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BY

NORMAN TAYLOR

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NORMAN TAYLOR

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Vol. 17 No. 1

THE NATURAL VEGETATION OF WESTERN LONG ISLAND SOUTH OF THE TERMINAL MORAINE

By Roland M. Harper

Introduction.—In the hundred years or so that New York has been a botanical center much time and energy has been expended in cataloguing the flora of the neighborhood, which consists largely of rather rare or imperfectly understood species; while very few persons have thought it worth while to study the vegetation, which is an important part of the landscape, and is mostly made up of common and easily identified species.* A considerable proportion of almost every local list of plants for a populous region consists of species which were not there a few hundred years ago, species not identified with certainty, species seen only once in the area, and records based on specimens from abnormal

* See Torreya 8: 156. 1908; Bull. Torrey Club 41: 557 (last footnote). 1914. The relation between flora and vegetation is much like that between anthropology and sociology, qualitative and quantitative chemical analyses, or dictionaries and literature. The services of a chemist who could make only qualitative analyses would not be worth much. Dictionaries are useful and well-nigh indispensable, but one does not need to know every word in the dictionary before producing any literature, and if all writers made revising the dictionary their chief aim we would not have much literature. Likewise one does not have to know all the plants of a region before describing its vegetation, and if all botanists were taxonomists primarily it would be difficult to get any information about the aspect of the vegetation in a region one had not visited.

For a concrete illustration of the difference between vegetation and flora see the treatment of those topics in the article on Florida in the latest edition of the New International Encyclopaedia (8: 708–709. 1914). A similar treatment for the whole United States was prepared for a later volume of the same work (22: 698–700. 1916), but there the flora part was crowded out entirely by exigencies of space, though the title still reads "Vegetation and Flora."

[No. 12, Vol. 16, of Torreya, comprising pp. 251–284, was issued 16 January, 1917.]

habitats, that ought never to have been collected at all.* In such lists a single specimen of a rare weed is often given as much space as the commonest native tree, and sometimes even more.

At the present time one of the most obvious advantages of studying vegetation rather than flora is that it makes possible much more significant comparisons between different (especially adjacent) regions. By the old floristic method, in order to compare the plant population of two areas it is necessary to determine what species are present in one and absent in the other, which requires pretty thorough exploration; for the finding of a single specimen of a certain species a few feet inside the boundary of the area from which it was previously supposed to be absent necessitates a readjustment of the statistics. But a determination of what species are more abundant in one area than in another is accomplished more quickly (several of them can be picked out in one day if the areas are close together and well provided with railroads and not more than a few thousand square miles in extent), and is more useful in almost every way. For when the region of greatest abundance of a given species is ascertained, that not only gives the ecologist a clue to its optimum environment, but tells the economic botanist where to look for it if it is of any economic importance.†

* Many if not most collectors do not hesitate to take specimens from fields roadsides, railroad embankments, etc., when the same plants could be obtained just as well in undisturbed habitats near by. The labels of such specimens, whether they indicate the habitat accurately, or—as is still a common custom, unfortunately—omit it entirely, tell little or nothing about the natural habitat of the species, which is of paramount importance. Worse still, a plant growing in a field may be a little out of its natural range, or larger or smaller or different in some other way from the same species in its native haunts, and in the course of time its descendants may even become specifically distinct, by mutation or otherwise (see Bull. Torrey Club 35: 355–356. 1908); so that placing such specimens in herbaria is likely to mislead the users thereof. Unless one is studying weeds, or the influence of unnatural environments on native species, ruderal plants should be let alone, for cumbering botanical collections with them may easily do more harm than good in the long run.

† Examples of the floristic method of comparison are common in botanical literature, but the following are among the most recent or easily accessible, or illustrate some special point: MacMillan, Metaspermae of Minn. Valley, 653 et seq. 1892; Beal, Rep. Mich. Acad. Sci. 5: 20. 1904; Harper, Torreya 5: 207–210. 1906; Fernald, Rhodora 9: 158–164. 1907; Gleason & McFarland, Bull.

This paper deals with a fairly homogeneous area within the limits of New York City, in which there is still enough natural vegetation to be well worth describing before it is all gone. It is that part of Kings and Queens Counties (or the boroughs of Brooklyn and Queens) south of the terminal moraine, which is a very conspicuous topographic feature in the western third of Long Island. The eastern boundary of the area under consideration is a political one, but it happens to mark almost exactly the western limit of the Hempstead Plains, whose vegetation is very different from that here described, and* the eastern edge of the extensive salt marshes around Jamaica Bay. The total area studied is about 100 square miles, including the marshes.

Geology and Soils.—The area is presumably underlaid at a considerable depth (100 feet or more) by Cretaceous strata of the coastal plain, which here have little or no influence on soil or topography. The surface material is classed by geologists† as "outwash" from the Pleistocene ice-sheet, which terminated at or near the present sites of Fort Hamilton, Prospect Park, East New York, Richmond Hill and Creedmoor.‡

There is no rock other than pebbles and small boulders of glacial or fluvial origin, which decrease in size and abundance

Torrey Club **41**: 511–521. Oct. 1914; Harshberger, Trans. Wagner Free Inst. Sci. **7**: 183–186. Dec. 1914; Taylor, Am. Jour. Bot. **2**: 26. 1915; Harper, Rep. Fla. Geol. Surv. **7**: 181–183. Sept. 1915; Bailey & Sinnott, Am. Jour. Bot. **3**: 25–27. 1916; Harshberger, Vegetation N. J. Pine-barrens, 181. Nov. 1916, For examples of the quantitative or census method and its applications see Coville Rep. Geol. Surv. Ark. **1888**[4]: 246–247. 1891; Harper, Bull. Torrey Club **34**: 363–366. 1907; Torreya **9**: 223. 1909; Bull. Torrey Club **37**: 113–117, 409, 417. 1910; Torreya **11**: 231. 1911; Plant World **15**: 245–247. 1912; Torreya **13**: 243–244. 1913; Bull. Torrey Club **41**: 562–563. 1914; Rep. Fla. Geol. Surv. **6**: 175 et seq. Dec. 1914.

* See Torreya **12**: 277–287. Dec. 1912.

† See U. S. Geol. Surv. Professional Paper 82, on the geology of Long Island, by M. L. Fuller, 1914.

‡ It is hardly possible to correlate the vegetation here with geological history, however, and the writer does not now attach the importance to such matters that some contemporary phytogeographers do. For vegetation of similar aspect, and most of the same species, can be found elsewhere on soils that are much older, while areas with similar geological history forty or fifty miles to the eastward have very different vegetation. The present environment is evidently more important—and incidentally much more easily determined—than any changes that have taken place in the past.

away from the moraine. (Consequently rock-loving plants are absent.) The prevailing upland soil types, in order of area, as mapped in the soil survey of western Long Island published by the U. S. Bureau of Soils in 1905, are "Hempstead loam" (this all in Brooklyn, and probably erroneously correlated with the typical soil so named in Nassau County), "Sassafras gravelly loam," "Norfolk sand," "Sassafras sandy loam," and "Hempstead gravelly loam." (These names indicate the character of the soils in a general way, and no attempt will be made to describe them. Descriptions and mechanical analyses can be found in the publication cited.) The salt marshes are mapped as "Galveston clay" and "Galveston sandy loam," and the dunes and beaches (Coney Island, Rockaway Beach, etc.) as "Galveston sand." No chemical analyses are available, but the soils are evidently distinctly non-calcareous, as elsewhere on Long Island.

Topography and Hydrography.—The highest altitude in the area is about 120 feet, in the northeastern corner, and the average slope to the southward is about 20 feet to the mile. The surface is nearly flat, except for the shallow and nearly straight valleys of several brooks and creeks flowing in a general southerly direction, and the dunes along the coast. Most of the valleys can be traced a mile or two above the points where the first water appears. As the crest of the moraine on the north coincides pretty nearly with the divide between the East River and the Atlantic Ocean, no permanent streams enter our area from the glaciated region, though of course some water runs down off the moraine in rainy weather. The streams are clear or nearly so, and sluggish. The salt marshes are dissected by tortuous tidal channels in the usual manner, and constitute the whole area of the numerous island in Jamaica Bay and a strip about a mile wide bordering the bay. The dunes are nowhere more than a mile from the outer beach, or more than ten feet high, and are moving very little at present.

Climate.—The climate of New York City is so well known that little needs to be said about it here. But for the benefit of readers in distant parts it may be well to state that the average temperatures for January, July, and the year are about 31°, 73°

and 52° F. respectively, the average growing season about 200 days, and the average annual precipitation about 45 inches. The normal monthly precipitation does not vary enough from one month to another to have any particular ecological significance, apparently.

Vegetation.—The uplands presumably were originally covered with forests much like the present-day remnants, and the streams were bordered by swamps, passing into meadows near their mouths. About 5 per cent of the original forest, including swamps, still remains, although there are now something like half a million people in the area. The swamps have been destroyed much less than the upland forests, because they are not so desirable for agricultural and residential purposes. The salt marshes, covering perhaps twenty square miles, and two or three square miles of dunes, are mostly in their natural condition yet, but are being invaded by houses more and more every year.*

In the list of plants below, for the sake of brevity, all the different natural habitats are combined. At some future time it may be possible or desirable to treat the upland forests, swamps, meadows, marshes and dunes separately, but it will hardly be possible to make satisfactory comparisons between the upland vegetation on different soils in this particular area, on account of the encroachments of civilization. In the list the habitat of each species is indicated as well as it can be done in two or three words, but without attempting any systematic classification of habitats. The upland forests vary from dry woods to rich woods, according to the amount of humus, etc. An intermediate condition between upland and swamp may be called low woods. The vegetation of dune hollows is intermediate between that of dunes and salt marshes.

The list is divided into five structural classes, namely, trees, small trees, woody vines, shrubs, and herbs. Bryophytes and thallophytes, which average much smaller than vascular herbs, are omitted, because of their small size (by reason of which they

*Although over thirty years has elapsed since the invention of the half-tone process, no published photographs of any natural vegetation (as such) in the area here discussed have come to the writer's notice; but the opportunities are not all gone yet by any means.

contribute almost nothing to the landscape), and the difficulty of identifying them in the field. The species in each structural class are arranged as nearly as possible in order of abundance, as determined by consolidating the field notes taken on ten or twelve walking trips through the area, mostly in the summer of 1916, in the course of which nearly every remaining patch of forest was visited. Although the numerical results obtained for each species are not yet sufficiently complete to warrant converting them into percentages, they make possible some significant comparisons between this and neighboring areas, which have not been possible before. It may be stated now, however, that the first tree listed makes up about 39 per cent of the present forest, the second about 19 per cent, and the third about 9 per cent, and the rest follow approximately in a geometrical progression. No such figures can be given for the herbs, on account of the difficulty of comparing the relative abundance of those scattered over wide areas of upland with those which are extremely abundant over limited areas of salt marsh.

Only the commoner native species are listed, but these probably make up at least nine-tenths of the total vegetation. The several hundred species not listed are either too rare, or too small to make much show, or are confined to unnatural habitats (though some of the last category are treated as native in current manuals). There will be plenty of time to study the weeds after the native plants are all gone.

The list may be criticized by some taxonomic specialists because some of the plant names are not in accordance with the latest developments in their line. The excuse is first that in rapid reconnoissance work it is simply impossible without long experience in the area studied to identify every species with absolute accuracy in the field, and out of the question to load one's self down with specimens to be studied later. Every plant seen in this sort of work has to be given some sort of name in the field notes, and if several species of such difficult genera as *Panicum*, *Sisyrinchium*, *Viola* or *Crataegus* are seen repeatedly within a short time it is difficult to be sure how many one has seen and to correlate the notes with the specimens. Furthermore, even if the plants were correctly identified according to the best existing knowledge, hardly a month passes but some taxonomist shows that what we have been regarding as a single species is really two or three, or that one of our plants is different from the southern or western or European species to which it was formerly referred; and it is hard for one who does not specialize in such matters to keep up with them. Fortunately minor errors of identification within generic limits do not materially affect the statistics.

As far as nomenclature is concerned Taylor's Flora of the vicinity of New York* is followed in the majority of cases. But acceptance of a particular style of nomenclature does not bind one to any particular conception of generic and specific limits, or preclude taking advantage of the latest taxonomic developments that may have come to notice. (For examples of the latter, see the footnotes in the list.

The list of plants now follows:

Trees

Quercus velutina	Upland woods
Quercus alba	" "
Hicoria alba†	" "
Castanea dentata†	" "
Acer rubrum	Swamps mostly
Quercus coccinea	Dry woods
Liriodendron Tulipifera	Rich woods
Quercus palustris	Low woods
Nyssa sylvatica	Swamps
Prunus serotina	Woods, etc.
Quercus montana‡	Dry woods

* Memoirs N. Y. Bot. Gard., Vol. 5, 1915.

† At present many of the hickories are dead or dying from the ravages of a bark beetle. The chestnut has been dying from canker for about ten years, but the dead trees and stumps are easily identified, and have been counted the same as living trees. As far as these trees are concerned therefore this list represents conditions as they were ten years ago.

‡ This has been commonly called *Q. Prinus* L., but that name belongs to a species of more southerly distribution, according to Sargent (Rhodora 17: 40, Feb. 1915).

Juniperus virginiana	Edges of marshes
Sassafras variifolium	Woods and swamps

Small Trees

Cornus florida	Dry woods
Betula populifolia	Various habitats
Sassafras variifolium	Woods, etc.
Populus grandidentata	Dry woods

Vines

Vitis aestivalis	Woods and swamps
Parthenocissus quinquefolia	" " "
Smilax rotundifolia	" " "
Rubus hispidus	Swamps and low woods
Celastrus scandens	Rich woods, etc.
Lonicera sempervirens	Woods
Rhus radicans	Woods and swamps

Shrubs

Viburnum acerifolium	Rich woods
Vaccinium vacillans	Dry woods
Gaylussacia baccata	Dry woods
Clethra alnifolia	Swamps
Myrica carolinensis	Dry woods and dunes
*Rubus nigrobaccus?**	Woods
Viburnum dentatum	Swamps mostly
Rosa virginiana	Dry woods
Benzoin aestivale	Rich woods and swamps
Alnus rugosa	Swamps and meadows
Rhus Vernix	Swamps
Sassafras variifolium	Woods, etc.
Gaylussacia frondosa	Swamps
Sambucus canadensis	Woods, swamps, etc.
Iva oraria†	Edges of marshes

† Formerly referred to *I. frutescens* L., which does not occur north of Virginia, according to Bartlett (Rhodora 8: 26, Feb. 1906).

* The blackberries have not been studied sufficiently. There may be more than one species.

Herbs

Spartina patens	Salt marshes
Ammophila arenaria	Dunes
*Spartina alterniflora glabra**	Salt marshes
Carex pennsylvanica	Dry woods
Panicum dichotomum?	Dry woods
Distichlis spicata	Salt marshes
Vagnera racemosa	Rich woods
Lysimachia quadrifolia	Dry woods
Solidago caesia	Dry or rich woods
Eupatorium purpureum?	Woods and meadows
Juncus Gerardi	Salt marshes
Solidago bicolor	Dry woods
Baptisia tinctoria	Dry woods
Geranium maculatum	Rich woods
Solidago sempervirens	Edges of marshes
Aster divaricatus	Rich woods
Falcata comosa	Rich or damp woods
Meibomia nudiflora	Dry or rich woods
Collinsonia canadensis	Rich woods
Spathyema foetida	Swamps
Impatiens biflora	Low woods
Fragaria virginiana	Dry woods
Potentilla canadensis?	Dry woods
Angelica hirsuta	Dry woods
Helianthus divaricatus	Dry woods
Salicornia ambigua	Salt marshes
Osmunda cinnamomea	Swamps, etc.
Aralia nudicaulis	Dry woods
Unifolium canadense	Low woods
Panicum virgatum	Edges of salt marshes
Limonium carolinianum	Edges of salt marshes
Aureolaria villosa	Dry woods
Silene stellata	Rich woods
Panicum commutatum?	Dry woods
Typha angustifolia	Meadows, etc.

* *S. stricta* of American authors. See Fernald, Rhodora 18: 178, Aug. 1916.

Sericocarpus asteroides.............Dry woods
Pteridium aquilinum..............Dry woods
Solidago juncea?.................Dry woods
Dryopteris simulata?..............Swamps
Leptandra virginica...............Rich woods
Smilax herbacea.................Rich woods
Chamaenerion angustifolium........Recently burned woods
Solidago rugosa?.................Woods
Dondia maritima?................Salt marshes
Salicornia herbacea...............Salt marshes
Crocanthemum sp.................Dry woods
Sabatia stellaris..................Dune hollows
*Circaea latifolia**.................Rich woods
Galium circaezans?................Dry woods
Sanicula marilandica...............Rich woods
Agrimonia sp....................Dry woods
Meibomia paniculata..............Dry woods
Spartina polystachya..............Brackish marshes
Eragrostis pectinacea..............Dunes
Scirpus americanus................Dune hollows, etc.
Chamaesyce polygonifolia...........Dunes
Antennaria plantaginifolia..........Dry woods
Glycine Apios....................Swamps, etc.
Polygonatum biflorum.............Rich woods
Aster patens.....................Dry woods
Meibomia rigida?................Dry woods
Nabalus sp......................Rich woods
Strophostyles helvola..............Dunes
Scirpus Olneyi...................Brackish marshes
Andropogon maritimus............Dunes
Atriplex hastata..................Brackish marshes
Hibiscus Moscheutos..............Brackish marshes
Lilium superbum.................Meadows
Meibomia marylandica............Dry woods
Cakile edentula..................Dunes

* Until recently confused with the European *C. Lutetiana*. See Fernald, Rhodora 17: 222–224. Nov. 1915.

olaria flava, Silene, Sericocarpus, Pteridium, Dryopteris simulata, Chamaenerion, Crocanthemum, Meibomia paniculata, Eragrostis, Chamaesyce, Meibomia rigida, Strophostyles, Andropogon, Lilium, Cakile, Aureolaria Pedicularia, Eupatorium sessilifolium, Carex vestita. Some of these are chiefly confined to swamps, which are less common in the more northerly area, some prefer (or tolerate) poorer soils, while the reasons in a few cases are less obvious. A reverse comparison might be made by listing plants that are more abundant in northern Queens County than here, but that would involve bringing in several species that have not been mentioned before, and can better be deferred until the vegetation of northern Queens is discussed. It is well worth mentioning, however, that three trees which are common just north of the moraine, namely *Betula lenta*, *Fagus*, and *Liquidambar*, are almost wanting in the area under consideration. In the case of *Liquidambar* this is contrary to what one might expect in view of the fact that in the northeastern states it is almost confined to the coastal plain, and this is near its northern limit.

The following species are more abundant in southern Kings and Queens Counties than in the geologically and topographically similar portion of Nassau:—TREES: *Quercus velutina, Hicoria alba, Liriodendron.* SMALL TREES: *Cornus florida.* VINES: *Vitis, Celastrus, Lonicera.* SHRUBS: *Viburnum acerifolium, Rubus nigrobaccus?, Sambucus.* HERBS: *Vagnera racemosa, Solidago caesia, S. bicolor, Geranium, Aster divaricatus, Falcata, Meibomia nudiflora, Collinsonia, Impatiens, Fragaria, Silene, Leptandra, Circaea, Glycine, Polygonatum, Juncoides.* The significant factors in most of these cases seem to be richer soil and more protection from fire. In the western half of Long Island the natural soil fertility is greatest toward the west, and bodies of water and other barriers to fire are also closer together in that direction, a circumstance which favors the accumulation of humus.*

Comparisons with several non-adjacent regions could also be made, but if one should begin that it would be hard to decide where to stop.

If other botanists will study the vegetation of this and other

* See Bull. Torrey Club **38**: 515–525. 1911.

easily accessible areas in this simple manner whenever they have opportunity for field work the accuracy of the foregoing statistics can be checked up, and at the same time significant similarities and differences, that are hardly suspected now, between different regions will be brought out.

COLLEGE POINT, L. I.

TYPE, COTYPE, AND TOPOTYPE LABELS

BY E. D. MERRILL

In all large herbaria that are rich in type material, the curator is confronted with the problem of properly indicating the important specimens, that is, those that are the actual types of species, cotypes of species, or in "collective species" those specimens that conform to the original type of the species as described, and agree with it as to origin. It is scarcely enough to indicate on the specimen that it is a type or a cotype, merely by writing these words on the sheet or on the label. Where one has to examine numerous sheets, as is frequently the case in large herbaria, before locating the critical specimen he is searching for, some special supplementary label is needed, one that is sufficiently prominent to attract the immediate attention of the herbarium worker.

In the Bureau of Science for a number of years the herbarium was stored in a wooden frame building, and one in which a large amount of chemical work was done. The danger of fire was always present. As the herbarium increased in size and value, and as the number of types and cotypes increased in number, it was felt that the critical material should be placed in a safer place. Accordingly all types and cotypes of Philippine species were segregated from the general herbarium, and stored in special cases which were in turn placed in a practically fireproof part of the Bureau of Science building. As to the number of specimens thus segregated, it is approximately 4,500 sheets. At the time the specimens were being segregated, each one was labelled with a special type or cotype label, as the case might be, as illustrated in Figs. 1 and 2. These labels are printed in *red* ink and are attached to the herbarium sheet immediately above the herbarium label.

TYPE OF:

FIG. 1. Label for type specimens (original label in *red* ink).

COTYPE OF:

FIG. 2. Label for cotype specimens (original label in *red* ink).

Recently it has been my privilege to work up two large collections of plants from outside of the Philippines, the material collected by the late Dr. C. B. Robinson in Amboina, to illustrate the species figured and described in Rumphius's Herbarium Amboinense, and an extensive collection made on Mount Kinabalu, British North Borneo, by Chaplain and Mrs. Clemens and Mr. Topping. Both localities are "classical" regions in Malayan botany, and naturally the collections from both places are very rich in topotypes. In working up this material, wherever the specimens agreed perfectly with the original descriptions of species based by various authors on Amboina or Kinabalu specimens, such specimens have received the special topotype label as shown by Fig. 3. This topotype label is printed in *green* ink, to distinguish it at once from type and cotype soecimens. For all practical purposes these topotypes are nearly as valuable as types or cotypes. In the case of the Amboina species, of which over 400 are typified wholly by Rumphius's descriptions and figures, no type specimens are extant, so that topotypes in this case will to a large degree take the place of the actual types in interpreting the numerous species based by the early authors wholly on Rumphius. In general, as groups of plants are critically studied, and in "collective species," such as *Callicarpa longifolia* Lam., when a specimen is found that originated in the type locality (Malacca in this particular case), and that agrees perfectly with Lamarck's original description, it is supplied with a topotype label, and all specimens that do not agree with this specimen are then removed from the *Callicarpa longifolia* cover.

TOPOTYPE, TYPICAL OF:

FIG. 3. Label for topotype specimens (original label in *green* ink).

It is believed that these special labels could be adopted with great profit in all large botanical institutions that are rich in type, cotype, and topotype material. As the task of going through any large herbarium and properly labelling such material would be a very great one, it is not advocated that this be done at one time. The special labels might be adopted for current herbarium work, and could be added to the specimens representing the species already described as various groups are revised or critically studied.

BUREAU OF SCIENCE,
MANILA, P. I.,
August, 1916

SHORTER NOTES

An Interesting New Station for *Geranium sibiricum*.—The Siberian crane's bill, *Geranium sibiricum* L., has until recently been established only on Manhattan Island, New York. According to the latest edition of Britton and Brown's "Illustrated Flora of the Northern States and Canada," it has been reported as occurring abundantly along roadsides in the northern part of New York City, no other stations being reported for this species of geranium.

During the past five years, the writer has noticed this pretty little plant becoming firmly established on the campus and ground of the Pennsylvania State College and in the waste places of the town, until it has become one of the commonest plants in the immediate vicinity. Specimens have been sent to Dr. N. L. Britton, who has verified the identification. Just how the plant was introduced into State College is unknown to the writer.

Geranium sibiricum is adventive from Asia.

Albert A. Hansen.

The Pennsylvania State College

REVIEWS

Trelease on Phoradendron*

The monograph of the genus *Phoradendron* by Professor Trelease should catch the interest not merely of professional botanists but of amateurs in botany as well for several noteworthy reasons. In the first place the author has long been identified with the development of American botany and especially with the monographing of certain of the more unique American plant groups so that we have come to look with expectancy for his monographs. Then, too, the group here monographed in part—the mistletoes—has a rather unusual interest

* Trelease, W. The genus Phoradendron. Pp. 1–224 + plates 1–245 and a map. Published by the University of Illinois, Urbana, Ill. 1916. Price $2.50, unbound $2.00.

both because of its biological relations and of its traditional status. Again, as a product of press work this volume is an impressive one, the more so because it bears the stamp of the University of Illinois as publisher and thus serves to emphasize the state university in its more recently assumed rôle of promoting research and of publishing the results of research. The greater bulk of the volume is comprised in an exposition of photo-illustrations which deserves special comment and commendation. There are 245 plates including a full-size illustration of characteristic portions of each species and 237 or nine-tenths of all the forms recognized are here illustrated for the first time. "It has been my aim (quoting Professor Trelease) to picture the more essential features of every species without alteration of size, by aid of the camera and if possible from type specimens." Manifestly such a thoroughgoing enterprise necessitated the visiting of all the major herbaria of America and Europe and a very generous attitude toward the use of specimens for these photo-illustrations. "That every species has been figured . . . may be my excuse for adding that words are lacking to express adequately my gratitude to the many botanists of Europe and North America who have opened their collections to me without restrictions, and in some cases have allowed type material to follow me across the Atlantic or have replaced photographs which were unsatisfactory in the first instance."

With regard now to the species and varieties of *Phoradendron* segregated by the author it will no doubt appear to many botanists that the multiplication of forms has gone beyond the point which any one not a specialist in the group can follow. Especially will this be the case if it finds one at the beginning point of contact with the genus where "all mistletoes look alike." The present reviewer, for example, while not possessing the taxonomist's powers of discernment, still has had a fairly extended field contact with a limited aspect of the genus (on the boundary between southern and southwestern territory), would scarcely have anticipated the possibility of segregating (under the section *flavescentes*) as many as twenty-three species and varieties out of the old *Phoradendron flavescens*. Nevertheless, every man who has come into intimate contact with the group *flavescens*, especially in the field, will have felt the need of a segregation of forms on some consistent basis and no doubt this will have been the experience of botanists in other geographic regions occupied by *Phoradendron*.

Now if we had a greater fund of knowledge about American Loranthaceae based on investigations in the morphology, physiology and ecology of the group, particularly if we had data based on continued studies and cultural experiments in the field, no doubt structural and growth-habit characters would suffice alone for a basis of segregation of forms. Professor Trelease has pointed out the shortcomings of dried herbarium specimens in furnishing such a reliable basis. In the absence of the fuller measure of such knowledge as that just specified, it is possible to bring to the support of this knowledge the facts of geographical distribution. This the author has done and one is impressed by the fact that the taxonomic scheme of *Phoradendron* offered by Professor Trelease is virtually a projection of the genus upon the geographic regions occupied by it. To be sure the number of geographic regions indicated (twenty-two) is only two fifths of the number of species, groups or sections defined (fifty-five) so that of course structural differences have been given due weight, nor must one infer that the species of any group are wholly confined to a single geographic region. But the mere mention of Sonoran region, Andean region, Caribbean region, etc., carries the presumption of forms of *Phoradendron* characteristic of or even peculiar to each.

This reviewer is led to remark upon the significant influence phytogeographic studies are having and are destined still more to exert upon taxonomic revisions of groups. The latter studies have of course aided in the definition of geographical provinces, regions, etc., but with even our present knowledge of the values of the geographic factors one may have in advance, in taking up a group such as the mistletoes, a certain degree of expectation as to what the segregation will be. And this invites also the further comment that the character of the monograph is being changed by the advancing point of view given of course by the

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

Correspondence relating to the above publications should be addressed to

DR. BERNARD O. DODGE

Columbia University

New York City

Vol. 17 February, 1917 No. 2

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A Monthly Journal of Botanical Notes and News

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THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR

JOHN TORREY, 1796–1873.

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NORMAN TAYLOR

④ TORREYA

February, 1917.

Vol. 17 No. 2

SELF-PRUNING IN THE AMERICAN ELM

By Jean Broadhurst

While self-pruning is not uncommon in trees, it is seldom as noticeable as in the Carolina poplar; in early autumn branches one to seven years old and ten to twenty inches long may be seen lying under any young tree in such numbers as to give a most untidy appearance to the street or lawn.

Early in September, 1913, I noticed underneath some American elms on the lawn just south of the Cornell library numerous smals twigs, two to four inches long, all as clean-cut at each end as if cut by a sharp knife. On closer examination these ends were found to be very similar to the scars found at the basal end of self-pruned branches. While fingering some of the longer twigs, I was surprised to have them break in two in my hands. These new breaks also occurred at the annual rings or scars formed by the terminal bud scales.

Fig. 1 shows a ten-year-old twig which was laid upon paper, and pressed gently at each annual ring; breaks occurred as shown, marking each year's growth. Fig. 2 shows a much more branched twig with the same tendency to break at the annual bud scars. The pruned branches of Carolina poplar are similarly cut off at their bases; but careful examination of many twigs has failed to show any tendency toward such breaks between the two ends of any self-pruned branch.

This raises a question with regard to the American elm; are these successive breaks due to a definite but incomplete abscissal development or to a lack of satisfactory union of the growth of any year with that of the preceding year.

No. 1, Vol. 17, of Torreya, comprising pp. 1–20, was issued 1 February, 1917.]

FIG. 1. A ten-year old twig showing breaks at each of the nine annual rings; last year's growth is lacking, having broken off at its base, no. 1.

The two photographs were made by Dr. B. O. Dodge, of Columbia University, and Miss Bernice Replogle of Bur Oak, Michigan.

TEACHERS COLLEGE,
COLUMBIA UNIVERSITY

RUSTS OF THE WEST INDIES[1]

BY J. C. ARTHUR

The rusts of the West Indies are not well known, and the present discussion can do no more than call attention to a few salient features regarding their kind, number and distribution. The first attempt at a collective account of the West Indian rust flora was made only a year or so ago, when the rich Porto Rican material collected by Professor F. L. Stevens in 1913–15 was studied.[2] This list gave 155 species for all the West Indies, only 20 of which were not known from Porto Rico. Had a list been compiled before this material was available it would have numbered less than 100 species, of which over half would have been recorded for Porto Rico, about half for Cuba, somewhat less than half for Jamaica, less than one fifth for the Bahamas, and still fewer for the Lesser Antilles and other small islands.

During two months in the early part of the present year (1916) the second extensive search for rusts in Porto Rico was made by Prof. H. H. Whetzel and Dr. E. W. Olive, which added 20 species to those already known for the island, and 17 species to the West Indian list, bringing the total up to 174.

In the meantime Mr. J. R. Johnston of the Experiment Station of Cuba has been searching for rusts in central and eastern Cuba, and Mr. Percy Wilson, of the New York Botanical Garden, has taken many rusts in western Cuba, especially in the Isle of Pines. The study of the rich material from these two sources, with addition of other scattering collections, shows a present rust flora for Cuba of 136 species, among which are found an addition

[1] Read before the Botanical Society of America at the New York meeting, Dec. 29, 1916.

[2] Arthur, J. C.—Uredinales of Porto Rico based on collections by F. L. Stevens. Mycol. 7: 168–196, 227–255, 315–332; 8: 16–33. 1915–16.

of 40 species to the known West Indian flora, bringing it up to a total of 214 species.

This much for statistics, in which the islands of Haiti (Hispaniola) and Jamaica, the second and third largest of the West Indies, with their highly varied topography and climate, have an insignificant part. It can be said that the rust flora of Cuba and Porto Rico, the largest and the smallest of the four large islands, is about as well known as that of many of the states of the Union, but that Haiti and Jamaica are practically virgin territory, yet awaiting the rust collector. None of the smaller islands has yet been explored to any extent for rusts.

The area of the Greater Antilles, embracing the four large islands, lies just within the tropical zone, and a long way from the equator. Its relation to the equator is about the same as that of the region about Rio Janiero, Brazil, and it is with the rust flora of this region that the greatest similarity is shown.

The four islands range through a latitude of five degrees, or about the same as that of the state of Illinois or New York. It can not be expected, therefore, that their individual rust floras should show any large differences. While there is yet not enough known to justify close analysis, still it is clearly evident that the Cuban flora favors that of North America, having many characteristic species in common with southern Florida, Mexico and Central America, while the Porto Rican flora favors that of South America, with species in common with Venezuela, Colombia and southward.

Comparing the rust flora as a whole with that of temperate regions the most interesting feature is the adaptation of the several methods of spore propagation to climatic conditions for the maintainance of the species. About 65 per cent of the known species appear to propagate almost or quite wholly by urediniospores. These include not only tropical species, but many that in temperate regions commonly produce teliospores and complete their life cycle, such as *Uromyces appendiculatus* on the legumes and *Puccinia salviicola* on the labiates. Only about 10 per cent of the long cycle species make use of their full complement of spores in maintaining their existence. The heavy preponderance of collections showing only urediniospores has long been recognized as one of the prominent difficulties in the taxonomic study of tropical rusts.

But doubtless the most unexpected feature of the flora is the large proportion of short cycle species. The opinions of Magnus and Eduard Fischer have generally prevailed, that a shortened life cycle is an indication of adaptation to a short season for growth, and that such species are more numerous on high mountains and far northward, where the brief growing seasons alternate with long periods of cold.

In the short cycle rusts the spores germinate for the most part while attached to the host plant, and dissemination is by the exceedingly small basidiospores, often called sporidia. The time required for one set of basidiospores to infect a plant, mature the fungus, and provide another crop of basidiospores averages from one to two weeks. It looks like a provision for a hurry-up development to escape extermination. But under a tropical sun in the Greater Antilles we find that 25 per cent of the species are short cycle forms. Evidently the explanation of this situation is not the one usually given.

Possibly the 65 per cent of species propagated by repeating spores, and the 25 per cent of short cycle species, are the expression of two ways the rusts have found to meet one and the same set of conditions that menace their existence. It is likely that some important problems in the elucidation of the very complex development and behavior of the rusts, such as this one, which have not been well worked out in temperate regions, may be studied to advantage in the tropics.

A more extended analysis of the West Indian rusts is scarcely advisable, considering the limited knowledge regarding them. To show how restricted our knowledge is it may be well to recapitulate. Altogether 214 species are recorded at this time for the West Indian islands. Of these 174 species are known to occur in Porto Rico, which has an area of 3,500 square miles, and only 136 species in Cuba, which is nearly thirteen times as large, having 44,000 square miles. Jamaica with 5,000 square miles is practically unexplored in this regard, and Haiti with 30,000 square miles is a veritable *terra incognita*.

PURDUE UNIVERSITY,
LAFAYETTE, IND.

SHORTER NOTES

CONCERNING SOME SPECIES OF CHRYSOPSIS IN COLORADO:—In studying my specimens of *Chrysopsis* I came to some conclusions which are somewhat different from the classification in our manuals. The genus is, of course, a rather difficult one, as the various treatments indicate, and I can only give my conclusions.

It seems to me that *Chrysopsis resinolens* A. Nelson and *C. fulcrata* Greene are the same species, and that since *C. fulcrata* was described earlier than *C. resinolens* it should replace that name. Dr. Greene sent me a specimen of *C. fulcrata*, and while it is a taller plant than any specimen of *C. resinolens* which I have seen, yet the main characters of leaf, the size of the flower-heads and their disposition at the end of the stem, the pubescence, and the resinous atoms on the leaves, are about the same. The species is quite variable according to localities in which it grows, and some forms might be distinguished, yet the plant I have from Dr. Greene and one I have from Prof. Nelson seem to be the same species.

Chrysopsis caudata Rydb. is not the same as *C. fulcrata*, but is a good species, distinguished by the different leaves and larger heads. *Chrysopsis amplifolia* Rydb. is much like *C. caudata* and I think may be referred to that species. *Chrysopsis horrida* Rydb. seems to be too close to *C. hispida* (Hook.) Nutt.

GEORGE E. OSTERHOUT
WINDSOR, COLO.

REVIEWS

Atkins's Some Recent Researches in Plant Physiology *

As stated in the preface, the general aim of this book is to present to senior students and investigators the results of recent

* Atkins, W. R. G., Some Recent Researches in Plant Physiology. Pp. i–xi +328. With 28 illustrations. London. Whittaker & Co. 1916.

work in a few of those branches of plant physiology which are at present attracting attention. Matter already found in textbooks has been almost entirely excluded. The method of treatment is largely historical, and the topics are for the most part confined to those with which the author has had a first-hand acquaintance in the laboratory—especially such topics as are being investigated by the staff of the school of botany, Trinity College, Dublin. Some hitherto unpublished work is included, and throughout the book quantitative data are quoted wherever obtainable.

There are fourteen chapters dealing, in succession, with the carbohydrates of the Angiosperm leaf in relation to photosynthesis, methods of estimating carbohydrates in plant extracts, the carbohydrates of the Thallophyta and Bryophyta in relation to photosynthesis, the pectic substances, osmotic pressure in plants, the osmotic equilibrium in the cell and its surroundings, the permeability of protoplasm, the permeability of organic membranes other than protoplasm, the magnitudes of osmotic pressures and electric conductivities in plants and the factors which influence them, osmotic pressure in relation to plant distribution, morphology, and cell division, the functions of the wood, the plant oxidases, the oxidases in relation to pigmentation and the anthocyan pigments, the oxidases in relation to plant pathology and to technology.

There is a bibliography of twenty pages, and a good index. The book will certainly be warmly welcomed by those who are pursuing advanced work along related lines, either with classes or as investigators. It serves to put one in convenient touch with a large list of recent titles, and the author's own experience has enabled him to evaluate much of the work he reviews in a manner that will prove helpful.

C. STUART GAGER

PROCEEDINGS OF THE CLUB

OCTOBER 25, 1916

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

The minutes of the meeting held October 10 were read and approved.

Miss Grace G. Lyman, 507 W. 121st St., N. Y. City, and Dr. Henry B. Douglass, 452 Riverside Drive, N. Y. City, were nominated for membership.

Dr. Britton suggested that it would be advisable to have a committee appointed to represent the Club in case it should seem desirable to take an active part in connection with the coming meetings of the Botanical Society of America and the American Association for the Advancement of Science in New York City. A motion was carried to appoint as such committee, with power, the members of the "subcommittee of the local committee" of the A. A. A. S. The members of this committee: Professor R. A. Harper, Dr. C. Stuart Gager, Prof. H. M. Richards, Prof. E. S. Burgess, and Prof. Bertram Butler, are also members of the Torrey Club.

Miss Grace G. Lyman was then elected to membership.

Mr. George V. Nash exhibited a flowering specimen of an interesting plant, a species of *Monodora*, then in flower in the conservatories of the N. Y. Botanical Garden. "The plant is about ten feet tall and was a gift of Miss Helen Gould in 1900. The Genus *Monodora* was based upon two species, *M. Myristica* and *M. microcarpa*, the latter now referred to *Diospyros*. *Monodora Myristica* was based on *Anona Myristica* Gaertn., who saw fruit of it in the Banksian Herbarium. Dunal referred to this as a native of Jamaica. In Botanical Magazine this is figured at plate 3059, the material from which the illustration was prepared coming from a Jamaican plant; this plant was said to have been brought from South America to the Retreat Estate, Clarendon, Jamaica. It is known as the calabash nutmeg.

"This plate does not quite agree with the present material, but at plate 7260 of the same work is figured a plant of *Monodora grandiflora*. This very closely resembles the specimen shown. It is a native of tropical west Africa, and Oliver, in his flora of tropical Africa, considers it a variety of *M. Myristica* under the name *grandiflora*.

"The genus *Monodora* is confined to tropical Africa, and contains about twenty species. The Jamaican plant must have come originally from Africa."

(The above abstract was furnished by the speaker.)

The announced scientific paper consisted of a paper on "New and Special Plantations of the N. Y. Botanical Garden," by Dr. N. L. Britton and Mr. G. V. Nash. Dr. Britton gave a general outline of the plans for the development of the additional one hundred and forty acre tract and the new plantations that are to be developed therein. He exhibited a map and showed the location of each, and stated under what auspices they are to be developed. Mr. Nash explained the details of planting and labeling.

After the conclusion of the program the meeting was adjourned and those present were invited to inspect these plantations under the guidance of the speakers.

B. O. Dodge,
Secretary

NOVEMBER 11, 1916

The first regular November meeting was held at the American Museum of Natural History, at 8:15 P.M. Vice-president Richards presided. There were forty-six persons present.

As there was no business to be transacted the speaker of the evening, Dr. Alfred Gundersen was introduced. Dr. Gundersen gave an illustrated lecture on "Foreign Trees in the City Parks." The speaker's abstract follows:

"European trees in many cases can be distinguished from the American species of the same genus by their keeping their foliage longer. Seedlings are coming up by a carpellate *Ginkgo* tree in Prospect Park near the Plaza with no staminate tree in the vicinity and a question was raised whether *Ginkgo* may be parthenogenetic. Other foreign trees in the Parks that are of special interest are English yew, cedar of Lebanon, *Cryptomeria*, *Cercidiphyllum*, Japan pagoda tree, *Phellodendron* and *Paulownia*."

The speaker exhibited a number of specimens of leaves and fruits of various park trees. A general discussion of questions raised followed the lecture.

Meeting adjourned.

B. O. Dodge,
Secretary

There was no business to be transacted. The announced program consisted of an illustrated lecture on "A decade of the Salton Sea," by Dr. D. T. MacDougal.

Adjournment followed.

B. O. Dodge,
Secretary

NEWS ITEMS

Rev. E. J. Hill, of Chicago, whose botanical papers have appeared in various journals for many years, died January 22, in his eighty-fourth year.

Exercises on the occasion of the dedication of the completed laboratory building and plant houses of the Brooklyn Botanic Garden are planned for April 19, 20, 21. The new building and greenhouse additions will be completed by that time. Sessions for the reading of scientific papers and a public reception are among the events planned. Members of the Club are invited to the scientific meetings, and further particulars will be published in the March number.

Mr. H. E. Thomas, instructor in botany at the Virginia Polytechnic Institute, sailed on March 3, to Mayaguez, to do work in plant pathology at the Federal Experiment Station, Porto Rico.

Mr. Lex Hesler of Cornell University, has been granted a year's leave of absence to study plant diseases in Porto Rico. He sailed for Mayaguez on February 10th.

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BY

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March, 1917.

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THE GENUS ARTOCARPUS IN THE HAWAIIAN ISLANDS

By Vaughan MacCaughey.

The breadfruit is beyond question one of the most famous and valuable trees of the Pacific. For thousands of years it has been intimately associated with the peoples of Indo-Malaysia and Polynesia. On many of the tiny island groups in the South Pacific it has been a food-plant of supreme importance since time immemorial. In the Hawaiian Archipelago, whither it was brought by the early Polynesians, it was highly prized by the natives, and carefully cultivated. It has played an important rôle in the economy of all the peoples of the central Pacific.

There seems to be at present, in the literature, no comprehensive account of the breadfruit in the Pacific; the references are scattering and for the most part difficult of access; and it is the purpose of the present paper to give a salient account of this important tree and its congeners, particularly as they occur in the Hawaiian Archipelago. It is significant that nowhere in the literature is there a complete description of the tree and its parts; the extant characterizations, both botanical and non-technical, are noticeably fragmentary and unsatisfactory. The present paper undertakes a reasonably complete description of the tree and its relations to human welfare.

The genus *Artocarpus**—Greek for bread-fruit—is moraceous, and comprises about forty species, chiefly trees and shrubs, indigenous to the Indo-Malayan region. A number of the trees are locally valuable for timber; however, the two species

[No. 2, Vol. 17, of Torreya, comprising pp. 21–32, was issued 8 March 1917.]

* A. D. E. Elmer, Synopsis of Artocarpus, Leaflet Philipp. Botany, 2. 1909 see also Engler and Prantl.

of prime importance are the breadfruit and the jakfruit. The genus is characterized by copious latex; large, thick, alternate leaves, either entire or pinnate; and deciduous axillary stipules. The plants are monoecious, and the two kinds of flowers are on distinct receptacles. The staminate flowers occur in long, crowded spikes; each perigone has two to four lobes and a single exserted central stamen. The pistillate flowers are massed in more or less globular heads; the floret has a tubular, obovate, or linear perigone, and a simple, uniovulate ovary. The style protrudes through the narrow aperture of the perigone and bears a spathulate stigma, which is sometimes 2–3-fid. The ovule is anatropous. The fruit is a large syncarpium, formed of the fleshy receptacle and greatly enlarged, fleshy, aggregated perianths and carpels (anthocarps). The tips of the anthocarps are hardened, truncate, pyramidal or spinous. The seeds are without albumen; the embryo is straight or curved, with thick, fleshy, equal or unequal cotyledons. In general the genus is distinctive of tropical regions possessing a uniformly humid atmosphere, moist soil, and good drainage.

The breadfruit is by far the most important member of the genus, outranking in economic value and in geographic range all of the others combined. It is one of the world's great trees, and for beauty, unique features, and human interest, has a place beside the orange tree and the coco palm. In the botanic and semi-technical literature it is designated as *A. incisa* L.f., although its correct scientific name is *A. communis* Forst. The confusion in nomenclature has been carefully worked out by Baum,* who states:

"The genus *Artocarpus* was first described in 1776 by G. and G. J. R. Forster in 'Characteres Generum Plantarum,' a work written as a result of their botanical studies made during Captain Cook's second voyage into the Pacific and round the world between 1772 and 1775. The combination *Artocarpus communis* was given in this work for the breadfruit tree, a name which, according to nomenclatorial rules, must replace the

* H. E. Baum, The Name of the Breadfruit, Science, N.S., 18: 439. 1903, see also A. Richter, Botan. Centralbl., 60: 169–70. 1894.

The enumeration of the native names given to the seedless breadfruit indicates the geographic distribution of the species;* its home is the Indo-Malaysian region, like that of many other members of the genus, but it has been widely disseminated throughout the tropics. The Polynesian race took this valuable food-plant with them in their extensive migrations in the Pacific, and established it in all their island groups that possessed the climatic conditions requisite for its growth. New Zealand, the home of the Maoris, proved inhospitable to the breadfruit, and the natives failed to establish it there. The Hawaiian Archipelago, the northernmost boundary of Polynesia, was more favorable, but the tree never attained the importance in the dietary of the primitive Hawaiians which it held in the warmer islands to the south. It is noteworthy that whereas over twenty varieties were known by distinctive names to the inhabitants of Tahiti, Samoa, and Fiji, and twenty-five varieties were cultivated in the Caroline Islands, the Hawaiian had but a single variety. There are, of course, numerous variations in the Hawaiian breadfruit, but these are not comparable to the clearly defined varieties of southern Polynesia. Nor was the paucity due to any lack of horticultural ability on the part of the natives, for the Hawaiians were more skilful in their cultural processes than were their southern kinsfolk, and their other food-plants show large series of designated varieties.

The breadfruit in Hawaii is thus at the northern limit of its Oceanic range, and does not reach the stature or productiveness of the southern forms. The ecologic requirements for its maximum development apparently comprise the following: a warm, humid climate throughout the year, copious precipitation; moist fertile soil, and thorough drainage. The absence of any one of these conditions is a serious detriment to the normal growth of the plant, or may wholly prevent its fruiting. It is scarcely tolerant of shade, and in Hawaii large trees are almost invariably found growing in the open.

Mention may be made here of the famous adventures connected with the introduction of the breadfruit into the West Indies.

* Fossil specimens are reported from California, Colorado, and Greenland.

Dampier and Cook both called attention to the tree as a source of food, and the latter recommended its transportation to the West Indian colonies. In 1787 Lieut. William Bligh was put in command of the *Bounty*, and commissioned to move a cargo of young trees from Tahiti to the West Indies. After the cargo had been secured and the vessel was on the return trip, a mutiny broke out, and Bligh and a portion of the crew were turned adrift in a small boat. The mutineers returned to Tahiti, from whence a number of them, with a few native men and women, sailed to Pitcairn Island, and established a remarkable colony there. Almost miraculously Bligh did not perish, but reached England, and was again commissioned to undertake the transplanting, which he successfully accomplished in 1792–93.

According to an ancient Hawaiian tradition the *Ulu* was introduced during that remote period of native history in which there was frequent intercourse with the homeland, "*Ka-hiki*," in the South Pacific. This was probably Samoa, rather than Tahiti. It is interesting to picture the remarkable canoe-voyages of the primitive Hawaiians back and forth across the vast stretches of the Pacific. As Lydgate states: "The successful introduction, perhaps acclimatization even, must have meant repeated voyages, extending over generations, or even centuries. And not time alone, but patience and skill must have been required for the successful introduction of a seedless tree like the breadfruit. Under favorable conditions it is not easy to propagate; exposed to the trying vicissitudes of a long canoe voyage; weeks of wind and weather and open sea; lack of water, burning sun and blighting spray, huddled into the bottom of the shallow canoe—how many, many failures there must have been!"

The voyagers, according to the legend, landed at Ewa, Oahu, and carried the precious young plants across the Ko'o-lau Mountains, to the Kualoa district. Here they were carefully planted and tended, probably under a heavy *tabu*. At the time of the coming of the first European explorers the breadfruit was plentiful around the native settlements and villages on all the islands; more plentiful than it has been at any subsequent period. It thrived in the humid regions of Kona and Hilo, on the island of Hawaii, and today there are many abandoned trees in these districts, marking the sites of once-populous Hawaiian villages. The extensive breadfruit groves of Lahaina, on Maui, were long famous for the excellence of their fruit. In humid valleys on Molokai, Oahu, and Kauai the tree was also abundant, rearing its splendid dome of glossy foliage high above the surrounding vegetation.

It is distinctly a tree of the valleys and lowlands in Hawaii, and with the decadence of the Hawaiian population, and the utilization of the fertile lowlands for sugar plantations, the majority of these fine old trees were sacrificed to make way for the white man's agriculture.

As has just been intimated, a mature *Ulu* tree possesses great beauty and dignity. As Melville states, "The bread-fruit tree, in its glorious prime, is a grand and towering object, forming the same feature in a Marquesan landscape that the patriarchal elm does in New England scenery. The latter tree it not a little resembles in height, in the wide spread of its stalwart branches, and in its venerable and imposing aspect." Although slow of growth, it eventually reaches a height of forty to sixty feet. The trunk is about two feet in diameter, but occasionally, on very old trees, measures three feet. It is normally quite straight and smooth, and rises to half its height, or at least ten or fifteen feet without a branch. The lower branches are the longest, and spread horizontally; the upper branches curve gently and gracefully at the ends. The branches are soft and brittle and are easily broken by the wind. Moreover, horses and cattle are very fond of the leaves and bark, so that trees are frequently disfigured through these agencies. These old, misshapen trees, that have been neglected for years, are not uncommon in Hawaii, and give the causal observer an entirely erroneous idea of the real character of the tree. When uninjured, the tree forms a magnificent high dome, casting a dense shade, and commanding attention because of its striking and distinctive beauty.

When growing in the soft moist soil which it prefers, the breadfruit roots shallowly and widely. Often a network of the exserted roots is visible above the ground. This habit is of the greatest value in propagation. The wounding or bruising of the root at any given point stimulates the production of an offshoot, and young plants for transplanting are produced solely in this way. This mode of propagation is naturally very slow and laborious, as the young shoots grow slowly, and are very sensitive to injury. A small breadfruit tree, rooted and ready for planting, commands a price of from one to five dollars in the Honolulu nurseries. The price varies with the size and thriftiness of the young trees.

Breadfruit roots are astringent and used medicinally by the natives as a purgative; they are sometimes macerated as a poultice and applied externally for various skin diseases.

The bark on the younger twigs is clear green; on the older branches it is smooth and gray. On the trunk it becomes half an inch or more thick, and in color very dark brown tinged with red; the surface is irregularly marked with obscure broken ridges. The inner bark is salmon-red, highly laticiferous and very fibrous; this material was formerly much used by the natives of the South Pacific for the manufacture of the coarser kinds of *tapa* or bark cloth. The making of *tapa* from the breadfruit bark does not appear to have been practiced in ancient Hawaii; perhaps because the *wauke*, *mamake*, and other plants were abundant, and the *Ulu* not so common. The *tapa ulu* was inferior to that of the *wauke* (paper mulberry) both in softness and whiteness, and was used by the common people, the finer sorts being reserved for the nobility. The bark was taken from the young trees, and the branches of old trees; the various stages in the preparation of the cloth were similar to those employed in the manufacture of *tapa wauke*.

The breadfruit wood is a fine, bright yellow, turning darker upon exposure to the air, and finally becoming dark brown. The sapwood is light cream color. The wood is rather light in weight and soft in texture; the grain is open and coarse. It is strong, elastic, and resistant to the attacks of termites; if kept dry it is quite durable; its specific gravity is 0.495. In ancient Hawaii it was used for a variety of purposes by the natives, such as house timbers, in the construction of the temples, etc. It was occasionally used for canoe bodies, but was not especially satisfactory for that purpose. In general the tree was much too valuable as a fruit-tree to be utilized for timber, and breadfruit wood is used chiefly in those regions that have an abundance of the wild, seed-producing variety. According to Safford, "In Samoa the framework of the roofs of all the best houses is made of the curved limbs of the breadfruit, beautifully rounded and scarped together and wrapped at the joints with cocoanut sennit." Several other species of *Artocarpus*, notably *A. hirsuta* and *A. chapalasha* of India, yield valuable mahogany-like cabinet woods, but these species do not occur in the Hawaiian Islands.

The breadfruit tree is highly laticiferous.* The milk is used by the Hawaiians, and by the natives of other regions, for glue, calking, and bird-lime. In Samoa it is chewed by the children, like gum. Safford states that

"Besides using the latex in calking boats, the natives of Guam find it, when fresh and viscid, an excellent medium for mixing paint, and it is a good sizing for whitewash. The usual pigments were a red ferruginous earth and lampblack made by burning cocoanut shells. The Caroline Islanders still use it with various pigments for painting their canoes, and it resists the action of water pretty well, though for this purpose it is inferior to oil."†

According to Baum‡ "The breadfruit trees throughout Porto Rico are scarred with machete marks made by the natives for the purpose of obtaining milk which they boil with coconut oil to obtain the thick, gummy substance used in caulking canoes and rendering bottles watertight." The breadfruit latex will probably never assume commercial importance, nor compete with the rubbers now on the markets, unless the methods of extraction and treatment for its gums are greatly improved.§

The leaf-buds and the floral buds of the breadfruit are large and showy, the latter more so than the former. The young leaves are conduplicate. The mature leaves are one to three

* See G. Fendler and H. Thoms, Bericht uber die Untersuchung der Milksafte von Artocarpus incisa, Notizbl. bot. Garten, Berlin, Vol. 4, pp. 285–86, 1907; also G. Fendler, same title, Arb. pharm. Inst., Vol. 5, pp. 280–81, 1908.

† W. E. Safford, Useful Plants of Guam, U. S. Nat. Herb., Vol. 9, 1905, p. 190.

‡ H. E. Baum, The Breadfruit, The Plant World, Vol. 6, pp. 197, 225, and 273.

§ Biffin, in Kew Bulletin, 140: 177–181. Aug., 1898.

feet long, with thick, short petioles. On young plants and shoots the leaves are frequently very much larger than normal; dwarf leaves are common on the fruiting branches. The shape is variable, on different trees and on different parts of the same tree. In general it is ovate or oblong, cuneate and entire at the base, with the upper part three to nine pinnately lobed. The lobes are acute or somewhat obtuse; the margin is smooth. The texture of the leaf is coriaceous, the old leaves becoming very leathery; the surface is glossy, scabrous, with minute, scattering, appressed hairs. The color above is a rich, dark green, very dark and heavy in the old foliage; the under surface is pale green. The venation is strong and conspicuous. The petioles, green parts of the branches, and peduncles are covered with very short, fine, harsh hair. The two stipules are very large, showy, axillary, free, and furled about the bud, but soon deciduous. They leave conspicuous amplexicaul annular scars on the twigs.

No special uses are known for the leaves of the Hawaiian *Ulu* but Melville gives an interesting account of the Marquesan form:

"The leaves of the bread-fruit are of great size, and their edges are cut and scalloped as fantastically as those of a lady's lace collar. As they annually tend toward decay, they almost rival, in the brilliant variety of their gradually changing hues, the fleeting shades of the expiring dolphin. The autumnal tints of our American forests, glorious as they are, sink into nothing in comparison with this tree.

"The leaf, in one particular stage, when nearly all the prismatic colors are blended on its surface, is often converted by the natives into a superb and striking head-dress. The principal fibre traversing its length being split open a convenient distance and the elastic sides of the aperture pressed apart, the head is inserted between them, the leaf drooping on one side, with its forward half turned jauntily up on the brows, and the remaining part spreading laterally behind the ears."*

The breadfruit leaves in Hawaii do not assume the gorgeous coloring described by Melville, but they do change to beautiful yellows and russets. Melville's account is probably somewhat

* Herman Melville, Typee, 1846.

exuberant. The petiole scars are round, symmetrical, and showy, with easily-seen bundle scars. A breadfruit branch, back of the foliage-bearing portion, is attractively marked with the petiole- and stipule-scars, and lenticels.

In the Hawaiian Islands the flowering and fruiting season of the breadfruit is very short as compared with that of more tropical countries. It extends from May or June through the summer into August,—a scant three or four months. There is some variation, of course, at different elevations and on the different islands. In the tropical and South Pacific, however, the season is eight to ten months in duration; in Guam it is about nine months. In a few very favorable Indo-Malaysian regions the tree produces two or three crops annually.

The flowers are terminal or nearly so, on the young wood, as contrasting with the Jakfruit tree, which fruits from the trunk and old wood. The staminate flowers are compacted in dense, club-shaped catkins, ten to sixteen inches long. At first both the staminate and pistillate clusters are covered by two large, showy spathaceous bracts, which are soon caducous. The perigon of the staminate flowers is two-lobed. The male catkin was called *Po-ulu* by the Hawaiians, who formerly mixed it with the fiber of the *wauke* in the manufacture of a certain rare kind of tapa called *tapa po-ulu*. No information is available to indicate why the catkins were thus used.

The female flowers are clustered in subglobular or globular echinate heads, with a spongy receptacle; the perigones are tubular or obovate; pistil with a two or three branched stigma. In the seedless variety no fertilization takes place. The fruit slowly enlarges to a diameter of six to eighteen inches and a weight of one to ten pounds. It is attached by a short, thick stalk, and grows either singly, or in clusters of two or three close together. It is oval or spheroid; bright green at first, becoming brownish when partially ripe, and rich yellow when thoroughly ripe. In the seed-producing typical form the rind is covered with short, hard projections (muricate), but in the seedless cultivated forms it is quite smooth and merely reticulate. The rind is relatively thin and fragile; the fruit bruises easily, and does not stand shipping.

into a mass resembling new cheese, in which state it gives forth a very disgreeable odor. The fermented paste is made into cakes and baked, and is then palatable and nutritious. This method of preserving breadfruit is also followed by the Samoans, who call the cakes '*masi*,' a name now applied by them to ship biscuit and crackers. In Rarotonga the fermented paste is called '*mai*.'*

Herman Melville gives a lively account in his romantic story of "Typee":

"The most simple manner (of cooking) consists in placing any number of the freshly-plucked fruit, when in a particular state of greenness, among the embers of a fire, in the same way that you would roast a potato. After the lapse of ten or fifteen minutes, the green rind embrowns and cracks, showing through the fissures in its sides the milk-white interior. As soon as it cools the rind drops off, and you then have the soft round pulp in its purest and most delicious state. Thus eaten, it has a mild and pleasing favor.

"Sometimes after having been roasted in the fire, the natives snatch it briskly from the embers, and permitting it to slip out of the yielding rind into a vessel of cold water, stir up the mixture, which they call 'bo-a-so.' I never could endure this compound. . . .

"There is one form, however, in which the fruit is occasionally served, that renders it a dish fit for a king. As soon as it is taken from the fire the exterior is removed, the core extracted, and the remaining part is placed in a sort of shallow stone mortar, and briskly worked with a pestle of the same substance. While one person is performing this operation, another takes a ripe cocoanut, and breaking it in half, which they also do very cleverly, proceeds to grate the juicy meat into fine particles. . . . Having obtained a quantity sufficient for his purpose, he places it in a bag made of the net-like fibrous substance attached to all cocoanut trees, and compressing it over the bread-fruit, which being now sufficiently pounded, is put into a wooden bowl—extracts a thick creamy milk. The delicious liquid soon bubbles around the fruit, and

* W. E. Safford, Useful Plants of Guam, Contr. U. S. Nat. Herb., 9: 189. 1905. See also Seeman, Flora Vitiensis.

leaves it at last just peeping above its surface. This preparation is called 'kokoo' and a most luscious preparation it is.

". . . the great staple articles of food into which the bread-fruit is converted by these natives are known respectively by the names of Amar and Poee-poee.

"At a certain season of the year, when the fruit of the hundred groves of the valley has reached its maturity, and hangs in golden spheres from every branch, the islanders assemble in harvest groups, and garner in the abundance which surrounds them. The trees are stripped of their nodding burdens, which, easily freed from the rind and core, are gathered together in capacious wooden vessels, where the pulpy fruit is soon worked by a stone pestle, vigorously applied, into a blended mass of doughy consistency, called by the natives 'Tutao.' This is then divided into separate parcels, which, after being made up into stout packages, enveloped in successive folds of leaves, and bound round with thongs of bark, are stored away in large receptacles hollowed in the earth, from whence they are drawn as occasion requires.

"In this condition the Tutao sometimes remains for years, and even is thought to improve by age. Before it is fit to be eaten, however, it has to undergo an additional process. A primitive oven is scooped in the ground, and its bottom being loosely covered with stones, a large fire is kindled within it. As soon as the requisite degree of heat is attained the embers are removed, and the surface of the stones being covered with thick layers of leaves, one of the large packages of Tutao is deposited upon them, and overspread with another layer of leaves. The whole is then quickly heaped up with earth, and forms a sloping mound.

"The Tutao thus baked is called 'Amar'; the action of the oven having converted it into an amber-coloured caky substance, a little tart, but not at all disagreeable to the taste.

"By another and final process the 'Amar' is changed into 'Poee-poee.' This transition is rapidly effected. The amar is placed in a vessel and mixed with water until it gains a proper pudding-like consistency, when, without further preparation, it is ready for use. This is the form in which the 'Tutao' is generally consumed."

Captain Cook gave an interesting account of the fermenting of the breadfruit by the Tahitians:*

"The fruit is gathered just before it is perfectly ripe, and being laid in heaps, is closely covered with leaves; in this state it undergoes a fermentation, and becomes disagreeably sweet; the core is then taken out entire, which is done by gently pulling the stalk, and the rest of the fruit is thrown into a hole which is dug for the purpose, generally in the houses, and neatly covered in the bottom and sides with grass; the whole is then covered with leaves, and heavy stones laid upon them; in this stage it undergoes a second fermentation, and becomes sour, after which it will suffer no change for many months; it is taken out of the hole as it is wanted for use, and being made into balls, it is wrapped up in leaves, and baked; after it is dressed it will keep five or six weeks. It is eaten both hot and cold, and the natives seldom make a meal without it. . . ."

Crozet's narrative contains an interesting record of the early uses of the breadfruit in the island of Guam:

"The fruit can be eaten when it has attained its full size, but though it still be green. In this stage the islanders cook it before eating; they take off its knotty rind and cut it in slices like pieces of bread. When they wish to preserve it, they cut it in round slices, and in this very thin sea-biscuit form they dry it in the sun or in the oven. This natural biscuit preserves its quality for years, and very much better than does our ships' biscuit. Our sailors ate it green, slightly grilled; they also made their soup of it; they had no other bread, and we attributed the quick recovery of those suffering from scurvy to the breadfruit diet. To this diet the inhabitants have always attributed antiscorbutic properties.

"When this fruit is ripe, it becomes yellow and soft, its odour is more fragrant, but it loses its farinaceous taste and becomes insipid. At this stage it has no longer the same properties as before; it is now laxative and heating; its pulp no longer takes the place of bread, and it has little to recommend it. Some of the breadfruit trees bear the male fruit and others bear female

* Cook's First Voyage, Hawkesworth ed., Vol. 2, pp. 211–13.

fruit. In the latter, which are rare, the seed consists of shell-less stones enveloped in a simple almost cylindrical pellicle of about the size of a chestnut but longer. When ripe these stones make up for the uselessness of the pulp; they are cooked and eaten like chestnuts, having the same taste.

"As the male breadfruit tree is the most useful, but has no seed, it is propagated by the Indians by making slight incisions in the root, from which shoots spring up; these are transplanted together with a piece of the original root which has produced them."*

Alfred Russel Wallace, in the Malay Archipelago† writes:

"We sometimes made curry or stew of it, or fried it in slices; but it is no way so good as simply baked. It may be eaten sweet or savory. With meat and gravy it is a vegetable superior to any I know, either in temperate or tropical countries. With sugar, milk, butter, or treacle, it is a delicious pudding, having a very slight and delicate but characteristic flavour, which, like that of good bread and potatoes, one never gets tired of."

In addition to the Hawaiian *Ulu*, which is the most common breadfruit in the Hawaiian Islands, there are at least three other varieties of *communis* represented to a lesser degree. The Samoan breadfruit was introduced into Hawaii by Mr. James Bicknell. The leaf is not lobed as deeply as that of the Hawaiian variety. The fruit is globular, with a distinctive raised collar or annular protuberance surrounding the place of attachment to the peduncle, which is unusually long. The flesh is orange yellow in color, and very sweet. The Tahitian breadfruit is another introduced form, but is comparatively rare. It is to be found in some of the old Honolulu gardens. The leaves are nearly entire, with very few incisions. The fruit is oblong, with deep yellow flesh.

The seed-producing or typical breadfruit was introduced into the Hawaiian Islands from the Caroline group. It has a variety

* Crozet's Voyage to Tasmania, New Zealand, etc., in 1771–1772, trans. by H. Ling Roth, London, 1891, p. 88. This refers to the breadfruit as raised in Guam. The seedless variety is erroneously called the male tree.

† 10th ed., 1894, p. 233.

of vernacular names—*Ulu-ma'a* in Samoa; *Uto-sore* in Fiji; *Dugdug* or *dogdog* in Guam; *Tipolo* or *Antipolo* in the Philippines; *Bulia* in the Solomon Islands; Breadnut in Burma; and *Castăna* in the West Indies. Although rare in the Hawaiian group, it "grows everywhere in Guam—in the woods, on rocky cliffs, and in low, sandy soil. It is the chief source of timber and of gum, the seedless *lemae* being too valuable as a fruit tree to be used generally for these articles. The fruit of the *dugdug* is inferior to that of the *lemae*, than which it is softer and more sweetish. It is seldom eaten, but its seeds, called '*nangka*' . . . are rich in oil and are relished by the natives. They are eaten roasted or boiled and are much like chestnuts." This use of the seeds by the natives is not confined to Guam, but occurs in all countries where the seeded form grows.

The second species of *Artocarpus* found in the Hawaiian Islands is the Jakfruit or Jackfruit, *A. integrifolia* L. It is native to Indo-Malaysia, and was introduced by Mr. David Forbes, of Kukuihaele, Hawaii. It is a large handsome tree rising twenty-five to eighty feet. The leaves are four to six inches long, and quite variable in shape; entire or sometimes three-lobed, obovate or oblong, very shortly acuminate, base acute; glossy; stipules spathaceous, deciduous. The flowers resemble those of the breadfruit, except that the female flowers are borne on the old wood and trunk. The fruit is very large, twelve to thirty inches long and six to twelve inches in diameter; the weight varied from twenty to sixty pounds. The rind is green and conspicuously muricate. The flesh is strongly odorous, and when fully ripe is literally overpowering. It is decidedly inferior to the breadfruit. The wood of the Jakfruit is yellow when first cut, but soon darkens to a rich mahogany color. It is used in Asia and Europe for musical instruments, marquetry work, brush backs, and for other fancy and ornamental purposes. The Jakfruit is not common enough in Hawaii to be of any commercial importance.

The most important factor in the development of the breadfruit as a commerical possibility in the Hawaiian Islands is the oceanic transportation. The fruit is a poor shipper, and until a fairly good market and better shipping facilities are assured, the breadfruit will be confined to strictly tropical markets.

College of Hawaii,
Honolulu.

PINUS CARIBAEA: AN EXTENSION OF RANGE IN LOUISIANA

By Wilbur R. Mattoon

Louisiana, west of the Pearl River watershed, has never been included within the range of *Pinus caribaea* Morelet, by any authority so far as has come to the attention of the writer. The western range of the species, as given by Sargent, is "along the Gulf coast to the valley of the Pear River, Louisiana."*

During a southern trip in the spring of 1916, the writer had occasion to observe closely *Pinus caribaea* from its northeastern limit near Charleston, S. C., westward across the coastal plain into Mississippi and Louisiana. At Slidell, St. Tammany Parish, west of the Pearl River basin in Louisiana, reproduction from scattering seed trees left in logging occurs over the flatland and about vacant lots and yards in town. The resulting local landscape effect is most pleasing and leaves no doubt as to the opinion that slash pine is "by far the most handsome of all southern pines."† The numerous outlying ponds contain cull trees about their margins and heavy stands of young slash within and generally for some distance around the ponds. The soil here is the low flatland type consisting of sand overlying clay. A striking advance of slash pine over ponds and flat swamps, formerly occupied by cypress and some of the so-called hardwoods, has taken place extensively in the south due to the removal by logging of the former continuous and protective virgin forest cover. North of Slidell, pure stands of mature slash pine cover mile after mile along the New Orleans Great Northern Railroad

* Sargent, Chas. S., Manual of the Trees of North America, page 18.

† Sargent, C. S., quoted by George Engelmann in the Revision of the Genus *Pinus* and Description of *Pinus Elliotii*, Transactions of the St. Louis Academy of Science, Vol. IV.

on lands within the Pearl River drainage basin. Logging and turpentine operations are being carried on by several large companies. Upon going in a northwesterly direction from Slidell to Covington on April 28, slash pine was observed in abundance over low ground. Particularly was this true of reproduction ranging in age from 3 to 20 years old and in height from about 4 to 50 feet. Older ages, however, were observed.

Slash pine in this region, as generally throughout its range, is

FIG. 1. Heavy stands of young *Pinus caribaea* on typical flat, sandy land near Slidell, La. The spread of slash is particularly rapid about towns where fire protection is afforded. (Tree marked x is a *Pinus taeda*.)

extensively replacing the original longleaf pine on the moister, flatland soils.* The factors which account for this chiefly are the production of an abundance of seed, which is readily transported by wind and practically immune from destruction by hogs, a high degree of tolerance, and a very rapid and vigorous growth. While the young seedling is very susceptible to ground fires, the rapid upward growth in from 2 to 3 years carries the

* This fact has been noted previously by various writers: Dr. Charles Mohr in Forest Service Bulletin 13, "The Timber Pines of the South," page 88; Dr. C. A. Sargent quoted by Dr. Engelmann in "Revision of the Genus *Pinus*," Transactions of the St. Louis Academy of Science, Vol. IV, 1880, and Manual of the Trees of North America, p. 19, by Sargent.

trunk, small crown of moderately small, curved, and forked branches, and relatively dense foliage as compared with that of both longleaf, and particularly, loblolly in its form of development over the southern coastal plain; the characteristic orange brown longitudinal bark plates are also well marked in the older trees. The region, it would seem, affords an excellent opportunity for someone to look for a farther extension of the western limit of this interesting and very valuable commercial yellow pine.

FOREST SERVICE, WASHINGTON, D.C.

REVIEWS

Gager's Fundamentals of Botany and Laboratory Guide*

These two books represent an unusually comprehensive and serious attempt to present the study of plant life so that college students may secure a good perspective of botanical science as a whole. Furthermore both books show clearly that the author sees no place for college botany which is not founded upon extensive and intensive first-hand study of plants. The intent is not to have students merely read interesting text materials *about* plants, but text and manual are both so organized as to be useful only in connection with constant study of plants themselves.

In the organization of the text, presentation of functions of plants precede presentation of any large amount of structure, an order of presentation which has found place in the practices of the best teachers of college botany, and an order which is essential if the student is to know "what it is all about." The text's general consideration of plant functions (pages 21–143) gives significance to the life-history studies (pages 144–445). Classification of seed-bearing plants (pages 446–501) presents the modern conceptions of the relationships of the leading divisions of the angiosperms, and the rest of the text (pages 502–620) deals with such specially important topics as "Evolution," "Darwinism," "Experimental Evolution," "Heredity," "Paleobotany," etc.

* Gager, C. Stuart, Fundamentals of Botany, 8 vo, pages xix+640; figures 434. A Laboratory Guide for General Botany, 8 vo, pages viii+191; both books published by P. Blakiston's Son and Company, Philadelphia, 1916.

As illustration of the quality of the books two important features of illustrations of the text may be cited. First, the photographs, in the main, represent common botanical situations which are of such kinds that the student, in his own studies, may discover similar illustrations and understand and appreciate them. The legends accompanying these photographs give evidence that the illustrations are not merely "enlivening pictures," but are organic parts of the presentation of the subject. For example, figure 60, which shows a young potato tuber developed as a branch from a sprout of an old seed-tuber, has eight lines of illuminating discussion composing the legend. This is very different from the usually observed legend, such as, "A Potato Tuber," which leaves one who really needs illustrations in a quite helpless condition. Such excellent legends are found throughout the text.

Secondly, a surprisingly large number of surprisingly fine diagrams of processes, life histories, family relationships, and evolutionary stories, serve not only to clarify confusing details, but serve also as splendid summaries of the topics under discussion.

Both the text and laboratory guide, while decidedly comprehensive and intensive, are of such splendid quality as to make them distinct contributions to the perplexing problems of college botanical instruction.

OTIS W. CALDWELL

NEWS ITEMS

In the more wide-spread fame of his later achievements, it is sometimes forgotten that the late Major-General Frederick Funston was for a brief period of his earlier career a botanical collector. In 1891, he accompanied Mr. F. V. Coville on a well-known botanical expedition to Death Valley in California. In 1893 and 1894, he made collections of plants in Alaska as special agent of the U. S. Dept. of Agriculture.

On Wednesday, March 14, the nearly completed building of the Brooklyn Botanic Garden was occupied for the first time, and within the next few days the library, herbarium, and offices were moved from the first section which has been occupied for over two years. The members of the Torrey Club are invited to the scientific program in connection with the formal dedication of this building and the plant houses of the Brooklyn Botanic Garden, to be held all day Friday, and Saturday morning, April 20 and 21. There will be also a popular scientific program on Friday evening, April 20, to which the members of the Club are invited. The Brooklyn Garden may be reached by the Brighton Beach Elevated, getting off at Consumers Park Station (a flag station for stopping at which the conductor must be notified at Park Place); or by the Brooklyn Interborough subway and Flatbush Avenue trolley.

Dr. Otis W. Caldwell, of the University of Chicago, has been appointed director of Lincoln School on Park Avenue, New York. This new enterprise, started as a result of a discussion some time ago as to the best methods of primary and secondary education, will open in September. The Rockefeller Foundation is financing the school, which its founders and managers hope may have far-reaching effects on primary and secondary education in this country. Dr. Caldwell is now professor of botany at the School of Education, University of Chicago.

The Torrey Botanical Club

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

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OTHER PUBLICATIONS

OF THE

TORREY BOTANICAL CLUB

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(1) BULLETIN

A monthly journal devoted to general botany, established 1870. Vol. 43 published in 1916, contained 676 pages of text and 35 full-page plates. Price $4.00 per annum. For Europe, 18 shillings. Dulau & Co., 47 Soho Square, London, are, agents for England.

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

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

Correspondence relating to the above publications should be addressed to

DR. BERNARD O. DODGE

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New York City

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

NORMAN TAYLOR

TORREYA

April, 1917.

Vol. 17 No. 4

SANDY SPOROPHORES

By Albert A. Hansen

During the summer of 1916, while botanizing along the sandy shores of Lake Superior in company with Dr. H. C. Cowles, of the University of Chicago, Prof. Winfield Dudgeon, of the Ewing Christian College, India, and others, an old dead pine tree with very peculiar outgrowths was found lying upon the sandy beach.

At first sight, the outgrowths were thought to be exudations of resin combined with sand. Upon further examination, however, hyphae were found running through the sand, suggesting strongly that the protuberances were really the fruiting bodies of a fungus which had become practically solid bodies of sand, due, perhaps, to the sand particles having become mechanically driven into and mixed with the vegetative tissue of the fungus.

Specimens were collected by the writer and identified as belonging to the saprophyte *Fomes pinicola* (Sw.) Cke. Identification was rendered possible by the finding of fruiting bodies which had yielded but slightly to the inroads of the sand. In fact, all stages, from almost solid bodies of sand to perfect sporophores, were found. In all these stages, the characteristic shape of the juvenile sporophores of *Fomes pinicola* was almost perfectly retained.

The phenomenon is evidently very unusual, since a diligent search through available literature failed to reveal any reference to similar abnormal growths. Specimens have been submitted to Dr. W. A. Murrill and Dr. L. O. Overholts, both of whom agree that they are abnormal sporophores of *Fomes pinicola*. The phenomenon is new to both of these mycologists.

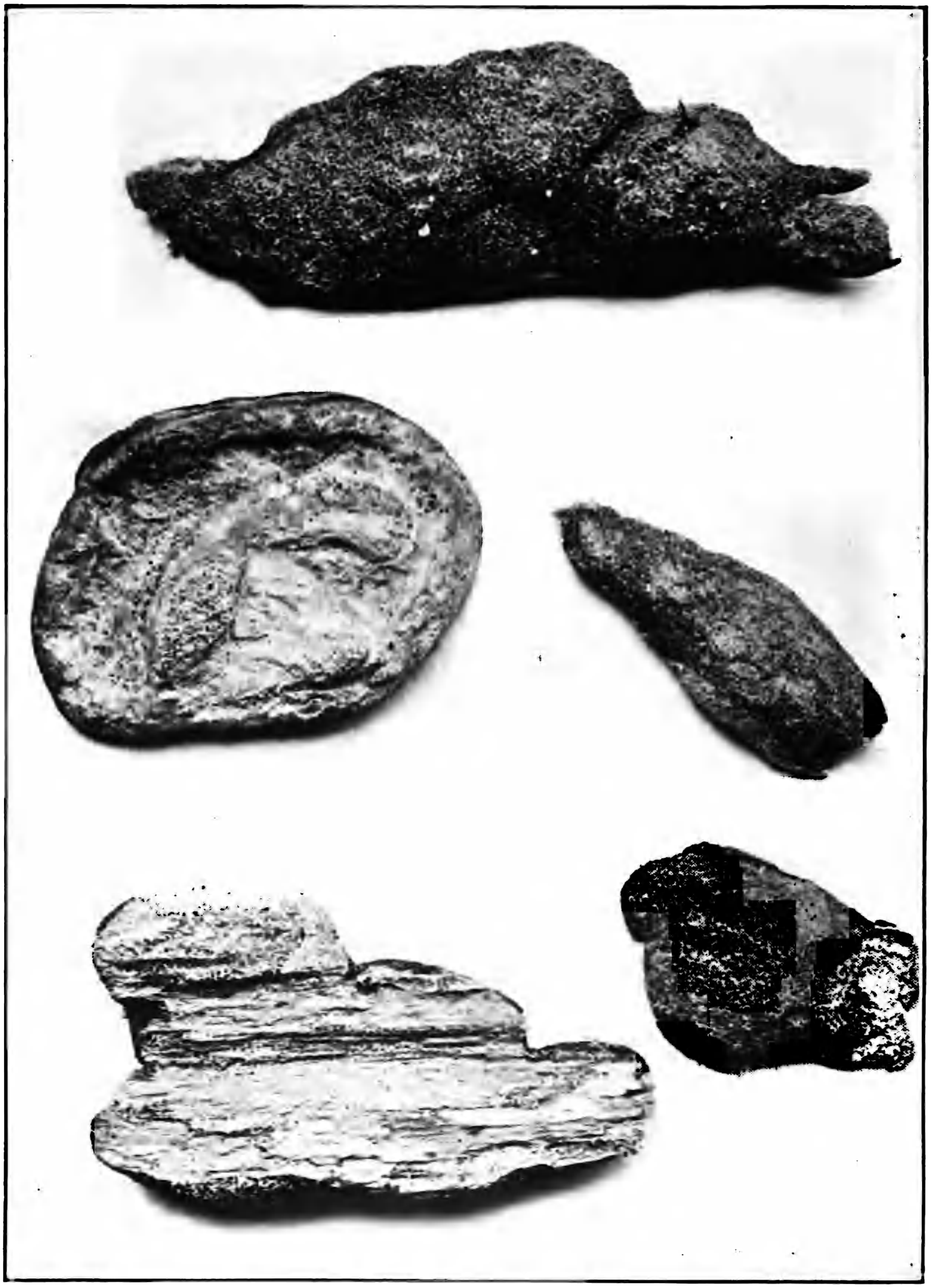

FIG. I. The single specimen in the upper row shows the front view of a sandy sporophore. The specimen to the left in the middle row is a sporophore in which there is but a little sand, occurring on the projection to the left center and to a depth of about one-eighth inch. In the lower left hand corner, the back view of a sandy sporophore is shown, in which part of the woody tissue of the sub-stratum, with strands of mycelium, are plainly visible.

The position of the tree indicated that the sporophores did not simply grow into the sand and the hyphae thus grow around the sand particles, since the various stages were found just as readily upon the upper side of the trunk as on the lower, and the general appearance of the tree indicated that the position had not changed since the sporophores had formed. However, it is entirely possible that the shifting sands of the beach had covered the tree while the sporophores were forming, the hyphae thus possibly intertwining among the sand particles. Shifting of the sands with consequential reëxposure of the host, would account for the sandy fruiting bodies on all sides of the tree.

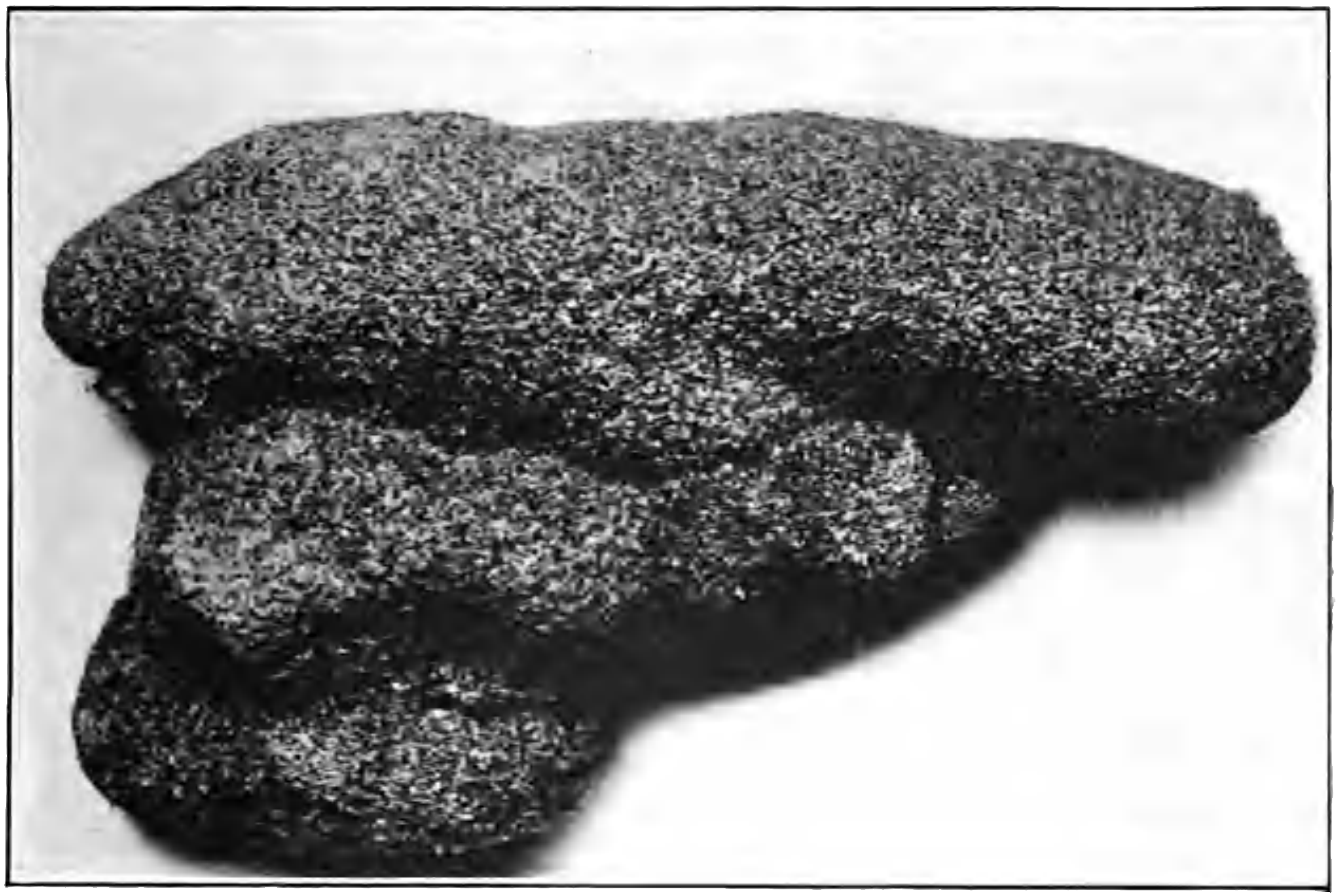

FIG. 2. View of a single sandy sporophore of *Fomes pinicola.*

The species of the tree was rather difficult to determine. The ecology of the immediate region aided somewhat in a possible identification. Within the memory of man, the vicinity had reached the pine-forest stage, but the recent rapid rise of Lake Superior probably caused rapid erosion of the beach. Temporary cessation of erosion, with the formation of dunes through the agency of *Ammophila arenaria* and *Hudsonia tomentosa,* both of which were abundant, probably caused the invasion of the pine forest by the dunes. Retrogression resulted, as was evidenced by the numerous dead pines on the beach front. A few living pines had survived; two species, *Pinus strobus* and *Pinus resinosa*, being represented. The tree upon which the sandy sporophores were found was probably the latter species, *Pinus resinosa*.

In the opinion of Dr. Arthur Hollick, who has examined the specimens, the conclusions of the writer were verified. He regards the phenomenon as the result of the mechanical mixing of the sand with the hyphae and compares it with the sponges which have been washed upon the shore, rolled around in the sand, often presenting a similar appearance and result. He states that "this is not replacement of the vegetable tissue by sand and is not analogous to petrification or conversion into mineral matter."

This interesting material was gathered upon the sandy shore of Presque Isle, one of the Apostle Islands in Lake Superior, northern Wisconsin. The accompanying photographs were taken from material collected and sent to the botanical laboratories of the Pennsylvania State College. Specimens have been deposited in the herbarium of the New York Botanical Garden and in the herbarium and museum of the Pennsylvania State College.

THE PENNSYLVANIA STATE COLLEGE

THE LENGTH OF ERYTHRONIUM STAMENS

BY F. L. PICKETT

In a recent note in this journal* Paul W. Graff recorded some interesting observations on the length of stamens of various *Erythronium* species. The facts recorded are of chief interest because they have not appeared in standard manuals and because of the appearance of figures in some manuals which are untrue to the actual conditions. The length of stamens may not be of diagnostic importance, but it seems that illustrations should at least be true.

* Paul W. Graff, The Stamens of *Erythronium Americanum*, Torreya **16**: 180–182.

The facts given in Mr. Graff's note are not new, but have not been given any considerable attention by American authors. The difference in stamen length in *E. americanum* and *E. albidum* was discussed quite fully by Meads in 1893,* and this discussion was noted by European botanists, as in Knuth's Handbuch.† The cut of *E. americanum* in Die Natürlichen Pflanzenfamilien clearly shows the stamens of different length.

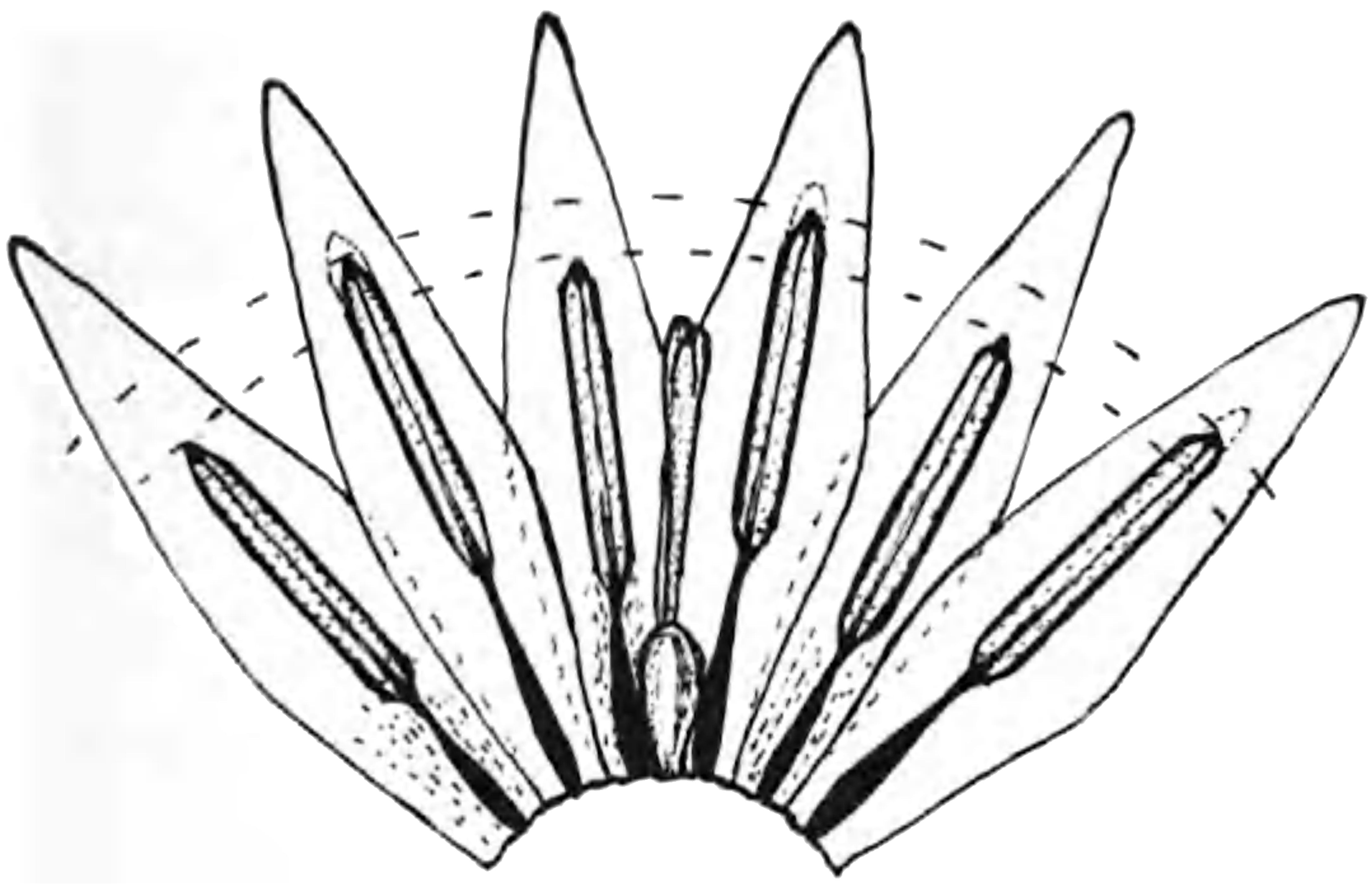

FIG. 1. Erythronium stamens.

Following Mr. Graff's suggestion as to northwestern species, I have carefully examined the material available at the State College, and present herewith the results. *E. grandiflorum* Pursh is the species common and abundant in eastern Washington. It shows considerable variation in the size of the plant and in the number and size of the flowers. Examination of more than one hundred specimens collected last summer show the stamens clearly dimorphic in every case. The difference is so evident that a full statement may be of interest. When the buds are ready to open there is a distinct difference, as shown in the text figure, the stamens opposite the outer perianth segments being the shorter by an average of 2 mm. The variation in total

* M. E. Meads, The Range of Variation in Species of *Erythronium*, Bot. Gaz. 18: 134–138.

† P. Knuth, Handbuch der Blütenbiologie, 3: 126. 1904.

length is due almost entirely to differences in filament length, there being hardly measurable differences in anther length. The shorter dehisce entirely before the longer, which continue to increase in length until in the fully open flower a maximum is reached, as indicated by the dotted tips in the figure. The preserved material at hand clearly indicates the maturity and dispersal of pollen from the short stamens before the stigma is functional, while the last pollen is dropped from the long stamens after that period.

The following species have also been examined, with results as given. With clearly evident dimorphic stamens are the following species: *E. citrinum* Wats., *E. giganteum* Lindl., *E. montanum* Wats., *E. propullans* A. Gray. The last named is represented here by a very few specimens, and I would be glad to know whether or not the same condition of stamen length is evident in larger collections. This is of special importance because of the fact that the illustration in Britton and Brown's Illustrated Flora shows the stamens of equal length. *E. parviflorum* (Wats.) Gooding has stamens of varying length but not clearly of two groups as in the other species examined. This point is important as bearing upon the possible relationship of this species with *E. grandiflorum* Pursh, since it was considered by Watson as but a variety or at most a subspecies.

WASHINGTON STATE COLLEGE,
PULLMAN, WASH.

BRYOLOGICAL NOTES

BY A. LEROY ANDREWS

III. FURTHER MOSSES NEW TO ICELAND*

As introductory to this short list of species it should be said that my Icelandic itinerary of 1914, which was largely controlled by other considerations than those of botanical research, consisted of part of a day at Seydhisfjördhur on the east coast, where collections were made at points readily accessible from the harbor, another half-day at Akureyri in the north, where

* Numbers I and II of this series were published in TORREYA, April 1915 and February, 1916.

Aug. 8. This is a plant of high northern distribution, appearing also in the Alps. The identification of my specimen rests upon its perfect agreement with one from northern Norway collected by Hagen, without the help of which it would probably have remained undetermined. As the fruit of this species is as yet unknown, its generic affinities are perhaps not absolutely certain. *Didymodon* is at best an artificial genus.

6. *Tortula subulata* (L.) Hedw. On rocks at Seydhisfjördhur, July 8; on the lava-field by Hafnarfjördhur, July 23; on rocks by the waterfall Tröllafoss near Reykjavík, July 28. This species must be common and it is probably due merely to an oversight that Grönlund omitted it from his revised list of 1881 after having included it in his preliminary one of 1873.

7. *Pohlia polymorpha* Hornsch. On lava-field by Hafnarfjördhur, July 23; on slope of Lágafell near Reykjavík, Aug. 4. This species was fully to be expected and is doubtless not uncommon.

ITHACA, N. Y.

REVIEWS

Clements's Plant Succession*

An important stage in the development of ecology is marked by the appearance of Doctor Clements's Plant Succession. This large and comprehensive work is the first systematic monograph on the series of complex phenomena in the development of vegetation called succession. It contains in addition to the author's own investigations a full account of the literature not only of the United States but of the entire world.

Just as many students of modern ecology have found Research Methods in Ecology (1905) so helpful in solving problems in a quantitative manner, likewise the rapidly growing ranks of synecologists may well turn to Plant Succession for a clear statement of the development of the subject, its present status, and its future outlook. Clements's work in the field for 20

* Plant Succession, an analysis of the development of vegetation. Frederic E. Clements, professor of botany in the University of Minnesota. Carnegie Institution of Washington, 1916, pp. i–xiii + 1–512, with 61 photographic plates and 51 figures in the text.

consecutive summers, together with his extensive opportunities of studying North American vegetation on a large scale for a period of 15 months in 1913–1915, during which time he made numerous journeys throughout the western half of the continent from the Great Plains to the Pacific coast and from the Canadian Rockies to the Mexican boundary, testing principles and processes of vegetational development, eminently fit him to evaluate and correlate the results of investigations in restricted areas.

The very complete set of abstracts of publications dealing with succession from the time of the earliest investigation (King, 1685) to the present (Chapter II); together with an historical summary of the units of vegetation (Chapter VII), a concise statement of the several views on the "Direction of Development" (Chapter VIII), and the various systems of classification (Chapter IX) in which the careful and full discussion of the views of such authors as Cowles, Cajander, and Moss are given, is a very valuable feature of the book, affording the student the necessary perspective for an understanding of the present status of the subject.

The principle, stated in 1904,* that the plant formation is a complex organism with a characteristic development and structure, is here elaborated and developed, forming the fundamental thesis. The formation is put entirely upon a developmental basis. "As an organism, the formation arises, grows, matures, and dies. Its response to the habitat is shown in processes or functions and in structures which are the record as well as the result of these functions. Furthermore, each climax formation is able to reproduce itself, repeating with essential fidelity the stages of its development. The life-history of a formation is a complex but definite process, comparable in its chief features with the life of an individual plant. The climax formation is the adult organism, the fully developed community, of which all initial and medial stages are but stages of development. Succession is the process of the reproduction of a formation, and this reproductive process can no more fail to terminate in the adult form in vegetation that it can in the case of the individual plant."

* Clements, F. E., Development and Structure of Vegetation, Rep. Bot. Surv. Nebr. 7.

"The formation is the unit of vegetation. It is the climax community of a natural area in which the essential climatic relations are similar or identical." It is an organic entity covering a definite area marked by a climatic climax. It consists of associations which are actual parts of the area with distinct spatial relations. The author distinguishes in North America ten forest climaxes or formations, six scrub formations, a prairie-plains climax and the tundra formation.

The subordinate vegetational units are either climax or developmental; the relation of these units to the formation, the relation of the units of each series to each other and the correspondence of the units in the two series is shown in the following table.

FORMATION

Climax Units:	Seral Units:
Association	Associes
Consociation	Consocies
Society	Socies
Clan	Colony
	Family

The need of a set of units to distinguish seral from climax phases of vegetation is felt by ecologists who are interested in the study of the development of vegetation, while to others, as the author points out, this may seem an unnecessary refinement. That the system of vegetation outlined is not only logically complete but that it corresponds well with actual phenomena of vegetation is shown in addition to the author's own illustrations by its application to vegetation in Minnesota by Bergman & Stallard* and to three plant formations in the Pacific Northwest by the reviewer.†

The term association is restricted "to those climax communities which are associated regionally to constitute the formation." Associations agree with their formation in physiognomy and development, and are recognized chiefly by floristic differences. Thus the prairie-plains formation consists of three associations;

* Bergman, H. and Stallard, H., Plant Succession in Northern Minnesota, Minnesota Botanical Studies, Vol. 4, No. 4, 1916.

† Weaver, J. E., Ecological Studies in Southeastern Washington and Adjacent Idaho, Univ. Nebr. Studies 17: 1, Jan. 1917.

the *Stipa-Agropyron* prairie, the *Bulbilis-Bouteloua* plains, and the *Aristida-Bouteloua* desert plains.

"The consociation is the unit of the association. It is characterized by a single dominant. The association is actually a grouping, the consociation is pure dominance." In the usual treatment most consociations appear as associations. In the *Aristida-Bouteloua* association, for example, the dominance of *Aristida* gives rise to an *Aristida* consociation.

Turning now to the seral units, "the associes is the developmental equivalent of the association." "It is composed of two or more consocies, *i. e.*, developmental consociations, just as the association consists of two or more consociations. Like the association it is based upon life-form, floristic composition, and habitat, but differs from it in as much as all of these are undergoing constant or recurrent developmental changes." While the association is permanent, in so far as development is concerned, the associes is transient, although it may persist for many years. Thus *Pinus-Pseudotsuga* and *Larix-Abies* form associes in Idaho which are developing towards the *Thuja* consociation of the Pacific coast forest formation. Now where *Pseudotsuga* dominates over an area we have a *Pseudotsuga* consocies, for a "consocies is a seral community marked by the striking or complete dominance of one species, belonging of course to the life-form typical of that stage of development." It differs from the consociation only in that it is a developmental or seral, while the latter is a climax community.

Whether the investigator is dealing with climax or developmental units can be determined only by the application of such exact quantitative methods as are outlined under "the investigation of succession" (Chapter XV). An application of such methods will go a long way towards solving the problems of vegetational development of a region—a phase of ecology which American investigators have recently shown to have a fundamental bearing upon forestry, grazing and agriculture.

The concept of succession as a series of invasions, a sequence of plant communities marked by the change from lower to higher life-forms is analyzed at length. "The essence of succession lies in the interaction of three factors, namely, habitat, life-forms, and species, in the progressive development of a formation. In this development, habitat and population act and react upon each other, alternating as cause and effect until a state of equilibrium is reached." "Succession can be studied properly only by tracing the rise and fall of each stage, and not by a floristic picture of the population at the crest of each invasion." The causative processes of succession are distinguished as initiating or initial, continuing or ecesic, and stabilizing or climatic. Initial causes—the getting ready of the field for action—are grouped under topographic, climatic and biotic. Under ecesic causes the phenomena of aggregation, migration, ecesis, competition and invasion are fully developed.

In Chapter V (Reactions) the writer points out how the reactions upon the habitat of communities of initial and medial stages are such as to produce conditions unfavorable to themselves or at least favorable for new invaders which succeed gradually in the course of competition or become dominant and produce a new reaction unfavorable to the pioneers. Ultimately, however, a time comes when reactions are more favorable to occupants than to invaders, and the existing community becomes permanent, constituting a climax. The climax vegetation is complete dominance, its reactions being such as to exclude all other species. The result of progressive invasion is stabilization. "It is the mutual and progressive interaction of habitat and community, by which extreme conditions yield to a climatic optimum and life-forms with the least requirements are replaced by those which make the greatest demands, at least in the aggregate."

"The recognition of development as the cause and explanation of all existing climax formations forced the conclusion that all vegetation has been developmentally related" and led the author to "the further assumption that the processes or functions of vegetation today must have been essentially those of the geological past, and that the successional principles and processes seen in existing seres hold equally well for the analysis of each eosere."

Past climates and climaxes are fully discussed (Chapter XII) under the captions of botanic and zoöic evidences, causes of climatic changes, climatic cycles and finally the correlation of climatic cycles and succession. The succession of plant populations in the various geological areas and periods forms the topic for three additional chapters.

The large number of well-chosen and excellent photographs add materially to the value of the book, which no working ecologist can afford to be without.

J. E. WEAVER

UNIVERSITY OF NEBRASKA

Grout's Moss Flora of New York City and Vicinity*

The study of the local flora of New York City and vicinity has been one of the main activities of the Torrey Botanical Club since its foundation and its members will welcome the appearance of Dr. Grout's attractive booklet on the moss flora of their region. Following so soon the publication of Taylor's "Flora of the Vicinity of New York," which was limited to the spermatophytes and pteridophytes, it will not only stimulate the study of the group of plants with which it is directly concerned, but will also encourage the publication of other special local floras covering the Hepaticae, fungi, algae, etc., of the region of New York City. Dr. Grout's moss flora includes descriptions of the families and genera, keys to the families, genera, and species, notes on the habitat and known distribution of the species, and very successful habit photographs of nineteen of the more characteristic or interesting mosses of the local field.

M. A. HOWE

NEWS ITEMS

The Board of Governors of the International Garden Club has authorized the publication of a *Journal* devoted to gardening and horticulture. The pages of the new *Journal* will be open to members and others, and it is expected to issue the first number as soon as possible. The Board appointed Norman

* Grout, A. J., The Moss Flora of New York City and Vicinity. 8vo, pp. 1–119. *pl. 1–12*. 1916. Published by the author, New Dorp, N. Y.

Taylor, of the Brooklyn Botanic Garden, as editor of the new *Journal*.

A schedule for Arbor Day compositions on Conservation, reprinted from the April number of the *Nature Study Review*, contains many hints and oultines for the guidance of those interested in this work. It will serve the needs of teachers in the schools and is modelled on a schedule which has been used for Arbor Day compositions in the public schools of Greater New York. Copies of this schedule may be had by applying to Mrs. N. L. Britton, New York Botanical Garden, Bronx Park, New York City.

The Torrey Botanical Club

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OF THE

TORREY BOTANICAL CLUB

(1) BULLETIN

A monthly journal devoted to general botany, established 1870. Vol. 43 published in 1916, contained 676 pages of text and 35 full-page plates. Price $4.00 per annum. For Europe, 18 shillings. Dulau & Co., 47 Soho Square, London, are, agents for England.

Of former volumes, only 24–43 can be supplied entire; certain numbers of other volumes are available, but the entire stock of some numbers has been reserved for the completion of sets Vols. 24–27 are furnished at the published price of two dollars each; Vols. 28–43 three dollars each.

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(2) MEMOIRS

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

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

Correspondence relating to the above publications should be addressed to

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Columbia University
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BY

NORMAN TAYLOR

JOHN TORREY, 1796–1873.

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May, 1917.

Vol. 17 No. 5

THE GENUS ANNONA IN THE HAWAIIAN ISLANDS

BY VAUGHAN MACCAUGHEY

The Annonas[1] or custard-apples comprise one of the best known and most highly prized groups of tropical fruits. Their rich, sweet, creamy flesh, abundantly juicy and with delicious aroma, is widely known throughout the tropics and subtropics of the world, both as a fresh fruit, and in the form of sherbets, ices, and preserves. Some of the most delicious fruits that are known to mankind belong to this interesting group.

The genus contains about sixty species, chiefly trees and shrubs. The majority of these are indigenous to tropical America, but a few are native to Africa. It is very interesting to note that although nearly all of the living species are indigenous to the New World, nine fossil Annonas have been discovered in the Tertiary deposits of Europe. A number of species are now in cultivation in warm countries throughout the world. None of the Annonas occur naturally in the Hawaiian flora, but several of the widely cultivated species just referred to were introduced in very early times, and have now become thoroughly established in Hawaiian gardens, and naturalized in some of the country districts.

The Hawaiian Islands lie just within the tropics, and are notably cooler than most tropical countries. Hence those Annonas that require a truly tropical environment do not attain

[1] The name *Annona* is Latin for "year's harvest" and was suggested by the Haitian name *Anon*, applied to one of the species. In the literature the name is commonly spelled *Anona*, but Linnæus used the double n, and *Annona* is the correct form.

[No. 3, Vol. 17 of TORREYA, comprising pp. 33–54 was issued 17 April; No. 4 comprising pp. 55–68 on 10 May, 1917.]

perfection in the Hawaiian Archipelago. Those species thrive best that require subtropical rather than tropical, conditions. The *Cherimoya* is the hardiest of the cultivated species, and requires a comparatively cool climate for optimum development.* The sour-sop, on the other hand, is very tender, and requires the warmth of tropical lowlands. The other species of horticultural importance are intermediate between these extremes.

The Hawaiian Islands are remarkable, not only for the very high endemicity of the indigenous flora, but also for the great diversity of the introduced flora. Plants have been brought in from all parts of the world, from the days of the first European explorers, down to the present time. These first explorers were Spaniards, and probably the earliest line of communication from the outside world to Hawaii was from Mexico and Central America, the home of many Annonas. Hence it is not surprising that the custard-apples became established in Hawaii at a relatively early date. The Spaniard, Don Marin, who settled in the islands near the close of the eighteenth century, was actively interested in tropical horticulture, and introduced many useful fruits and other plants.

The four species abundant in the Hawaiian Islands are *A. muricata*, *cheromolia*, *reticulata*; and *squamosa*. These are the forms most generally cultivated in other parts of the tropics. The genus *Annona* is characterized by two-ranked often pungent-aromatic, alternate leaves, without stipules; blade entire, leathery, and often punctate. The flowers are perfect; solitary or in clusters; rarely racemose; extra-axillary, often opposite the leaves, and sometimes subterminal; nodding. The calyx is usually gamosepalous, three-parted, deciduous. The petals are typically six, in two series; the outer valvate, fleshy, concave, converging, three-angled at the apex; in some species the inner series is reduced to small scales, or wholly lacking. Stamens numerous, crowded on the hemispheric receptacle; the filament is fleshy, and bears a pair of linear, parallel, contiguous anthers, united on its back; the anthers open extrorsely by a longitudinal

* See F. W. Popenoe, The Cherimoya in California, Journ. Econ. Bot. Pomona College, Vol. 2, 1912, pp. 277–300.

tary, nodding, and with a distinct odor. The exterior petals are thick and fleshy, ovate-acute, valvate or edge-to-edge; the interior petals are somewhat smaller and thinner, concave, rounded, imbricate or overlapping, and yellowish, or sometimes reddish, in color.

The sour-sop fruit matures at all seasons, but is most abundant in the summer months. It is large, oblong or heart-shaped, sometimes blunt and conical; in weight it varies from one to fifteen pounds. The larger fruits are usually quite superior in texture and flavor to the small ones; the Oriental gardeners habitually pick the fruit before it has properly matured. The skin or rind is glossy, dark green, and studded with numerous recurved fleshy spines, which correspond to the carpels. The flesh or pulp is soft, white, and cotton-like in texture; it contains a large amount of juice, which is pleasantly subacid, with a slight mango-like or turpentiney flavor. The flesh separates readily into a number of fibrous sections, the carpels; each contains a single shining black seed, about a half-inch long. The copious juice of the sour-sop makes it a favorite fruit for the preparation of sherbets, punches, jellies, etc. Although not as sweet as some of the other Annonas, the sour-sop possesses a rich sugar content, and is by no means as tart as its name suggests. A closely related species, which does not occur in Hawaii, is the *Annona montana* MacF., the mountain sour-sop of Mexico and Central America. The fruit of this species is not edible, but the tree is used as a stock in Florida, as it is much hardier than the sour-sop. It would undoubtedly prove of distinct value in the Hawaiian Islands, as stock for growing the sour-sop at the higher elevations.

Several other species that are closely related to the sour-sop may be mentioned as worthy of introduction into the Hawaiian group. *Annona purpurea* M. & S., the "negro-head" of Mexico (also called Cabeza de Negro, Soncoya, and Toreto), is abundant on the Isthmus of Tehuantepec, and is commonly sold in the markets of Mexico and south to Panama. The fruit is six to eight inches in diameter, deeply and conspicuously muricate, with delicious fragrant flesh. *Annona diversifolia* Safford is another excellent species that merits wider introduction. It is a small tree native to the west coast of Mexico, to Salvador, and is called "ilama" or "ilamatzapotl." The fruit is about six inches long and five inches broad, shaped and marked like a pineapple cheese. It is covered with a dense gray, felt-like tomentum; the flesh is cream or rose-colored and very finely flavored. This species has been introduced into southern Florida.

The Florida alligator-apple, *Annona glabra* L., may be mentioned at this point, as a very promising stock for the sour-sop, cherimoya, and custard-apple. It is a small to medium-sized tree, inhabiting swamps and marshy streamways in Florida, tropical America, the West Indies, the Galapagos Islands, and the west coast of Africa. It has a wider natural distribution than any other species in the genus. Other names are mamon, mangrove-annona, pond apple, corkwood. The light, spongy roots of this species are used as a substitute for cork. The fruit is smooth, the size and shape of an apple; the flesh is of buttery consistency, and very sweet, sometimes cloying. It is very common in the markets of Mexico City, but the fruit does not seem to be valued in Florida.

The second species that is abundant in the Hawaiian Islands is the cherimoya, *Annona cherimolia* Mill., also known as broad-leaved custard-apple, Jamaica apple, matzapotl, cherimoyer, etc. It is indigenous to Ecuador, Colombia, and Central America, but had been widely distributed throughout warm countries—Italy, southern France, Spain, northern Africa, Ceylon, Queensland, Florida, and southern California. It was introduced into the Hawaiian Islands in very early times, and is now naturalized, particularly in certain parts of the Kona and Ka-u districts, on the island of Hawaii. The cherimoya is essentially a *sub*-tropical fruit, and does not give good results in low tropical countries. It occurs in perfection on the great central plateau of Mexico. Its two most important climatic requirements are freedom from excessive humidity, and cool weather at the time of ripening.

The cherimoya is a tree ten to twenty-five feet high, with spreading branches and fulvo-tomentose young growth. The leaves are dark green, shining, ovate or obovate, sometimes elliptical; sparsely hairy above, persistently velvety beneath; the apex is obtuse or obtusely acuminate, the base is rounded. The flowers are greenish, and very fragrant; extra-axillary, often opposite a leaf at the base of a branchlet; usually solitary, but sometimes two or three on short nodding tomentose peduncles. The exterior petals are oblong-linear, about an inch long, keeled on the inside and excavated at the base; greenish-yellow on the outside and covered with fine tomentum; pale yellowish or whitish within, and marked with a purple spot at the base. The inner petals are small, squamose, ovate or triangular; usually flesh-colored or purple, and keeled on the outside.

The fruit is about the size of a large orange, and variable in shape. It may be conoid, heart-shaped, or oblate. The young fruit is covered with brown tomentum. When ripe the rind is gray-green, smooth or slightly areolate, sometimes "having the appearance of putty marked by finger prints." The carpels may be depressed, smooth, or raised, sometimes knobby. The flesh is white, soft, richly flavored, and pleasantly acidulous. It is said that fruits of exquisite flavor are produced in Madeira, where the trees are trained on trellises. This species has given excellent response to cultivation in southern California. The cherimoyas are rarely seen in the Honolulu markets, but occur in many private gardens. There has been no commercial exploitation of the fruit.

The third species, *Annona reticulata* L., is not very common in the Islands, but may be found here and there in private gardens and old estates. This is the true custard-apple, also known as bullock's heart, corazon, mamon, anonas, and quauhtzapotl. It is a native of the West Indies and tropical America, and is now grown in many tropical countries. It has been cultivated successfully in southern Florida and southern California.

The tree is ten to twenty-five feet high, and in some regions is deciduous. The young growth is fulvo-tomentose. The leaves are lanceolate or oblong lanceolate; apex acuminate; glabrate above, sometimes rough beneath; light green and rather brittle. The flowers are yellowish or greenish, with purple spots; they

In some regions it is deciduous, but in Hawaii all the species are evergreen. The leaves are thin, ovate oblong, often asymmetrical; slightly hairy on both sides; pale green, and minutely punctate. Like the other species, the leaves are malodorous when bruised. The flowers are greenish, fragrant, about an inch long, and closely resemble those of *reticulata*. They occur in clusters of one to three, opposite the leaves, on slender pedicels. The sepals are small; the exterior petals greenish, white inside, with a purple blotch at the base; the inner petals inconspicuous.

The fruit is three or four inches in diameter; spheroid or heart-shaped, and somewhat resembles an artichoke. In color it is greenish yellow, sometimes shaded with pink or purple. Each carpel is free and protuberant, forming a squamose or tuberculate surface. The loosely cohering carpels are rounded at the end, and grooved on the inner side. The exterior is covered with an easily rubbed glaucous bloom; the fruit is tender and turns black in spots when handled. The flesh is creamy-white, sweet, custard-like, and very delicious. There is a very slight trace of fiber. There are numerous small, dark-brown seeds, as in the other species. The fruit is always used uncooked, and makes delicious sherbets. Unlike the custard-apple, the sweet-sop fruits several times a year.

In the West Indies the leaves, unripe fruits, and seeds are often powdered and mixed with flour of gram (*Cicer arietinum*) for use as a vermifuge; this use is not known in Hawaii. The fruits rarely appear on the markets in Honolulu, although the tree is by no means uncommon.

In conclusion mention may be made of two very fine, but little known annonaceous fruits, that should become known to fruit-growers in Hawaii and other tropical portions of the United States. *Rollinia orthopetala* A.DC., the biriba, and *R. emarginata* Schlecht, the mirim, both of Paraguay, Brazil, and Argentine, are trees bearing very delicious large fruits. Those of the biriba attain a diameter of six or eight inches, and have been pronounced to be the finest annonaceous fruit of tropical America. They are practically unknown in North American markets.

As progress is made in our knowledge of tropical botany and horticulture, the annonaceous fruits will unquestionably come to have a high place in the horticulture of the continental and insular tropic regions of the United States.

College of Hawaii,
Honolulu, Hawaii

"PEANUTS!"

By Byron D. Halsted

Peanuts have been grown in the experiment grounds for the past two seasons and a few plants have occupied space in the greenhouse, that we might get in closer touch with this peculiar crop.

The peanut while young does not appear to be fond of its job, as one may judge from the poise of its wings (cotyledons) and the unkempt conditions of its tail feathers (plumular leaves). But later on when it gets its second wind, it goes forward with a fair degree of speed and decorum barring a seeming absurdity in locating its fruit underground.

In the peanut the parts seem to have been assembled with much trepidation and one wonders what may be added (or taken away) before the end is reached. As an instance, the leaflets seem to be unfinished at their tips and furthermore it is here that a "burn" is quite sure to locate and give the foliage the suggestion of maturity and the advent of autumn long before its time. Again the leaf has an air of decapitation, ending, as it does, in a pair of flaunting leaflets, there usually being but two pairs when all are counted. Still further the stipules are so long, hairy and closely appressed that one wonders whether they are worn for looks or to hide an abashed stem.

In about thirty days after planting the flowers make their appearance and are like gold-foil spangles among the nondescript stipules. Some day some one may have something more to say concerning these auriferous blooms, but for the present attention must be drawn to the fruits that follow.

To start again the peanut as one gets it at the store or entrance to the park for either home or street or menagerial consumption is really no nut at all, and therefore the botanist is at fault in not correcting a gross error in nomenclature. Why should not the urchin demand of the street roaster his five cents' worth of hypogaean legumes and add to the accuracy of our mother tongue as employed in commercial intercourse? It is thus seen that the units, one to sometimes four or possibly five, are seeds inclosed within a hard covering, the carpel.

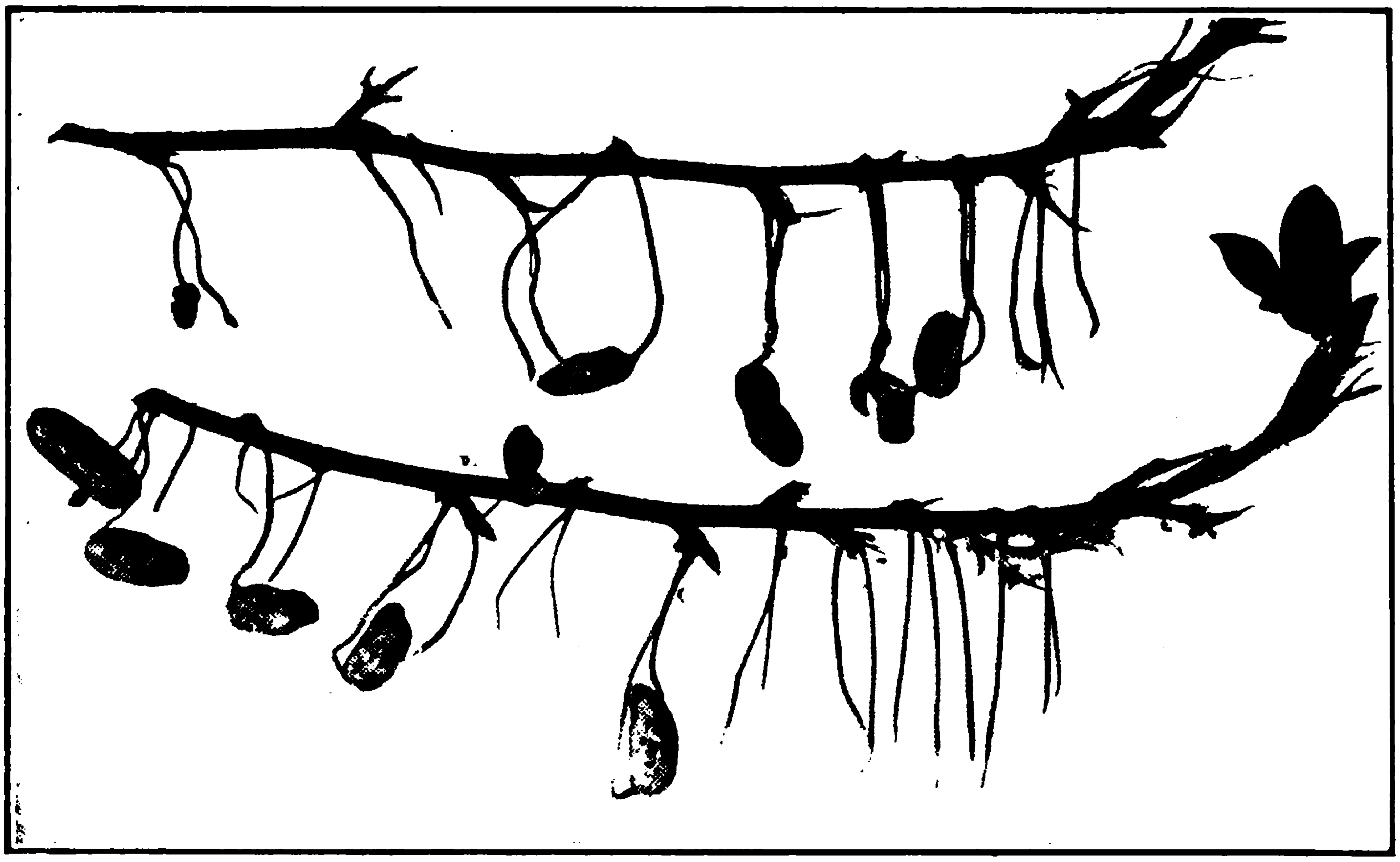

Fig. 1. Branches of the peanut plant "laid down" and from their axils have grown the peduncles that may develop fruits at their tips underground. Such branches, when left upright fail to be fruitful and the flower-stalks disappear.

Before we return to the blooming plant left standing in the field, but not to wait for our coming, we might consider briefly the pods of *Arachis hypogaea* in relation to those of some of its more nearly related plants. This brings up the subject of kinship so much in vogue in these days of genetics and eugenics. South America (or Africa) holds the honor of being the home of our savory boyhood delight, and therefore we can not go into our fields and forests and point with the finger of pride to the sisters or even first cousins of the subject in hand. Suffice it then that the vetches, peas and beans should be more than neighborly and time will tell whether any of the Leguminosae may admit the peanut by wedlock into the local and very extensive household. The interest that attaches to such an introduction may be the

employ an active pig, first putting a muzzle upon the "shovel" of the field assistant.

All are parts of a plan well laid,
Including "freakish" things we see;
Why then should mortal dare upbraid
An idiosyncrasy.

N. J. College Experiment Station,
New Brunswick, N. J.

THE NAIADALES OF THE FLORA OF THE LAKE GEORGE REGION

By Stewart H. Burnham

Since July 1, 1891, when I collected my first pondweed, *Potamogeton natans*, some attention has been devoted to this interesting genus in the region covering the counties of Washington, Warren and Saratoga, New York. Potamogetons are specially well represented in the bays of Lake George, and in Furnace Creek, which flows into South Bay, near the head of Lake Champlain.

I well recollect a call on the late Dr. Geo. D. Hulst, August 28, 1899, when he was stopping on Assembly Point, Lake George; and how he spread out his fine collection of pondweeds. At the time I went through the herbarium at the Brooklyn Institute of Arts and Sciences, October 5 and 12, 1901, but a small portion of Dr. Hulst's specimens had been mounted and placed in the herbarium. A few months afterwards Mrs. Hulst loaned me a book in which an exact copy of the Lake George plant labels had been made, before turning over the collections to the Institute. This list contained records of several pondweeds; the specimens of which I have been unable to examine. Dr. Hulst began his collection of pondweeds in 1891; but during the latter years of his life, 1898–1899, preserved most of his specimens. These specimens are now preserved in the herbarium of the Brooklyn Botanic Garden.

The Dr. Chas. H. Hall's specimens are also preserved in the herbarium of the Brooklyn Botanic Garden. There is no doubt but what further collecting will bring to light other species and forms, specially in Lake George. We have no records of what Potamogetons grow in some of the other larger bodies of water in the region; as Saratoga Lake, Cossayuna Lake, Lake Luzerne, Friends Lake and Loon Lake.

Potamogeton natans L. Ponds and slow streams; frequent. An early flowering species; fruiting in August and early September.

Potamogeton Oakesianus Robbins. In still pools of South Beaver Creek, Vaughns. The only station known. Determined by Dr. A. W. Chapman, Jan. 18, 1893.

Potamogeton amplifolius Tuckerm. In ponds and lakes in rather deep water; frequent. Dunhams and Harris bays, Lake George (G. D. Hulst), a specimen from latter station in the State Herbarium at Albany; Lake George, 1876 (C. H. Hall); Dresden, Aug. 22, 1898 (C. H. Peck's notes); South Bay; W. Fort Ann; Fort Ann; Tripoli millpond; Glen Lake; Clarks Pond; Hedges Lake; and Battenkill River near Shushan. Our handsomest species. The rootstocks creeping along the bottoms of ponds give rise to many leafy stems.

Potamogeton epihydrus Raf. Ponds and slow streams; infrequent. Dunhams and Paradise bays, Lake George (Hulst), a specimen from former station in the State Herbarium; pond near Lake Desolation, Aug. 2, 1880 (E. A. Burt's herbarium); South Bay, plants with and without floating leaves; Podunk Pond; Halfway Brook and tributaries; Glen Lake; Battenkill and Fly Kill near Shushan. Formerly known as *P. Claytonii* and *P. Nuttallii*.

Potamogeton americanus Cham. & Schl. Lakes and ponds. Ticonderoga, Essex Co. (Peck), N. Y. State Mus. Rep't 31: 31. 1879; specimen preserved in State Herbarium. Huletts Landing, Lake George (S. E. Jelliffe's list); Halfway Brook, east of Pattens Mills, specimens collected Aug. 13, 1914, have the leaves 20-nerved and blunt; Big Creek, Smiths Basin, this station probably destroyed by building the Barge Canal; Battenkill, south of Shushan. Formerly known as *P. lonchites*.

Potamogeton heterophyllus Schreb. Ponds and lakes. Dunhams and Harris bays (Hulst), a specimen from former station in the State Herbarium; Lake George, 1876 (Hall); South Bay; Podunk Pond; Glen Lake; Hedges Lake near Shushan. Specimens collected in Harris bay, Lake George, Aug. 28, 1899, grew in deep water and have no floating leaves.

P. heterophyllus graminifolius (Fries) Morong was found by Hulst at Lake George, July, 1898. This specimen has not been seen.

P. heterophyllus myriophyllus (Robbins) Morong. Lake George, 1876 (Hall). There is also a specimen at Brooklyn Botanic Garden collected by Hall at Lake George in 1876, which he called *P. Tuckermani* Robbins; which is a synonym of *P. confervoides* Reichb.

Potamogeton angustifolius Berch. & Presl. Glen Lake inlet, Aug. 9, 1900, in flower. Long Pond near Lake George, from 10 feet of water, Aug. 1876 (Hall), as *P. minor*. Glen Lake was formerly known as Long Pond, and undoubtedly these two localities are identical. Formerly known as *P. Zizii*.

Potamogeton praelongus Wulf. Harris Bay, growing in 6–15 feet of water, the stems not reaching the surface (Hulst); Podunk Pond; South Bay; Smiths Basin.

Potamogeton perfoliatus L. Shallow water in ponds and streams; rather frequent. Harris Bay (Hulst), a specimen also in State Herbarium; Dresden (Peck's duplicates); South Bay; Mud Pond, Pattens Mills; Halfway Brook in swift water; Clarks Pond.

P. perfoliatus Richardsonii A. Bennett. South Bay, Sept. 2, 1902; Battenkill south of Shushan (Frank Dobbin), July 19, 1913.

(*Potamogeton crispus* L. Lake George, N. Y.; (Mr. J. H. Eddy) in Torrey's Flora of the Northern and Middle Sections of the United States, Vol. 1: 198. N. Y., 1824. Mohawk River in Wright & Hall's, Catalogue of Plants growing without Cultivation in the Vicinity of Troy, 31. Troy, 1836. In his Flora of the State of New York in 1843, Torrey makes no mention of *P. crispus*. This naturalized species is not given in the first edition of Gray's Manual of Botany of the Northern United States, 1848. It would probably be difficult to say what pondweed was referred

spikes numerous, the stems being sometimes excessively branched above, no good fruit could be found. The plants grows at the head of the Lake in company with *Potamogeton lonchites*, *P. perfoliatus*, *P. compressus*, *P. hydridus*, *P. Claytonii*, *P. pectinatus* and *Bidens Beckii*." Peck in N. Y. State Mus. Rep't 33: 35. 1880. Plants of *P. Robbinsii* were found among Dr. Peck's duplicates; but he does not seem to have saved specimens of any of the other pondweeds observed at Ballston Lake.

Naias flexilis (Willd.) Rost. & Schmidt. Lakes and slow streams. Lake George, 1876 (Hall); E. Lake George; Glen Lake; Hadlock Pond; South Bay; South Beaver Creek and little pond west of R. W. Bakers, Vaughns; Lake Lauderdale; Clarks Pond, plants rather stout; Battenkill River south of Shushan. The plants are usually sterile; but fine fruiting plants were found in Harris Bay, Lake George, Aug. 28, 1899.

The following species and varieties of pondweeds have been found in the state of Vermont. *Potamogeton epihydrus cayugensis* (Wiegand) Bennett; *P. alpinus* Balbis; *P. Faxoni* Morong; *P. angustifolius connecticutensis* (Robbins) Bennett; *P. heterophyllus*, forma *terrestris* Schlecht.; *P. lucens L.; P. bupleuroides* Fernald; *P. confervoides* Reichb.; *P. foliosus* Raf.; *P. foliosus niagarensis* (Tuck.) Morong; *P. rutilus* Wolfg.; *P. Vasey*; Robbins; *P. strictifolius* Bennett; *P. pusillus Sturrockii* Bennetti *P. pusillus tenuissimus* Mert. & Koch; *P. filiformis* Pers.; and *Zannichellia palustris* L. Many of these have been found in Lake Champlain and its tributaries: and a more careful survey will probably add several of these to the Lake George region.

HUDSON FALLS, N. Y.

THE DISCOVERY OF ENDOPHYLLUM SEMPERVIVI (ALB. & SCHW.) DEBARY IN NORTH AMERICA

BY GEORGE M. REED

The writer first observed this interesting rust of *Sempervivum* in the alpine garden of the Brooklyn Botanic Garden on April 21, 1917. One plant of *Sempervivum albernettii* was found to be infected with the rust while the other plants adjacent proved to be free. Nearby a few plants of *Sempervivum punctatum* were also found to be infected with rust.

An effort was made to determine the origin of the rusted plants in the Garden. The plants of *Sempervivum* were obtained a year earlier from a large nursery in New Jersey. In connection with Dr. E. W. Olive this nursery was visited and the *Sempervivum* beds carefully examined. It was found that a considerable number of the plants of *Sempervivum punctatum* were badly rusted. One rusted plant of *S. albernettii* and one of an unknown species of *Sempervivum* were also found. The gardeners at the nursery stated that the appearance of the diseased plants had long been familiar to them, although they did not know the true nature of the trouble.

While it was not possible to get exact information it appears that the *Sempervivum* plants at the nursery were obtained from Holland about twelve to fifteen years ago. Apparently the disease did not attract the attention of the gardeners until two or three years after the introduction of the plants. For many years, however, the disease has been conspicuous in the beds and many plants have been rendered worthless. Apparently the disease has been more severe some years than others.

It is perhaps surprising that this European rust should so long escape observation in the United States. The fact that the mycelium is perennial in the tissues of the host makes it possible for the fungus to be readily distributed with the host plant. The appearance of the diseased plants is also quite striking. Generally the inner leaves of the rosette show the evidence of infection. These elongate more than the normal and assume a nearly vertical position; they are a much paler green at the base and are thickened towards the apex. The pycnidia and teleutospore sori are developed just back of the leaf tip, not being found to any considerable extent on the basal part of the leaves. The pycnidia are much more numerous on some leaves than others. The teleutospores germinate readily on soft agar and on the surface of water, typical promycelia with sporidia being developed.

REVIEWS

Report of the British Columbia Botanical Office*

This pamphlet of 70 pages besides containing administrative reports of the Provincial Botanist, has considerable material of interest to phytogeographers and ecologists. The botanical exploration of the province is discussed under "Skagit River Basin," "Bitter-root Grounds near Ashcroft," "Study of the Flora of Dryas Island" and "Contribution to the Flora of Windemere, B. C." Developmental phases of the vegation are treated at some length, and there are many lists of plant societies arranged in the order of frequency of occurrence of the species. Much welcome information about a botanically little-known region is presented in this report and the author promises further exploration in the future. There are eighteen excellent illustrations of ecological value, and a map of the region explored.

N. T.

PROCEEDINGS OF THE CLUB

January 31, 1917

The meeting was held in the morphological laboratory of the New York Botanical Garden at 3:30 P.M. President Richards presided. Twenty-five persons were present. The minutes of January 9 were read and approved.

Professor O. S. Morgan, Columbia University, New York City, was nominated for membership.

Dr. Marshall A. Howe presented the following report of the budget committee, which was adopted by the Club:

"*Report of Budget Committee of the Torrey Botanical Club, January 31, 1917*

"Met at the Museum of the N. Y. Botanical Garden at 2:30 P.M. Present: Barnhart (chairman), Harper, Rusby, Evans, Richards, Dodge and Howe. The following estimates of income and outgo for 1917 were made:

* Davidson, J., Third Annual Report of the Botanical Office of the Province of British Columbia. Victoria, B. C., 1916.

The resignations of Dr. Forrest Shreve, Edwin D. Hull and L. S. Hopkins were read and accepted.

The first paper on the announced scientific program was read by Dr. J. C. Arthur, on "The Nature of Species in the Rusts."

Dr. E. W. Olive followed with a paper on "Some Cytological Features of Porto Rican Endophyllums." An abstract of this paper follows:

"Certain facts concerning the comparative cytology of all six of the species now known were presented. Attention was called in particular to the number of nuclei occurring in the mycelium and pseudoparenchyma, as well as to certain noteworthy features of the haustoria, spores, peridium and intercalary cells. For example, the mycelium of *Botryorhiza* is 5–7 micr. in diameter, while that of the other Endophyllums does not exceed 3 mic. Further, the large botryose haustoria of *Botryorhiza* almost fill the host cell, being 10–14 mic. in diameter. Although the sexual fusions were not studied, the likelihood of such fusions taking place at the base of the sori was pointed out in connection with those three Endophyllums which possess mycelia with uninucleate cells; in the other three instances with binucleate mycelia, the fusions are undoubtedly pushed back, taking place some time before sorus formation."

Meeting adjourned.

B. O. Dodge,
Secretary

February 13, 1917

The meeting was held in the American Museum of Natural History at 8:15 P.M. President Richards occupied the chair. There were thirty persons present.

The transaction of business was dispensed with and the announced scientific program was carried out. Dr. W. A. Murrill and Dr. H. B. Douglass gave a joint paper on "Mushroom Poisoning." Dr. Murrill discussed a number of edible and poisonous species of mushrooms, illustrating his descriptions with colored lantern slides. Dr. Douglass gave an account of a case of mushroom poisoning of himself and other members of his family, due to eating quantities of a species of *Panaeolus*, identified by Dr.

Murrill as *Panaeolus semiglobatus* Murrill. Dr. Douglass also discussed several types of poisoning by mushrooms, illustrating by charts the principal features of his discussion. These papers will be published in the journals of the Club.

Meeting adjourned.

B. O. Dodge,
Secretary

NEWS ITEMS

In connection with the nation-wide movement to increase the available food supply for the current year, the Brooklyn Botanic Garden has furnished the entire time, so far as needed, of an expert gardener to inspect the soil of vacant lots in Brooklyn, and to give advice to individuals, neighborhood groups, and other organizations on planting and the cultivation of crops. The garden has also served as the center of distribution of seed potatoes in Brooklyn for Mayor Mitchel's food supply committee. Several thousand additional copies of the Garden's *Leaflets* on "The Small Vegetable Garden," and "Some Insect Pests," have been called for. A special class has been started for the training of older boys in vegetable gardening, and over two acres of the Botanic Garden grounds have been planted, chiefly to potatoes and beans.

Barrington Moore, a recently elected member of the Club, has gone to Plattsburgh with the Officer's Reserve Corps. Mr. Moore was appointed a curator of Forestry at the American Museum of Natural History in January, 1917.

The Detroit *Free Press* records the death on May 15th of Samuel Alexander, long known for his studies of *Helianthus*. Born in Ohio January 6, 1841; he went to Michigan when fourteen years old, serving later in the Civil War. During the twentieth anniversary celebration of the New York Botanical Garden, in September, 1915, he delivered a paper on the classification of sunflowers, having devoted many years to this study. He had published a few scientific papers in the Michigan Academy of Sciences Reports, and is reported to have "had in preparation a book on botanical subjects."

The Torrey Botanical Club

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OTHER PUBLICATIONS

OF THE

TORREY BOTANICAL CLUB

(1) BULLETIN

A monthly journal devoted to general botany, established 1870. Vol. 43 published in 1916, contained 676 pages of text and 35 full-page plates. Price $4.00 per annum. For Europe, 18 shillings. Dulau & Co., 47 Soho Square, London, are agents for England.

Of former volumes, only 24–43 can be supplied entire; certain numbers of other volumes are available, but the entire stock of some numbers has been reserved for the completion of sets Vols. 24–27 are furnished at the published price of two dollars each; Vols. 28–43 three dollars each.

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

(2) MEMOIRS

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

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

Correspondence relating to the above publications should be addressed to

DR. BERNARD O. DODGE
Columbia University
New York City

THE TORREY BOTANICAL CLUB

OFFICIAL ORGAN OF THE WILD FLOWER PRESERVATION SOCIETY OF AMERICA

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

NORMAN TAYLOR

// TORREYA

June, 1917.

Vol. 17 No. 6

WILLIAM YOUNG, JR., OF PHILADELPHIA, QUEEN'S BOTANIST

By John W. Harshberger

There appeared in 1916 a reprint of "Catalogue d'Arbres Arbustes et Plantes Herbacees d'Amerique," published in Paris in 1783 by William Young, Jr. The reprint is entitled "Botanica Neglecta, William Young, Jr. (of Philadelphia) 'Botaniste de Pennsylvania' and his Long-Forgotten Book being a Facsimile Reprint of his 'Catalogue d'Arbres Arbustes et Plantes Herbacees d'Amerique' published in Paris in 1783 with Prefatory Account of the Author and critical notes by the Editor Samuel N. Rhoads." Privately printed, Philadelphia, 1916. The copy of William Young's Catalogue which forms the basis of this reprint first came to the attention of Mr. Rhoads, the editor, while looking over a price-list of old books, issued in August, 1915, by a dealer in Scotland. It was obscurely listed, but Mr. Rhoads was fortunate in securing the copy bound in with a copy of Marshall's "Arbustrum Americanum."

Mr. Rhoads with the true interest of the bibliophile, then tried to find out something about William Young (Yong), Jr. References were found to him in the two volumes of Smith's "Linnaean Correspondence." This correspondence was carried on between Linnaeus, John Ellis, Peter Collinson, Dr. Fothergill and others. John Bartram refers to Young in the correspondence published in William Darlington's "Memorials of John Bartram and Humphry Marshall," Philadelphia, 1849. The editor of the reprint, Mr. Rhoads, then had recourse to the family records of the Darby Road Youngs and to his will found

[No. 5, Vol. 17, of Torreya, comprising pp. 69–89, was issued 2 June, 1917]

in the Office of Register of Wills, Philadelphia. The available history of the Youngs is given by Mr. Rhoads in his prefatory pages, and he raises certain points, which he thinks ought to be answered, such as the date of the botanist's birth and death, and his subsequent career as a scientific man.

The writer, following out a clue given on page ix of the reprint, has been able to supplement the known facts about William Young, Jr., and these facts are given in what follows. It is mentioned in the prefatory note of the reprint, the existence of William Young's Burying Ground at Fifty-second Street, one square west of Darby Road (Woodland Avenue) known as Leech, or Gaul, Burying Ground. As this locality is not far from the writer's home, a visit was paid to it on June 18, 1916, when it was discovered that the bodies of members of the Leech and Young families had been removed six years previously to Arlington Cemetery by Eugene Yerkes, undertaker at 71st and Woodland Avenue, Paschalville. Thomas L. Smith, who had moved in 1892 into the old road house built by John Leech in 1800, known as Sorrel Horse Tavern, still standing at 5123 Woodland Avenue, West Philadelphia, gave the information about the abandonment of the burial ground and the removal of those buried in it. John Leech was brother-in-law to William Young, who built his tavern in connection with an older house started by Johan Johansen, a Swede, in 1719. This old house is still standing and the old tap room is used as a kitchen by Thomas L. Smith, the present occupant. Calling up Mrs. Yerkes, the widow of the undertaker, she informed me that the bodies had been removed by Eugene Leech, an undertaker, living at 7127 Woodland Avenue, and not by Eugene Yerkes, her husband. Calling up Eugene Leech by telephone the writer ascertained that William Young was one of his family, that his body had been carefully removed and reburied in Bethany Section, Arlington Cemetery. He further stated that his father was Dr. H. K. Leech living at 185 East Plumstead Avenue, Lansdowne, and that he could give me information about the family tree. A visit to Lansdowne revealed the fact that Dr. Leech's son, Frank R. Leech, now connected with the Penn Mutual Life Insurance Company,

Young, Sr., built a house on Front Street for £1,000. On November 23, 1753, Ann Christiana married John Leech and the whole family, William Young, Sr., William Young, Jr., Catherine Young and Mr. and Mrs. John Leech moved to Kingsessing. Later, on March 21, 1755, William Young, Sr., and his two children William, Jr., and Catherine moved to a farm of 50 acres woodland at Kingsessing purchased at £5 per acre of Captain Collis, of Blockley. They thus became neighbors of John Bartram, whose place was located on the Schuylkill River. There were born at Kingsessing as the children of John and Ann Christiana Leech the following persons:

July 9, 1756, William Leech,
June 1, 1759, John Leech,
May 4, 1761, Elizabeth Leech,
Oct. 15, 1763, Maximilian,
Nov. 22, 1765, Henry and Catherine (twins).

On January 13, 1763, William Young, Sr., bought 15 acres of land from John Kite in Blockley for £60, perhaps from the proceeds of the sale of 400 acres of land in Virginia for £65 cash.

The first entry concerning William Young, Jr., is under date of February 12, 1764, when he sailed for England with Captain Culton by request of the King. He must have commenced the business of nurseryman and gardener in 1761, for we have this reference to him in a letter of Dr. Alexander Garden of Charleston, South Carolina to John Ellis of London dated July 25, 1761 (Smith's "Linnaean Correspondence," I: 512; Rhoads's Reprint): "I have at last met with a man who is to commence nurseryman and gardener, and to collect seeds, plants, &c., for the London market. He is a sensible, careful man, and has a turn for that business. He shall receive all the advice and assistance that I can give him. I must beg your interest in his favour; that you would bespeak what custom and commissions you can procure for him from your gardeners or nurserymen, or for any gentleman who may want what our province affords. He wants much to be acquainted with Mr. Gray and Mr. Gordon, at Mile, End; and I must beg that you would procure some commission from them to him. He is to employ his whole time in procuring whatever may be ordered. His name is Young, and any letters for him inclosed to me will be taken care of. I must beg that you would endeavor to inform me on his account, what the prices of our several seeds are, or the value of young plants of Loblolly Bay, Azalea, Umbrella Magnolia, Beureria, Magnolia palustris, Halesia, Stuartia and such like."

The next reference to Young in the Linnaean Correspondence is on page 522, where in a letter from Dr. Garden to John Ellis, dated November 19, 1764, this is found: "Agreeably to your desire, I have spoken to Mr. Young, and given him your directions and my best advice so that I doubt not but his seeds and young plants will be good and his prices much lower." By this time William Young was in England, for his sister Ann Christiana (Leech) received a letter from him on February 23, 1765, in which her brother refers to his good reception, his audience with the King, with whom he conversed about the curiosities of the American country.

John Bartram was evidently a bit uneasy that his young neighbor might supplant him in the favor of George the Third and under date of October 16, 1764, he writes to Peter Collinson, "Dear Peter: I sent by Captain Budden, by my neighbor Young, my spring specimens and a vial of Chinquapins, to try how they will do that way. Some think he will make such an awkward appearance at court that he will soon come back again. Others that the Queen will take care of the German gentleman. I think that if he is put under Dr. Hill's care he will make a botanist, as he is very industrious and hath a good share of ingenuity." In May, 1765, Collinson in a letter to Bartram refers to the Queen's protége: "I have not seen Young for some time. I conclude he is prosecuting his botanic studies."

With Collinson's next letter to Bartram, May 28, 1766, while Young was still in England, we read: "My dear John: I wonder thee should trouble thyself about the Queen, as she has Young, and everything will be shown him. It cannot be expected he will favour any one's interest but his own. He is now so new-modelled and grown so fine and fashionable, with his hair curled and tied in a black bag, that my people, who have seen him often, did not know him. I happened not to be at home, so could not inquire what scheme he is upon."

William Young returned to America on November 3, 1766, with Captain Marshall, having received the title of Queen's botanist, and November 23, when he went to the Carolinas for plants and John Bartram wrote to Peter Collinson under date of December 5, 1766: "I am surprised that Young is come back so soon. He cut the greatest figure in town, struts along the streets whistling, with his sword and gold lace, etc. He hath been three times to visit me—pretends a great respect for me. He is just going to winter in the Carolinas: saith there is three hundred pounds sterling annually settled upon him. But Captain Chancellor tells odd stories of him; that he was put in prison, from which he was taken by two officers and put on board ship; but his friends utterly deny it. Its a pity but the truth was known, and the trying party snubbed." In reply to John Bartram's letter of inquiry, Peter Collinson writes on February 10, 1767: "I believe there is too much truth in what the Captain saith about Young. He may live to repent his folly and extravagance," etc. From the family records, we learn that William Young, Jr., made the following trips to England and the Southern states in connection with his business. January 13, 1768, he sailed from Carolina to England with casks of roots and plants, returning in good health to America on November 6, 1768. On November 17, 1768, eleven days after, he sailed to the Carolinas, returning to Philadelphia on March 23, 1769, with 19 boxes of plants. November 5, 1769, sees William Young again on his way to England with Captain Folgonor and many boxes and casks of plants. He returned home on August 26, 1770, hearty and well. He sailed to England on November 13, 1771, on the ship commanded by Captain Folgonor, returning to America on December 30, 1772, with a wife which caused him, the journal states, to be unhappy the rest of his life.

The success of his business, although he seems to have antagonized John Bartram, is shown in the following from a letter from

between 3 and 4 o'clock in the afternoon, about two months after his son's death, William Young, Sr., who became sick on May 15, died of apoplexy with his clothes on, aged 73 years. This accounts for the fact that the son was not mentioned in his father's will (see Rhoads's Reprint, p. *X*). Later John and Maximilian Leech, in August, 1785, went to Gunpowder Creek for their uncle's body and found it, and on September 12, 1785, John Leech and William Young's widow took a carriage with three horses with a leaden coffin for the body. They returned on September 16, 1785' and buried William Young in the Burial Ground at Kingsessing. On December 23, 1785, John and Ann Leech began to keep tavern and raised a sign "A Citron (Orange) Tree and the Rising Sun." The final entry of interest concerning William Young, Jr., is that on June 15, 1786, his nephew, John Leech, bought his property in Kingsessing for £175, payable in six years, and that his widow, Martha Young, sailed on July 9, 1786, from Philadelphia for Dublin, Ireland, with her second husband, Mathias Newton Smith, an Irishman, born in Londonderry, a sailor on the ship Lady Hill, Captain Campbell. It might be said in closing that Harry K. Leech and his son Frank R. Leech are lineal descendants of Ann Christiana, sister of William Young, Sr., who died January 14, 1814, aged 77 years as the widow of John Leech, who died according to the family records on January 27, 1804, aged 78 years.

The family journal kept by Ann Christiana Young makes no mention of "Colly" mentioned in the will of William Young, Jr., probated on July 19, 1785. In the will, he left the farm to his wife Martha and after her death to his "Boy Colly," who was to be "lerned to read and write and so must be sent to lern it." Mr. Rhoads in his prefatory note suggests that Colly was probably named after Peter Collinson, but he thinks it strange that he did not call him his son, if, indeed, a son he was! I would suggest that William Young, Jr., meant his negro boy, or black servant, for in England Colley is a country word for soot, and a water-colley means a water blackbird, just as a colley (collie) dog meant originally a black sheep dog, or possibly a dog kept to look after the black-faced sheep. (Cf. The English Year Spring, p. 84, by W. Beach Thomas and A. K. Collett.) Nor do we know what the Queen's botanist did during the Revolutionary War, unless a certain Captain Young mentioned in the diary as serving with the American forces stationed at Bristol on May 1, 1777, happened to be the subject of this sketch. With these two exceptions, the biography of the Queen's botanist has been made reasonably complete by the discovery of the references to his life and work in the family journal in the possession of Harry K. Leech, of Lansdowne, Pennsylvania.

UNIVERSITY OF PENNSYLVANIA,
PHILADELPHIA

JUNIPERUS COMMUNIS ON LONG ISLAND AND STATEN ISLAND

BY WM. T. DAVIS

About Selden, Long Island, N. Y., there is much uncultivated country, some of it woodland and some one time fields now overgrown with native vegetation. On the 30 of August, 1916, I was walking along a sandy road to the south of the village, when I was surprised to see close to the road two considerable clumps of *Juniperus communis* L. growing so near together that they touched. One was about four feet high, while the other was twice as tall or more. Their relative positions and heights may be judged by the accompanying picture. I did not expect to see this plant on Long Island, for in the Flora of the vicinity of New York by Norman Taylor, 1915, it is said to be "unknown on L. I. and S. I."*

The boy that was with me at the time stated that there was still another bush like the one we were examining, on a hill to the southward, that is on one of the hills of the Ronkonkoma moraine. This I did not have time to visit.

While as far as is known there is no *Juniperus communis* now growing on Staten Island, it used to occur in the clumps of

*Since that book was published specimens of *Juniperus communis* have been seen from Cedarhurst, Aquebogue and Amagansett on Long Island, in addition to this new locality mentioned by Mr. Davis.—ED.

red cedars on the south side of the Island. In the Flora of Richmond County, N. Y. [Staten Island], 1879, by Hollick and Britton, is the statement that one tree of the erect variety grows in the "Cedars" near New Dorp, and in August, 1903, Mr.

FIG. 1. Juniper bushes (*Juniperus communis* L.) near Selden, L. I., New York, August 30, 1916.

Sharrot, whose house at that time was in the clump of cedars known as "Poppy Joe's Island," informed me that in his memory there were a number of others growing among the red cedars, but that they died out before the large one near his home. In my herbarium there are two specimens from this last-mentioned tree, one collected in 1880 and one in 1891. When the last specimen was collected the juniper was in a dying condition.

STATEN ISLAND,
NEW YORK

of the basal position are uniformly remarkably light, the lightest of all the pods, while those at the tip are next heavier, and those at the middle exceed all others in weight. In other words, the extreme in weight of all the positions is found adjoining in the 3-seeded pod, with a difference of 10.26 per cent.

Omitting the single-seeded pods which have the seeds neither base nor tip, it is observed that the basal seeds of both the 2- and 3-seeded pods are the lightest respectively in the order here given, and the tip seeds, in a similar manner, have the next higher weights, leaving the 3-seeded middle seeds with the heaviest rank.

Soybeans, in which selfing is the rule, should yield strains with marked uniformity of structural units, but among the pure lines the results in seed weight are as shown. It goes without writing that the hope of so standardizing leguminous plants that their seeds will be uniform in weight is groundless. Differences in weight, and somewhat in shape, must be accepted as due in part to environment within the plant and the determination of the relation of seed-position in the pod to crop-production becomes a significant economic problem. Sufficient results have been obtained to warrant the opinion that the location of the seeds upon, and in, the plant is a factor worthy of serious consideration in connection with its bearing upon field and garden culture.

The chief object of the present note is to call attention to a phase of botanical study that is within the reach of many, and to suggest that persons in widely separated regions may make substantial contributions to a knowledge of the seed-weights of wild plants that, like the soybean, have their seeds borne in pods. Of such one might name the lupines, crotolaria, genista, baptisia, wild-beans, amorpha, vicia, lathyrus, etc.

To some students the wild plants are more appealing than the cultivated kinds and for the present purpose may be superior because of the relative freedom from pod and seed diseases that often modify the records of subjects from the field and garden.

New Jersey College Experiment Station

SHORTER NOTES

A NEW STATION FOR COELOPLEURUM ACTAEIFOLIUM.—The seventh edition of Gray's Manual gives "Mass. to Greenl." as the range of *Coelopleurum actaeifolium* (Michx.) Coult. & Rose. In the *Bulletin of the Torrey Botanical Club* for February, 1914, Bicknell notes the occurrence of the species on the island of Nantucket and states that this "seems to be the southernmost point to which this northern plant has made its way." In July, 1916, the writer discovered the *Coelopleurum* near the western end of Fisher's Island, New York, growing in thickets close to the shore but not among the actual beach plants. This station is in about the same latitude as Nantucket but marks an interesting extension of range to the westward. The plants were numerous and robust and the bractlets of the involucels were, in some cases, strikingly large and conspicuous. Specimens have been deposited in the herbaria of Yale University, Harvard University, and the New York Botanical Garden.

ALEXANDER W. EVANS

YALE UNIVERSITY

REVIEWS

Shreve's Vegetation Map of the United States*

There have been many more or less satisfactory attempts to map the forests or other natural vegetation of areas varying in size from a few acres to the whole world. When the area is small enough for one person to explore it pretty thoroughly, and the vegetation types are clearly defined and not much disturbed by civilization (as is the case in some parts of Florida, for example†) the task is simple enough. A vegetation map of the world or a whole continent is also comparatively easy to make, because only a few types need to be represented, and errors of

* A Map of the Vegetation of the United States. By Forrest Shreve. Geographical Review 3: 119–125, with folded map 12½ x 20 in. Feb. 1917.

† In the 7th Annual Report of the Florida Geological Survey (1915), following page 134, is a map of the vegetation of about 1000 square miles in the central part of the state, made by two young men with little or no botanical training, who did remarkably well under the circumstances. Many foresters have made equally good maps of areas of similar size.

a hundred miles or so in the location of their boundaries are scarcely noticeable.

But to map the vegetation of a country or state of average size satisfactorily requires much experience and rare judgment. One individual does not usually live long enough to examine every square mile of such an area, and it is therefore necessary to collate the work of several persons, whose points of view may vary considerably. And even if the exact location of every plant was known, the different types of vegetation often intergrade in all sorts of ways, so that it may be impossible to say within a few miles just where one ends and another begins. Again, where the transition from one type to another is complete within a few yards they may occur in such small patches that they cannot be indicated separately on a map of a whole state or larger area, and no two persons might agree on how to generalize them into larger categories. Another great difficulty, in populous regions like much of the eastern United States and Europe, is reconstructing the vegetation that has been destroyed or greatly modified by civilization.

For these reasons very few vegetation maps of the United States have been made. Dr. Shreve's is the best and most detailed thus far published. He takes the correct position that vegetation should be mapped for itself alone, completely ignoring all environmental factors, but clearly recognizes the difficulties of such an undertaking. His map, on a scale of 1 : 9,600,000, shows 18 generalized types of vegetation, indicated by different colors,* about equally divided between the eastern and western halves of the country. There are about seven types of desert and semi-desert, three mainly grass-land, two of open park-like forests, and six of ordinary forests. Brief descriptions, averaging about seven lines each, are given in the text.

Nothing is said about the normal frequency of fire, which the reviewer has found to vary greatly in different regions and different types of vegetation, and depends on the nature of the

* The engravers unfortunately did their work rather poorly. Some of the colors meant to be different are too much alike, and some meant to be the same are different; and there are no numbers or other symbols (as on the government soil maps, for instance) to assist the reader in identifying them.

the Alleghany plateau in Pennsylvania; the giant redwoods of the California coast region, which seem to be almost exempt from fire and snow; and the open sunny yellow pine forests of the Sierra Nevada and central Arizona, with frequently burned grassy undergrowth similar in aspect to that of the southeastern pine-barrens. In the description of this type of forest there is no mention of the genus *Picea*, which is a very conspicuous element both in Maine and in the Rocky Mountains; and the white pine and hemlock, noted as characteristic, perhaps belong more properly to the "northeastern evergreen-deciduous transition forest."

"Swamps and marshes" is another diverse aggregation, including as it does the alluvial bottoms of the Mississippi and a few other rivers, with dense deciduous forests, the non-alluvial Dismal and Okefinokee Swamps, the treeless Everglades, and the salt marshes of the coast.

The alpine summits of New England and New York, as well as of Mt. Shasta, are not shown, probably because too small in area.

With the few exceptions here noted, the map gives an excellent bird's-eye view of the original vegetation of the United States. If it is compared with the latest geological, physiographic, and climatic maps of the same area many interesting correlations will be noted. It is to be hoped that other botanists who see Dr. Shreve's map will be stimulated to map their respective states or similar areas in a somewhat similar but more detailed manner. Perhaps in the not distant future it will be possible to employ statistical methods that will almost eliminate the personal equation; for example, to divide the country into natural geographical divisions* (based on soil, topography, climate, and all other significant factors), determine the relative abundance of the trees (or other plants where there are few or no trees) in each, and put on the map in order of abundance the names of enough to make up say 50 per cent, or better 75 per cent, of the total in each region. There will always be some difference of

* For a few recent maps of the United States or parts thereof that will serve pretty well for outlining the geographical divisions see Bowman's Forest Physiography, 1911, Hawley & Hawes's Forestry in New England, 1912, and N. M. Fenneman in Annals Assoc. Am. Geographers, Vol. 6, 1917.

opinion about the limits of the geographical divisions, as there is in the case of species, genera, etc., but there should be none about the relative abundance of the species after the regions are once defined, and explored sufficiently.

ROLAND M. HARPER

PROCEEDINGS OF THE CLUB

FEBRUARY 28, 1917

The meeting of February 28, 1917, was held in the morphological laboratory of the New York Botanical Garden at 3:30 P.M. with Vice-President Barnhart in the chair. Twenty-two persons were present.

The minutes of the meetings of January 31 and February 13 were read and approved. Dr. Michael Levine reported that the editorial board had cordially endorsed the proposition of Dr. Jean Broadhurst in regard to publishing in TORREYA a greater number of abstracts and reviews of botanical literature.

For the committee appointed to consider the application of Mr. Norman Taylor for a grant of $200 from the Esther Herrman Fund, Dr. Marshall A. Howe made a preliminary report to the effect that the income of this fund had for the present been set aside for the promoting of the natural history survey of Porto Rico.

A communication was read announcing the death of one of the Club members, Mrs. Cynthia Wood, on February 7. There was read also a letter announcing the death of Rev. E. J. Hill, a well-known botanist of Chicago, who had been for many years a subscriber to the Club's publications.

The resignations of Dr. Chester A. Darling and Mr. Joseph E. Brown were accepted.

The following persons were elected to membership: Professor O. S. Morgan, Columbia University, N. Y. City; Prof. H. C. Beardslee, Asheville, N. C.; Mr. Harry Braun, Columbia University, N. Y. City; Prof. J. Franklin Collins, 468 Hope St., Providence, R. I.; Mr. G. E. Meckstroth, University Club, State College, Pa.

The first number on the announced scientific programme consisted of a paper on "Two Long Island Peat Bogs" by Dr. Roland M. Harper. The speaker's abstract follows:

"Two interesting peat bogs, of approximately the same size, but about forty-five miles apart and differing considerably in vegetation, were described, and photographs of them exhibited.

"The first is Juniper Swamp, near Maspeth, Queens County. It is in a thickly settled neighborhood, and the peat in it is said to have been utilized to some extent in the first half of the nineteenth century. The trees are *Betula populifolia* and *Acer rubrum*, but most of them have been cut out from time to time, presumably for fuel. The commonest shrub, or shrub-like plant, making about half the total bulk of vegetation, is *Decodon verticillatus*, which renews its aërial parts every year. Other shrubs are mostly of the Ericales, including *Chamaedaphne*, which is not known elsewhere within thirty or forty miles. The commonest herb is *Triadenum virginicum*, and the occurrence of *Sagittaria Engelmanniana* is noteworthy. There is not much *Sphagnum*, and the peat affords a pretty firm footing.

"The other bog is at the north end of Lake Ronkonkoma, and is probably an old arm of the lake, cut off by a sand-bar. The trees on it are *Acer rubrum* and *Nyssa*, all rather small. *Chamaedaphne* is by far the commonest shrub, and about 75 per cent of the shrubs are of the Ericales. Herbs are numerous, especially in the wetter portions, and this is one of the few known Long Island localities for *Gyrotheca tinctoria*. *Sphagnum* is abundant and the bog very spongy.

"The differences in vegetation between these two bogs seem to be correlated with differences in the chemical composition of the water, which in turn depends largely on the soil of the surrounding country, which is rich loam in the first case and mostly sand in the other."

The second paper "On Some Rocky Mountain Pentstemons" was presented by Dr. Francis W. Pennell. The following abstract was furnished by the speaker:

"In the summer of 1915 the speaker collected Scrophulariaceae in the central Rocky Mountain States, studying the species

NEWS ITEMS

On account of the interest attaching to the man about whom Dr. Harshberger has written the first article in this issue of TORREYA we are glad to mention that a facsimile reprint of the only American copy of his "Catalogue d'Arbes, Arbustes et Plantes Herbacees d'Amerique" has been issued. This catalog was reviewed in a recent issue of TORREYA and may be purchased from S. N. Rhoades, 920 Walnut Street, Philadelphia.

At the meeting to commemorate the one hundredth anniversary of the New York Academy of Sciences, held Monday evening, May 28, Dr. N. L. Britton spoke on the Academy's exploration of Porto Rico, and Dr. J. Hendley Barnhart gave a summary of the last hundred years of the work of the Academy. The President, Dr. M. I. Pupin, spoke on the help that science could give the nation to win the war.

The Torrey Botanical Club

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OTHER PUBLICATIONS

OF THE

TORREY BOTANICAL CLUB

(1) BULLETIN

A monthly journal devoted to general botany, established 1870. Vol. 43 published in 1916, contained 676 pages of text and 35 full-page plates. Price $4.00 per annum. For Europe, 18 shillings. Dulau & Co., 47 Soho Square, London, are agents for England.

Of former volumes, only 24–43 can be supplied entire; certain numbers of other volumes are available, but the entire stock of some numbers has been reserved for the completion of sets. Vols. 24–27 are furnished at the published price of two dollars each; Vols. 28–43 three dollars each.

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

(2) MEMOIRS

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

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

Correspondence relating to the above publications should be addressed to

DR. BERNARD O. DODGE
Columbia University
New York City

THE TORREY BOTANICAL CLUB

OFFICIAL ORGAN OF THE WILD FLOWER PRESERVATION SOCIETY OF AMERICA

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

NORMAN TAYLOR
Brooklyn Botanic Garden
Brooklyn, N. Y

TORREYA

July, 1917.

Vol. 17 No. 7

THE FLORA OF THE TOWN OF SOUTHOLD, LONG ISLAND AND GARDINER'S ISLAND

BY STEWART H. BURNHAM AND ROY A. LATHAM

FIRST SUPPLEMENTARY LIST

The preliminary flora was published in Torreya 14: 201–225. Nov. 1914 and 229–254. Dec. 1914. The majority of the enumerated plants were collected in 1915. Mr. Frank Dobbin of Shushan, N. Y., also visited Orient Aug. 10–15, 1915, and spent considerable of the time collecting.

The territory of the region included in this flora lies wholly in the glaciated region. Along the shore of Long Island Sound is the obscure inner moraine of the Wisconsin ice sheet; and from this moraine is an outwash of thin deposits forming sandy plains over the older Pleistocene formation which shows through and in places controls the topography. Some of the beaches and many of the swamps and marshes belong to the Recent epoch. Gardiner's Island lies between the inner and outer moraines of the Wisconsin ice sheet: and being of more rugged topography "seems to have encouraged a more extensive re-working of the" older Pleistocene "deposits by the Wisconsin ice and a greater deposition of" the till sheet or ground moraine. ("The Geology of Long Island," by Myron L. Fuller, U. S. Geol. Survey Professional Paper 82: Washington. 1914.)

The authors are greatly indebted to many specialists, who have made it possible to publish the following catalogue of species.

INSECT GALLS*

Andricus cornigerus O. S.—Horned Knot Oak Gall.
Asphondylia globosus O. S.—On stems of *Helianthus divaricatus*.

* The majority of these galls were named by Dr. E. P. Felt, state entomologist of the State of New York.

[No. 6, Vol. 17 of TORREYA, comprising pp. 91–110, was issued 13 June, 1917.]

Diastrophus Potentillae Bass.—Cinquefoil Axil Gall; on stems of *Potentilla canadensis.*

Rhopalomyia Solidaginis Loew—Goldenrod Bunch Gall.

Trypeta Solidaginis Fitch—Goldenrod Ball Gall.

THALLOPHYTA

EUTHALLOPHYTA

EUPHYCEAE*

Botrydium granulatum (L.) Grev.—On wet earth.

Griffithsia tenuis Ag.—Long Island Sound.

Polysiphonia violacea (Roth) Grev.—On rocks in the Sound.

Ralfsia verrucosa (Aresch.) J. Ag.—On rocks in shallow water.

Rhizoclonium hieroglyphicum (Ag.) Kütz.—About roots of bushes in a fresh water swamp.

Rivularia atra Roth—On rocks at the water's edge.

Ulothrix implexa Kütz.—On rocks at mid-tide mark, Orient bay.

FUNGI

SCHIZOMYCETES

Bacillus tracheiphilus Erw. Smith—On *Cucumis sativus;* determined by Mr. F. V. Rand.

EUMYCETES

Phytophthora Phaseoli Thaxt.—On *Phaseolus lunatus;* determined by Mr. Rand.

Plasmopara cubensis (B. & C.) Humphrey—On *Cucumis sativus;* determined by Mr. Rand.

ASCOMYCETES (EXCLUDING PYRENOMYCETES)

Chlorosplenium chlora (Schw.) Mass.—On decayed wood of *Quercus coccinea;* determined by Dr. F. J. Seaver.

Dasyscypha Ellisiana (Rehm) Sacc.—On bark of living *Pinus rigida;* determined by Dr. Seaver.

Lecanidion atratum (Hedw.) Rabenh.—On bare wood of *Toxylon pomiferum;* determined by Dr. C. E. Fairman.

Melittosporium hysterinum (Fr.) Gill.—On bare wood of *Juniperus virginiana;* determined by Dr. Fairman.

Pseudopeziza Medicaginis (Lib.) Sacc.—On leaves of *Medicago sativa;* determined by Dr. Fairman.

Taphrina Quercus (Cke.) Sacc.—On leaves of *Quercus velutina;* determined by Dr. H. D. House.

ASCOMYCETES (PYRENOMYCETES)†

Anthostomella sepelibilis (B. & C.) Sacc.—On old stems of *Smilax rotundifolia.*

Botryosphaeria Ribis Grossen. & Duggar—On old stems of cultivated *Grossularia.*

* The algae were determined by Dr. M. A. Howe and are preserved in the Herbarium of the New York Botanical Garden.

† Unless otherwise stated, the *Pyrenomycetes* were determined by Dr. C. E. Fairman.

Valsa Liquidambaris Schw.—On branches of *Hamamelis virginiana;* determined by Dr. House.

V. pauperata C. & E.—On twigs and branches of *Acer rubrum* at Greenport.

Hypomycetes

Cercospora Teucrii E. & K.—"Orient Point, on living leaves of *Teucrium canadense.*" N. Y. State Mus. Bull. 179: 26. 1915.

Cladosporium Typhae Schw.—On old leaves and stems of *Typha latifolia;* determined by Dr. Fairman.

Trichoderma lignorum (Tode) Harz.—On bare wood of *Quercus velutina;* determined by Dr. Fairman.

Melanconiales

Pestalozzia conigena Lev.—On cones of *Thuja occidentalis;* determined by Dr. Fairman.

Sphaeropsideae*

Cytospora leucostoma (Pers.) Sacc.—On twigs of *Amygdalus Persica.*

Diplodia hyalospora C. & E.—On old stems of *Chenopodium album.*

D. Maydis (Berk.) Sacc.—On old stalks of *Zea Mays.*

Diplodina Atriplicis Vestgr.—On old stems and withered leaves of *Atriplex hastata.* Dr. Fairman says when this fungus occurs on stems, it is called *Diplodina Atriplicis;* when on leaves, *Ascochyta Atriplicis* Died. On your plants "we have fungi on both, so that it is as you please what you say, *Diplodina* or *Ascochyta,* at present. I have referred yours to *Diplodina* because most prominent on the stems."

Labrella nitida Schw.—On stems of *Polygonatum commutatum.*

Leptostroma filicinum Fr.—On old stipes of *Athyrium Filix-foemina.*

L. virgultorum Sacc.—On stems of *Aralia nudicaulis.*

Leptostromella hysterioides (Fr.) Sacc.—Determined by Dr. House.

Leptothyrium litigiosum (Desm.) Sacc.—On *Osmunda cinnamomea;* determined by Dr. House.

L. Pomi (Mont. & Fr.) Sacc.—On the skin of the fruit of *Malus Malus.*

Macrophoma pulchrispora (Pk. & Clint.) Sacc.—On stems of *Persicaria pennsylvanica.*

Phlyctaena arcuata Berk.—On dead stems of *Arctium minus.*

P. complanata (B. & C.) Sacc.—On dead stems of *Tiniaria Convolvulus.*

Phoma Cydoniae Sacc. & Schulz.—On old fruit of *Cydonia vulgaris* (Quince).

P. longipes B. & C.—"Orient Point on *Morus alba.*" The plant reported in the preliminary list to *Phoma moricola* Sacc. should be referred to this species. N. Y. State Mus. Bull. 188: 37. 1916.

P. media E. & E.—On old stems and branches of *Asparagus officinalis.*

P. nebulosa (Pers.) Sacc.—On dead stems of *Lepidium virginicum.*

P. sepincola (Kickx.) Sacc.—On branches of rambler rose.

P. strobiligena Desm.—On cones of *Thuja occidentalis.*

P. verbascicola (Schw.) Cke.—On stems of *Verbascum Thapsus.*

Phomopsis cryptica (Nits.) Trav.—On twigs of *Lonicera japonica.*

* Unless otherwise stated, the *Sphaeropsideae* were determined by Dr. C. E. Fairman.

P. occidentalis Sacc., var. *irregularis* Trav.—On twigs and branches of *Gleditschia triacanthos.*

P. vepris (Nits.) Trav.—On stems of *Rubus procumbens.*

Phyllosticta Baccharidis Dearness & House—"On living leaves of *Baccharis halimifolia*, Orient Point." This species is described in N. Y. State Mus. Bull. 179: 29. 1915: and the type is in the herbarium of the N. Y. State Museum.

P. orobella Sacc.—"On languishing leaves of *Lathyrus maritimus*, Orient Point, New to America." N. Y. State Mus. Bull. 179: 30. 1915.

Rhabdospora Lonicerae (C. & E.) Sacc.—On dead twigs of *Lonicera japonica.* Dr. Fairman says, "a rare find. It was originally found by Ellis on *Lonicera* in New Jersey and sent by him to Cooke who called it *Cryptosporium Lonicerae* C. & E. in Grevillea 6: 83. March 1878. It has curved hyaline spores and really seems to be a good *Cryptosporium.* I do not think Ellis ever found it again."

R. subgrisea Pk.—On stems of *Solidago sempervirens;* determined by Dr. House.

Septoria Caryophylii Scalia—On leaves of *Dianthus caryophyllus.* Dr. Fairman says, "I presume this has been called *S. Dianthi:* but it agrees better with the above."

S. graminum Desm.—On leaves of *Dactylis glomerata;* determined by Dr. House.

Sphaeronaema acerinum Pk.—On dead bark and twigs of *Acer rubrum.*

Sphaeropsis Arctostaphylii (Vize) Sacc.—On bare wood.

S. Celastrina Pk.—On *Celastrus scandens.*

S. Juniperi Pk.—On *Juniperus virginiana*; determined by Dr. House.

S. rubicola C. & E.—On stems of *Rubus procumbens.*

S. sepulta E. & E.—On dead twigs of *Morus alba* at Orient Point. N. Y. State Mus. Bull. 188: 53. 1916.

Vermicularia petiolicola P. Brun—On petioles of *Geranium maculatum.*

BASIDIOMYCETES

USTILAGINACEAE

Urocystis Cepulae Frost—On *Allium Cepa;* determined by Dr. G. P. Clinton.

Ustilago Crus-galli Tracy & Earle—On *Echinochloa Crus-galli;* determined by Dr. Clinton.

U. Rabenhorstiana Kühn—On *Syntherisma sanguinale;* determined by Dr. Clinton.

MELAMPSORACEAE*

Melampsora Medusae Thüm.—On leaves of *Populus tremuloides.*

COLEOSPORIACEAE

Coleosporium delicatulum (A. & K.) H. & L.—Southold on leaves of *Euthamia tenuifolia.*

C. Helianthi (Schw.) Arth.—On leaves of *Helianthus divaricatus.*

* Unless otherwise stated the Rusts were determined by Dr. J. C. Arthur and are preserved in the Herbarium of Dr. Arthur at Purdue University, Lafayette, Indiana. The authors are indebted to Dr. Arthur, who has read the manuscript of the Rusts.

Pucciniaceae

Gymnosporangium globosum Farl.—Greenport on *Crataegus chrysocarpa*.

Kuehneola Uredinis (Lk.) Arth.—On leaves of *Rubus alleghaniensis*.

Phragmidium americanum Diet.—On leaves of *Rosa blanda*.

P. Potentillae-canadensis Diet.—On leaves of *Potentilla canadensis*.

P. Rosae-setigerae Diet.—On leaves of *Rosa carolina*.

Polythelis Thalictri (Chev.) Arth.—On leaves of *Thalictrum revolutum*. (*Puccinia Thalictri* Chev.)

Puccinia Acetosae (Schum.) Körn.—On leaves of *Rumex Acetosella*. Dr. Arthur says, "this rust has been found at Woods Hole, Massachusetts, in South Carolina and Florida. Your locality making the fourth one."

P. angustata Pk.—Southold and Greenport on *Scirpus cyperinus* and *S. pedicillatus*.

P. canaliculata (Schw.) Lagerh.—On *Cyperus esculentus*, the telial stage; determined by Dr. House.

P. Caricis-strictae Diet.—Southold on *Carex stricta*, the amphisporal stage.

P. Cichorii (DC.) Bell—On leaves of *Cichorium Intybus*.

P. Clematidis (DC.) Lagerh.—On leaves of *Agropyron repens* and *Hordeum sativum*. (*Puccinia Agropyri* E. & E.; *P. agropyrina* Erikss.)

P. Convolvuli (Pers.) Cast.—On leaves of *Convolvulus sepium*.

P. Eleocharidis Arth.—On *Eleocharis tenuis*.

P. epiphylla (L.) Wettst.—On *Poa pratensis*. (*Puccinia poarum* Niessl.)

P. extensicola Plowr.—On *Carex hormathodes*, *C. scoparia*, *C. straminea*, *C. vulpinoidea* and *Dulichium arundinaceum*. (*Puccinia Dulichii* Sydow; *P. vulpinoidis* Diet. & Holw.)

P. fraxinata (Lk.) Arth.—On *Spartina patens*. Dr. Arthur says we have this rust "on the same host from Delaware and New Jersey: but not before from any point in New York."

P. Grossulariae (Schum.) Lagerh.—Greenport on *Carex debilis*. (*Puccinia uniporula* Orton.)

P. Impatientis (Schw.) Arth.—Gardiner's Island on *Agrostis alba* and *Elymus striatus*. (*Puccinia perminuta* Arth.)

P. Phlei-pratensis Erikss. & Henn.—On *Phleum pratense*.

P. poculiformis (Jacq.) Wettst.—On *Agrostis alba* and *Dactylis glomerata*.

Puccinia Polygoni-amphibii Pers.—On leaves of *Persicaria pennsylvanica*, *P. punctata*, *Tiniaria scandens* and *Tovara virginiana*.

P. Prenanthis-racemosae Sydow—Greenport on leaves of *Nabalus trifoliolatus*.

P. Proserpinaceae Farl.—Greenport on leaves of *Proserpinaca palustris*. Dr. Arthur says, "known only from Massachusetts, Illinois and Wisconsin."

P. Rhamni (Pers.) Wettst.—On *Avena sativa*.

P. Smilacis Schw.—Southold on *Smilax glauca*.

P. Xanthii Schw.—On *Xanthium commune*.

Uredinopsis mirabilis (Pk.) Magn.—Gardiner's Island on *Onoclea sensibilis*.

Uromyces fallens (Desmaz) Kern—On *Trifolium pratense*. (*Nigredo fallens* (Desmaz.) Arth.)

U. Hyperici-frondosi (Schw.) Arth.—Greenport on *Triadenum virginicum*. (*Nigredo Hyperici-frondosi* (Schw.) Arth.)

U. Junci-effusi Sydow—Greenport on *Juncus effusus*. (*Nigredo Junci-effusi* (Sydow) Arth.)

P. squamosus (Huds.) Fr.—On living trunk of *Salix nigra*, Gardiner's Island.

Polystictus cinnamomeus (Jacq.) Sacc.—Rich soil in oak woods at Greenport.

Poria medulae-panus (Pers.) Fr.—On spruce timber in a cellar.

P. pinea Pk.—On old log of *Pinus Strobus*.

P. radula (Pers.) Fr.—On *Quercus velutina* and rotten wood of *Sassafras Sassafras*.

Agaricaceae

Panus levis Berk.—On oak wood in a shed; determined by Dr. Lloyd, who says, "this is an American plant that is very rarely received by me. The spores of *Panus levis* are 4–6 x 10–12μ and slightly arcuate."

Pleurotus striatulus Fr.—On old wood; determined by Dr. Lloyd.

Gasteromycetes

Catastoma circumscissum (B. & C.) Morg.—Sandy soil in open cedar woods; determined by Dr. Lloyd.

Lycoperdon umbrinum Pers.—Sandy soil in open woods; determined by Dr. Lloyd. (*Lycoperdon glabellum* Pk.)

Sphaerobolus stellatus Tode—On old wood of *Vitis bicolor;* determined by Dr. Fairman.

Lichenes*

Biatora rivulosa (Ach.) Fr.—On bark of oak at Greenport.

B. uliginosa (Schrad.) Fr.—In open places on light bare soil.

Cladonia macilenta styracella (Ach.) Wainio—On old rotten pine log in sandy woods.

C. ochrochlora ceratodes Fkl.—On sandy soil in open woods.

Cyrtidula rhoica Minks—On bark of sumac.

Lecanora (§ *Ochrolechia*) *pallescens* (L.) Schaer.—On bark of large oak trees in woods at Greenport.

Lobularia pulmonaria (L.) Hoffm.—On trunks of trees in woods at Greenport. (*Sticta pulmonaria* (L.) Ach.)

Peltigera polydactyla (Neck.) Hoffm.—About mossy roots of trees in moist woods at Greenport.

P. scutata (Dicks.) Leight.—Mossy banks in woods at Greenport; determined by Miss Mary F. Miller.

Physcia obscura virella (Ach.) Leight.—On bark of oak in woods at Greenport.

Hepaticae†

Asterella tenella (L.) Bv.—On heavy soil along roadside in cedar woods.

Cephalozia fluitans (Nees) Spruce—Southold about base of trees in a sandy swamp; determined by Dr. A. W. Evans.

C. Francisci (Hook.) Dum.—On clean moist sand, at edge of a cranberry bog at the lake on Horton Point, Southold, forming beautiful green carpets 6 x 10 feet; determined by Dr. G. H. Conklin and Dr. Evans. Dr. Conklin says this species "has been found only a few times in North America. This the fourth or fifth

* Unless otherwise stated, the Lichens were determined by Mr. G. K. Merrill, Rockland, Maine.

† Unless otherwise stated, the Hepatics were determined by Dr. G. H. Conklin, Superior, Wisconsin: and are preserved in the Hepatic Herbarium of The Sullivant Moss Society.

time." Dr. Evans in his "Notes on North American Hepaticae. VI" in Bryol. 18: 83. Sept. 1915 says that the geographical distribution of *Cephalozia Francisci* "in North America is so incompletely known that the report of the following new stations seem justifiable." A station on Cape Breton Island, Nova Scotia: and "Southold and Orient Point, Long Island, New York, R. Latham," are reported. "The last two stations which represents a marked extension of the known range to the southward," having been found previously in Maine and New Hampshire," are of especial interest and indicate that the plant ought to be looked for in eastern Connecticut and Rhode Island." This rare hepatic has only been found at Horton Point, Southold: but has never been found at Orient Point, as stated above!

C. macrostachya Kaal.—Southold about base of bushes in a sandy swamp; determined by Dr. Evans.

C. media Lindb.—On old logs in moist woods at Greenport.

Fossombronia foveolata Lindb.—Sandy swamps, Horton Point; and dry soil in cedar woods, Orient, fruiting in November; determined by Dr. Evans and Dr. Conklin.

Lophocolea minor Nees—On a mossy rock in a swamp.

Notothylas orbicularis (Schw.) Sull.—Muddy bottom of a pasture pond at Orient.

Odontoschisma Sphagni (Dicks.) Dumort.—Edge of woodland swamp at Orient; determined by Miss Annie Lorenz.

Pallavicinia Lyellii (Hook.) S. F. Gray—About mossy base of trees in moist woods and swamps, Greenport and Southold.

Pellia Fabroniana Raddi—Edge of stream in woods at Greenport. Dr. Conklin says "this is a rare species."

Riccardia pinguis (L.) S. F. Gray—Among rushes on wet sandy shore of lake at Horton Point: and among grasses in brackish marsh at Orient; determined by Dr. Conklin and Dr. Evans.

Musci

Amblystegium Kochii B. & S.—On old leather and wood in a shady place; determined by Dr. A. J. Grout.

Fissidens minutulus Sull.—Small pieces of sandstone, under a shady bank, edge of lake at Horton Point; determined by Mr. G. B. Kaiser.

Fontinalis dalecarlica B. & S.—Trunks of bushes in wet places; determined by Mr. Kaiser.

Hypnum curvifolium Hedw.—All traces of this moss has disappeared where it was found in December 1909. This species should probably be referred to *Hypnum imponens* Hedw.

Plagiothecium Roeseanum (Hampe) B. & S.—Wet shady place; determined by Dr. Grout.

Pogonatum brevicaule (Brid.) Bv.—Wet stream bank at Greenport; determined by Mr. Kaiser.

Polytrichum commune uliginosum Hueb.—Dry soil at Southold; determined by Mr. Kaiser.

Sphagnum compactum DC.—Sandy bog at Southold; determined by Dr. A. L. Andrews.

S. subsecundum Nees—The form called *S. inundatum* Russ. in a sandy bog at Southold; determined by Dr. Andrews.

Pteridophyta

Polypodiaceae

Dryopteris hexagonoptera (Mx.) C. Chr.—Moist woods, Gardiner's Island.

Lycopodiaceae

Lycopodium adpressum (Chapm.) Lloyd & Underw.—Orient in a brackish meadow; the first club-moss found at Orient. No Lycopodiums have been found on Gardiner's Island.

ANGIOSPERMAE

MONOCOTYLEDONES

Zannichelliaceae

Potamogeton diversifolius Raf.—In the lake on Horton Point.

Zannichellia palustris L.—Shallow brackish stream, Gardiner's Island.

Gramineae

Agrostis alba L.—The var. *aristata* Gray, collected by Mr. Frank Dobbin in woods at Greenport; determined by Mrs. Agnes Chase.

Andropogon virginicus L.—Moist sandy soil, Southold; determined by Mrs. Chase.

Elymus halophilus Bicknell—Salt marshes. The very light glaucous green plants grow in tufts: and are never as tall as the other wild ryes.

E. striatus Willd.—Rocky woods, Gardiner's Island; determined by Mr. Dobbin.

Lolium multiflorum Lam.—Waste and cultivated grounds, rare at Orient; determined by Mrs. Chase.

Panicum flexile (Gattinger) Scribn.—Dry sandy soil, Southold; determined by Mrs. Chase.

P. Lindheimeri Nash—Dry ground, Mattituck; determined by Mrs. Chase.

P. virgatum L.—The var. *cubense* Griseb., collected by Mr. Dobbin at Orient; determined by Mrs. Chase.

Paspalum pubescens Muhl.—Dry pastures and cultivated fields; determined by Mrs. Chase.

Syntherisma sanguinalis (L.) Dulac—Common in cultivated fields and waste places; often known by the name of "Flat-grass."

Cyperaceae

Carex debilis Mx.—Greenport, the host of *Puccinia Grossulariae*.

C. laxiflora Lam.—Woodlands.

Cyperus Grayii Torr.—Abundant on the sands at Horton Point; also in sandy woods at Mattituck. "Orient Point": in the State Herbarium are two specimens collected on Long Island many years ago. "New Jersey is usually given as the northern range of this species." N. Y. State Mus. Bull. 176: 44. 1915.

C. Houghtoni Torr.—The specimens, previously reported from Orient, are probably referable to *Cyperus Grayii* Torr.

Orchidaceae

Blephariglottis psycodes (L.) Rydb.—Rich woods, Gardiner's Island; determined by Mr. Dobbin.

Polygalaceae

Polygala ambigua Nutt.—Dry pastures, Orient and Gardiner's Island.

Elatinaceae

Elatine americana (Pursh) Arn.—Shallow water of lake at Horton Point; determined by Mr. Percy Wilson.

Vacciniaceae

Vaccinium vicinum Bicknell—In woods about a spring, Gardiner's Island, fruiting specimens Aug. 15, 1915. These specimens have been compared with the type in the Herbarium of New York Botanical Garden.

Asclepiadaceae

Asclepias purpurascens L.—Moist place in woods, Gardiner's Island.

Boraginaceae

Lappula virginiana (L.) Greene—Rich woods, Gardiner's Island; determined by Mr. Dobbin.

Myosotis laxa Lehm.—Rare on muddy shores, Gardiner's Island; determined by Mr. Dobbin.

Labiatae

Teucrium littorale Bicknell—Wet woods, shores and salt marshes, Gardiner's Island and Orient.

Solanaceae

Datura Tatula L.—More common at Orient than the white-flowered species, *Datura Stramonium* L., with which *D. Tatula* has been combined; collected by Mr. Dobbin.

Lentibulariaceae

Utricularia geminiscapa Benj.—Shallow water of lake at Horton Point; determined by Dr. J. H. Barnhart. (*Utricularia cleistogama* (Gray) Britton.)

Rubiaceae

Diodia teres Walt.—Moist pasture at Orient.

Ambrosiaceae

Iva frutescens L.—Salt marshes at Orient; determined by Mr. Dobbin.

Compositae

Gnaphalium purpureum L.—Rare in dry woods.

Helianthus decapetalus L.—Moist woods at Orient; leaves a little narrower than usual and in whorls of four below.

Ionactis linariifolius (L.) Greene—Sandy soil on Long Beach, Orient, rare.

Mikania scandens (L.) Willd.—Edge of wet woods, Gardiner's Island; determined in part by Mr. Dobbin.

Solidago speciosa Nutt.—Rare in dry woods at Orient. The specimen had entire leaves with ciliolate margins.

SHORTER NOTES

A METHOD OF OBTAINING ABUNDANT SPORULATION IN CULTURES OF MACROSPORIUM SOLANI E. & M.—During the recent exercises held in connection with the dedication of the completed laboratory building and plant houses of the Brooklyn Botanic Garden the writer reported a method by which abundant sporulation may be obtained in pure cultures of *Macrosporium solani* E. & M. Since the full report will not be published for several months, this abstract of the paper is given.

The method described consists essentially in wounding vigorously growing cultures after they are two or three days old. The fungus is grown in Petri dishes on string bean agar or potato agar. After cultures have made a vigorous growth, the mycelium is wounded by scraping the colonies with a sterile scalpel. Although undisturbed cultures produce few or no spores, those properly wounded fruit profusely. The more thoroughly the wounding is done, the more abundant will be the sporulation in any given culture. Great numbers of conidophores arise from the cells of the radiating mycelial strands which have been injured by the scalpel. Each conidiophore bears a spore at its tip. Many thousands of spores may be obtained from a single culture which has received the wound stimulus. It is thought that this method may be of interest to those who work with other fungi that do not fruit readily on culture media.

L. O. KUNKEL

LAMIUM AMPLEXICAULE IN COLORADO.—I have today (May 4) collected this species in a vacant lot in Boulder. The genus is new to our Colorado list.

T. D. A. COCKERELL

REVIEWS

Fritsch's The Algal Ancestry of the Higher Plants.*

Dr. Fritsch, in his interesting discussion of "The Algal Ancestry of the Higher Plants," gives special attention to trying to corre-

* Fritsch, F. E. The Algal Ancestry of the Higher Plants. The New Phytologist 15: 233–250. *f. 1, 2.* 9 Ja 1917.

late the alternation of generations as now known among the algae with the alternation of generations as exhibited by the Bryophyta and Pteridophyta. Inasmuch as these higher groups have pure green chloroplasts, he, like most other botanical phylogenists, looks for their ancestors among the green algae, and, inasmuch as the spermatozoids in these higher groups are isokontan, he looks for these ancestors more particularly among the isokontan green algae. Though admitting that the so-called sporophytic phase may have arisen in different ways in different groups of plants, he seems inclined, on the whole, to favor the theory that the sporophytic and gametophytic phases are homologous, that is, that they have "arisen by a gradual differentiation from an indifferent generation bearing both asexual and sexual organs" rather than that they are antithetic, that is, "that the sporophyte is a new intercation in the life history, originating by a gradual elaboration of the zygote." Accordingly, with a little bias, perhaps, in favor of the homologous theory, his likely algal ancestor is conceived to display the following tendencies: "Differentiation of prostrate dorsiventral and radial upright systems, assertion of a main axis in the latter, and restriction of sexual organs to the prostrate portion and of asexual organs to the appendages of the upright system." In the genus *Myxonema* (*Stigeoclonium*) of the order Chaetophorales, he finds species with a thallus showing in various degrees a differentiation between a prostrate, attached, dorsiventral portion and an upright, essentially radial, portion. This genus, however, lacks one of the characters of his hypothetical ancestor in that there seems to be no restriction of the gametangia to the prostrate base and of zoösporangia to the erect filaments. But in two or more species of *Trentepohlia* (*Chroolepus*), representing another family of the Chaetophorales, he finds indications of such a segregation of the gametangia and zoösporangia, this segregation being correlated, he thinks, with the terrestrial rather than aquatic habitat of the species of *Trentepohlia*. He notes that in some cases the zoösporangia and gametangia are found on distinct, though similar individuals. "There are thus," he says, "all the necessary indications for the gradual differentia-

somes, would be too improbable and fantastic to consider. The diploid and haploid relation must have arisen in the first instance, it seems fair to say, either through the doubling of the original ancestral number in the fusion of two gametes or through the halving of the original number in sporogenesis. If the diploid condition arose through the fusion of two gametes, then any phase or generation continuing it would be an "antithetic" generation under the definition adopted by Dr. Fritsch. If, on the other hand, the haploid condition first arose through the halving of the original ancestral number, then any phase or generation continuing it would escape technical conformity with the definition of an "antithetic" generation, but would the relations of the two phases be really different? Would not the haploid gametophyte be "intercalated" instead of the diploid sporophyte? Probably Dr. Fritsch and other supporters of the homologous theory would reply that the gametophytic generation would not be in itself a *new* intercalation under these circumstances and that the only new thing about it would be its sudden change from a diploid to a haploid condition owing to a shifting of the reduction in chromosome-number from gametogenesis to sporogenesis. Dr. Fritsch, noting that the reduction in chromosome-number occurs in some algae at gametogenesis, in others at the first division of the fusion nucleus, and in others at sporogenesis, evidently regards this as a cytological character of no particular phylogenetic significance. And with the amount of evidence now at hand it seems just about as difficult to prove him wrong as it would be to prove him right!

The writer of the suggestive paper under consideration regards the origin of the almost wholly dependent sporophyte of the Bryophyta as different from that of the soon independent sporophyte of the Pteridophyta, calling the alternation in the former antithetic and that in the latter homologous or rather "pseudo-homologous"—a conclusion that may impress many of his readers as being somewhat forced in view of the marked morphological and physiological similarities of these two groups of sporophytes in the younger stages of their development.

In the case of the tetraspore-bearing red algae, whose diploid generation consists of two spore-bearing phases, the attached sporogenous filaments of the cystocarp and the free tetrasporic plant, Dr. Fritsch accepts the view of Dr. I. F. Lewis that the first of these represents an intercalated antithetic phase, while the second represents a phase strictly homologous with the sexual plant.

MARSHALL A. HOWE

Hybrid Origin of Oenothera Lamarckiana*

In this paper Davis reaches an approximate conclusion on the old question as to whether *Oenothera Lamarckiana* is of hybrid origin. The parents used were *O. franciscana* from California and *O. biennis* from Holland, which he assumes may have met in England, from where he believes de Vries's *Lamarckiana* came. The form obtained resembles *Lamarckiana* rather closely, but the assumption of the possibility of a cross between species native to regions as far apart as California and Holland makes the hybrid origin of *Lamarckiana* seem less convincing than if the assumed parents were found growing in closer proximity.

Davis calls his form *O. neo-Lamarckiana.* It is now in the fourth generation from the original cross and was derived from a single plant selfed in the F_2. From the "most promising" F_3, 549 offspring lived to be set out into the garden. Of these 198 resembled *Lamarckiana* de Vries, while the other 351 suggested *franciscana.* The author recognizes some variation among the neo-Lamarckiana plants, but he says "the best plants are so close to the *Lamarckiana* of de Vries that I can only distinguish them by small plus or minus expressions of a few characters." Davis does not state whether all the observed variations of his *Oenothera* fall within the range of variability for de Vries's *Lamarckiana.*

Davis tests the breeding behavior of *O. neo-Lamarckiana* with reference to the production of twin-hybrids and the throwing of mutants, which are the most important characters of the true *Lamarckiana.* He obtains twin-hybrids, but it is perhaps not at all established that the twin-hybrids of de Vries or Davis are

* Davis, B. M. Oenothera Neo-Lamarckiana, Hybrid of *O. Franciscana* Bartlett × *O. Biennis* Linnaeus. Am. Naturalist 50, 688–696, 1916.

distinct or easily separable forms and not members of a fluctuating series.

O. Lamarckiana of de Vries has 26–46 per cent. fertile seed and throws only a few mutants. Davis's *neo-Lamarckiana*, on the other hand, was highly fertile (87 per cent.), and gave a large number of "mutants," almost twice as many as plants resembling the parent. Davis believes that the reduction of the fertility of *neo-Lamarckiana* to that of *Lamarckiana* might readily result in the production of fewer mutants, thus paralleling the condition found among the true *Lamarckiana* offspring.

There is, however, no question but that Davis has produced a form which morphologically closely resembles de Vries's *Lamarckiana*.

H. M. Boas

Mechanism of Tumor Growth in Crown Gall*

In attempting to arrive at an explanation of the behavior of the host cells in the formation of crowngall, Smith comes to the conclusion that while the ultimate cause of cell proliferation is the organism *Bacterium tumefaciens*, the proximate cause must be the release within the cells of the host, by the bacterium, of one or more products of its metabolism.

On an artificial medium consisting of agar, water, calcium carbonate, grape sugar and peptone, *Bact. tumefaciens* produces chiefly ammonia and alcohol. With this fact as a clue Smith subjected plants to the action of various ammonia compounds, the chief methods being to inject the hollow stem of the castor bean plant, and young tomato fruits, with variously diluted solutions of the compounds and to expose the leaves of cauliflower plants to the fumes of the ammonia compounds, or to paint the solutions directly on the leaf.

In practically all cases striking proliferations occurred, the internal structure and outward appearance of which was identical with early stages of crown gall as produced by *Bact. tumefaceins*. Subsequent experiments demonstrated that this action is not restricted to ammonia compounds, but that it is characteristic

* Smith, Erwin F. Mechanism of Tumor Growth in Crowngall. Journ. Agric. Research, 8, 165–186 + 62 pls. 1917.

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THE NATIVE PLANT POPULATION OF NORTHERN QUEENS COUNTY, LONG ISLAND

Roland M. Harper

In the January number of Torreya the writer sketched the conditions of vegetation in the unglaciated portion of Kings and Queens Counties, in the western part of Long Island. The present paper deals in a similar manner with an area adjoining that on the north, namely, the glaciated portion of Queens County; and the explanation given in the former paper of the methods of gathering and digesting the facts will not need to be repeated here.

In the glaciated portion of Kings County (Brooklyn) there are now about 40,000 inhabitants per square mile, and consequently no natural vegetation worth mentioning other than small areas of tidal marsh; but in the corresponding portion of Queens, which although a part of New York City since 1898 has not over 5,000 inhabitants per square mile on the average, nearly 10 per cent. of the area, or five or six square miles, is still covered with essentially natural vegetation, which is well worth studying. Almost every remaining patch of forest as much as fifty acres in extent was examined by the writer during the past season, and some in earlier years, beginning about 1907. The statistics of the native plant population given farther on are therefore believed to be reasonably accurate as far as they go.

Geology and soil.—In Long Island City there are a few outcrops of gneiss (which probably once supported some rock-loving plants not found elsewhere on the island). Farther east the formation immediately under the glacial drift is Cretaceous, but it does not appear at the surface within our limits and has no perceptible influence on soil or topography. The surface material is glacial drift many feet thick, composed of clay, sand,

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and boulders of all sizes, the last all of trap, granite, and other non-calcareous metamorphic rocks, such as are found in place on the mainland not far away. Those less than a foot in diameter are pretty well rounded by the action of ice or water during the Glacial Period.

The commonest type of soil is a brown loam plentifully supplied with pebbles and cobbles. It is called "Miami stony loam" in the soil survey of western Long Island published by the U. S. Bureau of Soils in 1905, in which the following physical analysis is given of a sample taken two miles east of Flushing. This represents only the "fine earth," the pebbles exceeding two millimeters in diameter having been sifted out. The figures in the first column indicate the diameters of the soil particles, and the others percentages.

	Soil 0–14 In.	Subsoil 14–36 In.
Gravel, 2–1 mm.	1.72	1.78
Coarse sand, 1–.5 mm.	4.96	5.50
Medium sand, .5–.25 mm.	3.86	4.14
Fine sand, .25–.1 mm.	8.28	8.58
Very fine sand, .1–.05 mm.	20.48	22.90
Silt, .05–.005 mm.	43.36	44.40
Clay, .005–.0001 mm.	17.40	12.70
Organic matter	3.06	1.16
Total	103.12	101.16

The soil and subsoil do not differ much, which probably indicates that the soil has undergone very little weathering since it was deposited by the glaciers. No chemical analyses are available, unfortunately, but the principal minerals in the soil are said to be feldspar, muscovite and biotite mica, hornblende, and quartz. These and the large percentage of silt, clay, and organic matter indicate a soil well above the average in fertility. It is rather impervious to water, as shown by the occurrence of swampy pools near the tops of some of the hills.

Few of the pebbles and smaller boulders appear on the surface in undisturbed areas, probably on account of the activities of earthworms, which abound in this type of soil. The rocks too large to be buried by the worms are not large enough to support any vegetation other than a few mosses and lichens, and the

on the loamy uplands. These are well supplied with humus, and may be designated for brevity rich woods. On the more gravelly soil ("Alton stony loam") the forests are much the same in aspect, but include a few trees rarely seen on the richer soils, such as *Tsuga*, *Quercus coccinea* and *Q. montana*, and the shrubs and herbs differ correspondingly. Wet woods or swamps are quite common, but not extensive. There are a few wet meadows, similar to those so characteristic of New England, which may or may not be natural phenomena.* The salt marshes were almost undisturbed until about a square mile along Flushing Creek was filled in a few years ago, but they seem to present no striking features. Toward the heads of some of the streams emptying into Flushing Bay the salt marshes pass gradually into fresh marshes, with a greater variety of plants, much like the wet meadows above the influence of tide. There are also a few large cat-tail marshes several feet above sea-level and not connected with tidal marshes, and a few small ponds and undrained bogs. The abundant weed vegetation is not considered here, though it presents some interesting problems which may be worth investigating in the near future.

Plant census.—In the following list all the various habitats are combined, but the normal habitat of each species is stated briefly. The species in each structural class are arranged as nearly as possible in order of abundance, as usual, and for the trees the percentages are given to the nearest integer. Species believed to constitute less than half of one per cent. of their class are omitted, as are all bryophytes and thallophytes, for the reasons given in the paper on southern Kings and Queens Counties in the January number.

TREES

14 *Quercus velutina*	Uplands
11 *Castanea dentata*†	Uplands

* See Torreya 16: 269–270 (footnote). 1917.

† Since 1906 the chestnut has been dying from canker (*Endothia parasitica*), and there are now comparatively few living trees and no sound ones; but it has been counted here as it was in 1905. If it fails to survive the epidemic the percentages of the other trees will be increased proportionately.

11	*Betula lenta*	Rich woods
9	*Acer rubrum*	Uplands and swamps
9	*Quercus alba*	Uplands
7	*Fagus grandifolia*	Gravelly soils mostly
7	*Hicoria spp.**	Uplands
6	*Liriodendron Tulipifera*	Rich woods
5	*Liquidambar Styraciflua*	Rich woods
4	*Quercus borealis maxima*†	Uplands
3	*Quercus palustris*	Swamps mostly
2	*Ulmus Americana?*	Rich woods
2	*Prunus serotina*	Uplands
1	*Nyssa sylvatica*	Swamps mostly
1	*Tsuga canadensis*	Gravelly woods
1	*Fraxinus americana*	Rich woods
1	*Quercus bicolor*	Swamps mostly
1	*Juglans cinerea*	Rich woods, eastern portion

Small Trees

Cornus florida	Uplands
Betula populifolia	Various habitats
Viburnum prunifolium	Rich woods mostly
Sassafras variifolium	Rich woods, etc.
Carpinus caroliniana	Rich or damp woods
Ostrya virginiana	Rich woods

Woody Vines

Rhus radicans	Various habitats
Parthenocissus quinquefolia	Rich woods mostly
Vitis aestivalis	Rich woods
Smilax rotundifolia	Rich woods, etc.
Celastrus scandens	Rich woods, etc.
Rubus hispidus	Damp woods

Shrubs

Rubus nigrobaccus?	Rich woods
Decodon verticillatus	Peat bogs
Viburnum acerifolium	Rich woods, etc.
Benzoin aestivale	Damp woods mostly
Sambucus canadensis	Damp woods mostly

* Most of the hickories seem to be *H. alba*, but there are two or three other species which the writer has not yet identified satisfactorily. They are all lumped together here, but if they were separated they would of course come lower down in the list.

† This combination was made by Sargent and Ashe almost simultaneously, about the middle of March, 1916 (Rhodora 18: 48; Proc. Soc. Am. Foresters 11: 90), as a new name for the common eastern tree which had long passed for *Quercus rubra* L. In this latitude it is not always easy to distinguish from *Q. velutina*, and further investigations may modify their percentages.

Viburnum dentatum	Rich woods and swamps
Clethra alnifolia	Swamps and bogs
Rubus occidentalis	Rich woods
Vaccinium corymbosum	Swamps
Cephalanthus occidentalis	Around ponds, etc.
Azalea viscosa	Swamps and bogs
Corylus americana	Dry woods
Vaccinium vacillans?	Gravelly woods
Rhus Vernix	Swamps
Cornus alternifolia	Rich woods
Alnus rugosa	Wet meadows, etc.
Iva oraria	Salt marshes
Leucothoe racemosa	Swamps and bogs

(and about 20 others)

HERBS

Aster divaricatus	Rich woods mostly
Washingtonia longistylis	Rich woods
Vagnera racemosa	Rich woods
Typha angustifolia	Fresh and brackish marshes
Falcata comosa	Rich or damp woods
Solidago caesia	Rich or dry woods
Arisaema triphyllum	Rich or damp woods
Impatiens biflora	Damp woods mostly
Lysimachia quadrifolia	Dry woods mostly
Typha latifolia	Fresh and brackish marshes
Geranium maculatum	Rich woods
Circaea latifolia	Rich woods
Collinsonia canadensis	Rich woods
Scirpus americanus	Brackish marshes
*Eupatorium purpureum?**	Rich woods, etc.
Phragmites communis	Fresh and brackish marshes
Tovara virginiana	Rich woods mostly
Potentilla canadensis?	Dry woods, etc.
Lemna minor	Fresh marshes
Unifolium canadense	Rich or damp woods
Dryopteris noveboracensis	Rich or damp woods
Spartina patens	Salt marshes
Juncoides campestre	Rich or dry woods
Onoclea sensibilis	Rich or damp woods
Asplenium Filix-foemina	Rich or damp woods
Polygonatum biflorum	Rich woods
Carex Pennsylvanica	Dry woods
Dryopteris Thelypteris	Fresh marshes, etc.
Spathyema foetida	Swamps
Carex rosea	Rich woods

* The tall purple-flowered *Eupatorium* in rich woods may not be the same species as the one in wet meadows.

up only an insignificant part of the total stand of timber, certainly less than 1 per cent. About 15 per cent. of the shrubs belong to the Ericaceae and allied families. The only leguminous plant abundant enough to be listed among the first 75 native herbs is *Falcata comosa*, which constitutes about 4 per cent. of the total herbage outside of the marshes. (The next in abundance seems to be *Meibomia nudiflora*, which would come about 100th on the list.) The scarcity of members of this family is probably due to the aversion of most of them to humus.*

Cornus florida is evidently numerically the most abundant tree, but it constitutes probably not more than 5 per cent. of the total bulk of the forest, on account of its small size. It is about five times as abundant as its nearest competitor among the small trees. It would probably be hard to find a region of equal size where *Betula lenta* is more abundant than it is here. And it is interesting to find *Liquidambar* making up about 5 per cent. of the total forest here within a few miles of its northern limit.† The same might be said of *Liriodendron*, except that that ranges about 100 miles farther north.

Although no figures are given here for the vines and shrubs, the two commonest vines are just about as abundant as the two commonest shrubs. The abundance of vines indicates the infrequency of fire, for as far as known to the writer all woody vines are sensitive to fire.‡ The same thing is indicated by the presence of several ferns,§ and the abundance of herbs with fleshy or barbed fruits, such as *Vagnera, Arisaema, Unifolium, Polygonatum, Smilax, Allium, Washingtonia, Circaea, Deringa, Geum*, and *Galium*.|| For such fruits normally remain on the

* See Rep. Fla. Geol. Surv. **6**: 177, 238, 301, 319, 1914; **7**: 138–139, 174, 180. 1915.

† In Mississippi, which probably has more *Liquidambar* than any other state, it makes up only about 9 per cent. of the present forest of the state, according to the writer's (unpublished) estimates.

‡ See Rep. Fla. Geol. Surv. **6**: 227, 287, 318. 1914; **7**: 167, 174, 176. 1915.

§ See Am. Fern Jour. 6: 76 (footnote). Sept. 1916.

|| For notes on the occurrence of fleshy and barbed fruits, but without special reference to fire, see Davis, Rep. Mich. Geol. Surv. **1906**: 165. 1907; Warming, Oecology of Plants 88, 312. 1909; Harper, Bull. Torrey Club **31**: 16. 1904; Ann. N. Y. Acad. Sci. **17**: 49, 54, 61, 88, 101, 105. 1906. The comparative scarcity of such fruits in prairies and pine-barrens, which are burned over every few years, is quite noticeable.

plant for several months, and a fire in fall or early winter would be disastrous to them. (It is not claimed that fire is unknown in this region, however. Evidences of it may be seen in many places in the woods, but it probably does not occur often enough in any one spot to have any lasting effect on the vegetation.)

Comparisons with other regions.—The following species are evidently more abundant here than in the unglaciated portion of Queens County on the south and the glaciated portion of Nassau on the east, both of which have poorer soils:—TREES: *Liriodendron, Liquidambar, Ulmus, Quercus bicolor.* SMALL TREES: *Viburnum prunifolium, Carpinus.* VINES: *Rhus radicans, Celastrus.* SHRUBS: *Rubus nigrobaccus?, Decodon, Viburnum dentatum, Sambucus, Benzoin, Rubus occidentalis.* HERBS: *Aster divaricatus, Geranium, Washingtonia longistylis, Arisaema, Falcata, Carex rosea, Washingtonia Claytoni, Tovara, Allium, Circaea, Dryopteris Noveboracensis, Juncoides campestre.*

An investigation of what species are less abundant here than elsewhere brings out some interesting facts. The plants listed below are fairly common in some places within 100 miles of here, either on Long Island or on the mainland, or both, but comparatively rare or wanting in the area under consideration. Where the name of a genus (or family) stands alone it means that several or all of the northeastern species (in some cases there is only one in the northeastern flora) are found not far away, but none are common here. Where the generic name is followed by 'spp.' it means that some of the species are common elsewhere and rare here, but there may be one or more common here too. Where such genera have been subdivided lately (*e. g., Andropogon, Clematis, Saxifraga, Prunus, Linum, Cornus, Gentiana*) the names are here used in the older and broader sense, unless some particular segregate or species is designated. If space permitted one might go through a manual, or Taylor's recent Flora of the vicinity of New York, and pick out many additional species which from the published statements about their ranges might be expected to be common here but are not. Of course native plants only are considered. In this list the names of evergreens only are in italics, and of families in small capitals.

TREES: *Pinus, Tsuga, Juniperus, Chamaecyparis,* Populus, Salix, Ostrya, Hicoria ovata, Betula Alleghenienesis, B. lutea, Quercus coccinea, Q. Marylandica, Q. montana, Q. stellata, Ulmus, Morus, Platanus, Crataegus, Acer Saccharum, A. saccharinum, Tilia, Diospyros, Fraxinus spp.

SHRUBS AND VINES: *Juniperus communis depressa,* Smilax glauca, Salix spp., Myrica, Comptonia, Corylus, Quercus ilicifolia, Q. prinoides, Hamamelis, Ribes, Spiraea, Prunus maritima and others, Amelanchier, Crataegus, Ceanothus, Azalea nudiflora, *Kalmia, Chamaedaphne,* Pieris Mariana, *Arctostaphylos,* Gaylussacia, Polycodium, Vaccinium spp., Rhus hirta, R. copallina, *Ilex glabra,* Nemopanthes, Dirca, Viburnum Lentago, V. cassinoides, Lonicera, Diervilla, Baccharis.

HERBS: Botrychium, Dennstaedtia, *Dryopteris* spp., Anchistea, Lorinseria, *Asplenium platyneuron,* Pteridium, *Polypodium,* Equisetum spp., *Lycopodium, Selaginella, Isoetes;* Potamogeton, Triglochin, Vallisneria, Andropogon, Sorghastrum, Paspalum, Aristida, Muhlenbergia, Brachyelytrum, Sporobolus, Calamagrostis, Deschampsia, Eragrostis, Elymus, Cyperus, Eleocharis spp., Scirpus spp., Rhynchospora, Carex spp., Spirodela, Xyris, Pontederia, Juncus spp., MELANTHACEAE, Lilium, Erythronium, Aletris, Vagnera stellata, Trillium, Iris, ORCHIDACEAE; Saururus, Urticastrum, Boehmeria, Comandra, Asarum, Persicaria, Polygonella, Claytonia, Silene, Brasenia, Castalia, Caltha, Aquilegia, Anemone, *Hepatica,* Clematis, Ranunculus, Podophyllum, Sanguinaria, Bicuculla, Capnoides, CRUCIFERAE, *Sarracenia,* Drosera, Parnassia, Chrysosplenium, Heuchera, Tiarella, Saxifraga, Sanguisorba, LEGUMINOSAE, Geranium Robertianum, Linum, Polygala, EUPHORBIACEAE, Hypericum, CISTACEAE, Viola pedata and several others, *Opuntia,* Rhexia, Kneiffia, Proserpinaca, Myriophyllum, Aralia, Panax, Hydrocotyle, Zizia Oxypolis, *Pyrola, Chimaphila,* Monotropa, Hypopitys, *Epigaea, Gaultheria,* Trientalis, Limonium, Sabbatia, Gentiana, Bartonia, Apocynum, Asclepias, Acerates, Ipomoea, LABIATAE, Chelone, Mimulus, Gratiola, Ilysanthes, Veronica, Leptandra, Aureolaria, Agalinis, Melampyrum, LENTIBULARIACEAE, Plantago (native species), Houstonia, *Mitchella,* Triosteum, Campanula, Lobelia, Eupatorium spp., Laciniaria, Chrysopsis, Solidago spp., Sericocarpus, Aster spp., Erigeron pulchellus, Doellingeria, Ionactis, *Antennaria* (except A. neglecta), Rudbeckia, Helianthus, Hieracium spp.

The scarcity of many of these is easily explained by the rarity or absence of fire, rivers, ponds, peat bogs, dunes, rock outcrops, and sandy, calcareous, and alluvial soils; but some of the cases are still mysteries. Quite a number of the absentees are in the neighborhood of New York chiefly confined to mountainous regions, but range southward to Middle Georgia or thereabouts, so that it can hardly be any temperature factor that keeps them away from Long Island.

The species of *Crataegus* seem to be most numerous in calcareous regions, but there are many non-calciphile species in the genus, which one might suppose could find a congenial home here. But many of the recently described species are known

this region, as already stated. And *Vagnera*, *Arisaema* and *Geranium* seem to be holding their own very well.

Of course it might be said that the absence of any given species from such a small and long-settled region, with only five or six square miles of natural vegetation left, has no particular significance. But many of the species which are scarce here are equally scarce in much larger areas in the same latitude, and probably for the same reasons.

College Point, L. I.

NOTES REGARDING VARIABILITY OF THE ROSE MALLOWS

A. B. Stout

The swamp rose mallows usually classed as *Hibiscus Moscheutos* grow in abundance along the coastal region of the eastern United States, extending inland in somewhat scattered stations to Missouri. The tall vigorous growth of the plant with the production of numerous, large, gayly colored and conspicuous flowers makes it a noticeable and popularly well-known feature of the vegetation.

In regard to numbers, what may perhaps be considered as a climax development for the species is seen in marshes along the coast of southern New Jersey, especially in the vicinity of Sea Side. Here, a casual survey of the population of mallows will reveal marked variations. Especially is this the case in color of flowers which may range from white to a rather solid intense red with numerous grades of intermediate pinks and with various types of eye coloration combined variously with blade colors. One feature of this variation was recognized in the proposal of a new species by Britton (1903) which was named *Hibiscus oculiroseus*, and by the observation that hybridization between this and the ordinary pink-flowered form of *H. Moscheutos* results in an F_1 hybrid generation that is intermediate and which is of a form frequently seen in nature.

In 1912, at the suggestion of Dr. N. L. Britton, the writer began breeding experiments to determine various points regarding the polymorphism observed in *Hibiscus*. Living plants were obtained of various forms found in nature. Self-fertilized progenies were grown to determine what forms breed true, and cross-pollinations were made between various forms and between various well recognized species in the attempt to reveal clews as to their relationship and to the variability that may arise in nature by natural crossing.

These experiments have been prosecuted somewhat vigorously and as extensively as space in the experimental plots at the New York Botanical Garden would allow. The studies have revealed several facts that admit of a preliminary report at this time which may be of use to various observers in the field. The writer wishes to obtain as full information as possible regarding the regional and geographic variability of the species of *Hibiscus* growing in the eastern United States, especially of the two species *H. Moscheutos* and *H. oculiroseus*. Herbarium specimens are not very satisfactory for the identification of flower color, hence observations on this point should be made on living plants. In correspondence with persons who have very kindly made field observations for the writer, it had been a source of difficulty that there are no standard descriptions of forms. It is hoped that the following descriptions will be of use in this particular. More complete taxonomic descriptions of any that may be found to be species are reserved until later.

Hibiscus Moscheutos

The description of the general characteristics of this species may be given as presented in the second edition of the Illustrated Flora of the northern United States and Canada, by Britton and Brown.

"Erect, 4°–7° high, forming numerous cane-like stems from a perennial root. Leaves ovate or ovate-lanceolate, 3′–7′ long, cordate or obtuse at the base, acute or acuminate at the apex, the lower or sometimes all lobed at the middle, palmately veined, dentate or crenate, densely white stellate-pubescent beneath, green and glabrous or slightly stellate above; petioles 1′–5′ long; flowers 4′–7′ broad, pink, clustered on stout pedicels at the summits of the stems; peduncles often adnate to the petioles;

bractlets linear, not ciliate, shorter than the calyx; calyx-lobes ovate; capsule ovoid, 1′ long, glabrous or sparingly pubescent, abruptly short-pointed or blunt; seeds glabrous."

At the present time the cultures of *Hibiscus Moscheutos* grown at the New York Botanical Garden include several races which appear to breed true and which are sufficiently distinct to be readily identified. Unless specifically mentioned the characters agree closely with those of the species as described above. The color determinations were made with the aid of Ridgway's Color Standards and Nomenclature.

Race 1.—No red in foliage. Corolla-blades amaranth pink, except for an almost pure white area of a radius of about three eighths of an inch at base surrounding stamen column. Stamens of nearly equal length, those at base of column only slightly shorter. Pollen yellow. Stigmatic lobes broad. Pods blunt. The general character of this race is shown in the colored plate presented in the *National Geographic Magazine* **39**: 597 and which, as it now seems, may be taken as a biological type of the species.

Race 2.—Like race 1, but with darker shade of coloration in petals.

Race 3.—Like race 1, but decidedly paler, the color being noticeable but of a very pale diffuse pink.

Race 4.—Like race 1, but with the white of the center extending out along the main veins nearly to the tips of the corolla-lobes in radiating streaks.

Race 5.—An *alba* form, nearly pure white; faintest suggestion of pink coloration in buds and occasionally in flowers. Pollen almost white, noticeably less yellow than in races 1–4.

Race 6.—An eyed form: Tyrian rose at base of petals for radius of about half an inch, the color extending out in veins into the blades which are chiefly a dead white. Pollen white. Considerable red pigmentation in stems and in the petioles, and veins of the leaves.

Race 7.—Red coloration decided in stems and in the petioles and veins of the leaves. Corolla fully colored, amaranth pink at tips of lobes, the color gradually becoming more intense until

of the pod. The color of the corolla-blades is a sea-foam yellow rather than white, and the eye is of Tyrian rose, which is a rather intense shade of red. There are further distinguishing characters in the small stigmatic lobes, which here are scarcely expanded ends of the divisions, and in the light yellow or almost white color of the pollen. There is also a considerable difference in the length of the various stamens, those at the base of the stamen-ring having shorter filaments, and there is considerable red in stems and foliage quite as in Races 6 and 7 of *Hibiscus Moscheutos* described above.

Some lines of descent have bred remarkably true to the above mentioned characters, but others have shown considerable variation in the color of the flowers, the tendency seeming to be toward decreased intensity of the eye area and to the development of pale diffuse colors in the blade. Theie has also been a pronounced tendency toward dwarfness, as has been discussed by the writer (Stout, 1915).

HYBRIDS BETWEEN *H. oculiroseus* AND *H. Moscheutos*.

Britton and Brown (1913) recognize a hybrid between these two species and note that it is intermediate in flower character. The writer has produced these hybrids in pedigreed cultures from seed obtained by controlled pollinations. The F_1 hybrids between the typical *oculiroseus* and *Moscheutos* (Races 1, 2 and 3) have flowers with an eye of less intense color than has *H. oculiroseus* combined with a pale pink blade. The stigmas, stamens and pod characters are rather intermediate. It may be noted that the beautifully colored illustration given in *Flore des Serres*, vol. 12, Plates 1233–1234, 1857, and there identified as *Hibiscus Moscheutos* is an exact representation of the F_1 hybrids of this cross. The F_2 generation breaks up into almost every conceivable grade of variation in regard to eye and blade colorations and to characteristics of stigma, stamens and pods.

F_1 plants of the cross between *H. oculiroseus* and *H. Moscheutos*, Race 5, are at first sight quite readily taken for *H. oculiroseus*, but a more careful examination shows that the eye is paler and the blades are dead white instead of pale sea-foam yellow. Plants of the F_2 generation of this cross have not yet bloomed.

The results obtained in pedigreed cultures indicate that various races exist within the species of *H. Moscheutos* and that hybridization among these and *H. oculiroseus* will result in increased variability.

There is considerable literature (no attempt will be made here to summarize the literature) which indicates that there is more or less marked geographic limitations or even isolation of various races and that other races than those here mentioned may exist. Thus the variability may be quite different at various stations throughout the range.

Very little is known regarding the range of *Hibiscus oculiroseus*. In some localities plants resembling this species seem to predominate. Rev. J. P. Otis (personal correspondence) finds this to be the case near Marshallton, Delaware. However, flowers of nine plants which he sent to the writer showed that none of these conformed to the type of the species: the eye was much paler and the corolla-blades were either of pinkish tinge or were white instead of sea-foam yellow. Although there are many plants somewhat resembling *H. oculiroseus* to be found along the coast southward from New York City, none that the writer has yet seen have agreed with the type of the species grown at the New York Botanical Garden.

With the exception of Race 7, all the races of *H. Moscheutos* thus far tested hybridize readily with *H. militaris* giving highly fertile F_1 progeny. The latter species is decidedly distinct from either *H. Moscheutos* or *H. oculiroseus* and has a range that is more exclusively inland. It would seem, however, that in many localities both *H. Moscheutos* and *H. militaris* are to be found and that in such regions natural hybridization may occur producing much variability. Dr. O. E. Jennings has informed the writer, in a letter, that the form of *H. Moscheutos* which grows at Presque Isle, Lake Erie, has prevailingly three-lobed leaves. Evidently the shape of the leaves is somewhat like that seen in *H. militaris*, a condition which has not been seen in any of the races of Moscheutos that the writer has seen along the coast.

It will greatly facilitate the writer's efforts to make a field survey of the rose mallows if persons who have opportunity will report observations on the characteristics and relative abundance of the particular form or forms that they find at various stations. The writer will be pleased to receive fresh leaves and flowers for comparison with the species and races now growing at the New York Botanical Garden. If branches with flower buds are cut a day before the flowers are to open, slightly dampened with water, and immediately wrapped in paper and enclosed in a pasteboard box, they will keep in rather good condition for several days. Herbarium specimens may be made and while not revealing much regarding flower colors these are excellent for a study of leaf and pod characters.

It is also planned to extend the cultures at the New York Botanical Garden to include as many as possible of the different races or species found in nature. Plants can be transplanted at, or soon after, the close of the flowering period; the stems can be cut away, most of the dirt shaken from the roots, and the plant wrapped in paper to prevent drying out and shipped as soon as is convenient. A large majority of plants thus treated have lived when transplanted to the experimental plots. If possible, however, three plants of a particular form should be sent to insure against possible death of some.

The writer will fully appreciate any cooperation which will facilitate the study of these interesting and variable species.

New York Botanical Garden

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AN EXCURSION TO DELAWARE WATER GAP

William A. Murrill

The Decoration Day Excursion of the Torrey Botanical Club, led by Mr. Percy Wilson, was made to Delaware Water Gap, Pennsylvania, May 29–31. Eleven persons participated in this

4 rather interesting slime-molds. Of the fungi, 22 were gill fungi, 29 were polypores and their relatives, 11 were ascomycetes and their relatives, and 17 were rusts. Only one puffball was found and it was left over from last season.

Ideal weather and a party of varied botanical interests made the excursion a great success. Mr. Wilson is preparing a list of the flowering plants collected and Mr. Beal has promised to list the mosses. The fungi are already listed and may be published later.

Trees in Island Park

Alder
White Ash
Aspen
Black Birch
Butternut
Wild Black Cherry
Chestnut
American Elm
Slippery Elm
Hackberry
Pignut Hickory
American Linden
Black Locust
Silver Maple
Sugar Maple
Plane-tree
Sassafras
Staghorn Sumac
Tulip tree
Black Walnut
Bay-leaved Willow

The Torrey Botanical Club

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OFFICIAL ORGAN OF THE WILD FLOWER PRESERVATION SOCIETY OF AMERICA

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NORMAN TAYLOR

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THE INTRODUCTION OF FOREIGN WEEDS IN BALLAST AS ILLUSTRATED BY BALLAST-PLANTS AT LINNTON, OREGON

By J. C. Nelson

One of the striking features of the flora of that part of Oregon lying west of the Cascade Mountains is the very large proportion of introduced plants which have become fully established. Many foreign plants which are common in the Eastern States, but which disappear wholly or largely in the Central States and the Great Plains, reappear on the Pacific coast. The high humidity and mild winters of this region afford exceptionally favorable conditions for the propagation of these immigrants, and make it difficult to eradicate them when once established. The similarity of climatic conditions to those of Western Europe has enabled a very large number of plants indigenous to that region to obtain a foothold in western Oregon. Mr. John Burroughs has called attention to the surprising tenacity of the plants and animals of the British Isles when forced to struggle for existence with our native species. Unfortunately the plants which tend to survive in this contest are most often those which are not only of no value, but are a positive menace to the farmer and stockman. The vilest and most obnoxious weeds seem specially favored in the struggle, and spread with such surprising facility that under the prevailing methods of cultivation it is impossible to make head against them.

The precise agency by which these foreign plants are first introduced cannot usually be determined with any certainty. They are often encountered for the first time in regions remote

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from the ordinary routes of travel, and are mistaken by the collector for genuine indigenes. From these original stations they have spread with such rapidity that it has been very difficult for the few collectors scattered over this vast area to keep pace with them. I hope at some future time to present a somewhat exhaustive study of these introduced members of the flora of Oregon. In the present paper I desire to confine myself to calling attention to one of the "ports of entry" for these immigrants, and to show in what numbers they are finding lodgment on our soil at that point.

Every student of plant-life who has collected near the coast has observed what a prolific field for the introduction of new species is afforded by the heaps of ballast-material that are found in the neighborhood of the larger seaports. For one season at least, species from all parts of the world are mingled in wild confusion. Those indigenous to the tropics usually do not survive their first winter, and many others are mere waifs, appearing perhaps in considerable abundance for a single season, but disappearing entirely after their first flowering. Many others, however, more tenacious of life, or with vegetative organs better adapted to the struggle with new and adverse conditions, become fully established, and from the original point of introduction rapidly distribute themselves to all parts of the neighboring region. Several distributing points of this sort occur about the ports of the Pacific coast; and it has been my good fortune during the past two seasons to study one of the most interesting of these ballast-grounds. Lying along the left bank of the Willamette River at Linnton, seven miles from the heart of the city of Portland, and covering an area of some 40,000 square yards between the river and the tracks of the North Bank Railroad, is an old ballast-dump, now little used, that has remained undisturbed long enough to become covered with a dense growth of vegetation, nearly all of which is foreign, though near the edges a few native species have gained a footing. Many different "strata" of ballast can still be traced, and each has its own characteristic flora, though the more vigorous species have spread indiscriminately over the entire area. Much of

including every species collected on the Linnton area that was capable of determination, I have tried to follow as far as possible the order of families and genera as accepted in Gray's Manual, and to use the nomenclature of the Vienna Code. The list may be divided into three groups: (1) those that are indigenous to the Pacific coast, and which have probably invaded the ballast-ground from the surrounding territory, although in the case of a few of them I strongly suspect they were brought in in ballast; (2) those that, although introduced, are found elsewhere in Oregon. Whether these were originally brought to Linnton in ballast, or found their way in from the surrounding neighborhood, cannot in most cases be determined with any certainty; (3) those that I have found only on the Linnton area. Some of this last group will probably be transferred to group (2) by other collectors; but as far as my own experience goes, I have not found them at any other station. A few species that on account of the immaturity of the specimens could not be determined with any certainty are added at the end.

Group 1. Species Indigenous on the Pacific Coast

1. *Pteris aquilina* L., var. *pubescens* Clute. Our commonest fern—locally a bad weed.
2. *Equisetum arvense* L. Common throughout.
3. *Phalaris arundinacea* L. Not common in the Willamette Valley.
4. *Alopecurus aristulatus* Michx. Not uncommon in wet places.
5. *Agrostis alba* L., var. *maritima* (Lam.) Mey. Common along the coast.
6. *Deschampsia elongata* (Hook.) Munro. Very common.
7. *Distichlis spicata* (L.) Greene. Common along the coast.
8. *Poa Sandbergii* Vasey. It is hard to explain the presence of this species.
9. *Poa triflora* Gilib. As far as the Pacific coast is concerned, I suspect this should be regarded as introduced.
10. *Festuca megalura* Nutt. Very common—appears as if introduced.
11. *Festuca rubra* L. Perhaps introduced here, but undoubtedly indigenous in many places.
12. *Bromus carinatus* Hook. & Arn. Abundant.
13. *Hordeum jubatum* L. Probably introduced, but indigenous in other localities.
14. *Elymus glaucus* Buckl. Very common.
15. *Rumex occidentalis* Wats. Common near the coast.
16. *Spergularia rubra* (L.) J. & C. Presl.
17. *Spergularia marina* (L.) Griseb. Both perhaps introduced.
18. *Eschscholzia californica* Cham. Very common.
19. *Lepidium apetalum* Willd. Common in the interior.
20. *Rubus macropetalus* Dougl. An evident invasion from the neighborhood.

21. *Acer macrophyllum* Pursh. Not mature.
22. *Epilobium adenocaulon* Haussk. Very common.
23. *Epilobium angustifolium* L. Very common.
24. *Gilia capitata* Hook. Very common.
25. *Symphoricarpos albus* L. Blake. Common in wooded districts.
26. *Solidago lepida* DC. Indigenous northward.
27. *Aster Douglasii* Lindl. Abundant.
28. *Anaphalis margaritacea* (L.) Benth. & Hook. Abundant.
29. *Gnaphalium purpureum* L. Occasional in low ground.
30. *Franseria bipinnatifida* Nutt. Common along the coast.
31. *Artemisia Tilesii* Ledeb. Indigenous northward and in the mountains.
32. *Hieracium canadense* Michx. Very rare.

GROUP 2. INTRODUCED SPECIES OCCURRING ELSEWHERE IN OREGON

33. *Digitaria sanguinalis* (L.) Scop. Beginning to appear in lawns.
34. *Phleum pratense* L. A common escape.
35. *Agrostis alba* L. Very common.
36. *Polypogon monspeliensis* (L.) Desf. Not infrequent.
37. *Holcus lanatus* L. One of our commonest grasses.
38. *Avena sativa* L. A common escape.
39. *Cynodon Dactylon* L. Scarce; rarely flowers in other localities.
40. *Dactylis glomerata* L. Very common.
41. *Poa annua* L. Abundant on lawns and in waste places.
42. *Poa compressa* L. Common in dry soil.
43. *Poa pratensis* L. A common escape.
44. *Bromus hordeaceus* L. Very common.
45. *Bromus marginatus* Nees. Perhaps the same as No. 12.
46. *Bromus rubens* L. Rare in waste places.
47. *Bromus secalinus* L. Very common.
48. *Bromus tectorum* L. Rare in waste places.
49. *Bromus villosus* Forsk. Not infrequent.
50. *Lolium multiflorum* Lam. Very common.
51. *Lolium perenne* L. With the last, and equally common.
52. *Hordeum murinum* L. Very common about towns.
53. *Triticum vulgare* L. A common escape.
54. *Asparagus officinalis* L. Rather infrequent.
55. *Rumex Acetosella* L. Very abundant—a pernicious weed.
56. *Rumex conglomeratus* Murr. Infrequent.
57. *Rumex crispus* L. Abundant.
58. *Rumex obtusifolius* L. Common about dwellings.
59. *Polygonum aviculare* L. Abundant in door-yards, etc.
60. *Polygonum Convolvulus* L. Common in cultivated ground.
61. *Polygonum Hydropiper* L. Common in low ground.
62. *Polygonum Persicaria* L. Abundant.
63. *Chenopodium album* L. A troublesome garden weed.
64. *Chenopodium ambrosioides* L. Occasional on sand-bars along the Willamette.
65. *Salsola Kali* L., var. *tenuifolia* Mey. Beginning to appear in waste ground.
66. *Spergula arvensis* L. Common in cultivated ground.

67. *Stellaria media* L. Abundant.
68. *Cerastium viscosum* L. Common in cultivated ground.
69. *Saponaria Vaccaria* L. Rare in waste places.
70. *Ranunculus repens* L. Occasional in lawns and meadows.
71. *Lepidium perfoliatum* L. Beginning to appear in waste places.
72. *Capsella Bursa-pastoris* (L.) Medic. Abundant everywhere.
73. *Raphanus sativus* L. A common escape.
74. *Brassica arvensis* (L.) Ktze. Common.
75. *Brassica campestris* L. Common.
76. *Sisymbrium altissimum* L. Becoming common.
77. *Pyrus Malus* L. A frequent escape.
78. *Rosa rubiginosa* L. Very common.
79. *Prunus Persica* (L.) Stokes. An occasional escape.
80. *Ulex europaeus* L. Rare elsewhere.
81. *Trifolium hybridum* L. A frequent escape.
82. *Trifolium pratense* L. Very common.
83. *Trifolium procumbens* L. Occasional in waste places.
84. *Trifolium repens* L. Abundant.
85. *Melilotus alba* Desr. Common on roadsides.
86. *Melilotus officinalis* (L.) Lam. Infrequent in waste places.
87. *Medicago hispida* Gaertn. Common in waste places.
88. *Medicago sativa* L. A common escape.
89. *Erodium cicutarium* (L.) L'Her. Abundant in fields.
90. *Hypericum perforatum* L. One of our worst weeds.
91. *Conium maculatum* L. Occasional about towns.
92. *Foeniculum vulgare* Hill. Abundant about Salem.
93. *Anagallis arvensis* L. Occasional in cultivated ground.
94. *Convolvulus arvensis* L. Common along railroad tracks.
95. *Marrubium vulgare* L. Not uncommon in waste places.
96. *Melissa officinalis* L. Abundant about towns.
97. *Solanum nigrum* L., var. *villosum* L. Beginning to appear on sandbars along the Willamette River.
98. *Verbascum Thapsus* L. Common in dry soil.
99. *Verbascum Blattaria* L. Commoner than the last.
100. *Linaria vulgaris* Hill. Infrequent.
101. *Plantago lanceolata* L. One of our commonest weeds.
102. *Plantago major* L. Very common.
103. *Erigeron canadensis* L. Common.
104. *Achillea Millefolium* L. Very common.
105. *Anthemis arvensis* L. Infrequent.
106. *Matricaria suaveolens* (Pursh) Buch. Abundant in waste places.
107. *Chrysanthemum Leucanthemum* L. var. *pinnatifidum* Lecoq. & Lamotte. Common in meadows.
108. *Tanacetum vulgare* L. An occasional escape.
109. *Senecio sylvaticus* L. Becoming common, especially near the coast.
110. *Arctium minus* Bernh. An abundant and pernicious weed.
111. *Cirsium arvense* (L.) Scop. Too common. A vile weed.
112. *Cirsium lanceolatum* (L.) Hill. Very common.
113. *Centaurea melitensis* L. Common in southern Oregon.

151. *Rumex cuneifolius* Campd. A Patagonian species—probably its first occurrence in the United States.
152. *Roubieva multifida* Moq. Not before reported from Oregon.
153. *Chenopodium murale* L. Said to occur along the Columbia River.
154. *Atriplex patula* L., var. *hastata* (L.) Gray. Said to occur in the interior.
155. *Spinacia oleracea* Mill. Common in cultivation.
156. *Amaranthus gracilis* Desf. A tropical species, not before reported from Oregon.
157. *Tetragonia expansa* Murr. Probably introduced from China.
158. *Mesembryanthemum crystallinum* L. Reported from California.
159. *Mesembryanthemum nodiflorum* Haw. Not before reported from Oregon.
160. *Polycarpon tetraphyllum* L. Not before reported from Oregon; found second season only.
161. *Papaver Argemone* L. Reported from Seattle.
162. *Papaver dubium* L. Not before reported from Oregon.
163. *Lepidium medium* Greene. Reported by other collectors from various points.
164. *Lepidium Draba* L. Same note as the last.
165. *Lepidium Draba* L., subsp. *chalepense* Thell. Not before reported from Oregon.
166. *Lepidium graminifolium* L. Same note as the last.
167. *Lepidium virginicum* L., subsp. *texanum* (Buckl.) Thell. Same note as last.
168. *Lepidium reticulatum* How. This needs further study. Howell's species was indigenous.
169. *Coronopus didymus* (L.) Sm. Has been reported from other stations.
170. *Camelina microcarpa* Andrz. Reported from Vancouver Island.
171. *Brassica incana* F. W. Schultz. Becoming a bad weed in California.
172. *Diplotaxis tenuifolia* DC. Not before reported from Oregon.
173. *Sisymbrium officinale* (L.) Scop. Reported from other stations.
174. *Reseda lutea* L. Not before reported from Oregon.
175. *Reseda Luteola* L. Same note as the last.
176. *Rubus fruticosus* L. Same note as the last.
177. *Mimosa asperata* L. A Mexican species; did not survive first season.
178. *Trifolium arvense* L. Reported from other stations.
179. *Medicago lupulina* L. Same note as the last.
180. *Ononis arvensis* L. Not before reported from Oregon.
181. *Anthyllis Vulneraria* L. Same note as the last.
182. *Lotus corniculatus* L. Same note as last.
183. *Coronilla varia* L. Same note as last.
184. *Vicia angustifolia* (L.) Reichard, var. *segetalis* (Thuill.) Koch. Same note as last.
185. *Erodium moschatum* (L.) L'Her. Reported from other stations.
186. *Corchorus pilolobus* Link. Not before reported from Oregon.
187. *Modiola caroliniana* (L.) G. Don. Same note as last.
188. *Lythrum Hyssopifolia* L. Reported from other stations.
189. *Oenothera mollissima* L. A South American species, not before reported from Oregon.
190. *Cochranea anchusaefolia* (Poir.) Gurke. Not before reported from Oregon.
191. *Verbena officinalis* L. I have since found this around buildings at St. Paul, Oregon.

192. *Solanum nigrum* L., var. *Douglasii* Gray. Not before reported from Oregon.
192. *Solanum sisymbriifolium* Lam. Reported from other stations.
194. *Datura villosa* Fernald. A Mexican species, not before reported from Oregon.
195. *Nicotiana rustica* L. Did not survive first season.
196. *Plantago Coronopus* L. Not before reported from Oregon. Found second season only.
197. *Galium verum* L. Had been reported from Salem.
198. *Acanthospermum australe* (Loefl.) Ktze. Not before reported from Oregon.
199. *Ambrosia tenuifolia* Spreng. A tropical species; not found second season.
200. *Xanthium speciosum* Kearn. Indigenous in various western stations, but plainly introduced here.
201. *Xanthium spinosum* L. Reported from other stations.
202. *Hemizonia pungens* (Hook. & Arn.) Torr. & Gray, var. *Parryi* (Greene) Hall. Indigenous in California.
203. *Matricaria inodora* L. Reported from central Washington.
204. *Cotula australis* Hook. Reported from California and southern Oregon.
205. *Artemisia vulgaris* L. Not before reported from Oregon.
206. *Arctotis calendulacea* L. Not found second season.
207. *Senecio Jacobaea* L. Not before reported from Oregon.
208. *Senecio viscosus* L. Same note as above.
209. *Carduus crispus* L. Same note as the last.
210. *Carduus nutans* L. Same note as the last.
211. *Silybum marianum* (L.) Gaertn. Reported from other stations.
212. *Centaurea Calcitrapa* L. Reported from other stations.
213. *Centaurea consimilis* Boreau. Reported from eastern Washington.

In addition to the above, the following were collected, but on account of the imperfect state of the material—lack of fruit or flowers, or both—could not be satisfactorily determined:

214. *Salix* spp.—two forms; not in flower. One had the golden-yellow bark of *S. alba*, the other seemed a native form.
215. *Potentilla* sp. A creeping form, without flowers. Perhaps *P. reptans* L.
216. *Rosa* sp. In fruit only. Resembling *R. rubiginosa*, but much larger.
217. *Desmodium* sp. Not in flower. A prostrate form.
218. *Scrophularia* sp. In fruit. Capsules very small.
219. *Sambucus* sp. Not in flower. Probably one of the native species.
220. *Cucurbita* sp. Not in flower. Apparently one of the cultivated species.
221. A prickly Composite with yellow flowers, suggesting *Cousinia*, that baffled all attempts at identification.
222. A plant with immense prickly cut-toothed woolly leaves forming a rosette on the sand, without flowers. A probable Composite, possibly of the Thistle tribe.

Of the 213 identified species listed above, it will be seen that 32, or 15 per cent of the whole, are indigenous; 88, or 42 per cent, are introduced, but are not restricted to the Linnton area;

and 93, or 43 per cent, I have found only at Linnton, though at least 31 of these have been reported by other collectors from different points in the west. Perhaps it would be safe to say that 50 species of the above list have been collected for the first time on the Pacific coast, or at least within the limits of the state of Oregon.

PLEISTOCENE PLANTS IN THE MARINE CLAYS OF MAINE

By Edward W. Berry

The marine clays and associated sands of late Pleistocene age so widely distributed in northern New England and the St. Lawrence Valley and which in a large measure suggested the Champlain stage of the Pleistocene adopted by Dana in the first edition of his Manual have been the occasion of a considerable literature from the days of Desor down to the present.

These deposits occur at varying heights above the present sea level up to an altitude of 690 feet according to the recent determinations of Johnston.* Most observers have assumed that these deposits, commonly differentiated into "Saxicava sands" above and "Leda clays" below, could be correlated with precision over this area, often on the basis of lithology alone. That this is not true and that each locality must be considered separately in its relation to topography, physical history, adjacent glacial deposits and fossil content should be obvious. Recently Katz and Keith† have described the Newington Moraine and mapped it from near Portland, Maine, to Newburyport, Mass. This moraine is correlated with the late Wisconsin and the authors cited present evidence to show that it was submarine in origin and contemporaneous with that part of the so-called Leda clay of that region lying seaward of the moraine while the clay lying inside the moraine is younger. On the other hand Little,‡ who has been making a study of the Waterville (Maine) region

* Johnston, W. A., Can. Geol. Surv. Mus. Bull. No. 24, p. 5, 1916.

† Katz, F. J., and Keith, Arthur, U. S. Geol. Survey Prof. Paper 108B, pp. 11–29, 1917.

‡ Little, H. P., Bull. Geol. Soc. Am. (in press).

common throughout the northern and central sections of Maine and extends southward to the coast in Hancock and Knox counties, and occurs along riverbanks in Kennebec and Androscoggin counties.* Fossil forms of this species have been recorded from both the interglacial (warm) and intermediate floras of the Don Valley, Ontario.

Ilex verticillata at the present time ranges from Nova Scotia to Florida and is common throughout the state of Maine. It has not heretofore been known in the fossil state.

Gaylussacia dumosa is found at the present time in sandy bogs from southern Newfoundland to northern Florida, southern Alabama and southeastern Mississippi. In Maine it is common in bogs near the coast, extending inland locally to Manchester in Piscataquis County and Orono in Penobscot County. It has not heretofore been known in the fossil state.

Vaccinium corymbosum is found at the present time in swamps, thickets and woods from Newfoundland to Virginia and westward locally to Minnesota. In Maine it is abundant throughout the state near the coast and extends inland to Oxford, Somerset, Piscataquis and Penobscot counties. It has been found fossil in the Talbot formation of Maryland, the Chowan formation of North Carolina and the late Pleistocene of Alabama.

The foregoing four species occur as stray individuals that were brought by stream action to the place of deposition of the marine clays, in which they are associated with abundant traces of the invertebrate fauna. In the case of the *Gaylussacia* and the *Populus* the single hand specimens contain several shells. This marine fauna as it is represented at Waterville contains 22 determined species of a decidedly cold water facies, at least one of the forms not being known south of Labrador at the present time and several others being distinctly arctic types. The plants on the other hand afford conclusive evidence that the terrestrial climate at the time they were living could not have been very different from the present climate of the coast region of Maine, judging from the fact that the *Gaylussacia* and the *Vaccinium*

* I am greatly indebted to Professor M. L. Fernald, of Harvard University, whose accurate and detailed knowledge of the distribution of New England plants has been graciously placed at my disposal.

both reach their northern limits in southern Newfoundland and the *Ilex* in Nova Scotia, and that all except the *Populus* extend at present far to the southward of the Maine region. It would seem therefore that a glacial front below sea level as in the case of the Newington moraine farther south would not have been favorable for the development of vegetation unless it is assumed that the climate had already become warmer and the glacier had become covered with vegetation as is the case with some of the present Alaska glaciers. This is a possible explanation but it involves genial conditions extending over a number of years, during which it would seem as if ice melting would be rapid and the predicated mantle of soil on the glacier would be disturbed, moreover the species found fossil are not the types that would be at all likely to grow in such situations. On the other hand, bearing in mind the sort of contacts between the marine clay and the glacial materials, as described by Professor Little and his interpretation of the history of the Waterville region, the explanation that accords precisely with the facts observed would demand the retreat of the ice from this region, the introduction of vegetation from the south and the continued but diminishing presence of valley ice the melting of which furnished the cold water that enabled the marine fauna to continue its existence in these estuaries. If this is the true interpretation of the succession of events then the marine deposits at Waterville would be somewhat younger than the late Wisconsin clays in front of the Newington moraine and would constitute the closing event in the Pleistocene history of the Waterville region, assuming that a division can be made between what is commonly called Pleistocene and Recent.

SHORTER NOTES

SCLEROTINIA AND BOTRYTIS.—Connection has recently been established between an apparently undescribed species of *Sclerotinia* occurring in woods in the upper end of Van Cortlandt Park on the rootstocks of wild geranium and a species of *Botrytis* occurring on the roots and rootstocks of the same host. The field observations were made by the writer and the culture work was conducted in the New York Botanical Garden by Professor W. T. Horne. A joint paper will be offered on the subject in connection with the celebration of the fiftieth anniversary of the Torrey Botanical Club this fall. As it will be several months before this paper can appear in print, it was thought advisable to call attention to the facts at this time. While connection between *Botrytis* and *Sclerotinia* has been claimed by DeBary and predicted by more recent workers, this is one of the first and possibly the first case in which the connection has been definitely established by culture experiments.

F. J. SEAVER

CORRECTONS OF THE FLORA OF THE TOWN OF SOUTHOLD.—In "The Flora of the Town of Southold, Long Island and Gardiner's Island—First Supplementary List" on page 119 of TORREYA for July, 1917, *Odontoschisma Sphagni* (Dicks.) Dumort. should undoubtedly have been referred to *Odontoschisma prostratum* (Sw.) Trev. Miss Annie Lorenz informs us that she has not been able to find the specimen of *O. Sphagni* in her collection on which this determination was made: and that "*O. Sphagni* is not known in these regions from south of Nova Scotia."

Utricularia cleistogama (Gray) Britton, on page 122, which was put as a synonym of *U. geminiscapa* Benj., should have read "(*Utricularia clandestina* Nutt.)"!

STEWART H. BURNHAM,
ROY A. LATHAM

PROCEEDINGS OF THE CLUB

MARCH 28, 1917

The meeting was held in the Morphological Laboratory of the New York Botanical Garden at 3:30 P.M., Vice-President Barnhart in the chair. Twenty-two persons were present.

The minutes of the meetings of February 28 and March 13 were read and approved.

Dr. N. L. Britton, Professor R. A. Harper, Dr. M. A. Howe and the president of the Club were appointed a committee to

lium lutens on sweet potatoes in storage parasitic or saprophytic? The host plants are alive and will grow under proper conditions.

These and other questions on relationship of parasitism and saprophytism have been brought out in our studies. Of course, there is also much evidence on this subject in the writings of other workers.

It also appeared in the writings that the conception of variation in size is more evident when studying a drawing than when studying a written description. It is also evident that many descriptions are defective in regard to size, color and number of septa because of immaturity of the organisms at the time the studies were made. Our studies have also brought out some rather interesting points in regard to the wintering of apple scab (*Venturia inequalis*), black rot (*Sphaeropsis malorum*) and many other organisms.

Mr. H. W. Thurston, Jr., of Columbia University, spoke briefly on his studies on *Gymnosporangium bermudianum*. He would emphasize the variability of this species and considered several proposed allies but forms of this. Dr. W. A. Murrill showed specimens of a Chinese fungus recently sent to the Garden. These were purchased in a native drug store in Hong Kong by the director of the Botanic Garden there. The fungus is *Pachyma hoelen* Fries, and it is extensively cultivated on pine trees in Central China. It was known long ago to Rumphius.

FRANCIS W. PENNELL,
Secretary pro tem.

APRIL 10, 1917

The meeting was held in the American Museum of Natural History at 8:15 P.M. President Richards presided. There were thirty persons present.

The President called the Club's attention to an invitation from the Brooklyn Botanic Garden to take part in certain ceremonies in connection with the dedication of the new building. The invitation was accepted.

The scientific program consisted of an illustrated lecture on "Trees in Winter" by Dr. A. F. Blakeslee, of Cold Spring Harbor. The speaker described several of our common trees, giving the characters by which they may be recognized and their common habitats. He then described and illustrated various types of buds of trees and indicated how bud characters are sufficiently distinct to enable one to identify most species of trees by these characters alone. The pictures were projected on the screen and the audience was asked to name the tree shown. This proved to be a very interesting and instructive exercise. The speaker closed with a plea for a more extended study of our common trees during all seasons of the year.

Meeting adjourned.

B. O. DODGE,
Secretary

APRIL 25, 1917

The meeting was held in the morphological laboratory of the New York Botanical Garden at 3:30 P.M. On motion Dr. Stout presided and Dr. F. J. Seaver acted as Secretary. Ten persons were present.

The minutes for March 28 and April 10 were read and approved as amended.

The following persons were nominated for membership and the names referred to the nominating committee: Mrs. Alice R. Northrop, 520 East 77th Street, Mrs. Jerome W. Coombs, Scarsdale, N. Y., and Miss Helen E. Greenwood, 5 Benefit Terrace, Worcester, Mass.

The report of the committee appointed to consider some suitable exercises to be held in connection with the fiftieth anniversary of the founding of the Club was presented and on motion was accepted. (See report below.)

It was moved and carried that the matter of the Club co-operating in the publication of card indexes of phytopathological literature be referred to the editorial committee for consideration.

It was moved and carried that Dr. C. S. Gager be asked to serve with the committee appointed in connection with the celebration of the fiftieth anniversary of the Club and that this committee be given full power to act. On motion, the committee was authorized to solicit funds for the publication of the Memoir referred to in the report as well as for the permanent improvement of the finances of the Club.

The resignation of Isabel C. Darrow was read and accepted.

There was no regular scientific program for the afternoon but brief notes were called for. Mrs. N. L. Britton showed a number of enlarged photographs and colored lantern slides of wild flowers.

Dr. Britton called attention to Dr. Shafer's return from South America with one of the most remarkable collections of Cactuses ever made, including about 130 species.

On motion, the meeting adjourned.

FRED J. SEAVER,
Secretary pro tem.

THE SEMI-CENTENNIAL OF THE TORREY BOTANICAL CLUB

TO THE TORREY BOTANICAL CLUB:

Your committee appointed at the meeting of April 10 to consider arrangements for signalizing the fiftieth anniversary of the formation of the Club would report as follows:

1. The actual date of the semi-centennial is December 26, 1917. It is believed, however, that inasmuch as this date is very close to the holiday season and to the meeting of the American Association for the Advancement of Science, and also at a time of the year when out-of-door meetings are difficult, that the date had better be anticipated, and for these reasons we recommend the second week in October.

2. We recommend that the celebration be held on three afternoons of that week, say, on Thursday, October 18, Friday, October 19, and Saturday, October 20.*

3. That the Thursday meeting be held at Columbia University, the Friday meeting at the New York Botanical Garden, and the Saturday meeting at the Brooklyn Botanic Garden.

4. That historic papers, documents and reminiscences be included in the Thursday session, followed by scientific communications, and terminated by a dinner; that the Friday and Saturday sessions be given to scientific papers and discussions.

* It was first proposed to hold the celebration on October 11, 12 and 13, but the Catskill Water Celebration being subsequently announced for these dates, our anniversary has been placed a week later. Detailed programs will be mailed to all members about October 1st.

practical charge of the important collections of bryophytes, algae and fungi at the Muséum d'Histoire Naturelle in Paris, will be mourned by the numerous American botanists who have enjoyed his courteous and helpful coöperation in their taxonomic studies.

Charles Horton Peck, for more than 45 years the State Botanist for New York, died on July 10, 1917, in his eighty-fifth year. He was widely known for his studies of fungi.

The Torrey Botanical Club

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Myxomycetes: Mrs. H. M. Richards
Yeast and Bacteria: Prof. J. Broadhurs
Insect galls: Mel T. Cook

OTHER PUBLICATIONS

OF THE

TORREY BOTANICAL CLUB

(1) BULLETIN

A monthly journal devoted to general botany, established 1870. Vol. 43 published in 1916, contained 676 pages of text and 35 full-page plates. Price $4.00 per annum. For Europe, 18 shillings. Dulau & Co., 47 Soho Square, London, are, agents for England.

Of former volumes, only 24–43 can be supplied entire; certain numbers of other volumes are available, but the entire stock of some numbers has been reserved for the completion of sets Vols. 24–27 are furnished at the published price of two dollars each; Vols. 28–43 three dollars each.

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

(2) MEMOIRS

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

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

Correspondence relating to the above publications should be addressed to

DR. BERNARD O. DODGE

Columbia University

New York City

THE TORREY BOTANICAL CLUB

OFFICIAL ORGAN OF THE WILD FLOWER PRESERVATION SOCIETY OF AMERICA

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

NORMAN TAYLOR
Brooklyn Botanic Garden
Brooklyn, N. Y

TORREYA

October, 1917.

Vol. 17 No. 10

MUSHROOM POISONING

By Beaman Douglass, M.D.

I am not a botanist, I *am* a surgeon. For me, hunting mushrooms is a pastime, eating them an adventure. Therefore this paper on Mushroom Poisoning is not a scientific communication with new and startling discoveries, it is rather a semi-popular article aimed to restrain the hazardous and interest the inquisitive.

The purpose of my message will be lost should my readers share the opinion of the physician in Maine who was called to aid me, when last summer (1916) I had involved the three members of my family in difficulties with a poisonous form of mushroom. He said: "Everybody knows that there is one edible mushroom, all the rest are poisonous toadstools." I showed him the ponderous work of McIlvaine, wherein is stated that most of more than one thousand forms are not poisonous. I showed him the pessimistically enlarged black list of the United States Department of Agriculture, which, including even doubtful forms and erring well to the side of safety, publishes seventy-two varieties as "poisonous or suspected of being poisonous." Every effort failed to move this physician from his standpoint and he left us with the warning in the future "to leave those things entirely alone"—a warning, I may say, which we have obstinately not adopted. As far as I am concerned, I have always looked upon the result of his advice as an overthrow and defeat of one of the "pure sciences" by prejudice and ignorance.

It happened this way: We identified some mushrooms growing

[No. 9, Vol. 17 of Torreya, comprising pp. 151–170 was issued 2 October 1917.]

in a neighbor's cucumber bed as *Panaeolus retirugis* (they were later identified by Dr. Murrill as *P. semiglobatus*). Reassured by McIlvaine's opinion that this form is edible we gathered a quantity enough for three persons, prepared them by steaming with butter, poured the liquid on toast and ate the toast and the mushrooms. We smack our lips even now over the savory dish. In flavor they are equal or superior to the inky caps (*Coprinus*).

We ate them at 6:30 P.M.; each one ate about one half cupful of the caps and two pieces of toast saturated with the liquor. Then at 7:30 P.M. my wife and I went out to a neighbor's house to play bridge. While chatting with neighbors on the road about 7:45 my wife leaned against me and said she was dizzy and could not see distinctly. I laughed away her symptoms but she was unsteady and took my arm for aid in going down the road. This tendency increased and she was glad to reach the neighbor's house where she could obtain a seat. There was also at this time some air hunger. She began to play bridge. The dizziness increased, then some muscle fatigue was manifested. This period was preceded by one of stimulation, which lasted from 8:30 to 9:30 P.M. During this time the dizziness was constantly present and gradually increased. There was also a gradually increasing inability to control muscle movement, it was difficult to sit up and some uncertainty in walking about, cards would fall from her hands, the skin was cold and dry to touch but the skin sensation was hot, prickly and tingling. There was some cerebral stimulation too—a tendency to be jolly, hilarious—she laughed and talked inordinately and foolishly. She was unable to fix her mind on the card problems before her and played badly. After about an hour of this the stimulation was succeeded by symptoms of depression. It became impossible to see properly, the pupils dilated. Shortness of breath increased. The pulse became thin, weak and rapid. Now there was inability to sit up any longer, and I placed Mrs. Douglass in a hammock and went to our cottage for some atropine and morphine.

Up to this time my own symptoms had followed those which

correct these effects. My pupils were normal, so was my heart. I decided not to take any remedy, but to oxidize the poison, if possible, by exercise. So I helped carry Mrs. Douglass home, then I brisked about, washed out Mrs. Douglass's stomach, gave her some vinegar, sent for the doctor in case I should not be able to attend to her.

I then awoke the maid, who had also eaten the *Panæolus* and, unsolicited, she said that about 8:30 P.M. she was on the porch watching the boats in the bay. She became dizzy and could not see the boats any longer. The vertigo became worse so she went to bed. As she had apparently recovered I gave her no treatment except vinegar and a purge.

Six hours after eating and five hours after the earliest symptoms every evidence of poisoning had disappeared with us all, except that Mrs. Douglass's pupils remained dilated for 24 hours.

The experience just narrated diminished considerably the anxiety with which we searched for new species of mushrooms *to eat*, but it increased an interest in cases of mushroom poisoning. In looking over the literature on the subject I have come across some interesting facts, a few of which I have set down in the part of the communication which follows and I have been very materially aided by the excellent article of Dr. M. Roch entitled "Les Empoissonements par les Champignons," appearing in the Bulletin of the Botanical Society of Geneva, 1913, Vol. V, of which I have availed myself freely, sometimes even literally.

II. *Frequency*

My chagrin and the shock to my ignorant assurance and foolhardiness has been somewhat assuaged by learning that we moved among distinguished society. The wife and children of Euripedes, Pope Clement VII, Emperor Jovian, Emperor Charles VI, the wife of Czar Alexis and the Emperor Claudius were among those who have died of mushroom poisoning. In December, 1897, the Department of Agriculture in Washington issued a special brochure on this subject because two well-known residents were killed by toadstools and every summer the daily press publishes fatal results in various parts of the United States.

Cases of mushroom poisoning are apt to increase, due partly to an increased interest in the vegetable diet and an effort to find meat substitutes. Mushrooms in our shops are more abundant than formerly. Many more are used as food and as they are relatively expensive, people of moderate means who enjoy savory food are apt to seek in nature forms which they believe edible.

The movement of "Back-to-the-farm" for the city man, the Boy Scouts for the student, the high cost of living for everybody and an increased interest in nature study are other factors which will lead to an increase of poison cases. At present the greatest danger arises from children or from the poorer class of adults who see foreign-born laborers scouring the fields and woods for edible forms of mushrooms. Now, it happens that these foreigners think they know edible kinds and are careful to gather these alone or else they know how to render a dangerous kind harmless by certain methods of preparation. But the American does not with certainty identify his mushroom but gathers those which "look just like" those gathered by the foreigners and is apt to add a number of cases to the annual death list. The death rate from the "destroying angel" (*Amanita phalloides*) cases is over 52 per cent.—children are more susceptible than adults and there is one clear record of a death from eating one third of the top of an *Amanita.* With these facts in mind, perhaps the best advice is that given by a mother to her child, who seeing me gather some edible forms tried to imitate me, as children will do. The mother said: "Child, that man knows what they are, but for you they are *all* poison."

(To be continued)

A NEW MERTENSIA

By Geo. E. Osterhout

Mertensia media sp. nov.

Stem rather slender, 2–3 dm. high, glabrous or sparingly appressed pubescent, flowering branches from near the middle, leafy to the top; the leaves all narrowly linear from a broad base, 3–6 cm. long, about 5 mm. wide, the upper shorter, equaling or surpassing the inflorescence, appressed pubescent on both surfaces, the midrib prominent; flowers many in close clusters on ascending peduncles, the pedicels hirsute pubescent, the calyx 3–3.5 mm. long, divided to very near the base, the lobes narrowly linear, glabrous except the ciliate margins, the corolla about 10 mm. long, the tube and limb about equal in length.

Mertensia media belongs to the Lanceolateae, and, following Dr. Rydberg's Key in the Flora of Colorado, its characters lead to *M. lateriflora* Greene or *M. amoena* A. Nelson; but it is quite a different plant, noticeably in the pubescence. *M. lateriflora* has "the whole plant canescently silky-strigose," and *M. amoena* is much the same. It is a taller plant than *M. amoena*, the leaves are longer and more pointed, the calyx lobes are narrower and less ciliate. In general appearance it closely resembles *M. lanceolata* (Pursh) DC. Collected at Palmer Lake, El Paso County, Colorado, May 24, 1913; no. 4882.

WINDSOR, COLO.

SOME EFFECTS OF EXCESSIVE HEAT IN NORTHERN MICHIGAN*

BY HENRY ALLAN GLEASON

During the last week of July, 1917, a heat wave of unprecedented intensity spread over the region of the Great Lakes. At numerous stations of the Weather Bureau temperatures in excess of 100° F. were recorded. At the biological station of the University of Michigan, located seventeen miles south of the Straits of Mackinac, all previous records for high temperatures were passed. On July 29, the temperature was above 90° for over nine hours, and reached a maximum of 101°. The following day a maximum of 93° was recorded. On July 31, the temperature was above 100° for over five hours, with a maximum of 104°, and above 90° for eleven hours. During these same days the minimum was also unusually high, remaining above 80° for three and a half days continuously.

* Paper No. 166 from the Botanical Laboratory of the University of Michigan.

lower surface. Many sun leaves of *Rubus allegheniensis* developed sunburn spots in the center of each leaflet. Ripe fruits of *Vaccinium pennsylvanicum* partially dried on the plant. Leaves of *Diervilla lonicera* growing in the full sunshine developed sunburn to a marked extent. In fact, only a few plants escaped and so thoroughly was the color developed that patches of *Diervilla* on hillsides became visible at a long distance.

All of these effects may be referred to the unusually high transpiration, caused by high temperatures, wind, and low humidity, and furthered by the low water content of the sandy soil, on which no rain had fallen in ten days.

To obtain some idea of the reduction in leaf temperature caused by transpiration, the crude experiment of wrapping a leaf around the bulb of a thermometer was used. A single thickness of the leaf, with the lower surface exposed, was held around the bulb with a pair of forceps, and the temperature noted after 30 seconds exposure. Leaves of *Acer rubrum* produced no depression of temperature at all, and also showed greater evidence of immediate injury than any other plants on which the experiment was tried. *Populus tremuloides* caused a depression of one to two degrees, while *Populus grandidentata*, known to transpire at a more rapid rate, produced two to four degrees depression. *Gaultheria procumbens*, surrounded by an air temperature as high as 112° when the experiment was tried, produced an average depression of over four degrees.

THE PECK TESTIMONIAL EXHIBIT OF MUSHROOM MODELS

By Homer D. House

It is peculiarly fitting at this time to describe rather briefly the exhibit of mushroom models, recently installed in the State Museum at Albany, N. Y., as a memorial to the life and services of the late Charles Horton Peck, state botanist of New York from 1867 to 1915, a period of forty-eight years, all except the last two years having been spent in active service.

The final installation of these remarkable mushroom models was completed only a few days prior to his death, which occurred on July 10, 1917. The models, fifty-seven in number and representing fifty-five species of edible and poisonous mushrooms, are the work of Mr. Henri Marchand, an artist and sculptor of rare ability. The models are made of wax from casts in the field and reproduce with perfect fidelity to nature, the form, coloring and habitat of each species.

Space need not be taken to enumerate the entire list of species represented by the models, but the variety of form and color may be suggested by the following species, which are represented in the collection.

Poisonous

Amanita phalloides	*Russula emetica*
" *muscaria*	*Inocybe asterospora*
Clitocybe illudens	

Edible and Harmless

Amanita caesarea	*Morchella deliciosa*
Tricholoma sejunctum	*Gyromitra esculenta*
" *personatum*	*Russula virescens*
Russula cyanoxantha	*Strobilomyces strobilaceus*
Lepiota procera	*Pleurotus ostreatus*
" *naucina*	*Fistulina hepatica*
Agaricus campester	*Armillaria mellea*
" *arvensis*	*Boletus cyanescens*
Coprinus comatus	*Polyporus sulphureus*

The services of Doctor Peck in the field of mycology is surpassed by no other American student of fungi. His work, although not confined to the fleshy fungi, is best known by the hundreds of species which he has described in the fleshy and woody groups of fungi (Agaricaceae, Boletaceae, Polyporaceae, Hydnaceae, and Clavariaceae).

Without the advantages of European travel and study and frequently working without access to the older European literature upon fungi, his work stands out with conspicuous individuality. That he has apparently described, in some cases, species already described by older mycologists of Europe is no reflection upon his remarkable ability in the discernment of specific and generic characters of our native species.

His work will stand for all time as the foundation upon which later students of fungi may build with safety a more elaborate morphological and systematic revision of the fleshy and woody groups of fungi.

Those friends, admirers and fellow botanists who have contributed toward bringing into existence this testimonial exhibit of mushroom models may feel that there is no more suitable memorial possible. There are few pages of modern literature dealing with the fleshy and woody fungi that do not reflect in some degree the individuality of Doctor Peck's work, and looking at these models in the State Museum, with their exquisite variety of form and color, one may imagine with what pleasure and appreciation they would be viewed by him whom they memorialize.

THE WEIGHT OF SEEDS AS RELATED TO THEIR NUMBER AND POSITION

By J. Arthur Harris

Professor Halsted's interesting paper under the above title in the June, 1917, number of *Torreya* is well worthy of the consideration of those who, as he suggests, have the opportunity of investigating the internal factors influencing seed number and seed weight. Our knowledge of the physiology of seed production is very limited indeed. Much of the work which has been done has been based upon such small series of material that the conclusions are of little real value.

The question of the relationship between number of ovules formed, number of seeds developing, and position of seed in the pod in the garden bean, *Phaseolus vulgaris*, has received very detailed consideration.

In *Cladrastris* the mean weight of the seed is higher when only one seed is produced per pod than when the pod contains two or more. There is no essential difference between 2-seeded and 3-seeded pods. In series of pods containing 2–4 seeds the mean seed weight decreases from the proximal towards the distal positions.

Seed weight has also been studied with considerable thoroughness in *Crinum longifolium*.*

The weight of the large watery seeds of this species is far more variable than seed weight in general. The fact that there is a substantial correlation between the weight of the seeds of the same fruit indicates that all are subject to the influence of similar physiological factors.

NEWS ITEMS

Dr. and Mrs. Carl Skottsberg of Sweden, *en route* from Chili, are stopping in New York until the middle of November. After botanical work in Chili Dr. Skottsberg was going directly to Sweden, but war conditions made a stop in New York necessary. He attended the last two days of the Club's semicentennial program.

An account of the exercises in connection with the Club's fiftieth anniversary will appear in TORREYA for November. All of the meetings scheduled were held and there was an average attendance of fifty. About eighteen hundred dollars had been collected up to October 20 and the committee appeals for more subscriptions to enable it to publish all the papers read at the meetings.

Volume one number one of the *Journal* of the International Garden Club was issued September 26. It is a gardening paper of 285 pages and contains over 70 full page illustrations. Editorial or business matters relating to the new *Journal* should be sent to Norman Taylor, Brooklyn Botanic Garden, Brooklyn, N. Y.

* Harris, J. Arthur. Biometric data on the inflorescence and fruit of *Crinum longifolium*. Ann. Rept. Mo. Bot. Gard. **23**: 75–99. 1912.

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TORREYA

November, 1917.

Vol. 17 No. 11

THE SEMI-CENTENNIAL OF THE CLUB

The meetings scheduled in connection with the anniversary were all held and proved a successful and fitting memorial of the oldest botanical organization in the City. The program for Thursday, October 18, was as follows:

THURSDAY, OCTOBER 18, 2 P.M.

Department of Botany, Schermerhorn Hall, Columbia University
President Richards presiding

1. Welcome and reception by the staff of the Department.
2. History of the Club, by John H. Barnhart.
3. Reminiscences by older members of the Club.
4. "Contact and Pressure Reactions in *Pediastrum simplex*," by R. A. Harper.

* 5. "Origin of the Hawaiian Flora," by D. H. Campbell.
* 6. "Uredinales of Cuba," by J. C. Arthur and J. R. Johnston.
7. "Six Misunderstood Species of *Amanita*," by G. F. Atkinson.

* 8. "*Sisyrinchium Bermudiana*," by O. E. Farwell.
9. "The Individuality of the Bean-pod as compared with that of the Bean-plant," by Helene M. Boas.
10. "Two Months in the Southern Catskills," by O. P. Medsger.
11. "The Ferns of Subtropical Florida," by J. K. Small.

*12. "Fossil Plants from Porto Rico," by Arthur Hollick.
13. "A Cotton-rust Epidemic in Texas," by E. W. Olive.
14. "Bermuda Algae," by M. A. Howe.
15. "Some Factors influencing the Stimulative Action of Zinc Sulphate on the Growth of *Aspergillus niger*," by R. A. Steinberg.

[No. 10, Vol. 17 of TORREYA, comprising pp. 171–182, was issued 31 October 1917.]

16. "Centrosomes in fertilization stages of *Preissia quadrata*," by Margaret Graham.

*17. "Philippine Micromycetous Fungi," by P. W. Graff.

*18. "A Method of Teaching Economic Botany," by E. S. Burgess.

Among those who spoke under item 3, were Rev. H. M. Denslow, who at a dinner at the old Astor House, December 22, 1873, saw John Torrey and Asa Gray, and witnessed the meeting of what was afterwards incorporated as the Torrey Botanical Club. Dr. Denslow was then a boy of fifteen and attended the dinner with his uncle, W. W. Denslow, one of the founders of the Club. Mrs. Abraham Demarest, a daughter of the late C. F. Austin, spoke of his life and work. Dr. Britton and others also spoke regarding some of the earlier members and their remarks will be printed in the Anniversary Memoir.

Thursday evening after a dinner at the Faculty Club of Columbia University there was a discussion of the proposed new "Abstract Journal." With Dr. Richards as chairman and Dr. Murrill opening the discussion, the following also spoke briefly, in the order mentioned: C. Stuart Gager, Norman Taylor, R. A. Harper, N. L. Britton, J. Arthur Harris, G. F. Atkinson, John Hendley Barnhart, A. Gundersen, M. A. Howe, E. W. Olive, and others. A committee was appointed, consisting of the editorial board and Messrs. Britton, Harper, Gager and Barnhart to consider the question and report to the club at its first December meeting.

The programs for Friday and Saturday were as follows:

FRIDAY, OCTOBER 19, 2 P.M.

Mansion, New York Botanical Garden, Bronx Park

Vice-President Barnhart presiding

1. Welcome and reception by the staff of the Garden.
2. "The Flora of the Isle of Pines, Cuba," by N. L. Britton and Percy Wilson.
3. "Observations on the Development of *Peridermium Cerebrum*," by B. O. Dodge and J. F. Adams.
4. "Collecting Fungi at the Delaware Water Gap," by W. A. Murrill.

* Read by title.

11. "Parthenocarpy in Cucumbers," by A. F. Blakeslee and P. A. Warren.
12. "The Vegetation of the Hempsted Plains, Long Island," by R. M. Harper.
13. "Trimorphism and insect visitors of *Pontederia*," by Tracey E. Hazen.

At both the New York and Brooklyn Gardens tea was served, and many availed themselves of the opportunity to inspect the buildings and collections. The committee who had charge of the anniversary consisted of N. L. Britton, *Chairman*, C. S. Gager, R. A. Harper, M. A. Howe, who acted as secretary for all the meetings, and H. M. Richards. They request that all papers read at the meetings be in the hands of Dr. Britton before the close of the year, in order to ensure their inclusion in the anniversary volume of the Memoirs which goes to press January 1, 1918.

THE EARLIEST GLOSSARY OF BOTANICAL TERMS; FUCHS 1542

By Helen A. Choate

Among the more important German herbals of the sixteenth century the *De Historia Stirpium* of Leonardus Fuchsius, or Fuchs, is doubtless the best known, owing to its many plant descriptions and exceptionally fine wood cuts. A further point of interest, less well known but of much value, is its glossary of botanical terms which is considered by Sachs* and by Greene† to be the first of its kind. This glossary appeared only in the now rare first, or Latin, edition of 1542, and seems never to have been translated or published in English.

It is especially interesting to ascertain how many of the terms appearing in this first attempt to organize botanical terminology are still in use to-day. As a present standard I have taken Jack-

* Sachs, J., History of Botany, translated by Garnsey and Balfour, Oxford, pp. 20 and 21, 1906.

† Greene, E. L., Landmarks of Botanical History, Smithsonian Miss. Coll., 1909, p. 197.

son's Glossary of Botanic Terms,* and by comparison with that work have divided Fuchs's list into four groups, viz., (1) those terms still in use with identical or closely related meaning; (2) those in use but with changed meaning; (3) those obsolete; (4) those which are not botanical terms; and the status of each word on this plan is indicated at the close of its definition in the following list. Thus it appears that of the 127 terms (exclusive of synonyms) in Fuchs's list, 83 or 66 per cent. belong to Group 1; 22 or 17 per cent. to Group 2; 14 or 11 per cent. to Group 3; and 7 or 6 per cent to Group 4.

The translation has been difficult, because the Latin of Fuchs's time was far from classical. In at least two places there are obvious misprints. The definitions are often wordy and far from clear, but I have taken no liberties with the text, my translation of which is intended to render as closely as possible the original work of Fuchs.

I wish to acknowledge the courtesy of the librarian of Harvard University in loaning me the copy of Fuchs's Herbal from which my copy was made, and I desire also to express my thanks to Dr. William Muss-Arnolt of the Boston Public Library without whose generous aid my treatment of the Greek terms would have been far from complete.

An Explanation of Certain Terms Occuring Frequently Throughout This Work which the Inexperienced Reader Might be at a Loss to Understand.

Acetabula. Acetabula seem to have been named from *acetum*, although some think the word derived from *accipiendo*, and so write *acceptabulum*. They are cup-shaped vessels without wide rims, which, filled with vinegar, are set before one for sauce. Thence the word has been transferred to all other objects having a similar shape. First they have so named the concave places in the tentacles of polyps, by which this animal advances and, as if propped on these supports, raises itself. Then the word is transferred to the

* Jackson, B. D., A Glossary of Botanic Terms, J. B. Lippincott Co., Philadelphia, 1900.

womb and they call acetabula the openings of the veins and arteries which are said to open into the uterus. Even later this name was given to a plant which they named Acetabulum because it has leaves arranged in a circle like an acetabulum, descending gradually into a hollow cavity so that they deceive the senses. The Greeks call this κοτυληδόνες. [Cf. Acetabuliform.]

Acinus. Acinus means not only the stones within the grape as some think, but the whole fruit, which consists of juice, the flesh-like part, the stones, and the enclosing skin. Galen is our authority, who has written in Book 2, De facultatibus alimentorum: "The acinus consists of four parts, of that, naturally, which is as it were, flesh, and of that liquid scattered through it whence we obtain wine, moreover of the stone, and of that membranous covering which encloses all these on the outside. By the Greeks it is called ῥάξ. [Cf. Acinus, Acinarius.]

Aculei. Any rough, cone-shaped, pointed bodies which prick like thorns are called aculei. [Cf. Aculeus, Aculeate.]

Acus. Acus is the refuse of the grain, namely the lightest part of that which is thrown beyond the threshing floor by the winnowing forks. [Obsolete.]

Adnata. Adnata or Adnascentia or Appendices are branches which the trunk (caulis) occasionally produces like a new or adopted off-shoot. They are so called because they have, as it were, grown upon or been added to the stem. The Greeks call them παραφυάδες because they grow around the stem. (Cf. Adnascent.]

Alae. Alae are the angles between the stem and branches from which successive new shoots originate. They are so called by analogy to the human armpit. The Greeks call them μασχάλαι. [Obsolete in this sense. Cf. Alae.]

Alabastra. Alabastra are jars for holding perfume, made of very substantial and cold material, so called by the Greeks because it is difficult to hold them on account of their smoothness, and they easily slip and fall. Alabaster stone, now termed alabaster, is so called because alabastra are made from it. [Obsolete in this sense. Cf. Alabastrum.]

like a man's arms, especially the little branches of trees. [Cf. Brachiate.]

Bulbi. Bulbi are round tunicated roots such as those of hyacinth, asphodel and colchicus. [Cf. Bulb.]

C

Cachryes. Cachryes are rather long cones (nucamenta) like panicles (panicula) with many scales which hang from the branches. They grow in the winter, then spread out into scales which turn yellow, and fall, when the leaves appear. They occur in pine, fir and many other trees. Pliny calls them pilulae. [Obsolete.]

Calathus. A calathus is an upright top-shaped structure (turbo) *i. e.*, one which broadens out from a narrow base. The flower of the lily shows clearly the form of a calathus. [Obsolete in this sense. Cf. Calathide.]

Calyx. The calyx is the bag (follicus) in which first the flower, afterward the fruit is enclosed. [Cf. Calyx.]

Capillamenta. Very small parts, rounded off, and rather long and hair-like in shape are called capillamenta. [Cf. Capillaceous.]

Caput. A caput is any structure, basal or terminal, which has a globular form due to swelling up or to condensation. If it is relatively small it is called a capitulum. The term is used for the farthest portion of the vine, *i. e.*, the most remote and most fruitful shoot. [Obsolete in this sense. Cf. Caput.]

Capreoli. Capreoli are little twisted branches, like curls, appearing on the more slender shoots (pampini) by which vines, as if by hands, clasp and cling to supports. For these, in order to hold the vine, creep along to places to which they can cling, and because of their clinging are called capreoli. [Cf. Capreolate.]

Caro. Caro is the part directly beneath the bark (cortex). [Obsolete.]

Caudex. In trees and shrubs that is called the caudex or trunk which rises singly above ground from the root and into which the food is brought from the root. [Obsolete in this sense. Cf. Caudex.]

Caulis. In herbs the part which rises singly above ground is designated as the caulis. So caudex relates only to trees and shrubs, caulis to herbs. [Cf. Caulis.]

Cervix. Cervix is that very long and round part appearing from capitate roots. So called from its resemblance to the neck. [Obsolete.]

Cyathus. Cyathus is the twelfth part of a sextarius, so called by the Greeks from a word meaning to pour, χύειν. [Obsolete in this sense. [Cf. Cyathiform.]

Cymae. Cymae of herbs are very delicate and slender stems which are produced at the first budding and on the top of the stalk. For when spring approaches at the very first appearance of leaves, the cabbage, in which the flower buds up to this time have been suppressed, develops certain shoots (quasi turiones) in which the embryo first of the flower then of the seed is hidden. [Obsolete in this sense. Cf. Cyme.]

Cirri. Cirri are very much twisted filaments (capillamenta). [Cf. Cirrhus.]

Claviculae. Claviculae are tendrils by which, as if by hands, the on-creeping vine grasps supports. [Cf. Clavicle.]

Coma. Coma is any thing which in a very pleasing manner like hair adorns the summits of branches or trees. [Cf. Coma.]

Congius. A congius, which the Greeks call χοῦς, is a measure holding six sextarii. It is also called a congiarium. [Not a botanical term.]

Conus. The conus or pyramis of the Greeks is an inverted turbo, that is, something which diminishes in width and is drawn into a point. It is the opposite of our word calathus. [Obsolete in this sense. Cf. Cone.]

Cor. Cor is that which lies in the heart of the wood, and is enclosed for the third time by the bark (cortex), like the marrow in the bones. By some it is called the matrix, by others the medulla. [Obsolete.]

Corymbus. A corymbus is the fruit of the ivy, consisting of a cluster of hanging berries (acini), but the term is transferred to the fruit of many plants. [Obsolete in this sense. Cf. Corymb.]

Cortex. Cortex is the last part separable from the underlying tissue, like a crust for covering. [Cf. Cortex.]

Cotyle. Cotyle is a word of Greek origin, the equivalent of the Latin hemina. See Hemina.

Crenae. Crenae are a kind of incision on the extreme edge of leaves, giving them the name crenate, that is serrate, and cut on the edge. [Cf. Crena, Crenate.]

Cubitus. A cubitus is a measure extending from the elbow to the end of the middle finger, *i. e.*, six palmii or twenty-four digits. [Cf. Cubit.]

Culmus. The culmus is the stem of the grain which bears the spike (spica). [Cf. Culm.]

D

Decussis. A decussis was made by the ancients in the form of the letter X, which to the Latins meant ten. Hence to be decussate is to be arranged in the form of an X. [Cf. Decussate.]

Dilutum. A dilutum is a mixture. So wine mixed with water is a dilutum. However, a true dilutum is a liquid into which something has been poured and has steeped for a certain time: if wormwood has been poured into a jar of wine, the wine, when drawn off after a while, is called a dilutum of wormwood. [Obsolete.]

Dodrans. A dodrans is a measure of twelve digits, formerly called by the Romans palmus major, by the Greeks σπιθαμή. So a stem is called a dodrantalis if it is twelve digits long. [Cf. Dodrans.]

E

Echinus. An echinus is any thing thickly covered with numerous spines, whether back, or head, or top; so called because of its resemblance to the round mass of spines of a sea hedgehog. [Obsolete.]

herbs or legumes or even shrubs. So roots are termed geniculate which, divided as it were by joints, swell up into a round or somewhat head shaped structure. [Cf. Geniculate, Geniculum.]

Gluma. The gluma is the covering (folliculus) or case of the grain which is produced on the spike (spica). [Cf. Glume.]

Grossi. Figs which do not ripen are called grossi. Yet generally in a fig bearing fruit twice a year those which mature during the harvest are meant. These grossi the Greeks call ὀλύνθοι. [Obsolete.]

H

Hemina. Hemina is a Roman word derived from the Greek ἥμισυ which is half a sextarius. The Greeks call it κοτύλη It holds ten unciae as we have fully shown in our notes on the fourth book of Galen on the preservation of health. [Not a botanical term.]

Herba. An herb is a stemless plant with radical leaves, the seed often being borne on a stalk. [Cf. Herb.]

I

Internodium. The part between the knots or joints (genicula) is commonly called an internodium. [Cf. Internode.]

Intervenium. Intervenium is the space between the veins. [Cf. Intervenium.]

Iuba. Iuba is a reed-like hairy growth (coma), such as is in millet. The metaphore is taken from the term *iuba* meaning an animal's mane. [Cf. Juba, Jubatus.]

Iulus. With both Greeks and Latins a iulus is the closely-compact, hard clusters of fruit found on the hazel, which like very long worms hang each on a pedicel and precede the fruit. [Cf. Julus, Julaceous.]

L

Lachryma. Lachryma is that liquid which is seen exuding rapidly as soon as a root or branch or even the wood itself is broken. [Cf. Lachryma.]

Lanugo. Lanugo is a downy hairiness in herbs and trees which causes the leaves and young stems to grow gray. [Cf. Lanuginose, Lanugo.]

Liber. Liber is that part of the bark (cortex) which lies next to the wood. This gives the name to the books in which we write. [Cf. Liber.]

Libra. A Roman libra contains twelve ounces. [Not a botanical term.]

Ligula. A ligula is the fourth part of a cyathus, that is a semuncia or two scruples. [Obsolete in this sense. Cf. Ligule.]

Loculamenta. Loculamenta are cases which, like little boxes, enclose the seeds. [Cf. Loculus.]

Lomentum. Lomentum is bean meal. [Cf. Lomentaceous.]

Lacineae. Lacineae are margins cut into bits for the sake of decoration, and clippings of the extreme edge. Hence leaves divided into sections by means of sinuses, or separated according to their natural divisions are called lacinate. However there are those who use the term lacinosum for sinuosum. [Cf. Lacinia, Laciniate.]

M

Malicorium. Malicorium is the rind of a pomegranate. [Cf. Malicorium.]

Malleolus. Malleolus novellus is the young shoot of a vine produced upon last year's branch (flagellum), called from its resemblance to the object, because where it is cut off from the old twig (sarmentum) which extends on both sides, it has the appearance of a mallet. Or because it is wont to be planted pruned and with projections on both sides.* [Cf. Malleolus.]

Matrix. See Cor.

Medulla. See the same.

Mucro. A mucro is a point which terminates any part. Thus many leaves, certain siliques and all spines are sharp-pointed at the tip. [Cf. Mucro, Mucronate.]

Muscus. Muscus is that woolly substance that appears on the very surface of the bark (cortex) of some trees, just as the

* In the original the term "capillatus" is evidently a misprint for "capitulatus."

hoary hair of certain trees. Occasionally even a tree itself, which looks like a shaggy mass of flowers because of the great abundance of blossoms massed together was wont to be called a muscus as in Ligustrum and many others. [Obsolete in this sense. Cf. Musci.]

Muscaria. Muscaria are radially arranged hairy growths (comae) of herbs, or clusters of tips: named from their likeness to a fly brush by whose movement flies are driven away from the tables. [Cf. Muscariform.]

N

Nucamenta. Nucamenta are those structures with compact scale-like coverings which hang from the branches of nut, oak and fir trees: so called because they seem attempts of nature to make pine nuts. [Cf. Nucamentum.]

O

Oculus. The little bud on the shoots of plants which is the first sign of growth is called an oculus. [Cf. Oculus.]

P

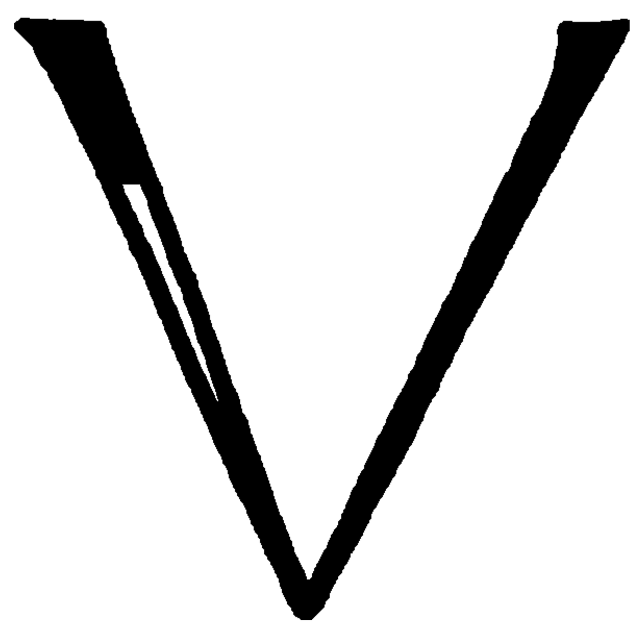
Palma. Palma denotes a larger branch (flagellum) on a vine on which bunches of grapes are produced. [Obsolete.]

Palmus. Palmus had a two-fold meaning with the ancients. Palmus minor, called by the Greeks παλαιστή, consisting of four digits; palmus major consisting of twelve digits called by the Greeks σπιθαμή. [Cf. Palm, Palmus.]

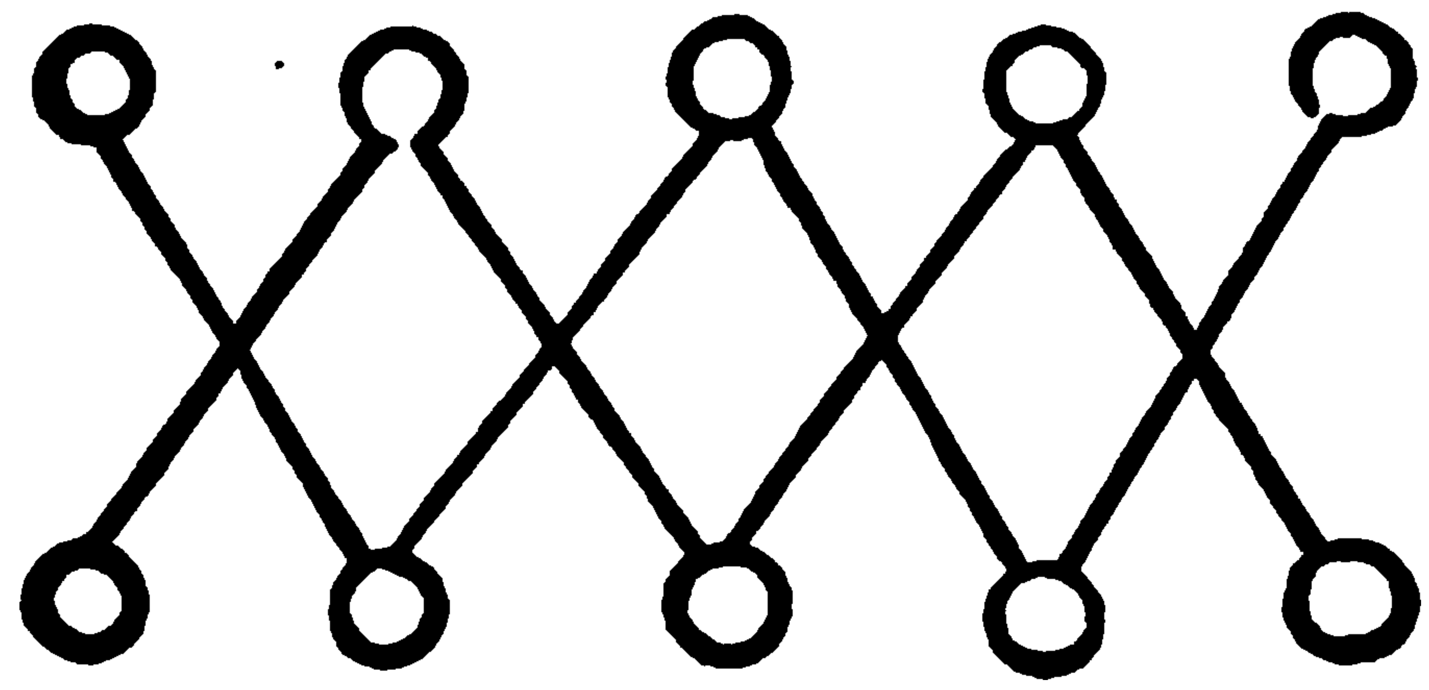
Palmites. Palmites are shoots which originate annually from stems and branches (surculi); so called because they produce twigs like fingers in the manner of the human hand. [Obsolete.]

Pampini. Pampini are the hairy outgrowths (comae) of leafy shoots and the stems producing fruit and protecting it from possible injury. Hence to pampinate is to remove the superfluous pampini from a vine after it has leafed out. [Cf. Pampiniform.]

Panicula. Anything may be called a panicula which swells up



Quincunx.



Ordo quincuncialis.

R

Racemus. Racemus is used for uva*, not only, however, in the case of a grape vine, but even in the ivy and other herbs and shrubs bearing certain kinds of clusters. Furthermore that part is called racemosum on which the berries hang. [Cf. Raceme.]

Rami. Rami are the numerous branches arising from the fission of the stem (caulis). [Cf. Ramus.]

S

Sarmenta. Sarmenta are very long shoots into which a vine branches luxuriantly. The term refers to the wood of the branches and stem of the vine not only while actually on the vine, but even when cut and removed. [Cf. Sarment.]

Scapus. A scapus is a stem (caulis) which stretches upward like a stake or is carried aloft; named from its resemblance to a columnar shaft. [Cf. Scape.]

Scopus. Scopus is the branch from which berries hang. [Obsolete.]

Sesqui. The word sesqui when joined to one of measure, quantity, number or time indicates not only the whole of that to which it is joined but a half more. So sesquilibra means one and one half librae, sesquimensis a month and a half. [Cf. Sesqui.]

Sextarius. A sextarius holds twenty unciae. [Not a botanical term.]

Siliqua. A siliqua is the cover within which the seeds of legumes or other plants are found. For not only legumes but many other shrubs and herbs also bear siliquae. [Cf. Silique.]

* Literally uva means a bunch of grapes.

Sinus. Sinuses are the angles of axils (alae). [Cf. Sinus.]

Spica. Spica is that which the stem of the grain (culmus) bears. Formerly the country people called it speca—seemingly named from *spe*. For they sow that for which they hope. Indeed it contains three parts, the seed, the husk (gluma), and the awn (arista). Spica mutica is one without an awn, mutica for mutila. [Obsolete in this sense. Cf. Spike.]

Spongiae. Ancient authors called tangled and entwined roots spongiae. Hence the roots of vigorous cultivated asparagus, coalescing by many twisted fibres (capillamenta), and interwoven forming a unit as it were, are called spongiolae, spongiae, and spongiosae. [Obsolete.]

Stamina. Stamina are those knobs (apices) which spring up in the middle of the calyx; they are so called because they grow out like filaments from the lowest portion of the flower. [Cf. Stamen.]

Stipulae. Stipulae are leaves surrounding the stem. [Cf. Stipules.]

Striae. Striae are certain elevated and projecting parts. Hence a striate stem is one possessing striae of this kind, or roughened with striatures. The term strigiles is also used if we believe Vitrurius. (Cf. Striate.]

Stolones. Stolones are the shoots from stems and the useless suckers from roots. [Cf. Stolon.]

Suffrutices. Suffrutices are plants with very abundant branches and woody shoots, but with uniformly small leaves. [Cf. Suffrutex.]

Surculus. Surculus is that which springs simply and alone from the branch, and is like a kind of bud produced on the trunk or stock (caudex). [Obsolete in this sense. Cf. Surculus.]

T

Thyrsus. Thyrsus is a stem (caulis) and deserves this name because it rises like a wand or spear. [Cf. Thyrse.]

Tomentum. By tomentum the Latins meant anything with which mattresses could be stuffed to make them softer and warmer, whether this be wool or feathers, or anything else one wishes, suitable for making them softer and keeping the body warm. So the leaves of Dictamnus which seem to be soft are called tomentitia and lanea by Dioscorides, that is, γναφαλοειδῆ. [Cf. Tomentose.]

Tori. Hard fleshy protruberances of parts are called tori. The Greeks called them κόνδυλοι. Hence κονδυλώδης, *i. e.*, torosus, means to the Latins a knot-like formation. [Obsolete in this sense. Cf. Torus.]

Triens. A triens equals four cyathi. [Not a botanical term.]

Tunica. Tunica is a thin and membranous bark (cortex) in which either a tree or root is wrapped. Thus an onion is tunicated with scales (folliculi). [Cf. Tunic, Tunicated.]

Turbo. Whatever, starting from a point, expands to greater size is called a turbo. Hence whatever advances uninterruptedly from narrower to wider is called turbinate. Thus the shape of the pear is seen to be turbinate. Moreover many leaves are turbinate at the tip. [Cf. Turbinate.]

Turiones. Turiones are the very slender shoots of the tops of trees which grow each year. [Obsolete in this sense. Cf. Turion.]

Topiarium. Topiary work is that which arranges trees, shrubs, or herbs into arches or vaults for decoration. Hence those trees and herbs should be called topiariae which are particularly adapted to this work owing to their natural flexibility and pliancy. [Cf. Topiary.]

V

Vascula. Vascula are seed cases. [Obsolete in this sense. Cf. Vasculum.]

Venae. Venae are parts having both branches and juice which are present in the leaves of plants. [Obsolete in this sense. Cf. Vena, Venation.]

Vermiculatum.* That which grows red, almost dark purple like a rose, is called vermiculatum.

Verticillum. A circle of leaves or flowers which crowns the stem or branch of an herb constitutes a verticillum, named from

* Misprint, vermiculatum means wormlike.

THE STRUCTURE OF POLYPORUS GLOMERATUS PECK*

By L. O. Overholts

Scarcely a single species of our native pore fungi has received less recognition than has *Polyporus glomeratus* Peck. On the other hand no plant is more worthy of specific rank than this same *P. glomeratus*. The species was described by Peck† in 1873 from specimens collected in New York state. Portions of the type specimens may still be seen at Albany and have been examined by the writer.

For many years after its publication the species remained unknown to other American mycologists. In 1885 Morgan‡ reported a species from the Miami Valley under the name *P. radiatus*. While that species probably occurs in Ohio Mr. C. G. Lloyd has stated§ that "he (Morgan) evidently told me that this (reference) was an error for *Polyporus glomeratus*, for I recorded it in pencil in my copy of his book . . . ." The specimens on which the record was based are preserved in the Lloyd Museum, but have not been examined by the writer. It may be safely asserted, however, that the name never reappeared in the literature on American mycology until in 1908. In that year Murrill|| listed it as a synonym of *Polyporus radiatus* (as *Inonotus radiatus*). This disposition of the name was concurred in by Lloyd until 1914. In that year, while examining the co-types of *P. glomeratus*, he discovered that the internal structure of the plant is entirely different from that of *P. radiatus*, and is almost unique among the pore fungi. Specimens were subsequently collected by Dr. C. H. Kauffman in Michigan. As far as known this was the third collection of the species to be made in this country.

Lloyd in 1915¶ called attention to the internal structure of the

* Contribution from the Departmennt of Botany, the Pennsylvania State College, No. 12.

† Ann. Rep. N. Y. State Mus. 24: 78. 1873.

‡ Jour. Cinc. Soc. Nat. Hist. 6: 1885.

§ Letter No. 58, note 292, 1915.

|| North American Flora 9: 90, 1908.

¶ Letter No. 54, note 204, 1915.

plant and so gave to the species an adequate characterization. In the same year the writer received specimens of the plant from Dr. Kauffman and included the species in a manual* then ready for the press. The species was not included in the recent manuals prepared by Dr. Murrill.

As far as known the three collections previously mentioned were the only ones made up to the close of the year 1915. In July, 1916, Mr. A. S. Rhoads, of the New York State College of Forestry, collected it in abundance on a beech log at Cranberry Lake, New York. As many as three or more additional collections were made by Rhoads in the latter part of 1916, some of them on logs of *Acer rubrum*, the habitat of the type collection. Abundant specimens from these collections have been supplied the writer and a limited amount of material is available for purposes of exchange. Mr. Lloyd also reported receiving some additional collections within the past year, and one or more collections are in the herbarium of the New York Botanical Garden under *P. radiatus*. When once known well developed specimens need not be confused with *P. radiatus*, even without reference to the internal structure. In the summer of 1916 the type specimens at Albany were studied and other collections agree with them in all essential details.

The facts concerning the characteristic internal structure of the plant can be easily gathered from the illustrations submitted in this paper. Embedded in the internal tissue (trama) of the walls of the tubes are large, brown, thick-walled hyphae that vary up to 15μ in diameter and run parallel to the long axis of the tubes (Fig. 2). In longitudinal section of the hymenium they are readily made out but can never be traced to their origin. The reason for this will be apparent later. These hyphae usually end blindly and are largest just before they taper to the apex, as will be seen in the illustration (Fig. 5). In rare cases they project obliquely into the lumen of the tubes from between the basidia, but are not to be confused with the true setae that are also present at times. Those are of much smaller size and protrude from between the basidia at right angles to the tube axis.

* The Polyporaceae of the Middle Western United States, p. 51, 1915.

In cross sections of the hymenium these hyphae are, of course, cut transversely and appear as circular thick-walled rings made more conspicuous by the light they refract (Fig. 3). It is also seen that they vary much in diameter, from the maximum size down to such sizes that make them almost indistinguishable from the ordinary hyphae. There is no regularity in the distribution of these hyphae as revealed in cross sections.

The writer was the first* to call attention to the fact that these peculiar hyphae are also present in great abundance in the context of the pileus. This fact makes the determination of the species an easy matter. Here the true nature of these hyphae becomes at once apparent if a bit of the context is teased out in KOH. They can be best described as having the general shape of setae but much larger in size. As stated previously and as will be seen from the illustration (Fig. 5) these bodies have a sharp-pointed apex and are largest just back of it. Farther back they gradually become smaller and smaller until they reach the diameter of the ordinary hyphae of the context and are indistinguishable from them. Consequently it must be admitted that these seta-like bodies are the modified ends of ordinary hyphae. Their origin also explains why they can not be traced for any considerable distance in sections as stated above.

It is difficult to even surmise what the function of these extraordinary bodies may be. No doubt their presence gives support to the sporophore and to the walls of tubes in which they occur, but it is doubtful if this can be considered more than an accidental function. The fact that the sporophores are not of the type to require such support, being much firmer than in many species, coupled with the knowledge that their duplicates are not known to exist in more than one or two other species of fungi and that fungi show very little hyphal differentiation of any sort, all point to the conclusion that at present they must be regarded as structures whose function is entirely unknown. It may be pointed out, however, that their presence in large numbers might be the means of deterring insects or other destructive animals of a smaller type from feeding upon the plants. Such a function has been

* Polyporaceae of the Middle Western United States, p. 51, 1915.

suggested in the case of the typical setae and cystidia that project from between the basidia in many species of higher fungi.

An examination of the structure of *Polyporus radiatus* reveals the fact that no such bodies are present anywhere in that species. Consequently *P. glomeratus* can no longer be considered a synonym of that plant. This position (first expressed by Lloyd) is strengthened by the existence of other important distinguishing characters that will be mentioned below.

The only other temperate region species of similar internal structure so far discovered is *Poria Weirii* Murrill, described from specimens collected in Montana by Weir. Mr. Lloyd has called attention to the structure of that species but has apparently overlooked one important difference between it and *P. glomeratus.* In cross-sections of the hymenium the large embedded hyphae present about the same appearance as in the latter species. But longitudinal sections reveal the fact that the tips of the large brown hyphae do project from between the basidia as typical setae that can thus be traced for considerable distances into the trama. This is not the case in *P. glomeratus.*

True setae of the usual type have never been reported for *P. glomeratus.* In the New York specimens they are present and sometimes rather abundant, but at other times difficult to locate. They are here illustrated for the first time (Fig. 4). After much careful study it has been determined that there is apparently no connection between these setae and the enlarged embedded hyphal structures.

The spores of this species are of a bright yellow or slightly yellowish-green color. In one New York collection the imbricate pilei were thickly dusted over with the spores that had fallen from the hymenium of the next overlapping pileus. They are globose and measure 5–6μ in diameter. The exact color of the spores of *P. radiatus* has been a matter on which accurate information is lacking. In sections they appear entirely hyaline under the microscope while the spores of *P. glomeratus* are decidedly colored.

A photograph of the species is included with this article (Fig. 1), and the plants described are on the basis of the recent New York specimens.

Pileus firm, sessile or more often effused-reflexed, 2–4 × 2–10 × 0.4–2 cm., buffy-brown to snuff-brown or buckthorn-brown, but often olive-ochre or greenish yellow from the spores, rough and more or less uneven, minutely velvety-tomentose or becoming glabrous, at length covered by a distinct, hard crust; context brown, 0.3–1 cm. or more thick behind; tubes 3–7 mm. long, sometimes in two layers, olive green within, the mouths gray, brown, or greenish, angular, 4–6 per mm.; spores globose, smooth, greenish, yellow, 5–6μ in diameter; setae absent or present but not abundant, projecting, brown; with elongated pointed setae-like hyphae, 8–12μ in diameter in the trama and the context; hyphae 3–4μ.

On logs of maple and beech.

Known from New York, Ohio, and Michigan.

PENNSYLVANIA STATE COLLEGE

NEWS ITEMS

Those interested in the life of the late E. L. Greene and in Dr. Bartlett's account of it in TORREYA for July, 1916, will welcome another account of his life from a somewhat different angle in the *Catholic World* for October, 1917, where there is a twelve-page biographical sketch by Margaret B. Downing. Few, if any, of Dr. Greene's biographers seem to know of a forty-page article about him by Mrs. Brandegee in *Zoe* for April, 1893.

Dr. Carl Skottsberg delivered an illustrated lecture before the Club on November 13, on the island of Juan Fernandez. On November 20, with Mrs. Skottsberg, he sailed for Sweden, after an absence of thirteen months spent in botanical work in southern South America.

OTHER PUBLICATIONS

OF THE

TORREY BOTANICAL CLUB

(1) BULLETIN

A monthly journal devoted to general botany, established 1870. Vol. 43 published in 1916, contained 676 pages of text and 35 full-page plates. Price $4.00 per annum. For Europe, 18 shillings. Dulau & Co., 47 Soho Square, London, are, agents for England.

Of former volumes, only 24–43 can be supplied entire; certain numbers of other volumes are available, but the entire stock of some numbers has been reserved for the completion of sets Vols. 24–27 are furnished at the published price of two dollars each; Vols. 28–43 three dollars each.

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

(2) MEMOIRS

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

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

Correspondence relating to the above publications should be addressed to

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THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR

JOHN TORREY, 1796–1873.

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THE TORREY BOTANICAL CLUB

OFFICIAL ORGAN OF THE WILD FLOWER PRESERVATION SOCIETY OF AMERICA

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

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NORMAN TAYLOR

or carrots. Mushrooms also contain a little fat, some sugar and phosphate, but as a whole they are to be considered vegetables of a low order and not as good as peas and beans or meat. We must remember, however, that it is perfectly absurd to measure the value of a particular food in terms of calories.

2. *Spoiled Mushrooms.*—If a perfectly edible form of mushroom is too old when gathered and especially if it is spoiled, softened, withered, stale or badly canned, changes may occur in its composition which render it unfit to eat. The symptoms of nausea, vomiting, headache, fever of 102 or pulse of 126 appear in one or two hours; to these is soon added a severe diarrhoea. The symptoms subside within a week without fatalities.

Mushrooms are also very early invaded by insects. These may be inoffensive but they are certainly not aesthetic. Some larvae, however, are poisonous and it is well to reject from your basket all mushrooms which are the feeding ground for small "worms." If the mushroom becomes softened and slimy we may assume that like putrid meat it is infected by microbes. These microbes produce a ptomaine called choline ($C_2H_4OHN(CH_3)_3OH$) which is also found in putrid meat. If this product, choline, is oxidized it becomes muscarine, the active poison of the "fly agaric" (*Amanita muscaria*) and other mushrooms. Choline and muscarine produce symptoms like cholera and may cause death.

3. *True Mushroom Poisoning* (poisoning from mushrooms due to a true poison contained in certain species).—It is an interesting fact that the most dangerous mushrooms are also the most perfectly evolved ones and are those which the botanist places at the head of his mushroom classification. There are more than 1,000 described varieties of mushrooms and of these there are only relatively few which if eaten are poisonous. The Department of Agriculture lists 72 varieties as "poisonous or suspected of being poisonous," while Dr. Murrill would reduce the number to between twenty and twenty-five varieties. To prevent poisoning by eating mushrooms there are two principles upon which to work; either be able to identify the poisonous ones surely or else learn to identify a few forms of edible mushrooms which do not

Group	Species	Clinical Classification of Poisoning		
		Name of Poison	Effects on Body	Poison Reaction
I. Excites muscle fiber.	Ergot of rye.	Ergotin.	Heart, blood vessels, uterus.	Not destroyed by heat. Symptoms after prolonged ingestion. Death rare.
II. Destroys red blood cells.	*Gyromitra esculenta* (if old or stale).	Helvellic acid or phalline.	Destroys red blood corpuscles. Oxygen starvation.	Not destroyed by heat or acid. Not dissolved out by hot water. Symptoms in 6–12 hours. Death 3 days or recovery in 1 week.
III. Gastro-intestinal irritant.	*Russulae*, *Lactarius*, (if peppery); *Entoloma*, *Boletus sensibilis*, *Panus stipticus*, *Cantharellus aurantiacus*, *Lepiota morgani*	A complex acid-resinoid.	Inflammation of stomach and inflammation of intestine.	Sometimes destroyed by cooking aided by gastric juice. Symptoms in 1 hour, recovery in 24 hours.
IV. Gastro-intestinal irritant plus effect on nervous system.	*Boletus luridus*, *Amanita cothernata*, *A. muscaria*, *A. pantherina*, *Clitocybe illudens*, *Inocybe infida* *Pholiota autumnalis*.	Muscarine choline nevrine "pilz-atropin"	Gastritis and enteritis with excitation and paralysis of nervous system.	Not destroyed by heat. Dissolved out by boiling 5 mins. Symptoms in 1 hour—Recovery in 24 hours to 1 week.
V. Stimulates nervous system.	*Panaeolus campanulatus*, *P. retirugis*, *P. papilionaceus*.	Pilz-atropin.	Stimulates nervous system.	Dissolved by salt and water. Symptoms in 2 hours, recovery in 24 hours.
VI. Destroys nervous system and viscera after period of incubation.	*Amanita phalloides*. *A. solitaria*. *A. spreta*. *Amanitopsis volvata*.	Amanitin (Ford).	After a period of incubation (10–12 hours) destroys cells of brain, nervous system, liver and other viscera.	Not dissolved out. Not destroyed by heat or acid. Symptoms in 10 to 12 hours. Death in 3–4 days.

in the least resemble any poisonous variety, and then leave all others strictly alone. Another safe rule is never to eat a mess unless the identification has been checked up by at least one other person. Later we shall turn to this subject again. For the present, remember that a few mushrooms are deadly poison, others (a greater number) dangerous, and that the most deadly ones give only slow evidence of poisoning. It is because of this that when symptoms appear it is too late to offer any antidote. The body is overwhelmed with the poison before it is manifest. As the fatal dose of poison is indeed very small, one poison mushroom in the entire mess may be sufficient to kill a whole family.

Some investigators have studied poison forms from the morphological characters, others from their chemical contents, or have classified them empirically as irritant, dangerous or deadly. Dr. Roch in the above mentioned communication uses a clinical classification. As this is simple, we shall, with slight modifications, adopt it and combine it with the morphological or botanical arrangement.

Group I. Fungus Exciting Action of Muscle Fiber.—The well-known ergot of rye (*Claviceps purpurea*) acts in this way and furnishes physicians with a remedy of considerable value. The muscle tissue strongly contracted, especially the muscle of the uterus and of all blood vessels. In acute poisoning by ergotin vertigo, itching, anesthesia, weak pulse, delirium and stupor have been noticed.

Chronic poisoning, which in the Middle Ages was quite frequent, occurred from eating cereals and bread contaminated with ergot. After prolonged ingestion the poisoning assumed a convulsive form or a gangrenous form, in which the fingers and toes sloughed away from insufficient blood.

Group II. Mushrooms Containing a Haemolytic Substance (Red Blood Corpuscle Destroyer).—One mushroom which is said to contain this poison is *Gyromitra esculenta*. *Amanita phalloides* also contains it along with other poisons. The poison is called helvellic acid by some, phalline by other writers, and one (Roch) says it is destroyed by cooking and probably by the gastric juice

are rendered harmless. Roch states that the poison is removed by boiling ten minutes in acidulated (vinegar) water and then even *Russula emetica* is safe. The negroes of the southern states are said to have learned empirically how to prepare this class, as well as *Amanita muscaria* which they eat freely. This method of preparation will be given later.

The poison is an acid resinoid which has a disagreeable taste or is peppery. The symptoms are violent, but recovery usually ensues within 24 hours. They are the symptoms of a severe cholera infantum (summer diarrhoea). Beginning *one hour* after ingestion there is nausea, prolonged and severe vomiting, accompanied by abdominal pain and diarrhoea which may be foetid and bloody. If the victim is young or enfeebled such violent purgation may so exhaust the water from the body and the brain that convulsions and death may ensue. Recovery within 24 hours is the usual rule.

Conclusions.—If boiled in acidulated water (1 cup vinegar to pint of water) for ten minutes, washed afterwards and all liquids thrown away, this class may be cooked and eaten with safety, although not without some misgivings unless one is a sophisticated and hardened mycophagist.

Group IV. Mushrooms Affecting Chiefly the Nervous System and the Gastro-Intestinal System.—This group, which like the preceding one is abundant, is made up of *Boletus luridus*, *Amanita cothernata*, *Amanita muscaria*, *Amanita pantherina*, *Clitocybe illudens*, *Inocybe infida* and perhaps *Pholiota autumnalis*. They produce both phenomena of gastro-intestinal irritation and irritation of the nervous system. This means that we have arrived at a group where special symptoms are present from a poison which affects chiefly the brain and spinal cord. Curiously enough sometimes the intestinal symptoms predominate, sometimes these are suppressed and the nervous symptoms are chiefly important. The locality of growth, the season and especially the culinary preparation seem to be responsible for this difference.

The two chief members of this group are *Amanita muscaria* (false orange mushroom; fly killing mushroom) and *Amanita pantherina*, and it is from the ingestion of these that many poison cases arise.

Roch* says that *Amanita muscaria* does not deserve its bad reputation and states emphatically that it does not kill. He recalls the fact that in Russia it is eaten freely if the cap is peeled and the mushroom soaked in acidulated water. In Siberia also the natives use the poison of *Amanita muscaria* in religious ceremonies to produce cerebral intoxication, excitement and ecstasy. He points to the fact that the poison is eliminated from the body by the kidneys with great rapidity and that in order to continue this cerebral debauch the dose is frequently repeated by drinking the excretion. Evidently there is something very desirable and nothing very dangerous about this drunkenness from *A. muscaria* or whatever alkaloid it may be that is contained in *Amanita muscaria*. The lesser symptoms are like a real alcoholic or cocaine intoxication; excited heart action, dizziness, laughing and crying, a desire to jump and dance, to run and sing, the devotees of muscarine (or as Roch calls it "pilz-atropin") are perfectly happy, they are in high spirits, experience religious ecstasy and this is all increased by ocular hallucination, in which distances are greatly increased, and size is distorted. They also have delightful visions of singing birds, palaces and beautiful landscapes. These symptoms remind one of the effect from hasheesh or Indian hemp as well as the effects of *Panaeolus* poisoning mentioned earlier in my paper.

Roch claims these symptoms are due to nevrine or pilz-atropin. He denies that muscarine can produce any such cerebral stimulation, claiming that muscarine in non-poisonous doses produces increased saliva, sweating, diarrhoea or colic, and contraction of the pupil, while in the poisoning from this class of mushroom we have added to the gastro-intestinal irritation produced by the muscarine or choline a wholly new group of symptoms produced by a substance he calls fungus atropine or pilz-atropin. When this particular effect upon the brain and nerves is more violent and serious the symptoms narrated above disappear and there sets in headache, fixed hallucinations, delirium, convulsions, loss of sensation, stupor, coma and perhaps death.

Roch states, however, that to meet death in this class the

* L. c., p. 63.

sufferer must have eaten *Amanita pantherina*. He states that poisoning by *Amanita muscaria* results in 100 per cent. recovery.

The symptoms from this class of poisoning develop within one hour. Recovery may require a day or a week.

Conclusions.—The poison is not destroyed by heat but it is soluble in hot water after five minutes' boiling. As I mentioned before the southern negroes may possibly be able to prepare this *Amanita muscaria* in a way which renders it edible.

The hot water boiling five minutes dissolves out the muscarine and neutralizes the acrid resinoid. Washing in salt and water removes the phalline and perhaps the pilz-atropin and if this does not, then steeping in vinegar removes any residual part of the poisons. As the poisons are not destroyed, only dissolved out of the mushroom, we must throw away all the water and vinegar used in preparing them.

Method of Preparation.—This method of preparing mushrooms should be used in all cases where there is any doubt about the edibility of the variety to be tried. But we must remember that there are poisonous mushrooms which never give up their poison by this method, namely, *Amanita phalloides*, *Amanita spreta*, *Amanita solitaria*, *Amanitopsis volvata* and stale *Gyromitra esculenta*. For all forms except these we may consider this method of preparation one which will remove or neutralize the poison.

This preparation is as follows:

Preparing Poisonous Mushrooms for Eating

The following mushrooms are always *deadly*. The poison is not removed from them by any culinary preparation:

Amanita phalloides
" *citrina*
" *verna*
virosa
spreta
" *mappa*
Amanitopsis volvata
Volvaria eleganti (Europe)
Gyromitra esculenta (if old or stale).

Culinary preparation which probably renders dangerous forms edible:

1. Scrape the stem.
2. Remove the gills.
3. Peel the cap (most poison is here).
4. Boil in salt water ten minutes (handful salt in 2 quarts water).
5. Steep in vinegar five minutes (bleaching process).
6. Wash in water, rejecting the water.
7. Cook any way you wish.

1. Scrape the stem, remove the gills, peel the cap (most poison here).

2. Boil in salt water ten minutes (this removes the phalline,

states that there are a great many cases. A study of combined statistics for all ages of victims and all varieties of *Amanita* of this class shows a mortality of 52.6 per cent. This toll of death strikes terror in our minds. There are only eight species belonging to this terrible class. They are *Amanita phalloides*, *A. solitaria*, *A. virosa*, *A. verna*, *A. citrina*, *A. mappa* and *Amanitopsis volvata*.

Poisoning.—There are probably two virulent poisons in mushrooms of this type. The first is phalline, which was the blood-destroying principle which we mentioned in the poisoning by stale *Gyromitra esculenta*. This poison is destroyed by heat and dissolved in salt and water.

The second poison is best known by the name of *Amanita*-toxin (Ford). It is most abundant in the cuticle of the mushroom next in the gills and least in the flesh of the cap. *It is not destroyed by any method which leaves the mushroom in a condition in which one would eat it.*

Symptoms.—There are no symptoms at all for eight to twelve hours after ingestion of this class of mushrooms; during this time absorption of the poison has been going on and the accumulated effects usually break out suddenly and violently and, as often happens, in the middle of the night or in the early morning. Lightning is not more dangerous, nor fate more certain when once the symptoms begin.

If the *Amanita* has been eaten raw the symptoms are increased by the disorganization of the blood due to the phalline. If the mushroom was cooked the symptoms are like Asiatic cholera in their severity and rapidity. From a sound sleep the sufferer awakens with terrible abdominal pains—vomiting, and a continuous diarrhoea. So severe are these that the patient is soon in a very sad state. The internal organs and the nervous system especially are deprived of the water which has drained away in the stools and delirium sets in. The heart and blood vessels contain too little blood and heart failure begins. The kidneys and liver refuse to act. Somnolence now intervenes at the end of forty-eight hours and the patient becomes quieter. The pain and diarrhoea cease, but it is only a false improvement. Exhaustion sets in and death results the third or fourth day, the later symptoms indicating grave changes in the liver, kidney and brain.

Conclusion.—If you are to gather your own mushrooms learn these poisonous forms so that you are able to recognize them as easily as you recognize the letters of the alphabet. Destroy every poisonous mushroom you see and for safety destroy other mushrooms growing in the immediate vicinity of the poisonous one.

There is a belief current among the populace that edible mushrooms growing near poisonous ones are rendered poisonous by this proximity. I can not say if this is so and botanists to whom I have spoken about it laugh at the idea, and yet I might believe that poisonous spores or poisonous gill fragments or even pieces of poisonous cuticle might settle upon the caps of innocent edible neighbors. Therefore, I say be on the safe side and destroy all mushrooms in the immediate vicinity of the poisonous ones.

Prevention.—Prophylaxis: The question of the prevention of mushroom poisoning must be considered now, for it is in the prevention that to-day there is more hope than in the treatment of the poisoning. There are more than 100 serious cases each year in France and of course many hundreds throughout the civilized world. The death rate is small if we consider all cases, but as each death is the result of carelessness, it is wholly inexcusable. Mushrooms are not such valuable vegetables that one can afford to try any experiments and each one who expects to eat those of his own hunting must learn one or two important rules and rid himself of much erroneous information which the public will furnish. I have formulated the question of prevention of mushroom poisoning as follows:

Rule I. Learn first to recognize every *Amanita* and *Gyromitra esculenta.*

Rule II. As soon as possible be able to identify the twenty-two varieties which are named on page 219.

Rule III. If you are sure you have not an *Amanita* you may taste a piece the size of a dime. If it tastes good and no symptoms follow the ingestion of a small piece you may cook one, throw away the water in which it is cooked, and eat it. If no symptoms arise that day and you like your new-found friend you may cautiously increase the dose.

Rule IV. Take two years if necessary to find out all about an unknown variety. If you do this Rule III will never cause you any trouble.

Rule V. Neither use the water in which an unknown variety has been cooked nor soups, sauces, gravies, etc., made from it.

Rule VI. All mushrooms should be well cooked. Avoid soft, stale, tough and old ones.

Rule VII. Soaking in salt and water then steeping fifteen minutes in vinegar and water, washing, and finally cooking will render inoffensive *Helvella*, *Russulae*, *Lactariae*, as well as *Amanita muscaria* and *Amanita pantherina*. Scraping the stem, peeling the cap and removing the gills before soaking are useful adjuncts.

Rule VIII. The above method does not change in the least the danger from the *Amanita phalloides* group.

Rule IX. Because slugs, ants, insects or ruminants eat a mushroom it does not follow that it is harmless for man.

Rule X. The popular notion that mushrooms are edible if they taste agreeable, do not coagulate milk, do not turn a piece of silver black, do not change color on breaking must be forever dismissed. The deadly Amanitas do none of these things.

Rule XI. People are usually susceptible in regular ratio to their age—children are very susceptible, so are enfeebled persons and those who are below normal weight.

Rule XII. In general, the earlier the poisonous symptoms are manifested after eating a poisonous variety of mushroom, the better the chances for a quick recovery, the less danger to life. The very dangerous kind give symptoms from eight to twelve hours after eating.

Rule XIII. Study your idiosyncrasies—some stomachs tolerate the most violent and irritant forms and destroy poisons. Nobody is proof against the *Amanita* class.

Rule XIV. The following mushrooms are all harmless and very good to eat. They are so different in appearance from the poisonous kinds that one cannot make mistakes in gathering them. They are found within one hundred miles of New York at the time mentioned, further south they are earlier—further north later.

II. The stomach should now be emptied—after a wait of fifteen minutes if the above remedies are used or at once if they are not used. I know of one life probably saved by mustard and water after eating a large piece of *Amanita verna*. Household emetics are always on hand. Soap suds, a tablespoon of salt and a cup of tepid water, mustard, one-half teaspoonful to a cup of tepid water, one half cup of linseed oil or sweet oil. These remedies will always occasion prompt vomiting and if they do not the victim should swallow about a quart of tepid water and the index finger should be shoved over the back of the tongue into the throat and held there, pressing forward on the base of the tongue until the contents of the stomach are rejected. This should be repeated several times until no more pieces of mushroom are observed in the ejected material. At a pharmacy one may obtain syrup of ipecac or sulphate of copper solution (30 grains copper sulphate), both of which are efficient emetics.

III. The third step in the emergency treatment is the use of a purge to bring from the intestinal tract any of the poison which has passed from the stomach. For this purpose a tablespoon of Epsom salts dissolved in a glass of water or two ounces (six tablespoons) of castor oil should be administered fifteen minutes after the victim has stopped vomiting. The purge should not be withheld because the victim is already purging. Diarrhoea is an indication for the use of a purge.

IV. If the patient becomes exhausted and stimulants are necessary, coffee and tea (both very strong) may be used. *Alcohol should never be administered by the stomach in cases of mushroom poisoning.* Strangely enough, it is the one thing people are always recommending and it is usually at hand.

Alcohol dissolves the poison from the mushroom very rapidly, and then both alcohol and poison are quickly absorbed by the victim. Therefore alcohol used when there are any remnants of mushroom in the victim's stomach will increase the poisoning and may cause a fatal result where one might possibly without the alcohol have made a recovery. A physician may use alcohol by hypodermic injection but it must never be swallowed.

V. These means having been used there is not much else to do unless one is practiced enough to know how to administer a medicament with a hypodermic syringe. A physician would use morphine sulphate gr. 1-6 to control convulsions and pain, he would give hypodermics of digitalis and alcohol and camphor to stimulate the heart. He would inject under the skin of the abdomen or the thigh about 500 cc. (1 pint) of a normal salt solution to replace the water drained from the body by the vomiting and purging and lastly he would use one or two hypodermics of atropine sulphate gr. 1-100. This remedy, atropine sulphate, is said to be a specific antidote to every poison except the fatal poison amanitin (Ford). The atropine sulphate is most useful for the symptoms which occur in the late stages of the poisoning. It checks secretion from the skin and gastro-intestinal tract. It therefore stops the exhaustive diarrhoea and it stimulates the brain and keeps the respiration and the heart going until the patient can neutralize or eliminate the poison.

The researches of Ford would indicate that atropine sulphate is a true specific against all mushroom poisons except amanitin (Ford). Every amateur who expects to collect and eat his mushrooms should learn from his physician how to administer hypodermic medication and should carry along with his botanical books and his bottle of vinegar, a hypodermic syringe and a few precious tablets of atropine sulphate.

THE GENUS ANAMOMIS IN FLORIDA

By John K. Small.

In the spring of 1904, Mr. P. Wilson and the writer collected specimens of twigs of a species of *Anamomis* from an old stump at a lately abandoned surveyor's camp on Long Key in the Everglades. In the winter of 1909, Mr. J. J. Carter and the writer collected similar twigs from stumps in the hammock on the eastern end of Long Key. About the same time we found some rather poor flowering specimens of the same kind of tree in the hammock of the small key which lies west of the southern part of Royal Palm Hammock.

These specimens were referred to the only species of *Anamomis* known to grow in the United States, the endemic *Anamomis dicrana*. The leaves on the twigs collected from sprouting stumps were evidently not typical of the normally developed tree, while those on our only flowering specimens were only partly developed. Last winter, however, I received a branch with fully and normally developed leaves, collected by Mr. Charles T. Simpson in the Arch Creek Hammock. This specimen revived my interest in the specimens we had collected in previous years; but it was not until April 1917 that the status of the plant was finally established. One morning in passing Arch Creek while going from Ft. Lauderdale to Miami, Mr. Simpson and I visited the trees Mr. Simpson had discovered in the winter, and fortunately we found one tree in full flower. The mature leaves and the flowers proved the tree to be different from the previously known Florida species of *Anamomis*, and also different from any species known from the West Indies. The tree should bear the name of the discoverer of the best specimens, and it may be named and described as follows:

Anamomis Simpsonii Small sp. nov. A tree 15 m. tall or less with a buttressed trunk when well grown, a smooth bark, and finely appressed-pubescent twigs: leaves numerous; blades narrowly obovate, elliptic-obovate, or nearly elliptic, 2.5–6.5 cm. long, acutish, obtuse, or notched at the apex, dark green and shining above, paler and dull beneath, coriaceous, finely glandular-puncate, entire, with rather distant primary straight lateral veins and coarse rather faint (except when dry) reticulations between them, with the branches forming marginal loops, rather slender-petioled: cymes lateral, 3–15-flowered, slender-peduncled, the peduncles about as long as the subtending leaves, sometimes longer, sometimes shorter, minutely appressed-pubescent, each bearing a pair of small leaf-like bracts at the apex: flowers fragrant, sessile: hypanthium short-obconic, densely silky-strigillose with white hairs: sepals 4, green, paired, two of them orbicular-ovate, two orbicular-reniform, 2–2.5 mm. long, obtuse, punctate, the narrower ones merely ciliolate, not scarious-margined, the wider ones with erose-ciliolate margins: petals white, concave, 4–5 mm. long, obovate to suborbicular, sparingly punctate, erose-ciliate: stamens mostly 60–70; filaments capillary, 5–6 mm. long; anthers globose-didymous, fully 0.5 mm.

in diameter: style filiform, slightly thickened under the stigma: berry ellipsoid, often broadly so, mostly 8–10 mm. long, red: seeds usually solitary, reniform.

On limestone, hammock on the southern side of Arch Creek north and south of the natural bridge, Florida. Types, for flowers, *Small & Simpson*, May 12, 1917, for fruit, *Simpson*, August 8, 1917, both in herb. New York Botanical Garden.

Anamomis Simpsonii differs from *A. dicrana* in the larger flowers, the several-flowered cymes, and the very numerous stamens. The following key will serve to differentiate the two species:

Corolla less than 1 cm. wide; petals 2.5–3.5 mm. long; stamens mostly 30–40; cymes few-flowered. 1. *A. dicrana.*

Corolla over 1 cm. wide; petals 4.5–6 mm. long; stamens mostly 60–70; cymes several-flowered. 2. *A. Simpsonii.*

The known geographical distribution is: Arch Creek Hammock, small key west of Royal Palm Hammock, and hammocks on the eastern end of Long Key, Everglades. It is to be expected in other hammocks of the Everglade Keys.

The other closely related species, *Anamomis dicrana*, grows in an entirely different part of Florida. It occurs along the eastern coast from about Mosquito Inlet to Cape Canaveral, and on the western coast from the Caloosahatchee River to Cape Romano.

Rather fragmentary specimens of an *Anamomis* were collected on Key West many years ago. These have been referred to *A. dicrana*, but that disposition of them now appears doubtfully correct. The rediscovery of *Anamomis* on Key West is extremely desirable for the proper disposition of that plant. If it has been exterminated on Key West, it may still come to light on some of the neighboring keys.

Two additional species, *Anamomis longipes* and *A. bahamensis*, are known from the limestone pinelands of the Everglade Keys and of the lower Florida Keys. Thus we can now definitely record four species of *Anamomis* from Florida, two of which also grow in the West Indies.

SEXUAL DIMORPHISM AND VARIATION IN GINKGO BILOBA, L.

By N. M. Grier

Nurserymen claim to be able to distinguish the sex of this tree by the habit assumed. According to their observations, the male tree while retaining the conical type of stem characteristic of the family, tends to approximate the columnar aspect as exhibited for instance in the Lombardy poplar. On the other hand they state the outline of the female tree is far broader at the region of lowest branching, *i. e.*, the outline of the female tree is a cone with a much larger base than that of the male. Personal observation of the fruiting trees seemed to confirm the difference claimed by the nurserymen, although some intergrades were found. The available literature contained no reference to any sexual dimorphism whatsoever nor to the following distinction between male and female trees based on leaves taken from the lower branches of 5 trees in the Shaw Botanical Garden and Tower Grove Park in St. Louis.

As has probably been observed, a large proportion of leaves of ginkgo are entire or devoid of true lobing, although they may become frayed and indicate a false division. Of a total of 535 leaves examined from 2 male trees, 322 showed a true lobing, generally into 2 well marked, but often 3 or 4 divisions less marked —60 per cent. In the 3 female trees, the proportion of bilobed or divided leaves is much less, 103 of 645 or 13 per cent. of the total. This condition of greater abundance of dissected leaves in the male seem to correlate with the distinction made by the nurserymen. The female tree, a broad-based cone consisting of excurrent trunk with branches diverging therefrom from base to apex at a constantly decreasing angle, would not require the same adaptation for lighting that the spire-like contour of the male would, which therefore may account for the greater abundance of dissected leaves in the male.

Central High School,
St. Louis, Mo.

REVIEWS

Harshberger's Mycology and Plant Pathology*

The author has compiled a lot of undoubtedly useful information and therefor deserves our sincere thanks. He has, however, undertaken a difficult, if not, indeed, impossible task in trying to combine successfully under one cover the subjects of mycology and plant pathology. Perhaps, however, the experiment has been worth while if only for the value of the encyclopedic compilation, notwithstanding the fragmentary treatment of some of the subjects.

The style is unfortunately at times rather involved and obscure; commas are often used wrongly or else omitted where necessary to make the meaning clear. The ending "*ic*" is used fairly consistently throughout the book; sounding rather poetic in such words as "chemic," "technic," "the mycologic student." But chemic*al*, physic*al*, typic*al*, spheric*al* have occasionally slipped by, along with some careless proofreading, such for instance as the failure to transfer pp. 324 and 325 to the end of Chapter XXIV and the inverted figure on page 229. "Funguses" is rather unusual; and the interpretation of "geographic distribution of fungi" as a study of "*habitats* is somewhat strained." Strict adherence to the Engler-Gilg syllabus and disregard of recent researches, in particular certain American ones, has made his treatment seem rather archaic in places.

E. W. OLIVE

Hesler and Whetzel's Manual of Fruit Diseases†

This manual is the first of a series, each to deal with a related group of diseases, which is promised from the department of plant pathology of Cornell University. It deals only with the diseases of certain important northern fruits: apple, apricot, blackberry, cherry, cranberry, currant, gooseberry, grape, peach,

* Harshberger, John W., A Text-book of Mycology and Plant Pathology. Pp. xiii + 779. 270 figures. Philadelphia, P. Blakiston's Son & Co., 1917. Price $3.00.

† Hesler, Lex R., and Whetzel, Herbert Hice, Manual of Fruit Diseases. Pp. xx + 462; 126 figures. New York, The Macmillan Co., 1917. Price $2.00 postpaid.

Professor R. A. Harper gave an illustrated lecture on "A Century of Botany."

Meeting adjourned.

B. O. DODGE,
Secretary.

MAY 23, 1917

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

The minutes of the meetings of April 25 and May 8 were read and approved.

Mr. John Enequist, The Chatelaine, 1111 Dean St., Brooklyn, was proposed for membership by Dr. N. L. Britton.

Dr. F. J. Seaver, in behalf of the program committee, asked for suggestions for the improvement of the Club's meetings.

The acting secretary announced the death of one of the Club's members, Mr. Lycurgus R. Moyer, of Montevideo, Minnesota, and showed obituary notices of the deceased.

The resignation of Mr. A. M. Johnson of Spokane, Washington, was read and accepted.

The following persons were elected to membership, subject to the approval of the committee on admissions: Mrs. Jerome W. Coombs, Scarsdale, N. Y.; Mr. John Enequist, 1111 Dean St., Brooklyn, N. Y.; Miss Helen E. Greenwood, 5 Benefit Terrace, Worcester, Mass.; and Mrs. Alice R. Northrop, 520 East 77th St., New York City.

The first paper on the scientific program was a discussion of "The Rusty-spored Agarics of North America" by Dr. W. A. Murrill.

This large and difficult group of gill-fungi contains about seventeen genera, some of them with one hundred to three hundred species. Professor C. H. Kauffman is monographing *Inocybe* and *Cortinarius* for the North American Flora, while Mr. L. O. Overholts has undertaken *Pholiota*.

In a part of North American Flora now in press, the following genera are treated: *Tapinia*, *Paxillus*, *Crepidotus*, *Tubaria*, *Galerula* (*Galera*), *Naucoria*, *Pluteolus*, *Mycena* (*Bolbitius*), *Phylloporus*, *Gymnopilus* (*Flammula*), and *Hebeloma*. A summary of the North American species in these genera is given below:

Genera	Old Species Also in Europe	Old Species America Only	New Species	Total
Tapinia	1	1		2
Paxillus	2			2
Crepidotus	3	36	7	46
Tubaria	2	8	4	14
Galerula	5	20	8	33
Naucoria	6	38	21	65
Pluteolus		11	4	15
Mycena		10	2	12
Phylloporus	1			1
Gymnopilus	6	66	13	85
Hebeloma	4	28	18	50
11	30	218	77	325

Dr. P. A. Rydberg followed with some notes on the "Flora of the Rocky Mountains." He first gave a brief review of the botanical explorations in this area, beginning with the expedition of Lewis and Clark, more than a hundred years ago, and mentioning the more important publications on the flora of the region. The speaker had been interested in this flora for about twenty-five years and had spent nine summers in making collections and field studies in the region indicated. About fifteen years ago he planned the publication of a manual of the flora of the Rocky Mountains and has since worked intermittently on the preparation of the manuscript. The work had now progressed so far that about a half of the proposed book was in type, and proof-sheets were exhibited. The manual will cover the flora of Colorado, Utah, Wyoming, Idaho, and Montana, and the western portions of Nebraska, South and North Dakota, together with the Canadian provinces of Saskatchewan and Alberta and a small part of British Columbia.

Under the title "Observations on Tree Girdling," Dr. Fred J. Seaver directed attention to two interesting cases, the first a tulip tree which had been girdled for apparently six or seven years and was still alive, and the second two maple trees in the grounds of the New York Botanical Garden, which had been girdled by beavers during the summer of 1915 and have just begun the third season's growth since the girdling took place. It is the intention to follow this latter case from year to year in order to determine what the final effect of this treatment will be.

Discussion followed each of the papers, adjournment taking place at about five o'clock.

MARSHALL A. HOWE,
Secretary pro tem.

DATES OF PUBLICATION

No. 1,	for January,	Pages 1–20	Issued February	1, 1917
No. 2,	February,	21–32	March	8, 1917
No. 3,	March,	33–54	April	17, 1917
No. 4,	April,	55–68	May	10, 1917
No. 5,	May,	69–90	June,	2, 1917
No. 6,	June,	91–110	June	13, 1917
No. 7,	July,	111–130	July	18, 1917
No. 8,	August,	131–150	August	14, 1917
No. 9,	September,	151–170	October	2, 1917
No. 10,	October,	171–182	October	31, 1917
No. 11,	November,	183–206	November	30, 1917
No. 12,	December,	207–242	January	24, 1918

ERRATA, VOL. 17.

Page 10, line 30, for *maritimus* read *littoralis*.
Page 12, line 1, for *flava* read *villosa*.
Page 137, line 43, for *Polygonatum* read *Polygonum*.
Page 138, line 27, strike out *Allium* and *Deringa*.
Page 169, line 26, for *R. L.* read *R. A.*
Page 184, line 6, for 1873 read 1866.
Page 185, line 34, for F. L. read F. H.