large majority of these trees the transverse portions are between twenty and forty inches from the ground. But in some cases the cross bars are almost hidden in the ground and in others they are shoulder high. Very few of the fences stand now as they did originally, for individual trees have grown larger and others have rotted to the ground or disappeared entirely, leaving wide gaps.

The height at which the cross bars were made probably varied with each fence builder, because these trees found near together usually have the bars at the same height. The transverse bar was made by cutting a notch in a sapling at the proper height and bending it over to the ground or fastening it down with a weight or rope. Some of these first notches were cut so deeply that the tree was never able to heal the wound and the splinters stick out like broken bones through flesh.

Branches from the transverse bar would sometimes grow up straight to form the new main trunk of the tree. If this was not likely to occur, a second notch and bend would be made in order that the original main trunk could again fulfill its duty of reaching skyward. So many scrub oaks in their natural condition have branches coming out at right angles fairly near the ground, that it is probable that in some cases where trees were to be used as fences, the main trunk was cut off entirely in order that a sturdy branch at right angles could take its place. In a few cases the branches on both sides of the main trunk were utilized as bars, giving an appearance of a candelabrum. However, most of the

trees were bent over or lopped to *one* side,—hence the name "lop fence."

In only one instance have we found trees other than oaks used. In that case a clump of beech trees was in the direct path of the fence and instead of cutting them out, the fence builder added them in a crude manner, some of the smaller trunks being slashed to the ground. These, however, had died, forming a tangle of dead wood. This gives an explanation of the fact that lop fences were made almost exclusively of oaks, for oaks are the only trees in the region that can withstand this harsh treatment.

These right-angle trees on the main highway caused so much family and neighborhood discussion that various exploration

FIGURE 1. Example of right angle tree at Martha's Vineyard.

trips were made throughout the island on old country roads, confirming the fact that the lop fence had at one time been in common use.

When we discovered this fact, we naturally believed that such fences could be found in other parts of the East where the same sort of scrub oak and pine with their ever-accompanying blueberry bushes are dominant features. We were therefore not surprised to find remains of lop fences on Cape Cod between Plymouth and Sagamore, near the Cape Cod Canal. Doubtless the early settlers of Plymouth and Duxbury learned to make fences in as quick a way as possible by using growing trees instead of split rails.

On Long Island, the Middle Island Road which stretches for miles and miles through scrub growth of pine and oak, wild grapevines and berry bushes, makes any lover of Martha's

Vineyard feel quite at home. On approaching this road east from Huntington, Long Island, we saw our first right angle tree —quite isolated from any other such trees and bent at an angle toward the state road. This tree was very slender, only four inches in diameter, and was surrounded by other small trees, all straight. Between this point and Smithtown, Long Island, we came upon the trail of many old bent trees (figure 2). The

FIGURE 2. Right angle tree near Smithtown, L. I.

greatest find was a row of at least fifty-two trees near Centereach, Long Island. They looked very old, were lopped over quite near the ground, and stood close to one another. This row, at an angle of 60° to the Middle Island Road, stood out clearly against the landscape because of the cleared fields on either side. This particular lop fence is the best example we have ever found. Rumors of others in Pennsylvania and Ohio have as yet not been confirmed by the writer.

WHITE PLAINS, N. Y.

Notes on Trinidad plants

Edw. H. Graham

In the fall of 1924, on his return to the States from a sojourn and collecting trip in the vicinity of Kartabo, British Guiana, the writer spent a few days at the island of Trinidad, British West Indies. August 17th and 18th, 1924, were spent in visiting points in the northern part of the island, with headquarters at Port-of-Spain. Plants were collected at four localities as follows: (1) vicinity of Blue Basin, 6 miles north of Port-of-Spain; (2) Valencia, 20 miles due east of Port-of-Spain; (3) 6 miles northeast of Sangre Grande along the Toco road; and (4) Balandra Bay on the rocky exposed east coast about 10 miles from the northeast extremity of the island. All of these localities are in the northern quarter of the island and as the present notes represent a hasty collection from the region they may best serve as a list of the plants collected and an indication of the most conspicuous and common plants to be met there. The specimens, representing 46 species, are now in the Herbarium of the Carnegie Museum at Pittsburgh, Pennsylvania.

Trinidad is the most southerly of the West Indian Islands, with a flora, fauna, and geology closely allied to that of northern South America, from which it is separated by the Gulf of Paria, the marginal extensions of Trinidad being less than 20 miles from Venezuelan shores, with which there was at one time a probable connection. The island is situated between 10° 3′ and 10° 50′ North Latitude and 60° 55′ and 61° 56′ West Longitude.[1] Its average length from north to south is about 69 miles, its breadth 54 miles. Three parallel mountain ranges traverse the island from east to west, the highest being that in the north, composed mostly of pre-Tertiary, metamorphosed, sedimentary rocks rising to more than 3000 feet. To the south lies an undulating blanket of Tertiary and Recent sediments with inliers of Cretaceous age. Igneous rock is found only at one place on the north coast near Toco. In the center of the islands is a range of mountains running diagonally from the southwest to the northeast rising to 1000 feet, and in the south there is a broad belt of low mountains seldom rising above 100 feet in

[1] For a general description of Trinidad see Handbook of Trinidad and Tobago. Port-of-Spain, 1924.

elevation. The hills of the northern and southern ranges are densely wooded.

The climate is tropical and two seasons are evident, one a dry season from January to the middle of May, with an average rainfall of 3 inches per month, and the other a wet season from June to December, with an average rainfall of 8 inches per month. A short dry season of four weeks, called "Indian summer," occurs in October. The mean annual rainfall is 63.22 inches, although that of 1921 reached 85.13 inches. The coolest period is from December to April. The average temperature is 80° F., the mean diurnal temperature being 84° F., the mean nocturnal 74° F.

Three mosses, representing three families, were collected near Sangre Grande. *Leucobryum martianum* (Hornsch.) Hampe and *Calymperes donnellii* Austin were found thriving on a sand-gravel bank while *Rhaphidorrhynchium subsimplex* (Hedw.) Brotherus grew both on the bank and on several dead logs in the vicinity. The latter is apparently a very common moss here, and of South American affinity. The writer collected it abundantly in the rain-forest of British Guiana.

Near Blue Basin we visited a cacao grove where cacao, *Theobroma cacao* L. and coffee, *Coffea arabica* L. were being cultivated. On the floor of the cacao grove, where there was considerable shade and comparatively few plants, the ferns *Dryopteris poiteana* (Bory) Urban and *Dryopteris tetragona* (Sw.) Urban seemed very much at home. With the ferns occurred *Amaranthus spinosus* L., a species of eastern United States, which seemed strangely out of place. On the branches of the trees in the grove *Polypodium incanum* (Sw.) and *Polypodium lycopodioides* L. were densely matted, in some instances completely covering the limbs. Other ferns frequently noted were *Pityrogramma calomelanos* L., the "Silver fern," so called because of the white powder on the under side of the fruiting frond; *Dryopteris parasitica* O. Ktze., which was collected in the gutter along the road; and *Alsophila microdonta* Desv., an enormous fern over 10 feet in height which also was collected in the Guiana rain-forest. Near Blue Basin a specimen of *Juniperus lucayana* Britton was found. It has been introduced, however, as there are no native conifers on the island. The striking lobelia, *Centropogon cornutus* (L.) Druce, which was also found

in Guiana, occurred here as well as at Sangre Grande and here the composite, *Clibadium surinamense* L. grew to a height of more than 6 feet, together with the shrubby *Hamelia erecta* Jacq.

Along the roads of the island were frequently observed the canna, *Canna coccinea* Ait.; the musaceous *Bihai psittacorum* (L.f.) Kuntze, with conspicuous orange flowers and large, reed-like stems; *Sida carpinifolia* L.f., a widely distributed tropical weed; the verbena, *Valerianodes cayennense* (L. C. Rich.) Kuntze; and the two madders, *Borreria laevis* (Lam.) Griseb. and *Borreria verticillata* (L.) Meyer. The delicate *Tussacia pulchella* (Donn) Reichenb., a member of the Gesneriaceae, is found here along roadsides, with *Physalis angulata* L.

Near Valencia, on gravelly soil, occurred the sedge, *Rhynchospora cephalotes* (L.) Vahl. Here were also collected *Clusia martini* Sagot, with remarkable, smooth, thick, obovate leaves, and the South American melastoms, *Miconia ciliata* (L. C. Rich.) DC. and *Pterolepis glomerata* (Rottb.) Miq. Not far from these shrubs grew the gentian, *Chelonanthus chelonoides* (L.f.) Gilg, as well as *Achetaria scutellariodes* (Benth.) Kuntze, and, trailing over the ground, the tropical American *Mandevilla tomentosa* (Vahl) Kuntze.

About some of the plantations specimens were collected of nutmeg, *Myristica fragrans* Houtt, extensively cultivated in the neighboring island of Grenada; the avocado pear, *Persea persea* (L.) Cockerell, in fruit; the orange, *Citrus aurantium sinensis* L.; and the grapefruit, *Citrus grandis* (L.) Osbeck. Trailing on the sandy soil were escaped squashes, *Cucurbita maxima* Duchesne. The flame tree, *Poinciana pulcherrima* L. was abundant as an ornamental, and *Hibiscus rosa-sinensis* (L.), a mallow with great, red flowers, was here used extensively for hedges, as it is in all tropical countries.

At Balandra Bay where the rocky coast is exposed to the open sweep of winds from the sea, and where the spray from the high dashing waves reaches it, there is a beautiful example of wind-pruned vegetation on the brink of the cliff, and the plants constituting this mat of woody growth were very interesting. Among them were *Randia mitis* L.; *Coccolobis uvifera* (L.) Jacq., the sea-side grape; and the mangrove, *Rhizophora mangle* L., which grows here as a dwarfed shrub. Over the rocks on the top

of the cliff was found a climbing milkweed, *Metastelma decaisneanum* Schlechter, and on the top of a nearby hill were found the calabash, *Crescentia cujete* L., and two members of the madder family, the tree-like *Isertia parviflora* Vahl, and the trailing *Tontanea guianensis* Aublet.

While many of the plants observed were obviously of South American affinity, a detailed study of the flora of the island may well show other relationships, as is indicated by the occurrence here of *Tussacia pulchella* (Donn) Reichenb., a species from Panama and Jamaica, and the fact that Hitchcock[2] reports very few of the grasses of the West Indies occuring also in British Guiana. Further study of Trinidad plants will furnish not only pleasant botanizing but profitable results as well, particularly from a distributional standpoint.

CARNEGIE MUSEUM
PITTSBURGH, PENNSYLVANIA

[2] Hitchcock, A. S. Floral aspects of British Guiana. Ann. Rep. Smithsonian Inst. **1919**: 301. 1921.

BRIEFER NOTES

A freak flower of the Chinese sacred lily

LeRoy K. Henry

Among a normal cluster of flowers upon a Chinese sacred lily (*Narcissus Tazetta*, var. *orientalis*) growing in a bowl of water, there appeared twin flowers on one of the peduncles. Normally each peduncle bears a single flower, but this one was broadened at the tip and bore two distinct flowers. These flowers were entirely separate, even to the ovaries, which were merely held together by the common epidermal covering. The tube of

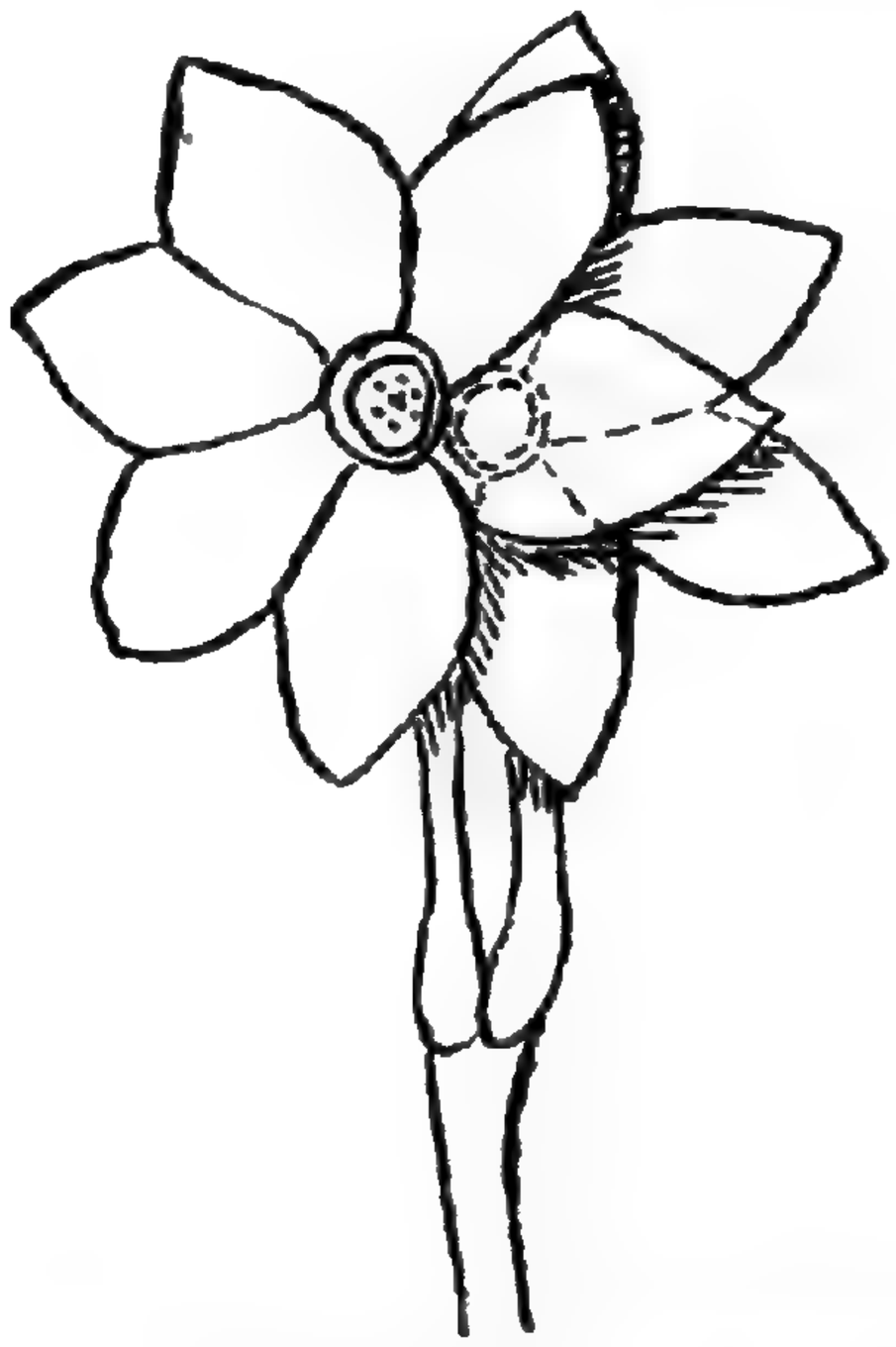

FIGURE 1. Twin flower of Chinese Sacred Lily.
(*Narcissus Tazetta var. Orientalis.*)

the one flower was larger than that of the other and, in growth had split longitudinally half of its length; also there seven stamens instead of the normal number of six. According to Worsdell's "Principles of Plant Teratology," this phenomenon is called floral fasciation. Fasciation varies in all degrees from flowers with abnormal number of floral parts, such as increase of stamens, calyx, corolla, or all three, to separation into two distinct flowers. For the plant in question, I have found no report of this type of fasciation in which there are two separate flowers. Often there is one flower with increased number of petals or sepals and two distinct ovaries, or one with a common

calyx and the remaining floral organs separate. This condition of the twin flowers evidentally arose from the longitudinal division of the primordial initial cell, which gave rise to two distinct ovaries with their accessory parts in place of the customary ovary.

CARNEGIE MUSEUM
PITTSBURGH, PENNSYLVANIA

Another Catskill occurrence of Potentilla tridentata

RAYMOND H. TORREY

At least two occurrences, in the Catskill Mountains, of the Three-Toothed Cinquefoil, *Potentilla* (*Sibbaldiopsis*) *tridentata*, may now be recorded, where previously there had been no record of the species in any catalogue of the flora of that region. Some time ago I stated in this journal that I had not found it on about twenty of the higher Catskills summits, although it is found on lower elevations in the same latitude or even farther south, such as Mount Beacon, 1640 feet on the Hudson opposite Newburgh, and on High Point, on Kittatiny Mountain, 1807 feet, in New Jersey; and at elevations of 4000 feet or higher, in Virginia and North Carolina. An occurrence at 4000 feet was also reported by Dr. R. L. Harper, I think, in Georgia.

After my statement appeared, Mr. William Gavin Taylor, of Arlington, New Jersey, found the plant in 1930 on the top of the cliffs of Overlook Mountain, on the eastern front of the Catskills in Ulster County, northwest of Kingston, New York. It is a bleak, exposed place, such as the species likes, and it appeared that it flourished there, at about 3000 feet, even though not found as then supposed on other Catskill summits, a thousand feet higher, in the interior of the mountains, which are clothed with dense sub-alpine fir and spruce, and are more protected than the Overlook cliffs.

On Aug. 30, 1931, I found plenty of it, at several points, on the ledges along the trail north of the Catskill Mountain House, in Greene County, at elevations from 2000 to 2400 feet. With it, on one ledge was associated a large bed of Bearberry, *Arctostaphyllos uva-ursi*, which is extremely rare in the Catskills, at least in the higher parts, where I have never seen it. Norman Taylor, in his catalogue of the flora of the vicinity of New York,

mentions Bearberry as found in Greene County, and this occurence north of the Catskill Mountain House may be the basis of that report, as it can easily be reached on the trail from the hotel and would be noticed by anyone acquainted with it.

The beds of *Potentilla tridentata* on these ledges are dense and flourishing. Their elevation is about the same as the colonies of the plant on Alander and Brace Mountains and Mount Everett, on the Taconic Plateau about 40 miles eastward of the Catskill location.

Since it appears from Mr. William Gavin Taylor's and my own report that *Potentilla tridentata* occurs on the exposed outer front of the Catskills, a search of ledges atop the cliffs north and south of Kaaterskill Clove, especially toward the Blackhead Range, where several high cliffs are visible, may disclose still other stands, which I hope to find.

Damsel Flies captured by Drosera

RAYMOND H. TORREY

I have seen during the past summer, several examples, and heard of another, of the capture by species of *Drosera*, of Damsel Flies, which seemed to me rather large and powerful insects to be taken by these insectivorous plants. At Little Cedar Pond, east of Greenwood Lake, in June, with the class in regional science of Teachers College, Columbia University, I saw a dozen blue damsel flies enmeshed on the leaves of *Drosera rotundifolia*. In some cases more than one plant, in a dense bed of them on the quaking bog that borders the pond, had seized a single insect; and the exudation from the hairs was increasing and the hairs were bending about the body of the insect, in the same manner as they inclose and digest smaller insects. The combination of the bright red hairs with their shining digestive fluid and the bright blue insect was very striking.

Mr. Max A. Elwert, a member of the Torrey Botanical Club, reported to me on Sept. 8, that he found a damsel fly caught on the leaves of *Drosera longifolia*, in a bog along the Davenport branch of Tom's River, in Ocean County, New Jersey. The capture of so large an insect, more than an inch long, by the narrower-leaved *D. longifolia* seems quite a remarkable performance.

Frost Flowers reported 100 years ago

RAYMOND H. TORREY

Since the reports in TORREYA, of "frost flowers" on *Cunila*, made by me, and the interesting comments and similar reports on them in the last number by Professor H. M. Jennison, of the University of Tennessee and by Dr. R. L. Harper of Tallahassee, Fla., reporting similar occurrences on *Verbesina* and *Pluchea*, I have received from the Missouri Botanical Garden, St. Louis, a copy of its bulletin, for October, 1924, with an article on the subject, containing photographs of large numbers of such ice crystals, in the Garden, on *Verbesina virginica*. The writer of the article says that a hundred years ago Stephen Elliott in "A Sketch of the Botany of South Carolina and Georgia," wrote of the marsh fleabane, *Pluchea*, that on cold frosty mornings, crystalline fibers nearly an inch in length shoot out in every direction from the base of the stem. "It would appear," he says, "as if the remnant of the sap or water, absorbed by the decayed stem, had congealed and had burst in this manner through the pores of the bark. Does this proceed from any essential, quality of the plant or from its structure?"

The Missouri Botanical Garden *Bulletin* also notes that Sir John Herschell, in 1883, found ice crystals on thistle and heliotrope, and the writer of the article says that since that time at least thirty different plants have been recorded as forming frost flowers, "including not only herbaceous annuals and perennials, but trees, such as walnut, pawpaw, Paulownia, etc." But he says that there are only a comparatively few plants in which this phenomenon can take place, and they are those where "the roots must retain their vitality long after the stems have died, and continue to force up water which either freezes on a cut or wound or finds some other outlet through the bark. The soil must contain a sufficient amount of water and the temperature in the soil as well as in the conducting tissues of the plant must be above freezing point, while the temperature of the air must be below the freezing point." Such were the conditions when I found the crystals on *Cunila origanoides* on Kittatiny Mountain, in Warren County, New Jersey last November. While many records may have been reported, possibly in scattered notes in botanical literature, the general manuals do not record

this phenomenon, on any other plant but the Frostweed, *Helianthemum canadense*, which receives its popular name from the occurrence. A definite and complete list of plants displaying such crystals would be interesting and might throw more light on the physical reasons therefor.

BOOK REVIEWS

Johnston's monograph of the genus Cordia in Southeastern South America

Under the modest title "Observations," this accomplished specialist in the family *Boraginaceae* contributes a paper (*Contrib. Gray Herbarium XCII*) which well sustains the reputation of that institution for comprehensive and accurate work. The keys to the several sections of the genus, the citations of publication and synonomy and the descriptions of new species are all excellent, as well as the citation of the specimen examined, but the most striking and valuable part of the work is in the extended discussions of the composition of the species. It is a lamentable fact that the taxonimist is usually unable to reach very positive conclusion as to identity from the majority of descriptions, without referring to type specimens, but it would be rather difficult for any careful analyst to be in doubt regarding the identity of his specimen after reading Dr. Johnston's discussion of its essential characters and variations.

Every student of tropical American plants must have been puzzled in his attempts to identify specimens of the difficult genus Cordia, even when he has good material for comparison. Dr. Johnston's "observations" regarding variations in the numerous specimens examined should contribute much toward accuracy in future publications of this genus. We cannot help regretting that the author should take so comprehensive a view of the limits of this genus. To the present writer, it seems that the generic distinction between groups which Dr. Johnston regards as sub-genera are greater than those which separate Cordia from its relatives. Both accuracy and convenience would seem to dictate the separation of Cordia, as here treated, into a number of genera.

H. H. RUSBY

Ferns and flowering plants of Hawaii National Park*

The author states that the purpose of the book "is to meet the need of visitors to Hawaii National Park who have had little or no formal botanical training, yet who wish to know the most interesting facts about local ferns and flowering plants, particularly in relationship to ancient Hawaiian customs." Following a very brief geological history is a short account of the origin of the Hawaiian flora, emphasizing the tragic results of the introduction of domestic animals and the escape of introduced plants. Most of the book is taken up with the description of the more common and striking plants of the park or of the roadsides leading to it, from the lycopodiums up. The descriptions are accompanied by excellent full page cuts. With the descriptions are accounts of the uses made of the plants by the people in olden times—of the making of grass huts and outrigger canoes, of mats and tapa cloth, of poi and candle-nut oil, of ceremonies connected with the hula, of kapus and legends. In addition there are good accounts of the sugar, coffee and pineapple industries. The book should add greatly to the interest and profit of a visit to the park by both botanists and those with no botanical training.

G. T. HASTINGS

* Ferns and flowering plants of Hawaii National Park, Otto Degener XV+308 pages. Honolulu Star-Bulletin, 1930, $4.00.

FIELD TRIPS OF THE CLUB

Trip of Sunday, July 19

The trip of July 19 afforded the 34 participants an opportunity to observe the chief features of the vegetation of Sandy Hook. This region, within such easy reach of New York City, presents a sample of largely unaltered "beach" vegetation, with the unusual spectacle of a maple-holly forest. The party first made observations on the vegetation of the Navesink Highlands, finding oaks and hickories to be the dominant trees, with a number of interesting introduced trees and shrubs.

After devoting an hour to lunch, the party gathered at the entrance to Sandy Hook, where they were admitted through the courtesy of the Commanding officer of Fort Hancock. By calling into use all available cars, the party was carried several miles up the Hook to headquarters, where an officer was provided to conduct them through the reservation. This arrangement proved to have double value, for it not only enabled the members to explore certain forbidden regions, but also made possible a closeup view of such non-botanical exhibits as disappearing guns, ammunition stacks, and other features of the coast defenses. It was pointed out that the lighthouse, now situated nearly a mile south-east of the tip of the Hook, was just at the tip when built over a hundred years ago.

Among the plant communities visited by the party was an established dune of the low type which is typical of the Jersey coast. Here were seen the red cedar, black cherry, beach plum, bayberry, and several species of *Rhus*, which dominate such areas, together with *Hudsonia tomentosa*, *Lechea maritima* and *Opuntia vulgaris*. When one enterprising botanist announced the discovery of a couple of belated flowers of this cactus, a scramble ensued, for all wished to see the large yellow double flowers of our eastern prickly-pear. In spite of the leader's warning, a few investigators got first-hand knowledge of the tiny glochids which abound on the joints of the *opuntia*—another form of "coast defenses."

After glancing at the little group of *Pinus rigida* which constitute the only pines on the peninsula, the party examined the remarkable community in which red maple and holly are domi-

nant. The large size of the latter (a foot or more in diameter), the abundant mantle of climbers such as *Psedera*, *Menispermum*, *Vitis* and *Rhus Toxicodendron*, the luxuriance of the undergrowth, including such a delicate plant as *Geranium Robertianum*, give one a rather false idea of the seemingly mesophytic nature of the region.[1] The difference between this forest and the oak-hickory combination seen in the adjacent Navesink Highlands was striking.

A third and very different plant community was the last one visited, namely, the salt-marsh on the west side of the Hook. *Spartina glabra* was seen to be the outlier, while *Iva oraria* formed a close second. Two species of *Salicornia* occurred in depressions, accompanied by *Suaeda linearis* and *Spergularia marina*. On higher ground were found the usual beach plants among which *Salsola kali* and *Euphorbia polygonifolia* attracted most attention. After some search, specimens of marsh rosemary (*Limonium*) were located, thus completing the list of exhibits.

The day was unusually favorable for field work, also for salt-water bathing, which concluded the program for some members of the party.

M. A. Chrysler

Trip of July 25

Cedarhurst, Long, Island, July 25. The wooded area owned by the Long Island Water Corporation, west of Cedarhurst and Hewlett, and south of Gibson and Valley Stream, at the base of the Rockaway Peninsula, which was visited by the club on Saturday afternoon, July 25, is a region lately discovered by the chairman of the field committee, which merrits more attention by botanists. It appears to be a remnant of the older patches of low land forest on the south shore of Long Island, having been preserved because it is used for the water supply through driven wells, of neighboring communities. It is closed to general public use, but permission was kindly given to the club by the water company for scientific field study. The timber, though it was perhaps cut in early days, is excellent dense

[1] The probable origin of this community has been discussed in a recent paper by the leader, Bull. Tor. Bot. Club. Vol. 57, No. 3; March 1930.

second growth, if not original in some spots. It is only a few feet above high tide, and on the western border is a fresh meadow, gradually becoming salty toward the creek which enters the western end of Jamaica Bay. The moist conditions of the meadow and the sides of a still brook which meanders through it and out to the marsh encourage many herbaceous plants loving wet spots.

The largest colony of the narrow-leaved Chain Fern *Woodwardia areolata*, which the writer has ever seen occurs in the forest, being the commonest fern present. It is as thick as the Sensitive Fern is usually in such places. Just outside the woods grows the other Chain Fern, *Woodwardia virginica*, in abundance among the marsh grasses, with Royal Fern.

Two beautifully fruiting Slime Moulds, *Conatrichia typhoides* and *Didymium melanospermum* were common in the shaded woods. In the fresh meadow were large colonies of many flowered specimens of *Lilium superbum*. The Great Burnet, *Sanguisorba canadensis*, was found in large stands. *Polygala cruciata* was very common on the sandy meadow soil, partly hidden by grasses and sedges. The change from fresh water species, such as pickerel weed and water arum in the brook, to brackish and salt water species is interesting as one follows the marsh west toward the head of the bay.

This region promises to remain unaltered, because it is too low for real estate development and is protected because of its water supply uses. It is worth frequent visits at various seasons, for its plant associations are apparently unchanged since earlier days.

Trip of August 2

Doodletown Valley, Bear Mountain Park, Aug. 2. An interesting feature of an excursion of the club in the eastern part of the Bear Mountain Park was the discovery of another flourishing colony of the Prickly Pear Cactus, *Opuntia Opuntia*, on one of the granite knobs in the midst of the meadows back of Iona Island. The cactus colony scheduled to be seen on this walk, on the northern knob, was observed and the party decided to look over the southern knob and see if the species occurred there too. It was promptly found, on the pegmatite dike of which these knobs are mostly composed. *Utricularia vulgaris* was in plentiful bloom in the stagnant pools along the

road to Iona Island. The lower part of Doodletown Brook, climbing from the State Highway, proved interesting, with many mosses and liverworts. *Conocephallum* and *Pellia* were plentiful and a leathery brown plant which looked like a liverwort proved to be the lichen *Dermatocarpon miniatum aquaticum*. The Purple Loosestrife and the Rose Mallow were in gorgeous bloom in the marshes. The former shows every year more development at higher levels, climbing up the brooks above its original stands in the salt marshes.

(The writer found another colony of Prickly Pear Cactus, in dune sand, east of Sunken Meadow State Park, at Kings Park. L.I., August 8.)

RAYMOND H. TORREY

TRIP OF AUGUST 22–29

Fifteen, in addition to the leaders (Dr. Gundersen and myself), appeared for the week's exploration of the Catskills, and were duly installed in three farmhouses in the village of Maplecrest, in Windham Township. Demands of summer visitors have resulted in a replacement of the local and botanically more inspiring name of Big Hollow (still on the topographic map) by the elevated name, Maplecrest. The hollow is some ten miles in length, hemmed in on the south by Thomas Cole, Black Dome and Blackhead Mts. and on the east and north by Acra Point, Windham High Peak, and Elm Ridge. These mountains are in general 3000–4000 feet high, rising from the valley which is at 1700–2000 feet.

The excursion combined both scenic and botanical interests. The itinerary began on Monday with the ascent of Hunter Mt., altitude approximately 4000 feet, lying about eight miles south of Windham. In sugar maple groves at the base were found two species of *Botrychium*—*B. lanceolatum* var. *angustifolium* and *B. ramosum* always to be looked for and not at all uncommon in such places. The common members of this genus, *B. virginianum* and *B. ternatum*, were also found in this region. Proceeding upward *Viola rotundifolia* conspicuously occupies the ground for an interval of about 300 feet with occasional *V. canadensis*

and *V. renifolia*. The brooks are lined with silver birches (*B. lutea*), mountain maple (*Acer spicatum*) and moosewood (*A. pennsylvanicum*) and in the brook bed itself grows *Impatiens pallida*. At the uppermost limit of the *V. rotundifolia* belt where the rocky ledges of the mountain begin to be apparent, *Polystichum Braunii* is abundant along the pathway (elevation between 2500 and 3000 feet), the only locality at which this northern fern was noted during the week. The rocky declivities are draped with *Ribes lacustre* and *R. triste* var. *albinervium*, the latter species so far as I know, not recorded as far south in New York State. *Festuca nutans* is here a common grass. Passing beyond this point the woods take on the general aspect of the Canadian forest—a monotonous repetition of few species which occur in picturesque abundance, *Picea rubra*, *Abies balsamea*, *Betula papyrifera* var. *cordifolia*, with a ground covering of *Oxalis americana* (*O. acetosella* of American auths.), *Aster acuminatus*, *A. macrophyllus*, *Clintonia borealis*, *Streptopus roseus* and predominantly the broad-leaved mountain representative of the shield-fern, *Thelypteris spinulosa* var. *dilatata*. The wand-like inflorescences of *Solidago macrophylla* brighten up these forests where flowers are conspicuously lacking at this season of the year. An exposed area along a spring-fed brook at about 3000 feet gave an unusual display of *Rudbeckia laciniata* and *Chelone glabra*. Near the summit the spruce woods become thicker and the ground almost boggy and here *Trillium undulatum*, *Cornus canadensis* and *Coptis trifolia* make their appearance, also *Conioselinum chinense*. Exposed places at the summit are occupied by the hair-grass, *Deschampsia flexuosa* and by *Cinna latifolia*. The view from the steel fire-tower covers the Catskills to all points of the compass and to the north extends far beyond the mountains.

August 25, Tuesday. Various members spent the morning working on material collected the previous day or joined in a short exploration, interrupted by rain, of the pastures and lower wooded slopes of Windham Peak. These yielded the same *Botrychium* found at Hunter, a single specimen of *Microstylis unifolia*, *Carex Deweyana*, and in the crevices of an exposed ledge, *Woodsia ilvensis* and *Asplenium platyneuron*.

August 26, Wednesday. The day was occupied in a visit to Overlook Mt., which occupies the southeast angle of the Cat-

skills and looks out upon the Hudson Valley. Rain set in before the summit was reached. Miss Rusk, Miss Vilkomerson and I remained somewhat behind the rest of the party and never did reach the top. Judging from the plants encountered, the region adjacent to the abandoned sandstone quarries toward the summit has a well-marked acid soil. The most interesting plant along this trail is *Ilex monticola*, bushes up to seven feet in height, which I had never previously seen here. *Kalmia latifolia, Viburnum cassinoides, Gaultheria procumbens, Quercus velutina, Myrica asplenifolia, Epigaea repens. Vaccinium pennsylvanicum* and *V. canadense* were abundant. The evening was spent by various members in passing buckets of water at a neighborhood fire. A small part of the water reached its destination.

August 27, Thursday. So far we had enjoyed only one clear day and Thursday was no exception to the generally rainy weather. In a let-up Dr. Ryder and I, under the guidance of one of the boys on the farm, searched ineffectually for a "cranberry meadow" in which pitcher plants were said to grow. We cut twice through an alder swamp overgrown with grass and at noontime returned for more and better directions. In the afternoon Mr. Irish, with whom I was staying, offered to lead the way. This time a first-class bog was uncovered. Pitcher plants (*Sarracenia purpurea*) were there in abundance, but of more interest was an open space of about an acre thickly carpeted with *Carex pauciflora*. The small cranberry (*Vaccinium Oxycoccus*), and tufts of *Eriophorum spissum* Fernald[1] (*E. callitrix* of most auths.) and *Kalmia polifolia* were intermixed. At the margins of the bog, shaded by *Picea rubra* and *Abies balsamea* were a few clumps of *Carex paupercula*, another sedge rare so far to the southward. Although *Carex pauciflora, C. paupercula*, and *Eriophorum spissum* range southward to Pennsylvania on the Pocono Plateau, none of them have been definitely reported from the area within New York State covered by Taylor's "Flora of the Vicinity of New York," (1915) which includes the Catskills, nor has House[2] listed these species from within this area with the exception of *C. pauciflora* which is

[1] Rhodora xxvii, 208 (1925).

[2] Bull. N. Y. State Museum No. 254 (1924). It is here assumed that House's report of *Carex paupercula* in Dutchess County (p. 138) is based on the doubtful citation by Taylor (l.c. p. 204).

said to extend to Delaware County. *Linnaea borealis* var. *americana* and *Chiogenes hispidula* were abundant in hemlock and spruce thickets surrounding the bog.

An informal meeting at Dr. Gundersen's concluded the day's program. Here we were visited by a terrific thunder storm, the lightning flashes disclosing the peaks of the Catskills as in daylight.

August 28, Friday. A second visit to the bog for the benefit of those who had not previously seen it, was followed by the ascent of Blackhead Mt. from the north. This mountain is much steeper than Hunter or Overlook and the vegetation of the slope has a more northerly aspect. For example, *Trillium undulatum* occurs down almost to the base of the mountain; on the other hand *Polystichum Braunii* did not make an appearance. *Streptopus amplexifolius* in a deep ravine and *Amelanchier Bartramiana* on exposed rock were perhaps the most interesting species on the north slope of Blackhead Mt. *Linnaea borealis* var. *americana*, occurring in patches on the summit, seems to be comparatively rare in the Catskills.

H. K. Svenson
Brooklyn Botanic Garden

NEWS NOTES

THE FIRST number of a new botanical journal has recently appeared—*Sunyatsenia*,—from the Botanical Institute of the College of Agriculture of Sun Yatsen University, Canton, China. In this number there are two articles: On Miquel's Kwantung species as based on Krone's collection by E. D. Merrill and Contributions to the knowledge of Kwantung Flora by E. D. Merrill and Woon-Young Chun.

IN A CAMPAIGN to rid the farms of weeds the following advertisement appeared in some Ontario papers this past spring: "To the rate payers of Ameliasburg Township—kindly take notice that the following weeds are proclaimed noxious under the Weed Control Act and that it is in your interest to plan your rotation and spring seeding so that you can eliminate some of them this year. Bladder Campion, Ox Eye Daisy, Sow Thistle, Canada Thistle, Blue Weed, Chicory, Docks, Ragweed, Ribgrass, Stinkweed, Tumbling Mustard, Wild Carrot, Burdocks, Hawkweeds, Wild Lettuce.

Sow Clean Seed, Cultivate and Rotate."

DR. RUSSELL A. OAKLEY, Senior Agronimist, U. S. Department of Agriculture, died on August 6 at Monrovia, California, where he had gone about a year and a half ago in the hope of regaining his health. He was well known among professional and amateur golfers for his interest in the improvement of fine turf grasses, He was co-author with Dr. C. V. Piper of Turf for Golf Courses.

DR. W. E. TOTTINGHAM, of the University of Wisconsin, was recently elected president and Dr. R. B. Harvey, of the University of Minnesota, vice-president of the American Society of Plant Physiologists. Dr. M. A. Gardner will continue as secretary for another year. (SCIENCE)

DR. L. O. OVERHOLTS, of the Department of Botany of Pennsylvania State College, has been granted a five months leave of absence to study timber diseases in the forests of Louisiana for the federal government.

PROFESSOR H. L. BOLLEY, dean of biology of the North Dakota Agricultural College, has returned from a year's leave of absence spent in the more temperate regions of South America. He brought with him some specially selected seeds, particularly from the flax crops of Argentina and Uruguay.

BULLETIN 1338-F of the U. S. Department of Agriculture describes two recent wilt-resistant varieties of tomato,—Marglobe and Break o'Day. The bulletin includes recent information on growing, gathering and preparing tomatoes for market. Tomatoes are our third most important truck crop, about 32,000 cars of early or intermediate tomatoes being shipped annually.

ON SEPTEMBER first Mr. James T. Jardin, formerly director of the Oregon Experiment Station, become head of the Office of Experiment Stations in the Department of Agriculture. His work is the correlation of research at the state and insular experiment stations. At present 53 stations are carrying forward approximately 9,500 such projects. Director Jardine is a brother of former Secretary of Agriculture, William M. Jardine, now Minister to Egypt.

AN IDEAL insect powder, deadly to insects but harmless to humans and animals, is described in a press notice of the department of Agriculture. This is rotenone, procured from the roots of several tropical plants, especially "cube" (pronounced coo-bay) in South America and derris in the East Indies. Native people have prepared fish poisons that stupefy fish without making them poisonous from these plants. Rotenone not only kills insects that eat leaves sprayed with it but also kills insects on which it is sprayed. There appears to be an unlimited supply of raw material, as cube is found in practically all parts of the upper Amazon basin and derris root is now being cultiated in the East Indies.

RICHARD W. WOODWARD, a former member of the club, and a graduate of Yale 1867, died on May 15, 1931, at the age of eighty-four years. For a time Mr. Woodward was in the United States government service as chemist for the explorations made

for the fortieth parallel geological survey, under Clarence King. He was much interested in systematic botany, and devoted much of his time to collecting plants. He was recognized as an authority on Connecticut plants and was a co-author of Bulletin No. 48, Conn. State Geological and Natural History Survey, entitled "Additions to the Flora of Connecticut." In addition to his membership in the Torrey Botanical Club he was a member of Skull and Bones at Yale, Phi Beta Kappa, the Connecticut Historical Society, the New England Botanical Club, and other scientific organizations.

THE DIVISION of Geology and Geography of the National Research Council has issued a Report of the Committee on Paleobotany as an appendix of the annual report of the council. This report, prepared under the direction of Dr. David White, lists the years important discoveries and the papers published, with notes on the work being done by students throughout the country. The material of the report is arranged according to geological periods. Copies of the report can be secured from the division at Washington, D. C.

THE AGRICULTURAL and Mechanical College of Texas has issued Bulletin No. 5, Vol. 2 of the Fourth Series on the Paleobotany of the Eocene of Texas by Dr. O. M. Ball. All the plants known of this period from Texas are described and many of them are illustrated in the nearly fifty plates.

THE NORTHEASTERN Forest Experiment Station, with headquarters at Amherst, Mass., received an increase in appropriation from Congress at the last session and is expanding its work in the study of forest planting and the growth and yield of hardwoods in New England and New York. In New York there are over 4,000,000 acres of idle land that should be replanted to forests and some 250,000 additional acres of sub-marginal farm land is being abandoned each year. In New England there are some 8,000,000 acres of farm land which have been abandoned in the past fifty years.

TORREYA

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A trip to the White Mountains of New England

HAROLD N. MOLDENKE

During the latter part of August, 1927, I was privileged to make a short botanizing tour to the New England States, including a trip through the White Mountains of Vermont and New Hampshire.

Starting our trip in the Carolinian life-zone of New Jersey we soon entered the Alleghanian, and the transition was most surprisingly noticeable. Among the most interesting plants observed along the way were the purple loosestrife (*Lythrum salicaria*) or "willow-weed" of Tennyson's "The Brook"—a plant whose exquisite beauty I never appreciated until I saw it in great purple colonies in New York marshes and meadows, and the birdfoot trefoil (*Lotus corniculatus*) which was often extremely abundant along the roadsides and showed the usual variation in the color of the corollas. The tall coneflower (*Rudbeckia laciniata*) was abundant and later on, in northern New York, we were charmed by the sudden appearance of *Juniperus sibirica*. This beautiful little evergreen grows in a most characteristic manner—forming a large closed circle with the rooting ends of the stems inward and the branches all growing outward, leaving what is often an open center several feet in diameter. The leaves are white above and green beneath, causing these colonies to be quite conspicuous features of the landscape. In connection with these dwarf junipers we found that we were also in one of the territories of the American larch (*Larix laricina*), which was easily distinguished from the many other species of evergreens by its very irregular growth, crooked branches, and short clustered needles.

After exploring the wonders of Ausable Chasm and taking in the sights of the large Silver Fox Farm there, we crossed the shimmering expanse of Lake Champlain and soon found ourselves in the heart of the majestic, never-to-be-forgotten White Mountains, which cover practically the entire States of Vermont and New Hampshire. The scenery here was the most won-

derful which I have yet seen—graceful, symmetrical, mountains towering up on all sides. Viewed from one of those summits, seemingly illimitable forests stretch in all directions as far as the eye can reach. The trees which were the most conspicuous because of their abundance in these vast woods were the gray birch (*Betula populifolia*), the sweet birch (*B. lenta*), the blue birch (*B. coerulea*), and, above all, the paper birch (*B. papyrifera*). Looking off to the west we could discern the towering heights of the Presidential Range, culminating in the majestic Mt. Washington.

Sunday, August 28, was destined to be the red-letter day of our trip. After an early breakfast in Crawford Notch, my father, who has climbed many of the highest and most famous mountains of the Old World, and I, decided to climb Mt. Washington, the highest mountain peak in northeastern North America. We were informed that the distance from Crawford House, where we started, to the Tiptop House on the summit of the mountain was $8\frac{1}{2}$ miles. Perhaps it was, but, if so, those were the longest and most difficult $8\frac{1}{2}$ miles that either of us had traveled for many a day! The trip took us $7\frac{1}{2}$ hours and in a number of spots my father said the climb reminded him of the ascent of some of the Swiss Alps which he climbed in his younger days. We followed the so-called Crawford Bridle Path which led us over Mt. Clinton, Mt. Pleasant, Mt. Franklin, and Mt. Monroe before we arrived at Mt. Washington proper—like gigantic stepping stones leading up to the monster ahead!

The trail started out through a dense woods—cool, damp, and reeking with all the rain of that summer. It was narrow and slippery, but well-defined. In these woods the following trees and shrubs were noted as most abundant: *Betula papyrifera*, *B. populifolia*, *Viburnum alnifolium*, *Acer spicatum*, and *A. rubrum*. In the moist black woodland soil beneath I found veritable beds of white woodsorrel (*Oxalis Acetosella*) and mountain clubmoss (*Lycopodium annotinum* var. *pungens*). Along the sides of the trail were loads of *Aster acuminatus*, *Carex Asa-Grayi*, *Galeopsis Tetrahit*, *Nabalus altissimus*, and *Solidago squarrosa*. The latter grew in such profusion in some places as to make the dark woods fairly agleam with its golden splendor.

Coming in due course of time to a fork in the trail, we determined to keep to the right, and in so doing soon found ourselves

in a little hollow along the side of Mt. Clinton. Here we found a delightful little spring known as the Mizpah Spring, surrounded by an extensive bog filled with large and showy fern-mosses and knights-plume moss, and interspersed with straggling but abundant specimens of *Ribes glandulosum*, which differs pronouncedly from ordinary wild currants in that it is practically a trailing or, at least, a procumbent shrub. At the spring (altitude 3800 ft.) we found the first of the series of Appalachian Mountain Club's huts. A few feet away I was delighted to find several beautiful specimens of the tall white bog-orchis (*Limnorchis dilatata*).

After leaving the spring we ascended an almost perpendicular slope for 475 feet, to the very topmost point of Mt. Clinton (altitude 4275 ft.). At the beginning of this, our steepest ascent, we found ourselves still in primarily deciduous woods, but in a very short time passed on into the zone of *Abies balsamea*, *Picea rubens*, and *Picea mariana*. The balsam fir with its delicious aromatic tang was particularly welcome, and its characteristically arranged cones (which were in erect clusters at the tips of the branches) of conspicuous pinkish-red were extremely interesting.

As we went on up and up and *up* these evergreens became lower and lower in stature and always more straggling, while the common birches, viburnums, and maples of the base disappeared altogether. After we had ascended about 300 feet we found ourselves in the clouds which surrounded us as a dense, white, penetrating mist, which rendered the climbing exceedingly difficult and our clothes exceedingly wet. During this climb we passed out of the Alleghanian life-zone and entered the Canadian. As we neared the top of Clinton we advanced above the level of the clouds and were again in bright sunshine.

The top of Mt. Clinton was a veritable paradise for the botanist. We were far above the timber line now and the wind blew with unceasing violence, sweeping over the top of Clinton and almost lifting us off our feet. It is little wonder that timber or any variety of tall plant growth is unable to exist there. Still, the entire top was covered by a matting of lichens and mosses, the tallest and densest growth of this kind that I have ever seen. In walking, one's feet sank into this carpet of vegetation as into some magnificent Persian carpet.

Not only did these cryptogamic forms of plant life flourish here, but also a number of species of phanerogamic plants as well. The top of Mt. Clinton, in the Canadian life-zone, furnished me with more new specimens of flowering plants for my herbarium than any other one spot on the ascent of Mt. Washington. Growing in the midst of the lichens and mosses we found beds of the great bilberry (*Vaccinium uliginosum*), and these, happily, were loaded down with delicious fruit upon which we feasted. Along with them there were hundreds of little bushes, only about 6 or 7 inches tall, in full bloom—each with 3 or 4 pretty red gamopetalous flowers. These proved to be the mountain rose-bay (*Rhododendron lapponicum*). Compared with the *R. maximum* as seen, for instance, in the damp valleys of the Pocono Mountains in northern Pennsylvania where it sometimes attains a height of 40 feet, this little alpine cousin, in full bloom when only from 2 to 7 inches tall, furnished an instructive lesson in the effect of environmental conditions on plants of the same genus!

Scattered along the trail and amongst the bilberries we found also groups of labrador tea (*Ledum groenlandicum*)—said to be the phanerogamous plant which approaches closest to the North Pole. Close by were scores of cloudberries (*Rubus Chamaemorus*), named thus because of being the only member of the genus to regularly grow above the level of the clouds. It is not a vine or trailer as are most of its low-lying relatives, but rather a little shrub, 3 to 10 inches tall, with only 1 or 2 leaves and a single terminal flower.

A few feet farther on, where the trail was a little wider and the ground drier and more exposed, were found nine more species of rare alpine plants. First was discovered the mountain Azalea (*Chamaecistus procumbens*); then two alpine rushes (*Juncus filiformis* and *J. trifidus*); then the three-seeded sedge (*Carex trisperma*) and the tufted club-rush (*Scirpus caespitosus*). Soon thereafter were found hundreds of little colonies of *Diapensia lapponica*, which grew in more or less circular clumps so dense and tightly appressed to the ground (in order to resist the dreadful wintry blasts which seek to tear everything off the more exposed portions of the mountain) that it required considerable effort to even penetrate these solid mats with a knife in order to procure specimens!

All through the region from Clinton to the top of Washington we found hundreds of thousands of clumps of mountain sandwort (*Arenaria groenlandica*)—whose pretty little clusters of white flowers, in solid mats no more than 4 inches tall, were crowded, it seemed, into almost every nook and cranny between the boulders, and gave a delightfully unexpected local color to the landscape. Here and there were to be found specimens of the black crowberry (*Empetrum nigrum*) in fruit, and in several places large beds of three-toothed cinquefoil (*Sibbaldiopsis tridentata*) in full bloom.

Reluctantly leaving Mt. Clinton after a brief period of rest, during which time I pressed in my portable portfolio all the specimens which had been collected thus far, we descended a short way, getting back into the upper limits of the timber zone, and then started up the slope of Mt. Pleasant, which is 500 feet higher than Clinton. Just before leaving the final reaches of the timber zone we went through a little hollow in whose center lay a small sphagnum bog. Here we discovered the rare northern bog orchis (*Lysiella obtusata*) and feasted our eyes upon hundred of specimens of that most delicate and lovely of all flowers—*Linnaea americana*.

Mt. Franklin is 145 feet higher than Pleasant and the trail up its summit was now beginning to become rough and rugged. Amongst the massive boulders which were found here in great profusion grew an infinite number of scrub birches (*Betula glandulosa*) and mountain alders (*Alnus alnobetula*). Not wishing to make the unnecessary trip over the very summit of Franklin, we skirted it on a narrow, and exceedingly slippery path, where one misstep might have hurled us over the edge. Nevertheless, even in such a position we were still able to observe and collect some specimens of *Calamagrostis canadensis* and *Houstonia caerulea*.

The transition from Mt. Franklin to Mt. Monroe was marked by a long straight ridge or saddle, not more than ten feet wide; and by leaving the trail for a few feet in either direction one was able to look down upon the verdant forest almost 4000 feet below. Our outlook at this point extended almost 50 miles in either direction, in which immense area we were able to discern only two human habitations, although others, of course, were hidden by the forest. We saw regions where the rain was

falling and others where the sun was shining brightly. In fact, being up so high, we were able to follow the course of a rainstorm far in the distance, noting how it advanced, and how on either side the sun was shining.

Mt. Monroe is 670 feet higher than Mt. Franklin—its altitude being 5590 feet—and coming down from its summit we were surprised and delighted to see ahead of us, in the hollow between Monroe and Washington, at an altitude of over 5000 feet, about a dozen small lakes. These are appropriately known as the Lakes of the Clouds. Along the margin of one of these lakes we discovered another very rare species—perhaps the rarest of the entire trip—a plant found only on the summits of the Presidential Range and on Mt. Kineo, Me. This was the yellow mountain avens (*Sieversia Peckii*), and in full bloom!—truly a sight to make the heart of a tired and very footsore botanist rejoice!

Leaving the charming Lakes of the Clouds and the welcome Appalachian Mountain Club shelter there, we saw ahead of us the towering height of Mt. Washington, whose summit was still 1290 feet above us. Looking at it from below it appeared to be one mass of gigantic boulders piled in hopeless confusion upon one another. There was not a tree or shrub or bush in the whole expanse of our view, and the path was but faintly discernible over and among the boulders! A botanical portfolio filled with large botanical driers, when soaked with moisture, has a way of becoming unbelievably heavy and burdensome—but our several hundred plant collections had to be carried along in spite of the inconvenience. Attempting to travel up this last and steepest ascent, juggling a water-soaked portfolio in one hand and a pair of binoculars in the other—over gigantic boulders covered in many places with wet *Umbilicaria* lichens—was a task not without its humorous incidents which, however, were not fully appreciated at the time!

During this final ascent of 1290 feet up Washington's slope we observed only six species of plants—three of which we had passed already on the slopes of preceding peaks, the *Umbilicaria* lichen, the mountain sandwort, and the scrub birch; and three which were seen here for the first time. These latter we found when about half-way up Mt. Washington where we came upon a broad expanse of meadow land lying most surprisingly among

the rocks and boulders which had completely hidden it from our view below. This alpine meadow covered about 5 or more acres and bears the name of "Bigelow's Lawns". In these "lawns" we found growing the rare alpine sedge known as Bigelow's sedge (*Carex concolor*), in fact the meadow was made up almost exclusively of this sedge. Scattered here and there among the sedges we found a number of specimens of low rattlesnake-root (*Nabalus nanus*) and Cutler's alpine goldenrod (*Solidago Cutleri*), neither of which attained a height of more than 3 or 4 inches and were yet perfectly normal and matured plants in full anthesis!

From Bigelow's Lawns to the summit of Washington was the most difficult section of our ascent. We eventually arrived at the very summit of Mt. Washington (altitude 6293 feet) in a state that was pretty close to exhaustion. We reached the Summit House (or "Tiptop House", as it used to be called) at 5:15 P.M., and certainly were thankful to find a dry room and supper and bed awaiting us.

The next morning was spent roaming about on the top of Mt. Washington, enjoying the wonderful view. One could see points in five States and Canada, and could gaze east to the Atlantic Ocean, west to Lake Champlain and the Adirondacks, south to Lake Winnipesaukee, and north to the misty outlines of Lake Memphremagog.

About 10 A.M. the cog railroad train puffed up to the summit, discharging a crowd of passengers who had come from many parts of the United States and Canada to see this sight, but who chose the easy and comfortable method of ascent. Several thousand tourists are brought up by this train every season.

Our return trip was by train, $2\frac{1}{2}$ hours from the Summit House to the Base Station (at the very base of the mountain but still 10 miles from Crawford House).

It was particularly interesting to note as we descended how gradually we left the zone of rocks and boulders and entered the zone of low herbs and flowers; then the region of dwarfed shrubs and bushes; and on into the timber zone. The upper margin of this timber zone was marked by most wonderful examples of the tenacity of living organisms in combating the elements. The trees were stunted and bedraggled in appearance, draped from top to bottom with epiphytic lichens and mosses, with not a single bud on the northern side developed so that each tree

looked as though some giant had come with a monstrous knife and had sliced off all the branches which protruded toward the north! Eventually we descended again into the zone of forests and noted with a sigh of relief the great increase in forms of wild life. The fireweed (*Chamaenerion angustifolium*), the red-berried elder (*Sambucus racemosus*), the American mountain-ash (*Sorbus americana*), the American larch (*Larix laricina*), the tall flat-topped white aster (*Doellingeria umbellata*), and the pearly everlasting (*Anaphalis margaritacea*) were the most abundant plants observed.

New York Botanical Garden

The relation of the flora of the New Jersey Pine Barrens to the geological history of the region*

RAYMOND H. TORREY

The relation of the peculiar flora of the Pine Barren region of southern New Jersey to the geological formations of the region, and to the history of their origin and various modifications by submergence and erosion, has long been a subject of interest to botanists, ecologists and geologists. Some correlation between the remarkable and unusual plants found in the Pine Barrens within rather well defined limits, and the nature of the surface formations has been sought and a number of interpretations have been offered. The matter is still unsettled and a subject for amicable debate, but some of the probabilities which have been suggested by various authorities are here summarized.

The source of the material which makes up hundreds of feet of sand, with some pebbly and clayey layers in the more arid portions of the Barrens, was unquestionably in the highlands in northern New Jersey and eastern Pennsylvania. These strata are composed mostly of detritus from ancient pre-Cambrian rocks, the principal minerals of which in the order of their frequency, are quartz, feldspar, mica, magnetite, and hornblende. Detritus of all sizes was worn off these highlands, formerly much higher than now, and was carried by swift streams, probably following more or less the same valley lines as are now followed by the Schuylkill, Lehigh, Delaware, Musconetcong, the upper waters of the Raritan, the Passaic and Hackensack Rivers. With interruptions due to repeated submergences of the continental shelf sometimes extending far back to the highlands, the general course of erosion was to carry off the waste of the uplands and lay it down in shallow water on the ocean front, from the Raritan Bay to Cape May. More than a thousand feet of material was thus laid down to make what is now south Jersey. The marl, or greensand formations along the western and northern borders of the Barrens were laid down in shallow water swarming with marine life, at times cut off from the ocean, by the sandy islands then existing between the Delaware and the ocean, in a broad inland strait something like Long Island Sound of today.

* Prepared for the week end field trip of the club on Sept. 25–27.

At the beginning of the long glacial period in the Pleistocene Epoch, the outlines of South Jersey and its elevation above sea level were probably very much like they are today. The ice did not reach South Jersey, for the terminal moraine extended from Perth Amboy, northwest over the Watchungs at Summit and westward to the Delaware at Belvidere. Some glacial material was carried down the southward trending valleys of the Raritan and Musconetcong, but it affected the composition of the soils of the Pine Barrens very little. It would not have changed them much, anyway, for the source of glacial material was the same as that of the detritus of the earlier stream erosion.

Of the mineral matter carried off the highlands into the ocean, or its arms as they may have existed from time to time in South Jersey, the quartz was the most resistant, and it makes up ninety per cent or more of the material of the Barrens today. The softer feldspar tended to break down into muds and clays. The magnetite was dissolved by vegetable acids and transformed into bog iron ore or clay iron stones. The other minerals left little trace. The Barrens therefore, when modern plants took possession of them in the Cretaceous Period, had a highly siliceous soil, on which humus was slow in forming, except along the streams where more sustained moisture and plant decay provided narrow strips for a richer flora. Fires were probably frequent in the forests established thereon, from lightning, and have repeatedly burned over the area from long before the white man or the red man, although the former added much to the fire hazards, and still does so.

The advance of the ice in the Pleistocene may not have caused so much change in the flora of the Pine Barrens as might be imagined. The ice was approaching a line at which the warmth of the more southern latitudes balanced the cold which caused it, and this balance wavered, as shown by frequent retreats, some small, some great. The Barrens were thirty to seventy miles south of the greatest advance, and it is quite possible that most of the species held their ground. Some species which are usually regarded as northern ones driven south before the ice, like the Bearberry and Broom Crowberry probably migrated into the region at that time and one of the most interesting facts about the flora is that they still remain here.

After the white man came there was considerable disturb-

ance of original plant conditions by attempts at cultivation and the consequent introduction of adventive weeds, but so resistant have been the Barrens to wholesale modification by agriculture and horticulture, that large blocks of them retain their original and peculiar species.

Dr. Witmer Stone, in his monumental work on the Plants of Southern New Jersey, is unwilling to state any positive conclusions as to correlation of existing conditions of plant distribution in the Barrens with geologic changes. He thinks that hypotheses on this line are purely conjectural. He does point out these facts. The coastal plain, including what is now the Barrens, was submerged when the elevated Piedmont region to the west must have been covered with vegetation; and the region north of the terminal moraine, including most of the highlands of north Jersey, was almost wholly without plant life while it was covered by the ice sheets. The area between the coastal plain and the moraine, comprising some part of west Jersey and eastern Pennsylvania, must have been continuously covered with plants longer than the submerged plain and the glaciated region. When the coastal plain rose above sea it must have received its flora from the higher country to the west and southwest. The partial submergences and emergences of the coastal plain may have resulted in invasions of plants from outside and changes in the general character of the flora.

Dr. Stone points out that the plant life of the eastern United States includes two elements, a boreal, more or less identical with the flora of northern Europe, and an austral, peculiarly American. If the austral or American flora covered the Piedmont area at the time the coastal plain was elevated, it would have spread into the new territory, and the species best adapted to the sandy, dry Barrens, would have persisted there. If an invasion of the boreal species over the Piedmont area followed, from the southward migration forced by the advancing ice, "we should probably have," he says, "exactly the conditions we find today, the survival of an earlier flora in the bogs and sandy areas and its disappearance where better soil has developed," in the western part of the State, where later submergence in Pensauken time and formation of alluvial deposits by the Delaware, made a richer soil and perhaps led to the destruction of the Pine Barren elements and confined them to the arid interior of South

Jersey. Dr. Stone concludes that "it would seem, therefore, that we have in the New Jersey and North Carolina Pine Barrens the sand and bog elements of a wide-spread American austral flora, which has been largely superseded by a more advanced element of similar origin over the rest of the coastal plain, both elements being richer the farther south we go, while along the western edge of the coastal plain, more especially to the northward, a boreal element has spread down over the fall line to a greater or less degree."

But Norman Taylor, in his "Flora of the Vicinity of New York," expresses his firm conviction that a geological explanation of the character of the plants in the Pine Barrens is the only one that will elucidate the peculiarly local nature of the flora.

He quotes Dr. Arthur Hollick and Dr. J. W. Harshberger in partial support of his belief. He refers to the Miocene sinking, when great quantities of material washed off the highlands were laid down to form the Beacon Hill formation, now found capping the higher parts of the Barrens. After uplift and erosion, the region was again submerged in Pensauken time, so that everything but the remnants of the Beacon Hill formation was under water. He stresses the point that this Beacon Hill formation has been out of water since upper Miocene time, and several times partly or entirely surrounded by the sea, making a large island extending from Farmingdale to Bridgeton, with smaller islands northward, including Atlantic Highlands and Beacon Hill. This Beacon Hill formation was the oldest in southern New Jersey that could have been continuously covered with vegetation. "This, it would seem," he says, "is why the Beacon Hill formation is the controlling factor in the origin and present distribution of the Pine Barrens. The area of the pine-barrens is not exactly coextensive with Beacon Hill but the differences are so slight that recent and local erosion of the formation would account for the failure of the two regions to superimpose, as it were."

He concludes, therefore, that the "New Jersey pine-barrens exist exclusively on this Beacon Hill formation, an area isolated by geological processes, and maintaining a relict or climax flora, the antiquity of which greatly antedates any of the rest of our vegetation hereabouts, so far as permanency of position and phytogeographical isolation are concerned."

This flora was modified by the effect of the last great glaciation which drove many northern species southward into this Beacon Hill or pine-barren area, in which some still persist, notably the Bearberry and Broom Crowberry.

Another interesting explanation of the character of the pine-barren flora is suggested by Professor M. L. Fernald of Harvard, in an article in Rhodora, the journal of the New England Botanical Club, for February, 1931, entitled "Specific Segregations and Identities in Some Floras of Eastern North America and the Old World." By means of paleogeographic maps, after Schuchert, Professor Fernald shows land connections between North America and northern Europe and Asia, which may account for the likenesses in many plants common to these continents. He points out the occurrence in the high mountains of eastern Tennessee of a number of species also found in the New Jersey pine-barrens. He supposes that these species were once numerous in east Tennessee when the region was a low, nearly base-levelled peneplane, in the Cretaceous Period. When it was later uplifted, species from the north, deriving from northern Europe and northern Asia, moved south, into the new highlands and the members of the groups of tropical and sub-tropical forms, once contented in the peneplaned lowland, were forced out into conditions more to their liking in the emerging coastal plain where acid savannahs, bogs, shallow pools and dry sands supplied the conditions which permitted them to survive. The occurrences of what we regard as typically pine-barren species in the Great Smokies are therefore probably dying remnants of a much larger distribution, migrants from which spread eastward and downward to conditions like those which existed in East Tennessee before the post-Cretaceous uplift.

These interesting attempts to interpret our pine-barren flora probably all have some measure of truth, but their authors would doubtless admit that they may have to be changed by later discoveries. That botanists of note may differ is indicated in Dr. Stone's footnote on Corema, Professor Fernald regarding it as a Coastal Plain plant pushing north to Newfoundland, while Dr. Stone had always looked upon it as a northern species ranging south to New Jersey.

Hollis, N. Y.

A "shell-hole flora" as a result of the World War

WALTER SCHWARZ

Who can ever forget the impression of senselessly destroyed life in the Argonne forests? For long stretches there were standing only tree stumps splintered by shells. Here and there some little green leaf showed itself. One could not get rid of the sad impression created by a pine-wood destroyed by poison gas, where the needles, brown and dry, hung on the branches. But scarcely were the ruined woods out of the direct fire zone, than a quite novel kind of flora suddenly sprang up. Here grew the delicate red blossoms of the Rosebay (*Epilobium angustifolium*) the tiny yellow heads of the Groundsel (*Senecio sylvaticus*) and other sun loving plants which are ordinarily only found in places where the trees have been felled. Here they got the upperhand, as the shade giving tree tops had disappeared. Even the deep shell-holes, soon after their formation, became the home of a new plant world. Splendid green algae flourished in the water collected in the bottoms. The sides immediately above the water surface were covered with moss. Higher up towards the edges flowering plants appeared. The conspicuous thing about these plants was that they were not previously found in the immediate neighbourhood. A plant society peculiar to these holes had been formed, a shell-hole flora. The conditions of life for the plants in the holes were quite different from those outside. Here there was greater moisture and changed light conditions. Only such plants could develop as were adapted to the new conditions. A natural selection in miniature had taken place. Even inside a single hole differences in colonization showed themselves. The side exposed to the morning sun was overgrown with plants different from those on the flank enjoying the afternoon sun.

Particularly interesting were the conditions where arable land had been ploughed through by shells. After the fighting zone had shifted, a new vegetation cover developed. Then the superiority of the wild flowers over those cultivated by man with so much care, showed itself. Everything was overgrown with magnificent red poppy, with luxuriant white Chamomile (*Matricaria inodora* and *M. discoides*) and red thistle (*Cirsium arvense*). Only here and there could there be found traces of the

former cultivated plants—a few stalks of rye, wheat and oats. Free nature was at work winning back from man territory taken from her.

At the Russian front an additional factor presented itself: the bringing in of plants foreign to the territory before the war. (For the exact study of this peculiarity we have to thank the naturalist Kupffer of Riga.) There, in the neighbourhood of the former Russian camps and places where there had been enclosures for horses were to be found a large number of plants whose home is in the southern steppes of Russia: the beautiful Oriental Larkspur (*Delphinium orientale*), the catchfly (*Silene Otites*) and many others. How did these growths come to the Baltic? The troops got the fodder for their horses from the interior of Russia. Numerous seeds of weeds were brought along and thrown away as refuse, or fell in the unloading. They then sprang up. In most cases they did not appear in succeeding years, as, in the unaccustomed climate, the seeds did not ripen. Conspicuous also was the quantity of sunflower appearing in the vicinity of the Russian positions. The sunflower is grown only occasionally in gardens in the Baltic provinces. It is not found wild or in extensive culture at all. In order to explain its appearance during the war, it is only necessary to bear in mind the habit of most Russians of chewing sunflower seeds. The soldiers always had their pockets full of them. How often it must have happened that seeds fell out and germinated. The red poppy, also not at home in Baltic regions, was brought thither, but this time by German soldiers, who everywhere in front of their blockhouses dug little gardens and ornamented their temporary homes with flowers. Among other growths foreign to the land they cultivated poppies, which spread from the gardens and became wild.

These are only a few examples. One could observe similar phenomena in many other cases. But one thing had proved itself everywhere: the creatures of nature can fight together to the point of mutual destruction, but nature herself is always creative, building up unceasingly.

GERMAN UNIVERSITY OF PRAGUE

A case of sprout formation from adventitious buds on the roots of cabbage

R. B. Dearborn

This unusual type of growth was found near South Weare, N. H., two plants out of some 100 exhibiting the type of growth shown in the photograph.

The two plants had solid heads, approximately four pounds in weight, and there was no evidence of injury or disease on any part of the plants. The plant pictured had only one sprout, formed on a secondary root about two inches from the main root. The mass of tissue formed was very much like the head tissue in color, taste, and general appearance.

The other plant was dissected and had many sprouts, nine on secondary roots and one from the main root, about three inches below the surface of the ground. The sprouts on this plant had not been formed as long as the one pictured as they all had the compact rounded appearance of cabbage heads, varying in size from half an inch to two inches in diameter.

University of New Hampshire
Durham, N. H.

FIELD TRIPS OF THE CLUB

Saturday, September 12

Croton Point, extending into the Hudson from Harmon, and dividing the Tappan Zee from Haverstraw Bay, proved a new and interesting objective for the club on the field meeting of Saturday afternoon, Sept. 12. The rounded and lobate contours of this recessional moraine, the dump of the Pleistocene ice sheets when they had decayed back from their farthest south at New York Bay, and had halted for a time 30 miles up the river, are quite similar to the kettle moraines of Long Island. The wooded areas, comprising about half the area, are of second growth deciduous trees, including some fine black oaks at the east end, red and white oaks elsewhere, beeches, gray birches, red maples and some fine copses of sassafras. The point was once under cultivation for fields and vineyards and the mansion, wine cellars and other buildings of the estates formerly occupied there, are interesting relics of former years. The Point is now preserved as one of the units of the Westchester County Park system, which has, so far, modified the conditions found upon acquisition very little, and it would seem as if further development might retain much of the area without artificial changes.

The salt marshes bordering the point and occupying the lowlands between the moraine lobes, are filled with purple loosestrife, rose mallow, both broad and narrow leaved cat-tails, *Phragmites communis*, and water arum, and the seaside goldenrod was coming into bloom. An interesting but irritating plant was the bur-grass, *Cenchrus tribuloides*, with its spiny seeds suggestive, as the specific name indicates, of the tribuli of the Romans, caltrops of medieval military usage, spiked globes thrown before horses to break up a cavalry charge. Dense beds of the partridge pea, *Cassia Chamaecrista*, with the leaflets folding back upon the midrib at a touch, were frequent. Brackish ponds on the south shore, emptying by rills across the beach at low tide, contain *Ceratophyllum* and *Zostera*. A colony of the great lobelia offered a fine touch of color.

Two large gingkos, part of the early ornamental planting of the estate, offered a strange contrast beside a copse of sassafras. The English hawthorn has escaped from early planting and was in dense fruit on the south side. The water hemp, *Acnida can-*

nabina, develops unusually large individuals, eight feet high and an inch through at the base. A colony of the great horsetail, *Equisetum hyemale*, borders what appears to be a kettle hole depression.

The boulder beaches are interesting, with a variety of ice worn fragments from far and near, diabase from the ridge of the Tors, opposite; norites from the Blue Mountain region, granites and gneisses from the Highlands of the Hudson and quartzite cobbles from just beyond, slates and limestones from the middle Hudson, Catskill sandstones and conglomerates, and Taconic schists.

R. H. TORREY

SUNDAY, SEPTEMBER 13

The trip to Fresh Kills, Staten Island, partly on account of the fact that the route taken was slightly different from that of last year, yielded several species not found before. A new station was located for *Robinia viscosa* Vent., the clammy locust, namely at the foot of the hill opposite the church, near the start of the trip at Richmond. The route was rich in polygonums, *P. hydropiperoides*, *arifolium*, and *sagittatum* being found in the brook at the beginning of the trip, and nearby also the rarer *P. Muhlenbergii*, with *P. pennsylvanicum* of course common in many places throughout the day. Besides these, *P. scandens* the climbing false buckwheat was seen, and, toward the end of the day, what appeared to be *P. orientale*, the prince's feather. Other noteworthy plants collected were *Angelica villosa*, *Eupatorium verbenaefolium*, *Panicum virgatum* and *Tridens flava*, *Acnida cannabina*, the water hemp, and *Aster tenuifolius* and *subulatus*. The last two are salt marsh asters and are very similar, but the former is perennial, while the latter is annual, with much smaller flowers than in *tenuifolius*. Only a few plants of *Sabatia stellaris*, the beautiful sea pink, were found in flower, but *Pluchea camphorata*, the salt marsh fleabane, was present in fair abundance. *Iva* and *Baccharis* were plentiful and in flower as usual. Eighteen members and guests comprised the party.

ARTHUR H. GRAVES

SATURDAY, SEPTEMBER 19

A group of over thirty was led by Dr. Alfred Gundersen along the top of the Palisades north from the Dyckman Street

ferry, and then back through the woods to the west. The object of the trip was the study of goldenrods. Specimens of all the varieties found were collected as the party went along. After eight or nine species had been found, the group sat down under the trees to determine them with the aid of a simplified key Dr. Gundersen had mimeographed for distribution. It was thus found comparatively easy to distinguish the species found with the exception of *Solidago altissima* and *S. rugosa*. Many plants found seemed to be intermediate in various degrees as to leaf and flower head characters between these two species. A large oak noticed by the party was apparently a hybrid between the red and black oaks, the leaves and large acorns resembling the red oak, but the cups in shape and loose scales resembling the black. In the definite objective which was followed to the exclusion of more general botanizing the trip was an unqualified success.

G. T. H.

Week End of September 25–27

Over 70 members of the Torrey Club, the American Fern Society and the Philadelphia Botanical Society registered at the Pig'n Whistle Inn at Brown's Mills in the Pine Barrens of New Jersey. The leaders, Mr. and Mrs. William Gavin Taylor had made all arrangements for the entertainment of the party and had planned a most interesting program and itinerary. Despite an intermittent rain on the Saturday, the party covered a large amount of ground by autos, visiting West Plains, where cars were left while all walked for a mile or more through a dwarf forest of pines (*Pinus rigida*) and scrub oaks (*Quercus marilandica* and *Q. ilicifolia*), the trees mostly less then four feet high. Below the trees were the heath-like broom crowberry (*Corema Conradii*), Hudsonia (*Hudsonia ericoides*) and sand myrtle (*Leiophyllum buxifolium*), the last with a few belated flowers. A few plants of the pine barrens gentian (*Gentiana Porphyrio*) were found but the blossoms were only half open because of the lack of sunshine. In an abandoned cranberry bog, reached after another drive and a walk through the scrub growth, the curly-grass fern (*Schizaea pusilla*) was found growing on the edges of what, at one time, had been a small drainage ditch. Near it grew the thread-leaved and round-leaved sundews (*Drosera filiformis* and *D. rotundifolia*) the plants bearing

ripe capsules and a club moss (*Lycopodium alopecuroides*). The bog here was grown up with white cedars (*Chamaecyparis thyoides*). Another drive through miles of pine forest, here trees thirty feet or more in height, brought the group to a station for the climbing fern (*Lygodium palmatum*). In a meadow that had been mowed earlier in the season the fern was growing abun-

CURLY-GRASS FERN
Fertile leaves above; curled, sterile leaves in the moss below.

dantly, but the plants were not over four or five inches high. Further on in the woods the plants climbed to a height of two or three feet among the bushes. Another drive, and the party hunted for the Massachusetts fern (*Aspidium simulatum*) in a boggy place. With it was found the Virginia chain fern (*Woodwardia virginica*). In another place the two species of *Woodwardia* (*virginica* and *areolata*) were found, growing together near a brook. The Virginia chain fern—as pointed out by Dr. Wherry—often becomes a troublesome weed in the cranberry bogs, almost the only fern of our region to become troublesome in any way.

After dinner there was an evening program of talks in the dining hall of the inn. Mr. Torrey's talk is printed elsewhere in this issue. Dr. Edgar T. Wherry spoke on the soil characters of the region as they affect the flora. He said the sandy soil had had all the bases leached out resulting in a soil so acid that almost no bacteria could grow in it, even the coffee-colored streams of the region are almost free of bacteria. The acid condition of the soil is responsible for the stunted growth of pine and oak trees which may be only three feet high, though over a hundred years old. The amount of endemism in the pine barrens flora is too little to warrant the idea of extreme age. Mr. A. Tennyson Beals spoke briefly on the mosses of the region, stating that sphagnums are the most characteristic mosses of the bogs of the region, 23 species of the genus being found. Mrs. Gladys P. Anderson spoke of the lichens and showed specimens she had collected. Mrs. Anderson also distributed some mounted specimens with mimeographed keys and had those present determine the species. Dr. William S. Thomas spoke of the mushrooms, noting that some species seemed to develop unusual shapes and colors under the peculiar conditions of the barrens. The program was concluded by a talk by Dr. M. A. Chrysler, illustrated by lantern slides made by natural color photography of characteristic flowers and ferns of the region.

Sunday morning the party visited the home of Miss Elizabeth White. In her garden were seen many of the uncommon plants of the barrens, large numbers of the pine barrens gentian in bloom attracting most attention. Several Franklinia trees (*Gordonia Altamaha*) with their large white flowers, were of especial interest. The party also saw the nursery beds where Miss White is growing several thousand cuttings of Franklinia. Thrifty pitcher plants (*Sarracenia purpurea*) with matured fruit and the Venus fly trap (*Dionaea muscipula*) were also seen in the garden. Miss White conducted the party through some of her extensive plantings of giant blueberries and described the methods of selecting and hybridizing by which she had secured several varieties in which the berries average over three fourths of an inch in diameter. Cranberry bogs in various stages of development were also seem. The party returned for a late dinner at the inn. The success of the trip was in large

measure due to the careful planning and graciousness of Mr. and Mrs. Taylor.

GEORGE T. HASTINGS

MONDAY, OCTOBER 12

A small party was led by Mrs. Gladys P. Anderson to Longwood Valley and Green Pond for a study of lichens. Mrs. Anderson had prepared a mimeographed leaflet for those on the trip, describing about sixty of the more common lichens, with a key for determining them. Some twenty species, exclusive of a variety of crustose forms, were found and studied. The little peltate forms of *Dermatocarpon* growing on the rocks, resembling miniature rock tripe, were especially interesting. The wooly *Crocynia* was abundant on the cliffs, beautiful plants of *Parmelia rudecta* and *caperata* were growing on the tree trunks with several species of *Physcia*. A number of species of *Cladonia* and the related *Baeomyces roseus* were found. The limestone ridges were rich in ferns—extensive patches of the walking fern, *Camptosaurus rhizophyllus*, scattered plants of the cliff brake, *Pellaea atropurpurea*, and the dainty wall spleenwort, *Asplenium Ruta-muraria* with an abundance of the maiden-hair spleenwort, *Asplenium Trichomanes*, as well as many of the more common species. The party examined several books on lichens that Mrs. Anderson had brought during lunch time while waiting for the coffee to percolate. In spite of its double wrapping of brown and wax paper the coffee was finally done, its unusual method of preparation adding to the zest with which it was finally consumed.

G. T. H.

PRICKLY PEAR ON BEARFORT MOUNTAIN

The most notable discovery of the field trip on Sunday, October 25, on Bearfort Mountain, west of Greenwood Lake, was a large patch of the prickly pear cactus, *Opuntia vulgaris*, which the writer had not found before on this ridge, although it occurs on Carris Hill ten miles south in the Wyanokie Plateau. This Bearfort Mountain stand is the farthest one the writer knows, from the seacoast, in this vicinity, being about 40 miles in a direct line, northwest of New York harbor. It is also the highest of record in this vicinity at about 1350 feet, exceeding in elevation the more meager patch on Bear Mountain in the

Palisades Interstate Park at 1300 feet. It seems evident that the species has no special preference as to the kind of soil it likes; it was here growing upon the Devonian conglomerate (Green Pond formation). It occurs, in the writer's observation, on granite, gneiss, basalt, diabase, dune sand, glacial outwash on Long Island Pine Barren sand, Cretaceous formations in Monmouth County, N. J. (marly sand), and the only nearby formations on which it has not been seen by the writer, are the Triassic sandstones, in New Jersey and Rockland Co. N. Y. or the Hudson Valley limestones and slates, and in Norman Taylor's catalogue it is reported presumably on the latter in Dutchess and Greene Counties.

Another stand of the red spruce was found, in a swamp on the west side of the outer ridge of Bearfort Mountain. It occurs in other swamps on this mountain, but this locality was a new one to the writer.

Lichens were in good condition, especially the cladonias, in fine plump state after a rain and with their apothecia in bright hues. A very large patch of the dog lichen, *Peltigera canina*, covered three square yards. Several small wet spots were densely filled with the virginian chain fern, *Woodwardia virginica*, which appears common on this conglomerate ridge, though much less so east of Greenwood Lake, within the granite-gneiss area.

R. H. T.

Lichen Collecting in Wawayanda Swamp–November 3

The field trip to the region west of Greenwood Lake, on Election Day, was promptly turned into a lichen collecting excursion when Mrs. Gladys P. Anderson of Rahway, N. J., appeared, for those who know her ardent interest and wide knowledge in that subject yield at once to her leadership. Most of the day was spent in collecting lichens in the rhododendron and southern white cedar swamp on Wawayanda Mountain, along the Appalachian Trail. Mrs. Anderson found the region very rich in lichens and discovered some unusual species.

To beginners in the subject, the commoner species were interesting, such as the beautiful bluish gray *Lecidea albo-caerulescens*, in broad circular thalli on smooth rocks; the golden *Cetraria juniperina pinastri* on the cedars, a handsome black

fruited *Rhizocarpon*, (*petraeum?*), with warm brown thallus, on a smoothly glaciated ledge, and a bright yellow fruited *Placodium* (*Caloplaca*) *aurantiacum*, on thin soil over rocks. *Parmelia conspersa*, the commonest lichen, was everywhere on the rocks, and Mrs. Anderson found the rarer *Parmelia physodes* on the cedars; also other uncommon forms, *Physcia speciosa*, and *Usnea trichodea*, in the swampy woods. Twelve Parmelias, ten Cladonias, five Physcias, three Pertusarias, and two Cetrarias were found by Mrs. Anderson, also *Leptogium chloromelum* and *Parmeliopsis aleuritis*.

On the way home, the party went back to Devonian botanizing, in the Pequanac shale on the Mount Peter Road, where they found impressions of stems and leaves of *Lepidodendron gaspéanum*. A large colony of an allied but reduced modern plant, *Equisetum aquaticum*, was observed in the northern arm of Greenwood Lake.

R. H. T.

Sunday, November 8

A party of over sixty rambled over the gneiss ridge northeast of Nepera Park noting the tree and shrub growth and looking for belated flowers. Along the road an abundance of the stalks of the plantain lily (*Funkia*) were covered with capsules. Witch hazel bushes were covered with flowers, though a few of them seemed to have been touched by the freeze of the night before and had all the blossoms withered, possibly only those most exposed or in the path of air drainage from the hill above had suffered in this way. Three species of aster (*A. cordifolius*, *paniculatus* and *ericoides*) were found in some abundance still in blossom. Three goldenrods (*Solidago latifolia*, *caesia* and *speciosa*) were found in flower, though only a few individual plants of hundreds of each species found had flowers remaining. In a small brook a colony of lizard tail, *Saururus cernuus*, was found in fruit. A few plants of the giant hyssop, *Agastache nepetoides*, attracted attention. As one object of the trip, the study of seeds and fruits had been announced. Of the class of fruits adapted to cling to clothing an abundance was collected—without intent—by the party. These represented several species of tick trefoil, black snakeroot, sweet cicely, agrimony, Virginia knotweed, burdock and cocklebur. Most of the party spent considerable time on the homeward ride on the trolley picking off these seeds.

G. T. H.

PROCEEDINGS OF THE CLUB

Meeting of October 6, 1931

The meeting was called to order by President Sinnott at 8:40 P.M. at the American Museum of Natural History with thirty-five members present.

The following people were unanimously elected to membership in the club: Miss Anna Hennedy, South Weymouth, Mass.; Miss Eleanor Utter, Brooklyn, N. Y.; Mr. Fred R. Clark, Southeastern Teachers College, Durant, Okla.; Mr. Ralph Hyams, New York, N. Y.; Mrs. Minnie G. Douglis, Brooklyn, N. Y.; Miss Estelle Feld, Brooklyn, N. Y.; Mr. Julius Jacobs, Brooklyn, N. Y.; Mr. James Murphy, New York, N. Y.; Mr. Milton O. Pozdena, Winfield Jc., Long Island, N. Y.; Dr. Gilbert L. Stout, State Department of Agriculture, Office of Plant Pathology, Sacramento, Cal.

Dr. C. Stuart Gager of Brooklyn Botanic Garden exhibited specimens of green roses from their rose garden. Dr. Gager reported that *Gordonia altamaha* has blossomed freely there this summer.

Mr. George T. Hastings and Dr. Tracy Hazen commented on the Western Meeting of the American Association at Pasadena this summer.

Dr. Edmund W. Sinnott reported on the summer meeting at the Pennsylvania State College.

Dr. Arthur H. Graves told about his hybridizing experiments with the Japanese and American chestnuts and showed a bur of the Japanese chestnut with very large fruit.

Professor Copeland gave an interesting report on the algae found in the Hot Springs of the Rocky Mountains, particularly of the Yellowstone, and reported that he found blue green algae at a temperature of eighty-four degrees centigrade. The species of Conjugatae are found only at very much lower temperature, less than fifty degrees. He showed some fine preserved specimens of the Hot Spring algae.

Mr. Raymond H. Torrey reported on the summer meetings and stated that the last one had brought out an unusual large attendance of one hundred people.

Dr. Forman T. McLean also announced that The New York Botanical Garden had recently received from Captain Bob

Bartlett an interesting collection of living plants from Greenland, collected during the Norcross-Bartlett Expedition last summer.

Meeting was adjourned at 9:30 for refreshments in the Bird Hall by the Refreshment Committee and there Mr. Elwert had a most instructive exhibit from the Pine Barrens which he collected this summer at Toms River.

Respectfully submitted,
FORMAN T. MCLEAN
Secretary

NEWS NOTES

AN AMENDMENT to the constitution of New York, passed this November, has for its purpose the reforesting of much of this abandoned land, both in the state parks and outside them. Much is being done at present in this regard, approximately 38,000,000 trees having been planted in 1931. Of these about half were planted on state land, 7,000,000 were planted by counties, 8,000,000 by individual land owners and the remainder by various clubs and organizations.

THE SAVE-THE-REDWOODS LEAGUE reports that the purchase of the Del Norte Coast State Park has been completed. About 2,500 acres has been secured at a cost of over $400,000. More than 1,000 acres of redwoods have been secured in other tracts through the activities of the league and work is being continued to secure other stands along the Redwood Highway. All these forests will be maintained in their natural state.

AT THE END of December a party sailed from Boston under the leadership of Dr. Ralph W. Chaney to search in the jungles of South and Central America for plants similar to those known in fossil form from the Eocene deposits in California and Oregon. A reconnaissance trip to Central America by Dr. Chaney last year made it seem probable that such plants will be found in considerable numbers.

GROUND WAS broken on November 9 for the Division of Plant Pathology at the Princeton branch of the Rockefeller Institute for Medical Research. The new buildings will consist of a laboratory, eight green house units and a potting shed. Dr. Louis O.

Kunkel, of the Boyce Thompson Institute for Plant Research, will be in charge of the new division. (Science)

THE NEW YORK Botanical Garden within the past year has arranged for certain field work in China, the coöperating institutions in that country being Nanking University, Sun Yatsen University, and Lingnan University. The Nanking University plan, in which the Arnold Arboretum is also coöperating, involves explorations in various provinces in Central China over a term of several years and a very successful season's work has just been consummated in Kweichow Province. The work with Sun Yatsen University involves botanical explorations in Hainan, and that with Lingnan University field work in Kwangtung Province. The New York Botanical Garden was enabled to undertake this work on the basis of a special gift from Mr. Henry W. de Forest.

DATES OF PUBLICATION OF TORREYA, VOLUME 31, 1931

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Names of species and varieties described as new are in **black face** type.