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JOHN TORREY, 1796–1873

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THE TORREY BOTANICAL CLUB

BY

JEAN BROADHURST

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ERRATA, VOLUME 8

Page 29, 2d line from bottom, *for* **305** *read* 305.

Page 48, 4th line, for *Corprinus* read *Coprinus.*

Page 49, title of picture, omit *comma* after *Saxifraga.*

Page 50, 11th line, for *Grimmias* read Grimmias.

Page 50, 13th line, for *Galiums* read Galiums.

Page 84, 19th line, *complete the brackets.*

Page 86, 3d line, *for* It *read* "It.

Page 86, 13th line, *for* size *read* size".

Page 86, 21st line, *substitute* semicolon for *comma after* D. C.

Page 94, 6th line, *for* f *read* If.

Page 97, 5th line from bottom, *for* **Hicoria glabra** *read* HICORIA GLABRA.

Page 98, 6th line from bottom, for **Juglans nigra** *read* JUGLANS NIGRA.

Page 104, 5th line, *omit* comma *after* included.

Page 136, 4th line, *for* Frond *read* "Frond.

Page 136, 13th line, *for* Rootstock *read* "Rootstock.

Page 139, 1st line, *for* figures 6, 7, 8, and 9 read *figures 6, 7, 8, and 9.*

Page 155, 19th line, *for* **Rhipsalis Cassutha** *read* RHIPSALIS CASSUTHA.

Page 156, 20th line, *for* **Rhipsalis alata** *read* RHIPSALIS ALATA.

Page 160, *for* Sept. 21, 1908, *read* Sept. 21, 1907.

Page 160, *for* Symposium of 1909 *read* Symposium of 1908.

Page 161, 12th line from bottom, for *Gymnopogon ambiguus* (Mx.) B.S.P. read *Gymnopogon brevifolius* Trin.

Page 162, 15th line, for *Pogonia diviricata* read *Pogonia varicata.*

Page 164, 13th line from bottom, before *Pyrola secunda* L. insert *Aralia spinosa* L. Georgetown.

Page 164, 9th line from bottom, for *Gentiana puberula* Mx. ? read *Gentiana Elliotii* Chapm. (fide Britton).

Page 167, 10th line, for *Wedeliella* read **Wedeliella.**

Page 167, 14th line, for *Wedeliella cristata* read **Wedeliella cristata.**

Page 167, 15th line, for *Wedeliella glabra* read **Wedeliella glabra.**

Page 167, 16th line, for *Wedeliella incarnata* read **Wedeliella incarnata.**

Page 167, 18th line, for *Wedeliella incarnata anodonta* read **Wedeliella incarnata anodonta.**

Page 167, 20th line, for *Wedeliella incarnata villosa* read **Wedeliella incarnata villosa.**

Page 167, 22d line, for *Wedeliella incarnata nudata* read **Wedeliella incarnata nudata.**

Page 173, 16th line, for *Fuscraea* read *Furcraea.*

Page 174, 10th line from bottom, *for* Paoso *read* Paso.

Page 180, 3d line, *omit* comma *after* it.

Page 200, 3d line from bottom, *supply* comma *before* and.

Page 212, 13th line, for *Eyrthronium* read *Erythronium.*

Page 218, 2d line, *omit* comma *after* species.

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THE TORREY BOTANICAL CLUB

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JEAN BROADHURST

Teachers College, Columbia University

New York City

TORREYA

January, 1909

Vol. 9. No. 1.

A NEW GENUS OF FOSSIL FAGACEAE FROM COLORADO *

By Arthur Hollick

Among the many beautifully preserved specimens of fossil plant remains from the Tertiary shales of Florissant, Colorado, sent to me for examination by Professor Theodore D. A. Cockerell, are the two here figured. They present the rare combination of leaves and fruit, the latter in different stages of development, attached to their respective branches, thus enabling us to identify the several parts as belonging to one and the same species.

Detached leaves of this species are abundantly represented in the shales, and years ago these were described and subsequently figured by Lesquereux under the name *Planera longifolia* ; † but the correctness of their reference to this genus has generally been regarded as questionable by those who had occasion to critically examine them. The nervation of the leaves is not typical of *Planera*, and the characters of the fruit, now found unmistakably associated with them, demonstrate beyond question that the original generic identification was erroneous. In view of these circumstances it therefore becomes advisable to determine, if possible, the correct botanical affinities of the remains and to redescribe them in the light of our newly acquired information concerning them.

The fructification is, superficially, so strongly suggestive of the Fagaceae that it is difficult to resist the conviction that relationship at least with this family is clearly indicated, and the leaves

* Illustrated with the aid of the McManes fund.

† Sixth Ann. Rept. U. S. Geol. Surv. Terr. 1872: 371. 1873. Rept. U. S. Geol. Surv. Terr. 7 (Tert. Fl.): 189. *pl.* 27. *f.* 4–6. 1878.

[No. 12, Vol. 8, of Torreya, comprising pages 277–315, was issued January 6, 1909.]

also are fagaceous in their general characters; but I have failed to make entirely satisfactory comparison with similar parts of species in any existing genus of the family; although several paleobotanical writers have referred certain fossil leaves more or less similar to ours in nervation and dentition to *Fagus* and *Castanea*.*

Taking all of these facts into consideration, therefore, the course which appears to be least open to objection is to regard the specimens as belonging to a species of an extinct fagaceous genus and to redescribe it under a new generic name.

Fagopsis longifolia (Lesq.) comb. nov.

Planera longifolia Lesq., Sixth Ann. Rept. U. S. Geol. Surv. Terr. **1872**: 371. 1873.

Fagus longifolia (Lesq.) Hollick and Cockerell, Bull. Amer. Mus. Nat. Hist. **24**: 88 (footnote). 1908.

General arrangement of growth of leaves and fruit on terminal branchlets similar to that of *Fagus Americana* Sweet; leaves

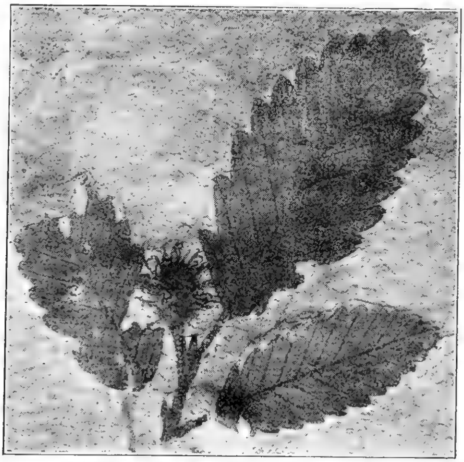

FIG. 1. *Fagopsis longifolia* (Lesq.) Hollick. Nat. size showing immature fruit.

* *Fagus dentata* Goepp. Paleontogr. **2**: 274. *pl. 24. f. 3.* **1852**; Heer, Fl. Foss. Arct. **1**: *pl. 10. f. 2, 7b, 9;* Gaudin and Strozzi, Mém. Gisem. Feuilles Foss. Toscane **1**: *pl. 6. f. 5; pl. 7. f. 1.*

Fagus castaneaefolia Ung., Synops. Plant. Foss. 218. 1845; Chlor. Prot., 104, *pl. 28. f. 1.* 1847; Heer, *l. c.*, *f. 7a, 8.* (= *Castanea castaneaefolia* (Ung.) Knowlton, Bull. U. S. Geol. Surv. No. 152, 60.) Etc.

elliptical-lanceolate in outline; margins coarsely and regularly crenate or bluntly dentate; nervation strictly craspedodrome, the secondary nerves almost parallel, each one terminating in the apex of a marginal dentition; fruit apparently single, on a

FIG. 2. *Fagopsis longifolia* (Lesq.) Hollick. Nat. size showing mature fruit.

stout, short peduncle, somewhat ovoid in shape and covered with spinous bracts when immature; globose, rough, and apparently destitute of bracts when mature.

Tertiary shales, station 14, Florissant, Colo., June, 1907.

Figure 1, specimen collected by Mrs. T. D. A. Cockerell. Figure 2, specimen collected by T. D. A. Cockerell.

Specimens in Museum N. Y. Bot. Gard.

NEW YORK BOTANICAL GARDEN

THE RUST OF TIMOTHY*

BY FRANK D. KERN

Timothy rust was reported from this country as early as 1881 or 1882 by Trelease in the Transactions of the Wisconsin Academy of Science † but it is only in very recent years that it has been found in sufficient abundance to attract much attention or to be the cause of any alarm. Except for this single report, rust on timothy has been so rare in this country that its previous existence might almost be questioned. In 1906 a fairly abundant amount was observed at one or two localities in New York, and in 1907 it was reported from Delaware, West Vir-

* Read before the Indiana Academy of Science at the Thanksgiving meeting, Purdue University, November 27, 1908.

† Preliminary List of Wisconsin Fungi, Trans. Wis. Acad. Sci. 7: 131. 1885.

ginia, and New York again, and also from two localities in Ontario, Canada. In New York it was rather common, having been collected in eight or more localities in different parts of the state. 1908 has added Michigan to its list and Wisconsin has reported it again. It is seemingly increasing in its distribution and occurring in much greater abundance.

This spread of a fungous disease on a crop of great importance has caused some anxiety concerning its identity and nature. This has led to some investigation concerning it. In the first place the American and European forms are undoubtedly identical and represent the same species. In the gross appearance of the sori and in the microscopical details of both the summer spores (*urediniospores*) and winter spores (*teliospores*) the species is indistinguishable from the black rust of cereals, *Puccinia poculiformis* or *Puccinia graminis*, as it is better known. In 1894 Erikson and Henning separated the timothy rust as a distinct species, *Puccinia Phlei-pratensis*,* on the grounds that their artificial cultures showed that it probably does not form its aecial stage on the barberry (*Berberis*). An examination of their original report shows, however, that out of nine trials (five in 1892, and four in 1893) while eight gave negative results, one gave a positive result showing pycnia in 16 days and developing aecia in 16 days more. It is noted that the cups formed were unusually small. During the present season eight unsuccessful inoculations on barberry were observed by the writer. Several seasons' experience with the cultures has shown that negative results are not always to be relied on; they may indicate lack of proper conditions or that infection does not take place readily. The one positive result mentioned ought, it seems, be accorded more weight than all the negative ones together, and proves that it does, even if with difficulty, form its aecial stage upon the barberry. The conclusion is that the timothy rust may be considered a race of *Puccinia poculiformis*, or a so-called physiological species, differing from the typical from in having somewhat smaller aecial cups and in the somewhat smaller size of

* Die Hauptresultate einer neuen Untersuchung ueber die Getreideroste, II. Zeits. f. Pflanzenkr. 4: 140. 1894.

the hyphae of the uredinial mycelium as cytological studies have shown, but there is no positive evidence to show that it can be regarded as a distinct species.

Knowing the taxonomic relationship, it may be predicted with reasonable certainty that there is not much danger of the rust transferring to timothy from the other cereals and grasses. It may be expected to become more general in its distribution and may locally do considerable injury; but in spreading it will be limited, chiefly if not entirely, to passing in the summer spore (*uredinial*) stage from timothy to timothy.

PURDUE UNIVERSITY,
LAFAYETTE, INDIANA

ABERRANT SOCIETIES OF SANGUINARIA AND TRILLIUM

BY ROSWELL H. JOHNSON

Several years ago, in the course of biometric studies on some of our wild flowers, I determined the variation in the number of petals of *Sanguinaria Canadensis* L., the bloodroot, for several localities. One of these localities gave results so aberrant that it seems desirable to place it upon record.

The manuals give the number of petals as 8–12 but always figure it with 8 petals. Dr. Cheney, formerly of the University of Wisconsin, informs me that the modal number is eight in every one of the localities in which he has seen it in that state. The following table gives my results, with a count from Milwaukee, Wisconsin, for which I am indebted to Dr. P. H. Dernehl.

Place	Year	No.	6	7	8	9	10	11	12
Yonkers, N. Y.	'99	102	0	0	18	18	16	25	24
Alpine, N. J.	'99	171	3	2	165	1	0	0	0
Glencoe, Ill.	'00	75	0	2	73	0	0	0	0
Milwaukee, Wis.	'02	103	0	1	98	2	2	1	0
Stony Brook, Mass.	'99	4	0	0	4	0	0	0	0
Blue Island, Ill.	'00	8	0	0	8	0	0	0	0
Eagle Heights, Wis.	'02	5	0	0	5	0	0	0	0

It is evident that in general any other number than 8 petals is a rarity. The society in Yonkers where the count was made is, therefore, a remarkably aberrant one, presenting a polygon of frequency of a peculiar character. The locality was a wooded slope in the area bounded by Midland, Yonkers, Jerome, and McLean Avenues. I have sent this note to TORREYA in the hope that some of the local botanists may care to make counts of this species in other surrounding *Sanguinaria* localities and investigate the nature of this peculiar society.

I am reminded, in this connection, of a similar aberrant society of *Trillium grandiflorum* Salisb. near Williamsville, Erie Co., N. Y. This grove contains an unusually large number of cases of acaulescence, petiolate leaves, and sepalody of the petals. These variations are all known in *Trillium grandiflorum*, but they are really common in this particular society.

BARTELSVILLE, OKLAHOMA

REVIEWS

Thaxter's Contribution toward a Monograph of the Laboulbeniaceae. Part II*

Part II of Professor Thaxter's monograph of the Laboulbeniaceae is a handsome work of 251 quarto pages and 44 plates and is throughout, as it is almost superfluous to remark, of the same high quality that characterized the first part of the monograph, published about twelve years ago. The growth of our knowledge of these small fungous parasites on insects and the manner in which Professor Thaxter has made this special field peculiarly his own is well illustrated by the fact that when he began his studies of the Laboulbeniaceae eighteen or twenty years ago the group in the world as a whole was credited with six described genera (four of them valid) represented by fifteen described species, of which only one was from North America. The present contribution brings the number of described species and varieties up to about five hundred, distributed in more than fifty genera, and the author intimates that during the progress of the work more than one hundred additional new species have accumulated, which must await elaboration at some future time. And this expansion is due in very slight measure to any change

*Thaxter, R. Contribution toward a Monograph of the Laboulbeniaceae. Part II. Memoirs of the American Academy of Arts and Sciences **13**: 219–469. *pl. 28–71*. Je 1908.

in point of view as to the taxonomic arrangement of previously known forms; practically all of the forms described as new have been hitherto absolutely unknown. In the first part of the monograph, printed nearly twelve years ago, the number of known species is given as 158, of which 130 were North American and 19 were European. No summary is given in the present part, but while North America is still apparently in the lead in the number of recognized species, its overwhelming preponderance has doubtless been relatively reduced by an increased knowledge of the Laboulbeniales of the other parts of the world. Professor Thaxter has twice visited Europe for the purpose of examining collections of insects in London, Oxford, Cambridge, Berlin, and Paris, and many exotic species of Laboulbeniales thus detected are here described and figured. His own extensive collections of these entomophilous fungi in South America in 1905–6 still remain to be described.

Professor Thaxter devotes a page to refuting Cavara's contention that the Laboulbeniales are essentially saprophytes rather than parasites, his conclusion being that although "the growth of these plants is not associated with any appreciable injury to the host, it is nevertheless a true parasitism of a typically obligate type." As to the details of the phylogeny of the group, the author of the monograph modestly and refreshingly "confesses his complete agnosticism in these matters, an agnosticism which embraces the question of the origin of the Ascomycetes as a whole, and the determination of the course of evolution in the entire fungus series." His conclusion as to the taxonomic position of the group is summed up as follows: "As to the Laboulbeniales, it may be said with safety that they resemble the Florideae in some repects more closely than they do any other plants, while at the same time they are more surely Ascomycetes than many forms included in this group, and the writer sees no sufficient reason why they should not be placed in the Pyrenomycetes, as a group coördinate with the Perisporiales, Hypocreales, etc."

A slight bibliographical defect in Professor Thaxter's monograph is the fact that the contribution which now, apparently, we are to consider "Part I", itself consists of a "Part I" and a "Part II", so that some such citation "Thaxter, Monog. Laboulbeniaceae, Part II, pp. 251–396" might possibly be interpreted as referring to the contribution of twelve years ago as well as to that of the present year. But, of course, no one ought to quote the work in any such fashion. If the Memoirs of the American Academy of Arts and Sciences are cited, as they should be, any such trifling chance of ambiguity will be obviated.

That such a notable extension of human knowledge as is evidenced in Professor Thaxter's monograph has been the work of an American scholar, must always remain a source of pride to American botanists. In connection with a contribution of this kind, it occurs to the reviewer to remark that the fungi parasitic on marine algae are still practically unknown and that though they are probably much less numerous than those parasitic on insects, they offer a field that is well worthy of the attention of mycologists.

Marshall A. Howe

PROCEEDINGS OF THE CLUB

November 25, 1908

The meeting was called to order at the Museum Building of the New York Botanical Garden at 3:40 p. m., with Dr. M. A. Howe in the chair. There were 14 persons present. The minutes of the meeting of November 10 were read and approved.

The resignation of Dr. Valery Havard, dated November 8, 1908, was read. A motion was made and carried that the resignation of Dr. Havard be accepted and that his name be transferred to the list of corresponding members.

There was no announced scientific program for this meeting, but the following communications were made:

Dr. Britton showed fruits of the rare and local tree, *Prioria copaifera* Griseb., which he collected in company with Mr. William Harris, at Bachelor's Hall, Jamaica, near where it was originally discovered sixty years ago by Nathaniel Wilson who sent it to Grisebach. *Prioria* is one of the largest trees of Jamaica, sometimes attaining a height of ninety feet, and is a member of the senna family. So far as is known, this tree is found only on two estates in Jamaica, and grows at an elevation of from five to six hundred feet. This species is characterized by having a one-seeded legume, which is indehiscent. The genus *Prioria* is reported to be represented also in the Republic of Panama.

Dr. Murrill displayed photographs and colored drawings of several of the larger local fungi. He also explained reproduction of colored drawings by the four-color process. This process seems to be the most satisfactory for representing fungi in colors.

Mr. Nash exhibited a living plant of *Dendrobium Coelogyne,* a rare orchid from Burma, which has just flowered in the conservatories of the New York Botanical Garden. Specimens of *Coelogyne* and of other species of *Dendrobium* were also shown to illustrate the characters of these two genera. While the flowers of *Dendrobium Coelogyne* resemble those of a *Dendrobium,* the habit is that of a *Coelogyne.*

The Club adjourned at 4:30 P. M.

PERCY WILSON,
Secretary

DECEMBER 8, 1908

The meeting was held at the American Museum of Natural History, President Rusby in the chair. About seventy-five persons were present. After the reading of the minutes of the preceding meeting, the following persons were elected to membership: Miss Jane R. Condit, 1230 Amsterdam Ave., New York City; Mrs. H. Mark Thomas, 239 West 103d St., New York City, and Professor Guy West Wilson, Upper Iowa University, Fayette, Iowa. The announced scientific paper of the evening on "Mechanical Response of Plants" was then presented by Sir Jagadis Chunder Bose, professor in the Presidency College of Calcutta and author of "Response in the Living and Non-Living", "Plant Response as a Means of Physiological Investigation", etc. The presentation of the subject was accompanied by an exhibition of some of the ingenious and delicately contrived apparatus constructed by Professor Bose for the purpose of measuring and recording the responses of plants to various stimuli. Following is an abstract of the paper compiled from notes furnished by Professor Bose :

The effect of stimulus impinging on a responding tissue is to induce a fundamental molecular derangement. This condition of derangement constitutes excitation. On the cessation of stimulus, there is a slow recovery, the tissue returning to its original condition. This molecular reaction is itself beyond our scrutiny, but it may be shown that we can gauge its intensity and extent by the observation and record of certain concomitant changes induced by it in the responding tissue. Amongst these are (1) changes of form, manifested as mechanical response, and (2) changes of electrical condition, which may be recorded as electrical response.

The intensity of the responsive change will obviously depend on the two factors of strength of stimulus and physiological condition of the tissue. Hence, when stimulus is constant, the amplitude of response gives us a measure of the physiological condition. Now we know that the changing environment must induce unknown changes in this physiological condition, of which there is no outward sign. But we are here enabled to make the plant itself reveal its condition, by the reply it makes to the blow of a stimulus. A stimulating agent will exalt, and a depressing agent diminish or abolish, this response. We have thus a means of attacking the deeper problem of the physiological variation in an organism.

The speaker had been able to overcome the numerous difficulties which occur in connection with the automatic recording of the mechanical response of the plant, by devising three types of instrument. These are (1) the oscillating recorder, (2) the optical lever, and (3) the balanced crescograph.

In the oscillating recorder, the recording lever is made of light aluminum wire and is suspended vertically on jewelled bearings. This lever is L-shaped, and the shorter arm, at right angles to the longer, is attached to the responding leaf. The great advantage conferred by the oscillating recorder lies in the fact that the friction of the writing point against the recording surface is practically eliminated. The source of friction in such arrangements arises from permanence of this contact. In this instrument, however, the writing lever is virtually free, except for the brief intervals in which the smoked glass surface is brought into periodic contact with it. For these records, the glass surface moves in a vertical plane by means of clockwork, and a minute oscillation to and fro is given to it by the agency of an electro-magnetic arrangement. The period of this oscillation is, say, one fifth of a second, and the record is thus made to consist of a series of dots, separated by time-intervals of one fifth of a second. Thus we can see the time-relations of the curve at a glance.

For responsive movements of minute leaflets the speaker employed the optical lever. By use of this a very high magnification is possible. The record is made on a traveling photographic plate by the spot of light reflected from the optical lever, connected with the responding plant.

For the instant detection of the effect of stimulus on the rate of growth, the balanced crescograph is used. Here a balanced and stationary point of light undergoes a sudden movement up or down, according as the rate of growth is enhanced or depressed by the action of an external agent.

In order to study the effects of external agencies on physiological excitability, it is first necessary to obtain a series of normal responses under stimuli of uniform intensity and duration, applied at regular predetermined intervals. This is accomplished by means of the automatic stimulator, in which an expansible fan periodically closes the exciting circuit. The intervals between successive applications and the period of stimulation are, in this instrument, capable of adjustment at will.

In a complete curve of response of the sensitive leaf or leaflet of *Mimosa* or *Biophytum sensitivum*, we find (1) a short horizontal line representing the latent period, (2) an up-curve showing attainment of maximum reaction ; followed by (3) a down-curve representing the recovery. The latent period in a vigorous *Mimosa* is about .24 of a second. The effect of fall of temperature or fatigue results in the prolongation of this latent period to .3 of a second in the former, and .58 in the latter case. The maximum fall of the leaf is attained in 1.5 seconds. Complete recovery takes place in 6 minutes in summer, and in 18 minutes in winter. In a leaflet of *Biophytum* the maximum fall is attained in .5 of a second and full recovery is reached in 3 minutes. The excitatory fall of the leaf takes place when stimulus is applied at or near the responding point. Seen from different points of view, this reaction will appear as a diminution of turgor in the pulvinus, constituting a negative turgidity-variation ; or a shortening or contraction of the more excitable lower half of the pulvinus. Electrically speaking, this reaction will have its concomitant in an electrical variation of galvanometric negativity. It is convenient to include all these excitatory symptoms together, under the single term *negative response.* Here, however, we may describe a responsive change of precisely opposite character, which takes place under definite conditions. This *positive response* consists of an erectile movement of the leaf, a positive turgidity-variation, expansion, and an electrical change of galvanometric positivity. The occurrence of this positive response may be demonstrated, in *Mimosa*, by applying stimulus at a point distant from the responding organ. In a certain experiment this positive or erectile response occurred .6 of a second after the application of the stimulus, and was followed, 2.8 seconds later, by the normal excitatory fall of the leaf. Here we have a response which is *diphasic*, positive followed by negative. When stimulus is moderate, and applied at a still greater distance, the response evoked is positive alone. These facts obtain universally, and from them we derive the following law of direct and indirect stimulation :

The effect at the responding-region of a strong stimulus transmitted to a short distance, or through a good conducting channel, is negative. The effect transmitted to a great distance, or through a semi-conducting channel, is positive.

Responsive movements, like those of the "sensitive" plants so-called, can be detected also in ordinary plants. It will be noticed, in *Mimosa*, that the responsive movement is made possible by the unequal excitability of the upper and lower halves of the pulvinus, the movement being determined by the greater shortening or contraction of the lower. If now we take a hollow tubular organ of some ordinary plant, say the peduncle of daffodil, it is clear that the protected inner side of the tube must be the more excitable. When this is cut into the form of a spiral strip, and excited by means of an electrical shock, we observe a responsive movement to take place by *curling*, due to the greater contraction of the inside of the strip. This mechanical response is at its maximum at that season which is optimum for the plant. When the plant is killed, its response disappears.

In *Mimosa*, under continuous stimulation, there is a fatigue-reversal, the responsive fall being converted into a movement of erection. The same thing happens in the response of ordinary plants, when the first contractile movement of the spiral, for instance, is reversed, under continuous stimulation, to an expansive uncurling.

An important series of observations is that on the modification of response by the tonic condition of the tissue. When the condition is sub-tonic, response is by the abnormal positive, instead of the normal negative, reaction. A strong or long-continued application of stimulus, however, converts this abnormal positive into normal negative.

Another important phenomenon is that for which the name of *multiple response* has been suggested. When the stimulus is very strong, the response is often not single, but repeated, or multiple. Excess of stimulus is thus seen to remain latent in the tissue, for rhythmic expression later. This storage of energy from the environment may in some cases be so great as to cause the continuance of rhythmic activity, even in the absence of immediate stimulation. We thus obtain a natural transition into so-called spontaneous or autonomous movements.

The various peculiarities of the spontaneous movements exhibited by *Desmodium gyrans*, or the telegraph plant, may be studied in the automatic record taken by the optical lever. The rhythmic tissues of the plant are then found to have characteristics which correspond to those of similar tissues in the animal. Lowering of temperature enhances the amplitude and diminishes the frequency of pulsation in the rhythmic cardiac tissue of the animal. The same is found to be true of the pulsatory activity of

Desmodium gyrans. The effects of various drugs are also very similar. The first result of the application of an anaesthetic like ether is to evoke a transient exaltation, followed by depression and arrest. Poisonous gases also induce a continuous depression of activity. A strong poisonous solution, again, induces a rapid arrest of pulsation.

It has thus been shown that by the waxing and waning of response, the variations in the plant's physiological activity, under changing external conditions, may be gauged. It has been shown also how numerous and varied are the factors that go to make up the complexity of plant-responses. It has been shown that stimulus may be modified in its effect, according as it is direct or indirect, and feeble, moderate, or strong. The modifying influence of the tonic condition of the tissue has also been shown, according as this is normal, sub-tonic, or fatigued. In the numberless permutations and combinations of these varied factors lies the infinite complexity of the responsive phenomena of life.

After a discussion of Professor Bose's paper by Doctors Rusby, Richards, and Pond, the meeting of the Club was adjourned to the second Tuesday in January.

Marshall A. Howe,
Secretary pro tem.

OF INTEREST TO TEACHERS

Food for Thought

School Science and Mathematics for January gives the following "simple plant experiment" by E. S. Gould, of Galva, Illinois.

"The following device for showing the necessity of CO_2 in photosynthesis may be of use to teachers of botany, especially where apparatus is limited.

"A bell glass with a rubber stopper is placed on an ordinary pump plate. The tube *C* of the plate is closed with a cork. In the cylinder inside is placed NaOH or $Ca(OH)_2$ to absorb the CO_2. Air is forced through tube *A* (tube *B* being open) for a few minutes until the most of the air in the bell glass is devoid of CO_2. What CO_2 is left in the glass will be absorbed by the NaOH in the cylinder. The air is changed every day so that if there were anything in air beside CO_2 that helped in photosynthesis the plant would be sure to have it. Tube *B* is kept closed except when it seems necessary to introduce water through it to the plant. Before commencing the experiment the leaves of the plant were found to contain starch, but after continuing it three days all traces of starch disappeared, thus proving that CO_2 is necessary in photosynthesis.

"The department editor * wishes to raise four questions relative to this experiment:

1. Do the pupils know enough chemistry to enable them to prove that NaOH or $Ca(OH)_2$ takes CO_2 from the air?

2. Is it true that forcing the air through the liquid in the cylinder by means of tube *A*, and out of the bell jar through tube *B* "for a few minutes" would render "most of the air in the bell jar" devoid of CO_2?

3. How does the pupil know that in watering the plant through tube *B* you do not introduce CO_2 sufficient for the plant's uses?

4. Does this prove "that CO_2 is necessary in photosynthesis"?

"Do not all the points raised in these questions refer to things that the student must take for granted upon the authority of the teacher? If so, would it be quite as well for the pupil to assume in the beginning that the teacher is correct when he says that CO_2 is necessary to the process of photosynthesis?"

The Outlook of December 19 has a short, practical article on forest fires and their prevention, written by Alfred L. Donaldson.

The increasing interest taken in our national forests is indicated by Speaker Cannon's statement that three years ago they cost three hundred and seventy-five thousand dollars, this year, nearly four million, and the estimates for next year are about six million dollars.

The North American Review for November, 1908, contains an article by Gifford Pinchot on "The Foundations of Prosperity" which is well worth reading. Mr. Pinchot remarks that the

* Professor O. W. Caldwell, School of Education, University of Chicago. It is with his permission that this article is reprinted from *School Science and Mathematics*. — EDITOR'S NOTE.

" Forest Service is the sole present example of a branch of our National Government which finds the reason for its existence in the need of a long look ahead" ; and he rightly emphasizes the present discussion of the conservation of natural resources as "the most fundamental question now before the country." For " if we succeed in the conservation of our natural resources, we shall have an opportunity to succeed in everything else."

Science has recently printed another article on the coconut bacterial disease known as bud-rot, which is becoming very common in tropical America. "It is confined to the crown, or terminal bud, of the tree, in which it causes a soft, vile-smelling rot. Owing to the great height of the coconut trees and the difficulty experienced in getting at the terminal bud, surrounded as it is by the sheathing cases of the petioles of the leaves, it is almost impossible to treat the disease locally." The results of the investigations carried on by the United States Department of Agriculture and by appropriations in Cuba are expected to prove helpful. At present the disease seems to be increasing rapidly and none but very early cases are checked by treatment.

Professor Edward L. Nichols, retiring president of the Amerian Association for the Advancement of Science, in his Baltimore address on "Science and the Practical Problems of the Future", said, " Forests may be renewed and the soil restored to its maximum fertility but the problem which is presently to confront the race is that of civilized existence without recourse to energy stored by the slow processes of nature. This problem must be definitely solved before the complete exhaustion of our inherited capital. The problem is not without conceivable solution, since the annual accession of energy from the sun, did we know how to utilize it without awaiting the slow processes of storage employed by nature, is ample for every thinkable need of the future inhabitants of our planet. Estimates of the constant of solar radiation show that about 2.18 kilowatts of power is continually received from the sun for every square meter of the earth's surface or over seven and a half millions of horse-power per square mile. The present use of power in the United States is about eighty million horse-power or one horse-power per capita. This quantity is likely to increase more rapidly than the population in the future unless curtailed by lack of fuel, but it is evident that a very small fraction of the sun's radiation would meet all demands."

NEWS ITEMS

Mr. E. H. Eaton has been made professor of biology at Hobart College.

Mr. A. J. Grout has been transferred to the Curtis High School, New Brighton, Staten Island.

Dr. J. K. Small has recently been sent to Florida by the New York Botanical Garden for a month's collecting trip.

In December, 1908, New York State, at a cost of about $600,000, added 15,000 acres to its forest reservations in the Adirondack and Catskill regions.

Mr. Raphael Zon is studying forest management in Europe, preparatory to taking charge of the experimental work of the United States Forest Service.

The Sullivant Moss Society met at Baltimore with the American Association for the Advancement of Science. Several interesting papers were presented.

Mr. C. A. McLendon, of the South Carolina Experiment Station, has accepted the position of botanist and plant pathologist at the Georgia Experiment Station.

On January 11 the United States Senate passed a bill appropriating $90,000 for acquiring all private holdings in the Sequoia and General Grant national parks, California.

Collections are now being made for the New York Botanical Garden along the northern coast of Cuba by Dr. J. A. Shafer, who expects to spend three months in that region.

The State Agricultural College at New Brunswick, New Jersey, offers several short winter courses in general agriculture, fruit farming, market gardening, etc. Tuition is free to residents of the state.

An address by Professor N. L. Britton on "Darwin's Work in Botany" will form part of the Darwin exercises which are to be held at the American Museum of Natural History by the New York Academy of Sciences on February 12.

Dr. James Fletcher, botanist and entomologist, died last November in Montreal. He had served as botanist at the Dominion Experimental Farms, and Dr. L. O. Howard has termed him "the heart and soul of the Botanical Club of Canada."

Earl Grey, Governor-General of Canada, and President Diaz, of Mexico, have been asked by President Roosevelt to send representatives to a national conference on the conservation of natural resources, which will be held in Washington, February 18, 1909.

A prize of $1000 is offered by the Naples Table Association for promoting laboratory research by women. The prize is awarded in April, 1909, for the third time; it is given for the best thesis, written by a woman, on a scientific subject and must be based on independent research in biological, chemical, or physical science. Further information will be given by Mrs. A. D. Mead, 283 Wayland Avenue, Providence, R. I.

The Baltimore meetings of Section G of the American Association for the Advancement of Science alternated with those of the Botanical Society of America. The vice-presidential address of Professor Bessey was given Tuesday afternoon. An unusually large number of papers — over sixty — was presented, and it was necessary to run two parallel subsections of the section: one for pathology and one for morphology, physiology, ecology, and taxonomy. The officers for next year are: Professor D. P. Penhallow, of McGill University, vice-president, and H. C. Cowles, secretary.

The Botanical Society of America together with the Society for Plant Morphology and Physiology and the American Mycological Society held several sessions in the Eastern High School building. President W. F. Ganong presided. Papers by E. C. Jeffrey and J. M. Coulter on vascular anatomy and its recent development opened the first scientific program. The symposium on ecology included the following papers:

"The Trend of Ecological Philosophy", H. C. Cowles; "The Present Problems of Physiological Plant Ecology", B. E. Livingstone; "Vegetation and Altitude", C. H. Shaw; "Local Distribution of Desert Plants", V. M. Spalding; and "The Relation of the Climatic Factors to Vegetation", E. N. Transeau.

A special Darwin Memorial Session was held on Thursday afternoon. The program was as follows:

"General Sketch and Estimate of Darwin's Work on Cross-pollination in Plants", William Trelease; "Estimate of Darwin's Work on Movement in Plants", H. M. Richards; "Darwin's Influence on Plant Ecology and Plant Geography", F. E. Clements.

Many other interesting papers were presented at the regular sessions. Dr. J. C. Bose, by invitation, gave his address on "Electrical Response in Plants." The address of the retiring president, Professor G. F. Atkinson, was given at McCoy Hall, Tuesday evening. The botanists' dinner, held on Wednesday evening, was attended by about one hundred and twenty people. The officers for the new year are as follows: President, Roland Thaxter; secretary, Duncan S. Johnson; and treasurer, Arthur Hollick.

An editorial in *Science* for January 8 says in discussing the Baltimore meeting of the American Association for the Advancement of Science, "It seems to be scarcely credible, but it is the case, that there were on the program published by the association the titles of more than one thousand papers to be read at the meeting. The great majority of the papers represent research work of a high order. It is sometimes said that the United States is not doing its part in the advancement of science, but this program is a conclusive answer to such criticism. No other country except Germany could hold a meeting in which so many scientific researches maintaining such high standards could be presented as the result of a year's work, and Germany has never held such a meeting."

The Darwin centenary memorial exercises were held January 1, at McCoy Hall, Johns Hopkins University, Baltimore, as previously announced. Beginning at 10 A. M., the entire day was devoted to the commemoration of the 100th anniversary of the birth of Charles Darwin and of the fiftieth anniversary of the publication of the first edition of the "Origin of Species". The exercises were held under the joint auspices of the American Association for the Advancement of Science and the American Society of Naturalists. All the addresses are to be printed in a memorial volume to be published by Henry Holt and Co., of New York. The program for the whole day included:

1. Introductory Remarks, Prof. Thomas C. Chamberlin, University of Chicago, President of the Association.

2. "Fifty Years of Darwinism: Past and Future Experimental Work Bearing on Natural Selection", Dr. Edward B. Poulton, Hope Professor of Zoölogy, Oxford University.

3. "The Theory of Natural Selection from the Standpoint of Botany", Dr. John M. Coulter, University of Chicago.

4. "Determinate Variation", Dr. Charles O. Whitman,* University of Chicago.

5. "The Isolation Factor", Dr. David Starr Jordan,* Stanford University.

6. "The Cell in Relation to Heredity and Evolution", Dr. E. B. Wilson, Columbia University.

7. "The Direct Effect of Environment", Dr. Daniel T. MacDougal, the Carnegie Institution of Washington.

8. "The Behavior of Unit Characters in Heredity", Dr. S. W. E. Castle, Harvard University.

9. "Mutation", Dr. Charles B. Davenport, Carnegie Institution of Washington.

10. "Adaptation", Dr. Carl H. Eigenmann, Indiana University.

11. "Recent Paleontological Evidence of Evolution", Prof. Henry Fairfield Osborn, Columbia University.

12. "Evolution and Psychology", Dr. G. Stanley Hall,* Clark University.

The subscription dinner given in the evening was attended by about three hundred people. Appropriate addresses followed the dinner.

* Not read.

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A Monthly Journal of Botanical Notes and News

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

JEAN BROADHURST

JOHN TORREY, 1796–1873

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OFFICERS FOR 1909

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NORTH AMERICAN ROSE RUSTS*

By J. C. Arthur

From the days of Schweinitz, that is, the times of the first studies of American fungi, down to the near present, all rusts upon roses in North America had been placed under two species, *i. e.*, *Phragmidium speciosum*, a strictly American form, and *P. subcorticium*, a cosmopolitan form. The latter name has many synonyms, *P. mucronatum* having been especially popular, but the earliest and consequently the rightful name appears to be *P. disciflorum*, and therefore will be used in this paper.

In 1876 Peck vaguely called attention in his twenty-eighth Report of the Botanist of the New York State Musuem (page 86) to a variation in teliospores that he had observed. His words are "American specimens generally have the spores more opaque, and with two or three more septa than the typical form. This variant form might be called var. *Americanum*." The variety was placed under *P. mucronatum*. Two years ago Dietel published an extended taxonomic study of the genus *Phragmidium* in Hedwigia, and five months later a supplementary article in the same journal (**44**: 112–132, 330–346). In these two articles Dietel established and well defined four new species of *Phragmidium* inhabiting American roses, and one new species of *Caeoma*, *C. Rosae-gymnocarpae*, from California. This comprises all important taxonomic work upon rose rusts of America up to the present time.

In pursuing the study of American rusts for systematic presentation in the forthcoming North American Flora the genus *Phragmidium* has been reached, and I desire to give in this

*Read before the Botanists of the Central States, at the Madison meeting, March 29, 1907. Illustrated with the aid of the McManes fund.

[No. 1, Vol. 9, of Torreya, comprising pages 1–20, was issued January 26, 1909.]

paper some of the more interesting results that have come to light pertaining to the forms on roses.

Very little has been learned about the Californian *Caeoma*. It s clearly an aecial stage of the type of *Caeoma nitens* on *Rubus*, and like it may belong to the genus *Gymnoconia*. But as no hint has yet been secured regarding the telial stage, the assignment to any other than a form-genus is hazardous.

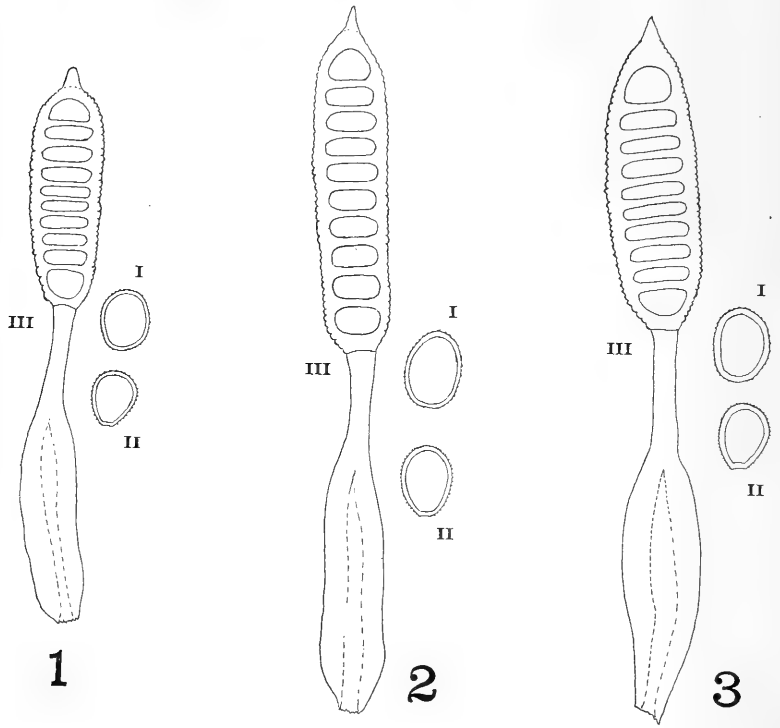

FIG. 1. Spores of the three species of *Phragmidium* on rose having slender eliospores: 1, *P. americanum*, 2, *P. Rosae-setigerae*, 3, *P. Rosae-californicae*; I, aeciospore, II, urediniospore, III, teliospore.

The characters of the rust which has been called *Phragmidium speciosum*, such as the non-gelatinous pedicels of the teliospores, the large, compact telia, found on the stems, and the absence of a uredinial stage, show that it does not accord with true members of the genus *Phragmidium*, and justify its separation under the name *Earlea speciosa*, made some two years ago. This rust occurs upon any and all species of roses in North America, both wild and cultivated, and extends throughout the United States and southern Canada. Its omnivorous and adaptable habits are in marked contrast with the fastidious and restricted habits of all true species of *Phragmidium* on roses found in the same region.

In carefully going over the available material of American rose rusts, properly assignable to the genus *Phragmidium*, the old world species, *P. disciflorum* and all the species erected by Dietel

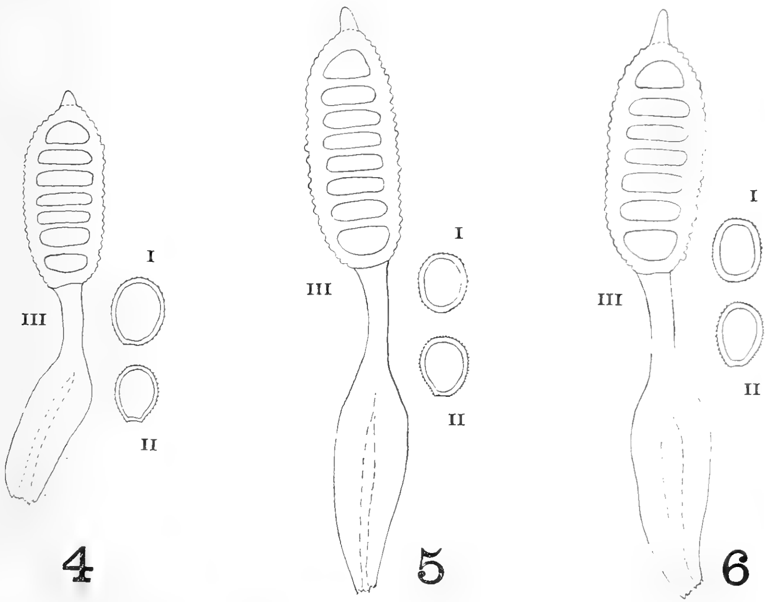

FIG. 2. Spores of the three species of *Phragmidium* on rose having stout teliospores: 4, *P. Rosae-arkansanae*, 5, *P. montivagum*, 6, *P. disciflorum*; I, aeciospore, II, urediniospore, III, teliospore.

are confirmed, as common in North America, together with one additional species now to be described. In defining these species, characters have been drawn from all three stages of the rust, aecial, uredinial, and telial. The new species may be characterized as follows:

Phragmidium montivagum Arthur, n. sp.*

Pycnia amphigenous, gregarious and often confluent, in small groups surrounded by aecia or on spots opposite the aecia, inconspicuous, subcuticular, 80–112 μ in diameter by 30–35 μ high.

Aecia hypophyllous and petiolicolous, 0.4–1.5 mm. across, solitary, or in irregular groups, often confluent over areas 5–10 mm. long, applanate; paraphyses abundant, conspicuous, surrounding each individual sorus, noticeably taller than the spore-mass, spatulate-capitate or clavate, 12–25 μ by 50–70 μ, wall evenly thin, 1–1.5 μ; aeciospores globoid or broadly ellipsoid, 16–19 μ by 21–26 μ, wall medium thin, 1.5–2 μ, rather sparsely but distinctly verrucose.

Uredinia hypophyllous, numerous, scattered, round, small, about 0.1 mm. or less across, soon naked, inconspicuous; paraphyses numerous and noticeable, encircling the sorus, cylindrical or slightly clavate, 9–11 μ by 45–64 μ, wall thin, about 1 μ, slightly thicker above on outer side of curve; urediniospores obovate-globoid, 16–19 μ by 19–23 μ, wall pale yellow, rather thin, 1–1.5 μ, closely verrucose-echinulate.

Telia hypophyllous, at first arising from the uredinia, numerous, thickly scattered, 0.1–0.5 mm. across; paraphyses none; teliospores cylindrical, 24–29 μ by 64–96 μ, usually rounded below and narrowed above, cells 6–9, closely and rather moderately verrucose, apex usually with a conical subhyaline papilla 7–10 μ long; pedicel rugose when dry, upper half 7–9 μ in diameter, lower part swelling in water to 15–30 μ at broadest part.

On *Rosa Sayi* Schw., Cummins, Albany Co., Wyo., July 26, 1895, *Aven Nelson 1499* (type), Crow Creek, Albany Co., Wyo., August 12, 1903, *Aven Nelson 8913*, Belt Mountains, Mont.,

* Pycniis amphigenis, in greges dispositis, inconspicuis, 80–112 μ diam., 30–35 μ altis.

Aeciis hypophyllis vel petiolicolis, 0.4–1.5 mm. latis, saepe confluentibus, applanatis; paraphysibus conspicuis, marginalibus; aeciosporis subglobosis vel ellipsoideis, 16–19 × 21–26 μ; episporio subhyalino, 1.5–2 μ crasso, verruculoso.

Urediniis hypophyllis, numerosis, minutis, rotundatis; paraphysibus cylindraceis vel clavatis, marginalibus; urediniosporis obovato-globosis, 16–19 × 19–23 μ; episporio dilute flavo, 1–1.5 μ crasso, verrucoso-echinulato.

Teliis hypophyllis, numerosis, sparsis; teliosporis cylindraceis, 24–29 × 64–96 μ, verrucosis, 5–8-septatis, loculo terminali apiculo conoideo hyalino 7–10 μ longo ornato; pedicello supra 7–9 μ diam., infra incrassato, oblanceolato vel ellipsoideo, 15–30 μ late.

In foliis *Rosa Sayi*, Cummins, Wyoming, Julo 26, 1895, *Aven Nelson, 1499.*

September, 1889, *F. W. Anderson;* and also on related species of hosts from Colorado and Utah northward in the Rocky Mountains.

Of the rose rusts in North America belonging to the restricted genus *Phragmidium* there are now to be recognized six valid species, all indigenous but one. Space does not permit, and the needs of this discussion do not require the full characterization to be given for each species, but the following key, when taken in connection with hosts and geographical data, will provide some aid to those persons who desire to determine their collections.

Teliospores slender, 8–11-celled.	
Walls of aecio- and urediniospores thin, 1–1.5 μ.	
Teliospores long, 80–100 μ.	1. *P. americanum* Diet.
Teliospores very long, 90–130 μ.	2. *P. Rosae-setigerae* Diet.
Walls of aecio- and urediniospores thick, 2–3 μ.	
Teliospores long, 90–112 μ.	3. *P. Rosae-californicae* Diet.
Teliospores stout, 5–9-celled.	
Walls of aecio- and urediniospores medium, 1.5–2 μ.	
Teliospores 5–8-celled.	4. *P. Rosae-arkansanae* Diet.
Teliospores 6–9-celled.	5. *P. montivagum* Arth.
Walls of aecio- and urediniospores thick, 2–3 μ.	
Teliospores 5–7-celled.	6. *P. disciflorum* (Tode) James

These six species of *Phragmidium* have a most interesting distribution, both as to hosts and territory. The one species coming from Europe occurs chiefly upon thick-leaved roses of the dog and cabbage rose sections, *Rosa canina* and *R. Gallica*, their allies and hybrids, and appears to follow wherever these roses are cultivated. It is known throughout the United States from the Atlantic to the Pacific, northward into Canada, and southward into Mexico and Central America. It does not appear to have passed over to any native rose.

The distribution of the five indigenous species is shown by the accompanying chart. *P. americanum* inhabits the northeastern region along the Atlantic coast from Maryland northward and north of the great lakes, chiefly on *Rosa blanda, R. lucida, R. Sayi*, and certain cultivated varieties derived from these. *P. Rosae-setigerae* is only known upon *Rosa setigera* and *R. carolina*, extending nearly throughout the region of the hosts from central New York to central Nebraska. *P. Rosac-arkansanae* is only known on the prairie rose, formerly called *Rosa arkansana*, now known as *R. pratincola*, and extends from northern Illinois to Kansas and northward. *P. montivagum* is found in the Rocky Mountains from southern Colorado and Salt Lake in Utah northward. It occurs on all or nearly all the many species of native roses of this region, having been reported on *Rosa Bakeri*, *R. Fendleri*, *R.*

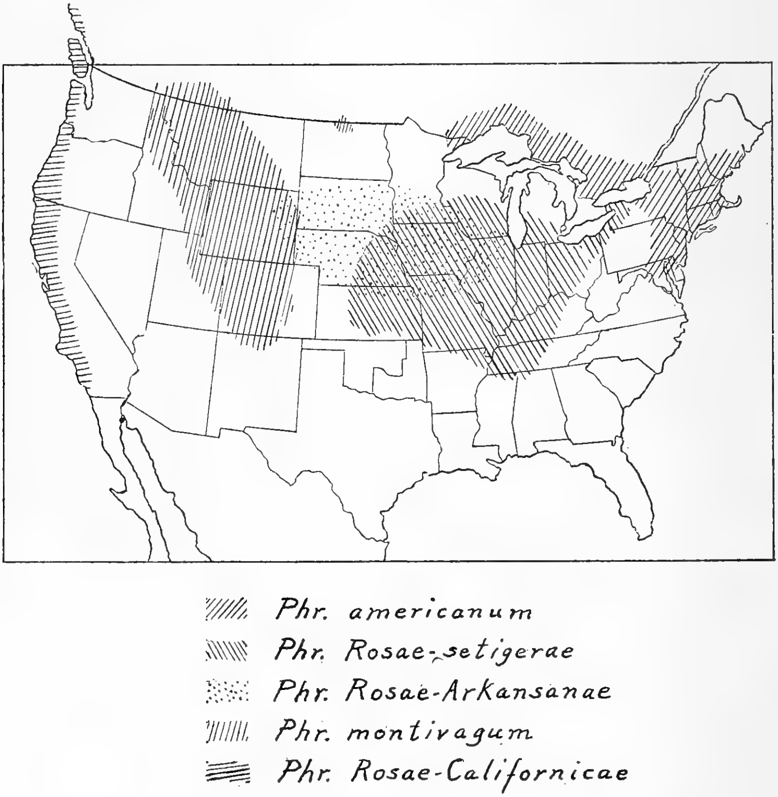

Fig. 3. Distribution of the five American species of *Phragmidium* occurring on native roses.

grosse-serrata, *R. manca*, *R. Maximiliani*, *R. Sayi*, *R. Underwoodii*, *R. Woodsii*, and others. *P. Rosae-californicae* extends along the Pacific coast from southern California to southwestern Alaska, on *Rosa californica*, *R. gymnocarpa*, *R. pisocarpa*, and *R. acicularis* chiefly.

It will be observed that there are large areas from which no native rose rusts are reported, notably all the southern region, and the plateau between the Sierra and Rocky Mountains. Probably this is in part due to the sparseness of native hosts in these areas, to the oversight of collectors, or it may be to the absence or rarity of the rusts because of unfavorable conditions. At present it is only possible to call the attention of observers to this hiatus in our knowledge.

The especially prominent feature brought out in the study of the native rose rusts is the remarkable parallelism between them and their hosts in regard to geographical distribution and specific variability. Each species of rust inhabits one species of host or a group of species of similar physical characteristics, and ranges over quite definite areas, usually nearly coextensive with the range of the respective hosts. Probably the most variable species of all is *P. montivagum* of the Rocky Mountains, and it is also true that the roses on which it occurs form the most intricate complex of ill-defined species known to North America. Furthermore, intergrading forms are not infrequent between the mountain species, *P. montivagum*, and the prairie species, *P. Rosae-arkansanae*, along the foothills of Colorado and Wyoming, just as intergrading forms of the hosts also occur along this tension line.

In explanation of these facts probably many of the ecological factors controling the distribution of the hosts on which the rusts occur would also have a bearing on the distribution of the rusts themselves. It is not possible, however, to resist the impression that one of the chief factors is the intimate relation between host and parasite. Whatever the nature of this relationship may be, and it would be difficult to define it, it permits of a certain thriftiness of the parasite in proportion to the susceptibility of the host. Any tendencies to variability in the parasite must therefore be accentuated by changes in the host. That the variability in the parasite does not originate through any qualities in the host probably needs no proof, but has an admirable illustration in this connection. *Earlea speciosa* is found abundantly throughout all the territory and upon all the hosts inhabited by the five species of *Phragmidium*, and yet shows no marked variations, whether comparison is instituted between specimens from widely separated regions, or from strongly dissimilar hosts. This species of *Earlea* possesses an aecium exactly comparable in appearance and habit of growth with that of the species of *Phragmidium* under discussion; and in other ways a near relationship is evident.

The fixity of characters in *Earlea* and the high variability in *Phragmidium* as shown in American rose rusts present an interesting contrast. Regarding the latter it may be safely asserted that each species of *Phragmidium* has attained a degree of orthogenetic development and a diversity of characters corresponding to those of the hosts on which it occurs, always, however, with a certain lag due to the inhibiting nature of parasitism.

PURDUE UNIVERSITY,
LAFAYETTE, INDIANA.

THE PERENNATION OF THE CLOVER DODDER, CUSCUTA EPITHYMUM MURR *

BY F. C. STEWART AND G. T. FRENCH

In almost all botanical writings the numerous species of *Cuscuta* are all classed as annuals. It appears to be the prevailing opinion that none of the dodders survive the winter in the thread form and that, in order to perpetuate themselves, they must start anew every year from seeds. Yet, so long ago as 1868 Dr. Julius Kühn made the announcement,† based on his own observations, that clover dodder, *Cuscuta Trifolii* (= *C. Epithymum*), lives over winter on clover and alfalfa plants in Germany. Also, Sorauer, in the second edition of his well-known Handbuch der Pflanzenkrankheiten, published in 1886, states that clover dodder is not annual but perennial, and that on perennial plants it perpetuates itself more often by the further growth of the previous year's dodder plants than by the germination of new seeds. On the other hand, Frank,‡ ten years later, makes an equally positive statement that the dodders are all annual plants that start anew every year from seed. In 1900 Kühn

* Read before Section G of the American Association for the Advancement of Science, Baltimore Meeting, December 31, 1908.

† Ztschr. landw. Centralvereins der Provinz Sachsen 25 : 238.

‡ Die Krankheiten der Pflanzen, Zweite Aufl. 2 : 523.

published a second paper * on the subject, in which he characterizes the supposed annual habit of clover dodder as one of those errors which, even in the realm of science, are sometimes held to with remarkable tenacity. After citing his observations made in 1868, he states that he has since confirmed them in various years, even in those having the hardest winters.

With the exception of two recent articles † by the writers of this paper, there seems to be no published record of any dodder living over winter in the United States. Yet, our observations indicate that *Cuscuta Epithymum* is frequently perennial here.‡ During the past three years this species has lived over winter in New York alfalfa fields, hibernating on the crowns of alfalfa, red clover, and certain weeds. This is not accidental or occasional, but of common occurrence. In the writers' opinion, it is the chief method by which dodder is carried over from one year to the next in New York alfalfa fields. In dodder-infested fields live dodder may be found readily during the winter and spring at any time when the ground is free from snow. One should take a sharp, heavy hoe or light grub-hoe and cut off and examine the crowns of plants standing on the margin of a dodder spot of the previous season. For the most part, the hibernating dodder threads appear in the form of tufts of short, stout yellow threads, one fourth to one half inch long, attached to the bases of the branches close down to the ground around the crown of the host plant and especially on the under sides of branches lying close to the ground. Yellow, haustoria-bearing threads tightly coiled around the very lowest parts of the stem are also common, but in no case have we observed dodder on the root proper.

Besides alfalfa and red clover, the favorite winter hosts of dodder are fleabane (*Erigeron annuus*) and yellow trefoil (*Medicago lupulina*). We have seen it also on dandelion. Although

* Ber. Physiol. Lab. u. Vers. Anst. Landw. Inst. Halle. 1900. Heft 14, 144–155.

† (1) Stewart, F. C. Further studies on alfalfa dodder and trefoil. N. Y. State Dept. Agr. Report of Director of Farmers' Institutes and Normal Institutes for the year 1906, 67, 1907. (2) Stewart, F. C. et. al. Troubles of alfalfa in New York. N. Y. Exp. Sta. Bull. 305. Nov., 1908.

‡ Full details of these observations are given in N. Y. Exp. Sta. Bul. **305**: 369–374.

Erigeron annuus and *Medicago lupulina* are generally classed as annuals, they are regularly biennial in New York alfalfa fields.

While the appearance of the hibernating dodder is such that there seems little reason to doubt that it really is alive and capable of further growth, the writers have thought it best to place the matter beyond question by forcing the threads into growth. This has been accomplished several times by placing the dodder-infested crowns in a moist chamber for a few days. Given warmth and moisture the dodder threads begin to lengthen promptly. In six such experiments the dodder-infested crowns were placed in contact with thrifty young alfalfa plants growing in pots in a moist inoculation chamber in a greenhouse. In every case the dodder started promptly, established itself on the alfalfa plants and there made a vigorous growth.

Our observations have been confined to the State of New York; but dodder hibernates there so frequently and under such a variety of conditions as regards soil and exposure, that we can but believe that it is perennial also in other parts of the United States.

Whether other species besides *Cuscuta Epithymum* are perennial, we cannot now say. In every instance in which the identification of the dodder has been made possible by the appearance of flowers, the species has been found to be *C. Epithymum.*

Agricultural Experiment Station,
Geneva, New York.

NOTES ON SAGITTARIA

By Kenneth K. Mackenzie

Almost all American botanists are acquainted with the common arrow-head (*Sagittaria latifolia* Willd.), and are familiar with the great amount of variation in the shape of its leaves. These are ordinarily strongly sagittate, but they vary from several inches broad to but two or three millimeters. All botanists are, however, thoroughly agreed that these variations, while striking, are of no importance from a systematic standpoint, but depend entirely on the conditions under which the plant has grown. This, then, being the thoroughly understood condition with reference to the above species, one necessarily approaches the study of related species with similar thoughts in mind.

Two plants closely related to the common arrow-head were separated in 1894 by Mr. Jared G. Smith in his revision of the North American species of the genus. All the standard manuals since that time have recognized these two plants as valid species, and the distinctness of *Sagittaria Engelmanniana* J. G. Smith and *Sagittaria longirostra* (Micheli) J. G. Smith, as these two plants were named, has not been questioned. They are, of course, both thoroughly distinct from *Sagittaria latifolia*, but when one comes to study the distinctions relied on between the two plants themselves, he soon finds out that the distinctions emphasized are the very ones which are universally agreed to be of no value in separating forms of *Sagittaria latifolia.*

Thus Mr. Smith's own key is as follows:

"Fertile pedicels much shorter than the bracts; leaves ample; beak of the achenium stout, erect.. *R. longirostra*

"Fertile pedicels longer than the bracts; leaves with linear lobes; beak of the achenium erect .... *S. Engelmanniana*"

Practically the same key is used in the Illustrated Flora except that the achenium characters are omitted, and properly so, because in Mr. Smith's detailed description he says that *S. Engelmanniana* has a stout beak, thus leaving no marks of difference in this respect.

In the recently issued "Gray's Manual" the key used is

"Stout; leaf-blades broadly ovate-oblong.......................... *S. longirostra*

"Slender; leaf-blades linear .... *S. Engelmanniana*"

So much then for the history of the plants, and now for an experience of my own with them. Although I had collected the plants before this year, the collections never had been under the most favorable conditions, but this year conditions seemed to be just right, when on Labor Day I went to Forked River in the New Jersey pine-barrens. Immediately beyond the station there, there is an artificial pond, the shores and shallower portions of which I quickly found were lined with *Sagittaria.* It was in fine fruiting condition and many specimens agreed well with *S. Engelmanniana* as described in the manuals, but others had broader leaves. Continuing my journey around the pond I found back in the bushes at the margins other specimens with the broad leaves and stouter appearance of *S. longirostra*, but I also found all manner of intergradation between the two, just as one would find with *S. latifolia*. In fact as many forms could have been found as there have been of the common plant. As to the comparative length of bracts and pedicels all I can say is that these organs varied with individual plants just as in *S. latifolia*, and differences in their comparative length are of no value in separating the plants under discussion.

My conclusion then is that *S. longirostra* and *S. Engelmanniana* as described in the manuals are but forms of the same species. Whether *S. Engelmanniana* is technically based on specimens really representing a species distinct from *S. longirostra*, is a question which Dr. Small is now investigating for the North American Flora. At all events, however, the characters heretofore relied on to separate these plants are plainly insufficient.

NOTES ON RUTACEAE — II

Xanthoxylum cubense P. Wilson, comb. nov.

Zanthoxylum juglandifolium Rich. Ess. Fl. Cub. 332. 1845. Not Willd. 1806.

Fagara juglandifolia Krug & Urban, Bot. Jahrb. **21** : 587. 1896.

Type locality: In high mountains of Vuelta de Abajo and around Guanimar, Cuba.

Distribution: Cuba.

Xanthoxylum jamaicense P. Wilson, sp. nov.

A glabrous tree 5–10 m. tall with a spiny trunk; branches unarmed or armed with few, solitary, slender, brownish prickles, 3–6 mm. long; leaves odd-pinnate, 13–24 cm. long; leaflets 3–9, oblong to oval or somewhat obovate, 2.8–11 cm. long, 1.5–4.8 cm. broad, short-petioluled or subsessile, more or less crenate, short and obtusely acuminate or rarely rounded at the apex, cuneate and equilateral or inequilateral at the base, dull or somewhat lustrous above, paler and the venation more prominent beneath; inflorescence terminal, paniculate-corymbose; staminate flowers (immature): sepals 3, semioval to broadly triangular; petals 3, ovate; stamens 3; pistillate flowers: sepals 3, broadly triangular; petals 3, ovate, 2–2.2 mm. long, 1–1.2 mm. broad; ovary 3-carpellary, sessile; follicles (immature) subglobose, 4 mm. in diameter, brown, apiculate, the surface pitted.

Type collected at Dolphin Head, Jamaica, N. L. Britton no. 2318; also collected in hills near Kempshot, N. L. Britton no. 2433.

Distribution: Jamaica.

TRIPHASIA Lour Fl. Cochinch. **1**: 152. 1790.

Triphasia trifolia (Burm. f.) P. Wilson, comb. nov.

Limonia trifolia Burm. f. Fl. Ind. 103. 1768.

Limonia trifoliata L. Mant. 237. 1771.

Triphasia Aurantiola Lour. Fl. Cochinch. **1**: 153. 1790.

Triphasia trifoliata DC. Prodr. **1**: 536. 1824.

Note: The illustration of the flower in Burm. f. Fl. Ind. (pl. 35) is incorrectly figured with five petals.

Type locality: Java.

Cultivated and naturalized in tropical and subtropical America as far north as Florida and Texas.

PERCY WILSON.

THE FIELD MEETINGS OF THE CLUB FOR 1909

In order that the field meetings of the club may be attractive to the members, and also accomplish work of permanent value, it is proposed to arrange a definite plan of campaign for the entire season of 1909.

This will be done in coöperation with the chairman of the local flora committee, so that the local herbarium may be increased where it is weakest, and sufficient material may be accumulated to serve as a basis for a descriptive list of the plants growing within the area prescribed by the preliminary catalog of the club in 1888. The specimens in the club herbarium, together with the collections of the New York Botanical Garden are being critically studied and tabulated, so that when the season opens everything will be in readiness for an effective system of field meetings. These will have in view partly the enlargement of the collections, and partly the equally desirable end of providing attractive and interesting excursions for members interested in our metropolitan flora.

Various features of interest will be planned from time to time such as (*a*) changes from month to month in the floristic aspect of restricted ecological areas, (*b*) the encroachment of plants beyond their supposed natural habitats, (*c*) the behavior of aquatic and land plants when subjected to unusual conditions, (*d*) introduced plants and their ability to spread and maintain themselves, (*e*) the pine-barrens of Long Island and New Jersey and their relation and similarity, and (*f*) so-called "weeds" and ballast plants and their occurrence and adaptability. These are only a very few of the problems that offer delightful possibilities to those willing to take the time and trouble of collecting and making careful notes. In Torreya for July 1908, Dr. R. M. Harper has outlined scores of such problems, but many of them are unfortunately beyond the scope of the field meetings of the club. Care will be taken to distribute the excursions so that those interested particularly in the cryptogamic flora will not suffer injustice because of a preponderance of meetings planned for the higher flowering plants, and vice versa.

There are about thirty-one days upon which it is possible to hold field meetings, and it is necessary in order to systematize them to make plans early in the season. To do this will require the hearty coöperation of members able and willing to act as guides. The chairman of the field committee will attend all the meetings possible, but it is essential to the success of the meetings that an efficient corps of guides volunteer for the work. Everything that can be done towards the arrangement of time and place of meeting will be carefully planned. Those willing to act as guides will greatly further the work if they will send their names, together with the dates upon which they will serve and the districts with which they are familiar, to the undersigned.

Norman Taylor,
Chairman Field Committee

New York Botanical Garden.

REVIEWS

Recent Bulletins of the State Geological and Natural History Survey of Connecticut*

The State Geological and Natural History Survey of Connecticut published in 1905 "A preliminary report on the Hymeniales of Connecticut," by Edward Albert White, and "The Ustilagineae or smuts of Connecticut," by George Perkins Clinton. In the latter part of 1908 there appeared notable continuations of the published results of the botanical survey of that state in "A preliminary report on the algae of the fresh waters of Connecticut" by Herbert William Conn and Lucia Washburn (Hazen) Webster, and "The bryophytes of Connecticut" by Alexander William Evans and George Elwood Nichols. The report on the fresh-water algae consists essentially of brief synopses of the classes and orders, keys to the genera and short descriptions of them, the names of the species found, and, with few exceptions, figures of all the species collected by the writers within the limits of the state. A few species are admitted on the authority of Hazen and of Setchell, and the names of a considerable number from the "Phycological notes of Isaac Holden," published by F. S. Collins in Rhodora, have been introduced in brackets. The Cyanophyceae and Characeae are included, but no attempt is made to treat the Diatomaceae. The treatment of the Characeae is, however, very inadequate, only one species and that an unnamed one being figured. The authors have evidently not made use of the monographs of T. F. Allen and of C. B. Robinson, in which Connecticut materials are mentioned. The authors appear to have devoted their attention largely to the Conjugatae. Under *Spirogyra*, *Zygnema*, *Closterium*, *Cosmarium*, *Staurastrum*, and *Micrasterias*, numerous species are listed and figured, but under genera like *Cladophora*, *Oedogonium*, and *Vaucheria*, which may reasonably be supposed to be well represented in Connecticut, the lists are confined to two or three species each. For the

*Conn, H. W., & Webster, L. W. A preliminary report on the algae of the fresh waters of Connecticut. State Geol. and Nat. Hist. Surv. Conn. Bull. **10**: 1–78. *pl. 1–44.* 1908.

Evans, A. W., & Nichols, G. E. The bryophytes of Connecticut. State Geol. and Nat. Hist. Surv. Conn. Bull. **11**: 1–203. 1908.

species, no descriptions or keys are given, and specific determinations, if they are to be made from the report at all, must be made from the figures. The keys, it is to be regretted, are often inadequate and sometimes positively misleading, as when under *Chara* it is asserted that "The stems are covered with a cortex," a statement that would result in excluding *Chara Schweinitzii* (*C. coronata* of most American authors), one of our commonest species. Many of the figures, especially, perhaps, those of the desmids, give a fair idea of the general habit and form of the organisms treated, but some of the others, like that of *Gloeotrichia Pisum*, can scarcely be of service to the student, in the determination of the species, at least.

The bulletin on "The bryophytes of Connecticut" by Professor Evans and Mr. Nichols is a thoroughly scholarly and scientific paper and one that is likely to have much good influence in stimulating and aiding the study of the bryophytes in Connecticut and neighboring states. The catalogue of species is prefaced by a general introduction of thirty-seven pages, in which are discussed "General characteristics of the bryophytes", "History of bryology in Connecticut", "Distribution of the bryophytes in Connecticut according to environment", and "Economic value of the bryophytes". Under the head of distribution according to environment, the factors considered are latitude, character of substratum, intensity of light, and water supply. In the body of the catalogue are keys to the families, genera, and species, lists of the known Connecticut species, names of collectors, references to exsiccatae and to the principal literature, and statements as to the extra-limital distribution of the species. The general summary shows that 387 species of bryophytes are at present known to occur in Connecticut and that of these 12 belong to the Marchantiales, 92 to the Jungermanniales, 3 to the Anthocerotales, 31 to the Sphagnales, 2 to the Andreaeales, and 247 to the Bryales. Only about 18 per cent. of the species are peculiar to America. Over 62 per cent. are common to Europe and Asia, while, of the remainder, 16 per cent. have been found in Europe but not in Asia and 4 per cent. have been found in Asia but not in Europe. Misprints in this paper are few, but on page 101 *Dicranum fulvum* is listed where *D. montanum* was evidently intended, as is apparent from the key. It is to be hoped that members of the Torrey Botanical Club will in the near future devote themselves to the study of the flora of the metropolitan district with the purpose of publishing a series of papers similar to "The bryophytes of Connecticut" in order to facilitate the study and ready identification of both the seed-bearing and seedless plants of the vicinity of New York City. Meanwhile, "The bryophytes of Connecticut" will prove almost as useful in New York and indeed along our whole North Atlantic seaboard as it will in Connecticut.

MARSHALL A. HOWE.

PROCEEDINGS OF THE CLUB*

JANUARY 12, 1909

The first meeting of the Club for 1909 was held at the American Museum of Natural History, with President Rusby in the chair. There were ten members present.

After the reading and approval of the minutes for December 8, 1908, the resignations of the following members were presented and accepted: Miss Anna Murray Vail, Miss Henrietta E. Hooker, Mrs. John R. Delafield, Mr. C. C. Hanmer, and Mr. Albert Ruth.

This being the annual meeting of the Club, reports were presented by the treasurer, editor, chairman of the field committee, and the secretary. These were read, accepted, and placed on file.

The editor reported the completion of Volume 35 of the *Bulletin*, containing 608 pages and 40 plates. The only *Memoir* published during 1908 was "A Study of the Lactariae of the United States" by Dr. Gertrude S. Burlingham. This paper was issued in May as No. 1 of Volume 14 of the Club's Memoirs, and contained 109 pages and 15 half tone illustrations.

Mr. Charles Louis Pollard presented his report as chairman of the field committee up to the time of his resignation in August. Mr. George V. Nash, who acted as chairman for the remainder

* No meeting was held the last Wednesday in December.

of the season, presented a supplementary report. Mr. Norman Taylor was appointed by the president chairman of the field committee for 1909.

The secretary reported that 15 regular meetings had been held during the year, at which 463 persons were present. Nine persons have been elected to membership but not all have qualified, and 14 resignations have been received and accepted. Through death the Club has lost three members.

The treasurer's report indicated that the Club's finances are in a satisfactory condition.

The following officers were elected for the year 1909:

President: Henry Hurd Rusby.

Vice-Presidents: Edward Sandford Burgess and John Hendley Barnhart.

Secretary: Percy Wilson.

Treasurer: William Mansfield.

Editor: Marshall Avery Howe.

Associate Editors: John Hendley Barnhart, Jean Broadhurst, Philip Dowell, Alexander W. Evans, Tracy Elliot Hazen, William Alphonso Murrill, Charles Louis Pollard, and Herbert Maule Richards.

The Club adjourned at 10:15 P. M.

PERCY WILSON,
Secretary

OF INTEREST TO TEACHERS

LABORATORY TEACHING

Professor Charles H. Shaw, discussing laboratory teaching for culture students in *Science* for September 11, states that the average student falls to a discouraging degree short of "developing that power of obtaining knowledge which it was planned that he should," and "as a matter of fact the hours when actual independent work is being done are few and precious, and the greater part of the laboratory time is spent in merely performing assigned tasks."

Professor Shaw further adds: "In looking for a solution my point of departure would be the fact that *certain* of the lessons actually do call out a real interested and independent effort on the part of the student. That ounce of fact is worth tons of theorizing. Then if it is true that the greatest good which can come to the student out of such courses is the development of his own powers of obtaining knowledge, it would not seem far to this principle: *The laboratory course should be composed mainly of those lessons which the instructor can so present as to arouse independent effort on the part of the student.*

"Then the question will at once arise 'What about the lessons of which this is not true; what about the many and important topics in which the student can at best scarcely do more than to perform faithfully the task assigned?' My answer would be to remove most of them frankly to the domain of lecture and demonstration. A good demonstration, where the student feels the spark of inspiration from the teacher's performance and example, is far better for both teacher and student than a time-serving laboratory exercise.

"No doubt a certain proportion of laboratory lessons which are mere verification exercises are desirable, but on the whole it still remains true that for culture students *the laboratory hours are too precious to be used in anything but independence begetting work.* In the lecture room is the place to see that the course is rounded out, kept coherent, and the ground covered."

In a recent paper, Charles J. Brand, of the U. S. Bureau of Plant Industry, traces the history of alfalfa in the United States. The earliest date of introduction is 1855, from South America to California; the next, 1857, from Europe to Minnesota.

The South American seed finding a congenial soil and climate easily became the basis of an extensive industry now netting $150,000,000 a year. The European seed, despite the favorable soil in Minnesota, was acclimated with difficulty; but Grimm, the farmer who introduced it, worked with "characteristic German persistence, realizing neither the practical nor the scientific importance of his unconscious experiment in acclimatization." He "patiently saved generation after generation of seeds from the plants that survived each successive winter, planting new fields to replace the deteriorated ones on his own farm, and selling his surplus seed to his neighbors. He was probably oblivious both to the difficulty of the task he had undertaken and to the great value of the result, and took as a matter of course the yearly degeneration of his stands," until now the Grimm strain is recognized as one of the hardiest; it "is undoubtedly the direct product of fifty-one years of perpetuation of fit and elimination of unfit individuals under climatic conditions whose rigors are unknown in Germany."

Robert Kennedy Duncan in his recent book, "The Chemistry of Commerce," has a chapter on cellulose which is written in a manner making it equally interesting to a scientist or to a novice in the field. He shows the stupendous industrial utility of cellulose and the immense value of each fact gleaned from the field of cellulose research. At present, although one third of the dried vegetable matter of the world is cellulose, it cannot be synthesized in the laboratory and very little is known about it.

One class of cellulose industries is based on its inertness and resistivity to the disintegrating action of air and moisture. First in importance comes paper, both that made from the comparatively pure cellulose of rags and that from wood pulp. As most of the cellulose in wood exists chemically encrusted with other substances, the problem has been either to manufacture the paper directly from wood, in which case it does not last, or to devise a means of extracting the pure cellulose. This has been done but the resulting cellulose is not so pure as that from cotton. Another important cellulose industry, the making of fabrics, has almost reached perfection. One interesting phase is the mercerization of cotton by the application of caustic soda. Twine and rope are also cellulose products. Out of the 110,000 species of flowering plants that exist in the world, the fiber-making possibilities of only half a dozen are used.

Cellulose also has merit as a chemically active body. Dissolved in one substance it forms vulcanized fiber or may be carbonized for incandescent light filaments. When treated in another way an insulating material for electric wires is formed. By still another method, viscose, a very plastic form of cellulose, can be obtained. This can be moulded into various forms or made into films possessing great elasticity. The addition of nitric acid or nitroglycerin results in gun cotton, blasting gelatin, or smokeless powder. Our common celluloid comes from low cellulose nitrates dissolved in solid camphor and alcohol. One of the greatest triumphs of technological science is the production of artificial silk from either cellulose nitrate or viscose. The value of a pine tree is increased nearly 600 fold when it is spun into this silk.

The cellulose industry is developed upon an exceedingly slender knowledge of the raw material and it would be well for manufacturers and centers of technical education to give more attention to the subject.—Jane R. Condit.

Recent government publications contain the following statements: "When water falls on the soil part of it runs off the surface, and part of it runs through the surface by gravitation and comes out in the subsoil, and part of it starts and rises as soon as we get sunlight on the surface, and this part comes up in films over and through the finer spaces, and is bringing with it dissolved material from below." The water that passes through larger openings, gets very little of the soluble material, "because it is not long in contact with the soil grains. It gets some by reason of the fact that, as we know, our springs and rivers and wells are all soil solutions and carry mineral matter. Now, water rising by capillarity cannot get very concentrated because it gets saturated with the minerals, and any excess that is contained in it is thrown out, except in extreme conditions, as in the west, and then we get alkali conditions; but under ordinary humid conditions we cannot have an excess of it, and the soil solution is bringing materials from below which the plant gets, and, as a matter of fact, the most important discovery of the Bureau of Soils in recent years is that plants are feeding on material from the subsoils, far below where the roots go. If this is true, and there are many other arguments in the same line, it is absurd to make an analysis of the surface soil and say that is the soil that the plant is feeding on." Professor C. G. Hopkins, in a lecture given at Cornell last July, refers to the above quotation and states that because of proven "uncompensated loss by leaching of the upper soil in all normal humid sections, we dare not base our definite plans for systems of permanent agriculture upon a theory that by the rise of capillary water plant food is brought from the lower subsoils sufficient to meet the needs of large crops and to maintain the fertility of the surface soil in all places and for all time."

Professor Hopkins further says: "One dollar taken from 100 dollars leaves not 100 dollars, but only 99 dollars. This is a scientific fact which no theory or hypothesis can nullify. Likewise when a crop removes 20 pounds of phosphorus from the soil it leaves that soil 20 pounds poorer in phosphorus than before the crop was grown. The rotation of crops or the application of salt or some other stimulant may liberate another 20 pounds of phosphorus from the soil and thus enable us to grow another crop the next year, and possibly this may be repeated for several or many years, but meanwhile the total supply of phosphorus in the soil is growing smaller and smaller year by year, until ultimately neither crop rotation nor soil stimulants can liberate sufficient phosphorus from the remaining meager supply to meet the needs of profitable crops. It is certainly safe teaching and safe practice to return to the soil as much or more than we remove of such plant-food elements as are contained in the soil in limited amounts when measured by the actual requirements of large crops during one lifetime."

The following extracts from President Roosevelt's recent message to Congress are of interest:

(1) "There are, of course, two kinds of natural resources. One is the kind which can only be used as part of a process of exhaustion; this is true of mines, natural oil and gas wells, and the like. The other, and of course ultimately by far the most important, includes the resources which can be improved in the process of wise use; the soil, the rivers, and the forests come under this head."

(2) "There are small sections of our own country, in the east

and in the west, in the Adirondacks, the White Mountains, and the Appalachians, and in the Rocky Mountains, where we can already see for ourselves the damage in the shape of permanent injury to the soil and the river systems which comes from reckless deforestation. It matters not whether this deforestation is due to the actual reckless cutting of timber, to the fires that inevitably follow such reckless cutting of timber or to reckless and uncontrolled grazing, especially by the great migratory bands of sheep, the unchecked wandering of which over the country means destruction to forests and disaster to the small homemakers, the settlers of limited means."

(3) "Not many centuries ago the country of northern China was one of the most fertile and beautiful spots in the entire world and was heavily forested.

"We know this not only from the old Chinese records, but from the accounts given by the traveler Marco Polo. He, for instance, mentions that in visiting the provinces of Shansi and Shensi he observed many plantations of mulberry trees. Now there is hardly a single mulberry tree in either of these provinces, and the culture of the silkworm has moved further south, to regions of atmospheric moisture. As an illustration of the complete change in the rivers, we may take Polo's statement that a certain river, the Hun Ho, was so large and deep that merchants ascended it from the sea with heavily laden boats; to-day this river is simply a broad sandy bed, with shallow, rapid currents wandering hither and thither across it, absolutely unnavigable.

"But we do not have to depend upon written records. The dry wells, and the wells with water far below the former water mark, bear testimony to the good days of the past and the evil days of the present. Wherever the native vegetation has been allowed to remain, as, for instance, here and there around a sacred temple or imperial burying ground, there are still huge trees and tangled jungle, fragments of the glorious ancient forests. The thick, matted forest growth formerly covered the mountains to their summits. All natural factors favored this dense forest growth, and as long as it was permitted to exist the plains at the foot of the mountains were among the most fertile on the globe, and the whole country was a garden.

" Not the slightest effort was made, however, to prevent the unchecked cutting of the trees or to secure reforestation. . . . The big trees disappeared centuries ago, so that now one of these is never seen save in the neighborhood of temples, where they are artificially protected ; and even here it takes all the watch and care of the tree-loving priests to prevent their destruction."

NEWS ITEMS.

Professor John M. Coulter, of the University of Chicago, and his family were on the steamer Republic during the recent collision with the Florida. Professor Coulter lost the manuscript of his proposed new book on gymnosperms. He expects to resume his journey soon ; he had originally planned to attend the Darwin celebrations in England.

The University of Wisconsin is to build on its campus a building suitable for the United States Forestry Service, thus enabling the Service to concentrate its western laboratories, and carry on a series of investigations on timber, lumbering, the making of wood pulp, and the utilization of present by-products. The government will in return equip the building and provide for lectures to students at the university.

A series of nine lectures on Charles Darwin and his influence on science are being given Friday afternoons, at 4 P. M., in 309 Havemeyer Hall, Columbia University. The first two on "Darwin's Life and Work" by Henry Fairfield Osborn and "Terrestrial Evolution and Paleontology" by William Berryman Scott, have been given. The others are: "Darwin's Influence on Zoölogy" by Thomas Hunt Morgan, February 26; "Darwin in Relation to Anthropology" by Franz Boas, March 5; "Darwin's Contribution to Psychology" by Edward Lee Thorndike, March 12; "Darwin's Influence on Botany" by Daniel Trembly MacDougal, March 19; "Darwinism and Modern Philosophy" by John Dewey, March 26; "Cosmic Evolution" (date subject to change) by George Ellery Hale, April 2; and "Darwinism in Relation to the Evolution of Human Institutions" by Franklin Henry Giddings, April 16.

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A Monthly Journal of Botanical Notes and News

EDITED FOR

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BY

JEAN BROADHURST

JOHN TORREY, 1796–1873

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BOTANICAL OBSERVATIONS IN ICELAND AND SPITZBERGEN *

By Julia T. Emerson

In July of this year the writer was so fortunate as to have the opportunity of visiting some of the islands of the northern seas of Europe, and it is hoped the following notes may prove of interest to others who are as ignorant of the countries seen as the writer was.

The steamer was in port often for a few hours only, in one or two places for thirty-six hours, and the excursions on land never went far inland or off the regular roads. A small trunk already well filled, and nothing but a life preserver to press specimens with made it necessary to keep the collections very small; therefore the list of plants observed does not pretend to be complete, especially as the writer was unfamiliar with the flora of northern Europe.

After a couple of days in Edinburgh, one being spent in the city and the other in a hurried trip through the Trosachs, we reached Kirkwall in the Orkney Islands in the middle of the day. Substantial stone or brick houses with small windows and little yards or gardens made a typical Scotch town. The sycamore maple and the beech were the most conspicuous trees, and they were evidently glad of the shelter of houses, for exposed specimens were blown sideways by the strong winds, and the surrounding hills looked bare of trees or shrubs. All the seasonable vegetables and flowers were growing in the cultivated grounds near the town, but as the old Saint Magnus Cathedral and the ruins of the bishop's and the earl's palaces were well worth looking at there was no chance to get into the real country.

[No. 2, Vol. 9, of Torreya, comprising pages 21–44, was issued February 26, 1909.]

* Illustrated with the aid of the Catherine McManes fund.

Thorshavn, Faroe Islands

A misty, cool day and the few trees or cultivated flowers made us feel as if we were getting rather far north. Perhaps the many rocks and high winds discouraged farming or else fishing was a more profitable industry; at any rate the season was late and probably short, although the friendly fisherwomen declared they did not have a cold winter, and that it frequently was no colder than the day we were there. Grass was luxuriant on the sodded roofs of many of the tiny houses of the very picturesque little settlement, and some of the spring flowers were still in bloom — such as buttercups, marigold, forget-me-not, daisy, *Viscaria vulgaris*, and a pink stone crop. A species of *Sorbus*, broad leaved willow, mountain ash, alder, hawthorn, and maple, grew behind buildings, and in the yards were rhubarb, potatoes, and gooseberries. Some people who had gone inland came back with orchids, somewhat like the English *Orchis pyramidalis*, in their button-holes, which showed that a walk on those bare hills might lead to interesting discoveries. All the inhabitants turned out to receive us and were so cordial and clean, that in spite of the difficulties of speaking Danish we would have been tempted to remain for a few days had it been possible.

On leaving Thorshavn our course took us through our first fiord, between Stromoe and Osteroe, and it was all the more impressive because unexpected. High terraces of bare rocks gave way to mountains with sides so sheer that the sheep seemed clinging to precipices, and multitudes of sea birds rose in whirring clouds from the deep fissures, startled by the unaccustomed sound of our whistle. The hills crowded in upon the waters until we could toss a biscuit ashore on either side; clouds hung low, lifting momentarily to reveal higher peaks beyond; the wind caught in such narrow valleys howled in the rigging, and as we had a glimpse of open sea through two majestic, jagged guardians of this gloomy passage, all the blasts of Boreas at once bore down upon us, and threatened rough waters outside — but instead the waves were not ruffled, the sun came out and the wind went as abruptly as it had come, while we went on our way to Iceland awed by such a strange farewell from those volcanic islands.

Iceland

Pointed snow summits emerging above pink clouds and blue water was our first picture of Iceland, and all one wonderful day we watched the mountains assume more solid form, and could scarce believe our eyes when we came abreast of the vast Jokull ice fields which reached very nearly to the sea; gradually the coast became less wintry in aspect, and as we got around to the west side and passed between the Westmann Islands we could see grass on the hill slopes.

The approach to the harbor of Reykjavik was during a ten o'clock simultaneous sunset and moon rise, and our anchor was hardly down before we were greeted by a boat load of young women and men, who made a circle of our ship singing their native songs. The town of Reykjavik has no beauty; the houses are of wood covered with corrugated iron as a protection against fire, and have none of the picturesqueness of the little fishing village of Thorshavn. The harbor was large and occupied by a number of whaling or fishing boats, and on a clear day must have been rather fine in its setting of snow-patched mountains, but clouds hung low on the 11th of July veiling the sun sufficiently to interfere with taking photographs. The country around the town was destitute of trees or color, and the hills were not high enough to be impressive. Even a New England farmer would be in despair at the stones of Iceland, and one is surprised to see any grass or plant growth when one looks at the unpromising soil, if it can be called that. I believe the flowers and vegetables I saw in the yards in the town must have been grown on imported earth, and yet there were little fields of fairly thick grass which was most carefully cherished as hay for the ponies. One man came to the gate of his yard when he saw me looking at his garden, and we had a peculiar talk, he knowing no English and very little German and I no Danish, so the Latin names of the plants furnished our means of communication. His plants looked as if they had been set out about a year, and I understood that they were not all native and certainly the trees were dwarfed and pathetic in appearance; he had growing the mountain ash and sycamore maple both 5–6 feet tall, *Ribes alpina*, *Lonicera* (?) in bloom, rhubarb, potatoes, poppies, and young cabbages, *Caragana Sibirica*, and either a geranium or a malva. In another garden I observed tulips, phlox, forget-me-nots, *Sorbus*, and, on a new lawn, a bunch of *Corprinus*. On a drive a couple of miles inland to see the hot springs where the women wash their clothes, I noticed patches of pink thyme in among the stones, and, where the ground was wet, cotton grass and real grass and a number of little inconspicuous things were taking

FIG. 1. On the road between Reykjavik, Iceland, and the Salmon River. Pink thyme, *Statice* and *Silene maritima*, *Polygonum viviparum* and some other little plants growing in scattered clumps among the stones.

advantage of favorable conditions, such as *Statice maritima*, *Silene maritima* and *S. acaulis*, *Polygonum viviparum*, *Alchemilla alpina*, *Galium verum*, and *Tofieldia palustris*.

There was a pony race in the afternoon after a very good concert, and it took place on a great level plain which was one mass of little stones with about a dozen plants in a square yard; a desolate spot but gay with people gathered from the ends of the earth watching those sturdy, fleet little horses scamper over the course.

AKREYRI

As the clouds lifted in the late afternoon of the 12th we found we were close to the north coast, which here shows plainly its volcanic origin as the mountains were craters or half craters of considerable height and regularity, every basin and flank touched with patches of snow; and it was surprising how level the layers of rock or lava deposits were, seldom tipped or broken though worn by weather into cathedral columns, or when painted by the

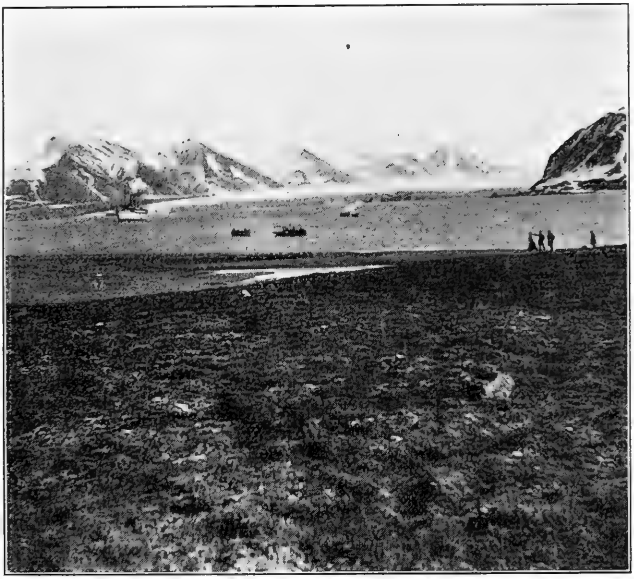

FIG. 2. Bell Sound, Spitzbergen; in foreground *Saxifraga, oppositifolia, Dryas octopetala* and *Cassiope tetragona.*

rosy rays of a low evening sun, turned into veritable Valhallas, fit abodes for northern heroes. We wound far up a beautiful fiord to a whaling station and saw four dead monsters, and met another being towed in by a little tug hardly bigger than the whale. The settlement of Akreyri, which is called the second largest town of Iceland, is situated at the end of a long fiord and surrounded by high hills, which here have retreated a short distance from the water, leaving lower grassy slopes which make good farms for the fishermen. As at Reykjavik there was nothing attractive about the little town, and we all walked a mile inland to a brisk river which took a thirty or forty foot plunge into a small canyon. It was refreshing to sit near the falls as it was a warm day, and here was the best collecting ground I had found, both for flowering plants and mosses. *Dryas octopetala* was very pretty and common; *Eriophorum angustifolium* and *E. vaginatum*, *Parnassia palustris*, and *Viola tricolor* made bright spots of color; and *Pinguicula vulgaris* was in cracks of the damp rocks, where *Racomitrium lanuginosum* and several *Grimmias* were mixed with *Distichium capillacium*, *Timmia austriaca* or *Philonotis fontana*. There were also *Empetrum nigrum*, *Galiums*, *Erigeron alpina*, *Silene acaulis*, and yarrow, dandelions, and sorrel, but no trees or shrubs.

It took us three hours to steam out of the fiord and about 7 P. M. we crossed the Arctic circle and had a call from Neptune, who invited us to be present at the baptismal ceremonies on deck the next afternoon, and then he disappeared astern floating away in a smoking barrel. We could scarcely believe we were within the Arctic circle it was so mild, only 55° F. on deck after dinner, and the sun gave up any attempt at setting. The next two days at sea however were cooler, and in the evening we sighted an ice floe off to the northwest where Greenland was not very far away, and the thermometer said only 39° F.

Spitzbergen

It was pleasant to have reached a place where the birds were so tame and so numerous as at Advent Bay. There were funny ones, puffins I think, which could not rise from the water but flapped their wings frantically and half walked in a zigzag path, graceful gulls often sitting on the icy water within ten or twenty feet of the boats, and many others I did not know, and all in great numbers. The island is well named Spitzbergen, its peaks are generally very pointed, very steep and pretty much covered with snow, and the valleys are filled with great glaciers whose ends break off into the waters of the Bay, which is also said to be the terminus of the Gulf Stream. There was little floating ice, it was too late in the season. A couple of whaling boats, a steamer come to get coal from a mine recently opened which has remarkably good, hard coal, and, on the land, the mining buildings and one or two houses for the workmen, and a shanty put up for the occasional hunter, were the only signs of life in this great arena of dazzling snow, black rocks, and blue water. We brought with us the best day the isolated men had had for the year, and our pilot, a whaler of forty years experience, declared the bay was more open and the seas quieter than he had ever known them.

FIG. 3. Merok, in the Geirangerfiord, Norway. The tree is a white birch, and there are plenty of flowers and grass and other birches part way up the mountains, which are perhaps 4,000 feet high.

We went ashore merely to say we had set foot on Spitzbergen, and wondered why otherwise we took the trouble, it looked so uninteresting. At the point where we landed there was a plateau of great extent about six feet above the level of the shingle beach, and composed of flat stones, probably left by a retreating glacier; what had looked like a barren field of rock proved to be a garden with many dainty little flowers about six inches high, which forced their way between the stones. Here were the Iceland poppy (*Papaves radicatum*), *Saxifraga oppositifolia*, either pink or white and with a delicate odor, *Pedicularis lanata*, *Potentilla emarginata*, and *Pulchella*, and *Cerastium Edmonstoni*, these last three very hairy, *Dryas octopetala*, a *Draba*, perhaps *lapponica*, and *Cassiope tetragona* making quite a turf or bog where melting snow was near it, and with it the tiny *Salix retusa*. There were a number of mosses but none with fruit, and I brought back specimens of only *Polytrichum gracile*, *Hypnum uncinatum*, and of *Grimmias* not yet identified. The *Pedicularis lanata* was most beautiful growing on the very edge of a snow bank, nestled in between the stones and daintily protected by its veil of grey hairs, through which the pink of the waiting flowers shone.

Many of the climbers achieved the summit of the nearest mountain, and it was appallingly steep as we looked at their progress from below, over the sliding, wet stones, with no ledges or trees to afford a foothold and a deep ravine with a milky river rushing far below them. When they were ready to come down they sat down on the snow and coasted, and we on a much lower shoulder found it the best way to get over the half melted banks we encountered. The light for taking photographs was better at I A. M. than it had been twelve hours earlier when we came into the bay, and we all stayed up to see the weighing of the anchor and the sun at our northernmost point of the trip; and indeed, it was the night of nights to stay up there was so much that was beautiful and strange to see.

Later in the morning we woke at *Bell Sound*, a favorite harbor of whalers, where three or four immense glaciers empty into one little bay. Here again we had marvellously clear skies and were deceived as to distances, so opinions varied as to the breadth and height of the glaciers, whether two miles or five, and forty feet or one hundred in height. Unfortunately there was not time to walk on any of the glaciers. Perhaps the Captain felt such weather was too good to last long, so we sadly bade adieu to the regions of clean snow and magnificent distances, and in a couple of days, towards eight o'clock one evening, first beheld that great rock called the North Cape of Norway.

North Cape

It seemed like being in the tropics to see such a luxuriant growth of grass, butter-cups, geraniums, sweet yellow violets, pink campion, saxifrages, etc., as were wild in the somewhat sheltered valley up which the exceedingly steep path zigzagged to the flat top of the great cliff. But the first steps on the windswept stony summit were as devoid of plants as the plains of Iceland had been. Walking to the very edge we looked off to the sun just at its lowest point for that night, it being then twelve o'clock, and proved the photographer's warning useless in this instance for we could take pictures when the sun was just at setting or rising. From this height of about 900 ft. there was a fine view of the other bays and headlands, only less tremendous than the one we were on, of which the coast is composed.

In the Lyngenfiord still well to the north of the Arctic Circle, we spied our first trees, white birches, and many other flowers; and here too we visited the Laplanders in their summer camp in a beautiful valley within sight of a fine glacier. At Digermulen on the Lofoten Islands we climbed a mountain about 1,100 ft. high to get a view of many fiords and islands and snowy summits, and on the way up noticed the following plants: *Calluma vulgaris*, white heather or lyng, which is supposed to have suggested the name of the Lyngenfiord, violets, *Cornus suecicia*, *Lotus corniculatus*, which I had last seen in bloom on the South Downs of Sussex in early June, *Trientalis Europoea*, *Vaccinium*, *Vitis idaea*, *Andromeda polyfolia*, very fresh pretty pink, *Rubus chamaemorus*, and dwarfed willows, and *Betula nana*, also many mosses and ferns.

I will make no attempt to enumerate the flowers in the remaining places we visited, because they were too many and are well known to anyone familiar with the European flora or even with the English country at this season of the year, but must mention two places we stopped at because of their surpassing beauty. Merok is at the end of the very narrow Geirangerfiord and is like a gem of deep blue-green color in a setting of lofty, jagged mountains, whose lower parts are good farms well watered by countless falls and brimming brooks. The other is Gudvangen and Stalheim, which we reached by driving eight miles up the Naeroedal, a valley at the base of mountains 4,000–5,000 ft. almost sheer from sea level, and so close together that our necks ached with the effort of seeing their summits. At the end of the drive we walked up the winding road to the Stalheim cliff and hotel, from which we had a fine view down the narrow valley and the many mountains one behind the other until they faded into the blue distance. Those two places were a fitting conclusion to a most interesting journey and are within easy reach of Bergen. In the little botanical garden in Bergen I found in flower and named some of the plants I had noticed in the yard of the man in Reykajavik.

I am indebted to Mr. Rydberg for naming the plants I brought back, which are now in the New York Botanical Garden herbarium.

NOTES ON UROMYCES

By John L. Sheldon

In the spring of 1906, I found an *Uromyccs* on a number of plants of *Sisyrinchium graminoides* Bick., usually associated with *Aecidium houstoniatum* Schw. on *Houstonia caerulea* L. Mention has been made of this in a previous number of Torreya,[1] together with a description of the *Uromyces* and the results obtained from inoculations made in the field. Observations and inoculation have been kept up for the past three years. Successful inoculations of plants of *Sisyrinchium graminoides*, with aecidiospores from *Houstonia cærulea*, have been obtained each year. During the winter and spring of 1907, I finally succeeded in obtaining aecidia on a few plants of *Houstonia caerulea*, grown in the greenhouse and inoculated with teleutospores from *Sisyrinchium graminoides*. These results showed that the *Uromyces* and the *Aecidium* are different stages of the same rust. And

[1] A rare Uromyces. Torreya **6** : 249–250. D 1906.

according to the system of nomenclature in use at the present time, the name becomes *Uromyces houstoniatus* (Schw.) n. n. If the system of nomenclature proposed by Professor J. C. Arthur is followed, then the name becomes *Nigredo houstoniata* (Schw.) n. n.

One of the most interesting things in the life history of this rust is that the teleutospores germinate in the living leaves of *Sisyrinchium* and probably infect plants of *Houstonia* during the summer and autumn, the mycelium remaining dormant until the following spring when aecidia develop. In so far as I have been able to ascertain, species of *Uromyces*, whose teleutospores germinate in living leaves, rarely have an aecidial stage.

I have tried several times to inoculate *Sisyrinchium graminoides* with aecidiospores from *Houstonia purpurea* L., both in the field and the greenhouse, but without definite success. Whether the plants were not susceptible at the time the inoculations were made, or whether the *Aecidium* of *H. purpurea* is not the same as the one of *H. caerulea*, I am unable to say. I have shown elsewhere* that there is considerable difference in the susceptibility of plants to infection by rusts, even the same plant, at different times. I have repeatedly observed a marked difference in the susceptibility of *Trifolium pratense* L., *T. hybridum* L., and *T. repens* L. to infection by *Uromyces trifolii* (A. & S.) Wint. When one of these was seriously injured by the rust, the other two, growing beside it so that their leaves intermingled, were not affected by the rust.

Last spring I noticed that there were abundant aecidia on a blue violet growing beside *Andropogon virginicus* L. having *Uromyces andropogonis* Tracy on the dead leaves and stems. To test whether the *Aecidium* was related to the *Uromyces*, pieces of the rusted grass were collected and taken to the laboratory. The next day the pieces of grass were distributed through five clumps of the same kind of violet. Two weeks later yellow spots began to appear on the leaves of each clump, followed by aecidia. In all probability, aecidia on certain species of *Viola* have been determined as those of *Puccinia violae* (Schum.) DC.

* Preliminary studies on the rusts of the asparagus and the carnation: Parasitism of *Darluca filum*. Science, N. S. **16**: 397. 235–237. 8 Ag 1902.

when they should have been determined as those of *U. andropogonis.*

West Virginia University,
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REVIEWS

Willis's Flowering Plants and Ferns*

The publication of a third edition calls attention to this handbook in the Cambridge Biological Series as a book which is probably not so widely known in this country as its usefulness might warrant. The preface states that the book is aimed to supply such information about the plants met with in a botanical garden or museum, or in field work, as is required by any but specialists. The introduction contains helpful notes on field work and collecting. Following this, about one hundred pages are occupied with a brief and somewhat categorical account of general morphology and physiology, the paragraphs on nutrition, in particular, being rather inadequate. The constant emphasis on the phylogenetic point of view gives the discussion of morphology a suggestive value for teachers. This standpoint is further emphasized in the chapter on evolution and classification. In a two-page note at the end of the first part, the author announces his conversion to the theory of mutation, giving a brief but effective apology for this change during the publication of the work. The other chapters of this part are devoted to useful summaries of plant geography and economic botany.

The second and larger part of the book (covering over 400 pages) is a dictionary of "the classes, cohorts, orders, and chief genera of the flowering plants and ferns." It is unfortunate that this "provincial" group-terminology is retained, in view of the general use in America and in the best Continental works of the terms order and family, as prescribed in the Vienna Code, though even the makers of that Code had not arrived at a full appreciation of the desirability of uniformity in ordinal terminations.

* Willis, J. C. A Manual and Dictionary of the Flowering Plants and Ferns. 12 mo. Pp. xii + 714. 1908. [3d ed.] Cambridge, University Press.

Part III consists of a glossarial index, including English names. Although the preface states that this edition has been enlarged to bring in colonial and American names of plants, yet the absence of such names as *Dryopteris*, *Stenanthium*, *Philotria*, *Filix*, and *Gyrostachys*, as well as scant mention of American works in his bibliography, suggests that the author is not very familiar with our manuals or journals. Nevertheless, this dictionary, especially as regards plants growing outside of our region, may be commended as a very convenient and valuable reference hand-book for American teachers and students.

TRACY E. HAZEN

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PROCEEDINGS OF THE CLUB

JANUARY 27, 1909

The meeting was held at the Museum of the New York Botanical Garden at 3:40 P. M., President Rusby in the chair. There were 17 persons present.

After the reading of the minutes of the meeting of January 12, Mr. Fred. J. Seaver was nominated for membership.

The President appointed the following committees for the year 1909.

Finance Committee: Addison Brown and H. M. Richards.

Program Committee: Fred. J. Seaver, Tracy E. Hazen, Miss Jean Broadhurst, Charles L. Pollard, and Mrs. E. G. Britton.

Field Committee: Norman Taylor, E. B. Southwick, and Wm. Mansfield.

Committee on Local Flora: N. L. Britton, Chairman; *Phanerogams,* — N. L. Britton, C. C. Curtis, Eugene P. Bicknell, K. K. Mackenzie, E. S. Burgess, and E. L. Morris. *Cryptogams,* — Wm. A. Murrill, Mrs. E. G. Britton, Tracy E. Hazen, M. A. Howe, and Philip Dowell.

The scientific program consisted of two papers of which the following abstracts were prepared by the authors.

"Studies in the Embryology of the Mistletoe, *Dendropemon*", by Miss Mary M. Brackett.

This study was made from two species of Loranthaceae — *Dendropemon caribaeus*, gathered by Prof. F. E. Lloyd from lime trees in Dominica, and *Dendropemen parvifolius* collected by the writer from the bitter-broom, *Baccharis*, at Cinchona, in the Blue Mountains of Jamaica.

The flowers of *Dendropemon* are perfect, regular, and symmetrical. The buds form in clusters of three in the axils of the leaves, and are protected by bracts. The corolla consists of six petals, which, in *D. parvifolius*, are of a reddish color on the outside, and a delicate pink within. There are six stamens borne upon an inferior ovary, the three fertile stamens alternating with three sterile stamens. The flower has one style and one stigma. At the top of the ovary is the cup-shaped calyculus.

At the time that the corolla and stamens appear as rounded knobs, two carpellary leaves meet over a central placenta, forming a cavity. The carpellary and placental tissues gradually unite, filling the cavity. Growth in the length of the pistil begins to be rapid, and the stamens develop. During this time cell division is going on in the region of the nucellus. There is, however, nothing to mark the development of an ovule as a distinct organ, nor is there any indication of integument. In the center of the ovary the cells increase in number and size and contain large nuclei. They elongate parallel to the main axis, become irregular, and constitute the archesporial tissue. Their growth is accompanied by periclinal division in the adjacent cells. Several large archesporial cells form megaspores; the neighboring cells become disorganized and gradually disintegrate. Apparently only one of the megaspores becomes an embryo-sac.

The embryo-sac was not made out in these species, but a long slit was observed reaching from the center of the ovary into the tissues of the style, which it seemed, had been occupied by the embryo-sac. Of this Hofmeister says (*Neue Beitrage zur Kenntniss der Embryobildung der Phanerogamen*, 539, 1859). "The growth in length of the embryo-sac is not ended with its formation. The sac makes its way through entangled cells of the closed style to a quarter of its length upwards."

Young stages of the proembryo were observed composed of four, and then of six cells in two parallel rows, with the long suspensor, of three greatly elongated cells, reaching into the tissues of the style for nearly half its length.

The embryo occupies a vertical position in the center of the berry, and from its position in the surrounding tissue, suggests all the characters of an orthotropous ovule. As the embryo develops, it is surrounded with endosperm. A change in the nature of the tissue below the embryo suggests a series of conducting cells between the embryo and the starch-filled cells in the lower part of the ovary. The cotyledons become green, and the suspensor gradually disappears, except for a few capping cells at the anterior end of the embryo, which now occupies the ovarial cavity for almost its entire length.

The points of particular interest are: the rapid disintegration of the cells of the gynoecium before and after fixation, the lack of an ovule as a distinct organ, the lack of integument, and the green color of the embryo as it lies in the berry.

"Botanical Observations in Iceland and Spitzbergen", by Miss Julia T. Emerson.*

Dr. Britton showed a photograph of a new and interesting cycad collected by Dr. MacDougal and Dr. Rose in Tomellin Cañon, Mexico, in 1906. The plant was sent to the New York Botanical Garden and installed in the propagating houses, where it remained for two years before showing any signs of growth. This appears to be a new species of *Dioon*.

Dr. Murrill exhibited a number of tropical fruits obtained on his recent trip to Jamaica.

The Club adjourned at 5:10 P. M.

PERCY WILSON,
Secretary

FEBRUARY 9, 1909

The Club met at the American Museum of Natural History at 8:15 P. M. and was called to order by President Rusby. The attendance was 20. After the reading and approval of the minutes of the preceding meeting, resignations were read and accepted from Mr. LeRoy Abrams, Mr. W. Ralph Jones, and Mr. John M. Holzinger.

* Printed in full in this issue of TORREYA. — EDITOR'S NOTE.

Mr. Ewen MacIntyre was nominated for membership.

The announced paper of the evening on "The Rubber Forests of Mexico" was then presented by Dr. H. H. Rusby. The lecture was illustrated by lantern slides made from photographs, many of which were obtained by the speaker while in the field. This paper has been printed in full in the January number of the Journal of the New York Botanical Garden, and an abstract accompanied by illustrations will appear at an early date in TORREYA.

The meeting adjourned at 9:40 P. M.

PERCY WILSON,
Secretary

OF INTEREST TO TEACHERS

COLLEGE ENTRANCE BOTANY

A fourth report on the college entrance course in botany has been formulated by the Committee on Education of the Botanical Society of America. In authorizing the publication of this report * the Society urges that a year's thorough work in botany be accepted by *all* colleges as an "entrance option" for under the present educational conditions it is "practically impossible for any subject to receive suitable consideration in the three upper years of most high schools unless it can be counted for entrance to college."

The "ten principles upon which the course is formulated" are given below, and the general statement of the subject-matter will, for lack of space in this issue, be printed next month. The preparation of such a course of study is not an easy matter; and the work of the members of the committee, Professor W. F. Ganong, of Smith College, Professor F. E. Lloyd, of the Alabama Polytechnic Institute, and Professor H. C. Cowles, of the University of Chicago, should receive our hearty appreciation. Thanks are also due the Society for the effect such a course will have upon the teaching of botany in the high schools — both directly and indirectly. What do the teachers of high school

* The School Review, Vol. 16. November, 1908.

botany think of the following principles upon which the course is based? From them the committee should receive most helpful criticisms. Here, as indicated by the committee in the last paragraph of this paper, is an opportunity by the high school teachers to help form the "college requirements" which are so generally denounced in all secondary subjects.

PRINCIPLES UPON WHICH THE COURSE IS FORMULATED

1. It is founded upon the two important reports of the National Educational Association — the "Report of the Committee of Ten" (Washington, 1893), and the Report on College Entrance Requirements (Chicago, 1899). These have been modified in accord with the results of more recent experience, and the advice of leading teachers.

2. While intended primarily as an option for entrance to college, it is designed equally for the education in the high school of the general student who can follow the subject no farther; there are in botany no advantages in having the college preparatory and the general educational courses different, at least none that are at all commensurate with the additional burden thus laid upon the schools.

3. It is designed to yield a mental discipline fully equal in quality and quantity that yielded by any other subject studied for the same length of time.

4. It should, if possible, have as a foundation a considerable body of botanical fact learned through nature-study in the lower schools; it should be given in one of the three upper years as part of a four years' high-school course in the sciences: it should be considered and treated as an elementary or preliminary course leading to second courses in college, and colleges accepting the option should arrange second courses to articulate economically with it.

5. The immediate plan of its construction is very simple, namely, to include those topics in the leading divisions of the subject which most teachers now regard as fundamental, whether for their value in scientific training, or as knowledge; but the individual teacher is left free to follow his own judgment as to sequence

of topics, text and other books, and special methods. Advice is occasionally offered, however, upon important points in which most teachers are now known to agree.

6. It recognizes the existence of, and provides for, two modes of procedure in the sequence of topics. In one, which is that strongly advised by the committee, the general facts of plant structure and function, permitting a beginning with large and familiar objects and phenomena, are first studied, to be followed later by a study of representatives of the groups of plants from the lower to the higher ; in the other the study of the groups is the backbone, as it were, of the course, which begins with the lowest forms and introduces the physiological and morphological topics at appropriate places in the ascending series. The two modes, however, lead to substantially the same result, and a common examination is practicable for both.

7. The amount of work in the course is designed to occupy a a year of five periods a week under good conditions. Where special circumstances, such as exceptional difficulty of obtaining material, etc., prevent the completion of the entire amount while allowing its equivalent in thoroughness, it is recommended that some of the minor topics here and there be omitted rather than that the attempt be made to cover all superficially. To provide for this possibility the examination papers should always include a number of alternative questions.

8. The time per week, inclusive of recitation, preparation, and laboratory should be the same as for any other subject. Where five periods a week, with an hour of preparation for each, are demanded for other studies, this course should receive the equivalent of two recitation periods with their preparation, together with three double (not six separated) periods in the laboratory. Variation from this should be towards a greater, not a lesser proportion of laboratory work. The preparation of records of the laboratory work, in which stress is laid upon diagrammatically accurate drawing and precise and expressive description, should be regarded as an integral part of the course ; and these records, preferably in a notebook, should be counted at least one-third towards the students' standing.

9. The course is arranged in two parts, each occupying a half-year and complete in itself. This is in part to accord with principle 6, preceding, and in part to allow either a combination of a half year of botany with a half year of zoölogy to form a year's course in biology, or else to provide a shorter course as needed in some schools. In any case a half-year course in botany should consist of Part I or Part II, never of a combination of both, a recommendation based partially upon educational principle and partly upon the practical difficulty of providing examinations and articulating later college courses with such diverse combinations.

10. The course is intended to be relatively permanent, yet is modifiable in adaptation to changing educational conditions and the approved results of experience. Changes will not, however, be made for some time, and not until announced in a fifth edition of this report. The committee will welcome all suggestions and criticisms.

Those interested in the theories of sex-heredity will find an interesting paper on "A Mendelian View of Sex-heredity" by Professor W. E. Castle, of Harvard, in *Science*, for March 5, 1909; in this paper Professor Castle brings "into harmony the seemingly discordant results of Wilson, of Correns, and of Bateson and his associates."

NEWS ITEMS

A company called "The Luther Burbank's Products Company, Incorporated" has recently been formed with a capitalization of several million dollars. The company will attend to business matters connected with Mr. Burbank's work, and control the distribution of his new productions.

Dr. N. L. Britton, director-in-chief of the New York Botanical Garden, accompanied by Mrs. Britton and Dr. Marshall A. Howe, curator of the museums, sailed for Jamaica, February 20. They expect to spend about six weeks visiting the eastern parts of Jamaica and Cuba, and possibly some of the southwestern Bahamian islands.

Two new national forests were recently created by President Roosevelt. One is the Ocala National Forest in Marine County, in eastern Florida, the first created east of the Mississippi River, and it contains over 200,000 acres, well adapted to the growth of sand pine. The second is the Dakota National Forest in Billings County, North Dakota, and it consists of over 14,000 acres in the Bad Lands region, part of which are to be used as an experimental field for forest planting. It is to be hoped that these Dakota nurseries may prove most successful, as North Dakota has a lower per cent. of forest land than any other state — about one per cent.

The first number of *Mycologia*, a new journal devoted to fungi and lichens, was issued in January, 1909. Dr. William A. Murrill, of the New York Botanical Garden, is the editor. Many well-known mycologists appear as associate editors ; and several others have promised their support. Although undertaken in continuation of the work formerly done by the *Journal of Mycology*, edited by the late Professor Kellerman, *Mycologia* has not assumed any of the obligations of the publisher of that journal. The main features of the new journal will be, first, technical articles of value to investigators in pure or applied mycology, second, popular articles of interest to the fungus-loving public, third, good illustrations, many of them in natural colors, fourth, news and notes, largely relating to literature of interest to American students.

OTHER PUBLICATIONS

OF THE

TORREY BOTANICAL CLUB

(1) BULLETIN

A monthly journal devoted to general botany, established 1870. Vol. 35 published in 1908, contained 608 pages of text and 40 full-page plates. Price $3.00 per annum. For Europe, 14 shillings. Dulau & Co., 37 Soho Square, London, are agents for England.

Of former volumes, only 24-34 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. 28–35 three dollars each.

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

(2) MEMOIRS

The MEMOIRS, established 1889, are published at irregular intervals. Volumes 1–11 and 13 are now completed; Nos. 1 and 2 of Vol. 12 and No. 1 of Vol. 14 have 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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NEW YORK CITY

Vol. 9 April, 1909 No. 4

TORREYA

A MONTHLY JOURNAL OF BOTANICAL NOTES AND NEWS

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

JEAN BROADHURST

JOHN TORREY, 1796–1873

CONTENTS

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THE TORREY BOTANICAL CLUB

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TORREYA

April, 1909

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THE DISTRIBUTION OF THREE NATURALIZED CRUCIFERS

By E. J. Hill

Late in the autumn of 1906 I noticed a strange cruciferous plant in a vacant lot near my home on the south side of the city of Chicago. It was growing by the sidewalk and had been subject to such severe treatment by children who use such spaces for playgrounds that I was not certain as to its specific identity, except that it was a *Diplotaxis*. It was not observed the next season, but it had survived and good specimens were obtained the past summer which showed it was *D. muralis* (L.) DC. I have not seen it elsewhere nor heard of its presence hereabouts from others. The range accorded it in Britton and Brown's Illustrated Flora (1897) is: "Waste places and ballast, Nova Scotia to New Jersey and Pennsylvania, chiefly about cities." This is substantially repeated in Britton's Manual (1901). The Gray's New Manual (1908) says: "About Atlantic ports and rarely inland," but without specifying how far from the coast. In Beal's Michigan Flora (1904) a single station is given, Grand Rapids, about the same distance from the coast as Chicago. Not having been mentioned in previous editions of Gray's Manual, it may be regarded as a comparatively recent introduction. As the migration of adventive plants is a matter of interest it seems well to record its appearance here.

In 1890 I recorded the finding of another cruciferous plant, *Nasturtium sylvestre* R. B., since called *Roripa sylvestris* (L.) Bess, and which now has another name, *Radicula sylvestris* (L.) Druce, the common yellow cress. It was growing in the low ground adjacent to Salt Creek, a tributary of the Desplaines

[No. 3, Vol. 9, of Torreya, comprising pages 45–64, was issued March 26, 1909.]

River, and along the highway that crosses the creek not far from Western Springs, a few miles west of Chicago. Since then it has spread throughout the region, being abundant by water courses, and especially so by the low margins of the Desplaines to Joliet and below. It should now be looked for southwest of here along the Illinois and perhaps the Mississippi, to which rivers the Desplaines is tributary. As it does not require wet grounds exclusively for prosperity, but may do well by moist roadsides or even on drier railway embankments, creeping up probably from near by ditches, it has still another means of distribution.

This plant seems to have received its first notice in American botany in 1818, both by Nuttall in his Genera (**2**: 68), and by Barton in his Compendium Florae Philadelphicae (**2**: 55), both published that year. It was not mentioned by Barton in his earlier work, Prodromus of the Flora Philadelphica (1815), nor in Muhlenberg's Catalogue (1813), nor in Pursh's Flora (1814). Taking these dates as a starting point, it may be concluded that it was introduced into this country not far from that time, since otherwise it could hardly have escaped the eyes of those who then represented the most active botanical center in the land. Under the name of *Sisymbrium vulgare* Persoon (*sylvestre* L.), or the creeping water rocket, Nuttall states of it: "On the gravelly banks of the Delaware, near Kensington, Philadelphia. Introduced? Agrees exactly with Sir J. E. Smith's very accurate description, Flor. Brit., 2, p. 701. I have never before seen it in America." Barton, under *Sisymbrium sylvestre* L., says: "This plant covers large patches of ground on the low wet margins of the Delaware, just above Kensington; and it has every appearance of being a native there. It is not improbable, however, that it has been accidentally introduced in that neighborhood, where at least it is unequivocally naturalized. I have this summer found young leafing specimens four miles higher up the Delaware." From the tenor of this and from the question mark used by Nuttall it would seem that there was some doubt about its foreign origin. In Torrey and Gray's Flora of North America (1838–40), under *Nasturtium sylvestre* R. Br., Philadelphia is the only station mentioned, Nuttall being cited as authority. So also in Eaton and Wright's Botany (1840), and Wood's Class-Book (1854). In Gray's Manual (1856) it appears with an additional station, the entry being: "Wet meadows near Philadelphia and Newton, Mass., *C. J. Sprague.*" In the fifth edition (1868) the range had been extended, as we read: "Massachusetts to Virginia, rare." This is repeated in the sixth edition (1889). In the Illustrated Flora (1897) the range is still further extended. "Occasional from Massachusetts and Virginia to Ohio." In Britton's Manual (1901) the range is "Newf. to Mass., Va. and Mich." It had found a place in Beal's Michigan Flora (1904) but was not in the preceding catalogue of Beal and Wheeler (1892), the single station being Detroit. In Kellerman and Werner's Catalogue of Ohio Plants (1893) a single station is also mentioned, Painesville, near Lake Erie, or just east of Cleveland.

One cannot from these data make out more than a general movement of the plant north and south, near the Atlantic coast, or westward toward the interior, either from the original station at Philadelphia or from other points of introduction along the seaboard. I find it mentioned for New York in a report of the State Cabinet of Natural History for 1865. The regent reporting on the topic refers to a previous list of Torrey, made in 1853, in which it does not appear, and says, that to his knowledge it had been reported from no other place than the one mentioned, Flushing, Long Island. The authority for the station was Mr. W. H. Leggett, who subsequently, as well as others, gave additional localities for New York and vicinity, as I find recorded in the Bulletin of the Torrey Botanical Club from time to time, up to 1889. One of these by Addison Brown mentions it in 1879, among ballast plants, as if a new introduction by such means in that special case.

Taking the rest of the state of New York, the plants of the central and western parts are quite well represented in four catalogues or floras issued between 1865 and 1896. The first of these is Paine's "Plants of Oneida County and Vicinity" (1865). That of David F. Day, "The Native and Naturalized Plants of the City of Buffalo and Vicinity" (1882), took in most of the territory west of the Genesee River, as well as a portion west of the Niagara, as its radius was one of fifty miles about Buffalo. The Cayuga Flora of Professor Dudley (1886) was for the basin of Cayuga Lake and some adjoining ground, though covered in part already by Paine's Oneida list. The three lists mentioned do not record the plant. In the " Plants of Monroe County and Adjacent Territory," published in 1886 by the Rochester Academy of Sciences, it is listed for places near the Genesee River, being abundant in some of them. Macoun does not give it in any list of Canadian plants up to 1890, that being the date of some entries as " additions and corrections to parts I–IV " of his Canadian catalogue. I can add as a matter of personal observation, that in the summers of 1882 and 1884 I spent some weeks examining streams, lakes, and ponds in western New York for the study of Najadaceae, but collected other plants as well. The localities were principally south of the area recorded in the Rochester list and east of that of the Buffalo list, being in the counties of Wyoming, Genesee, Livingston, and some adjoining parts of Monroe and Ontario counties. I did not meet with the plant. Judging by the rate at which it has spread since it was first observed in the Desplaines valley, it is not likely to be present in a locality for any length of time without becoming abundant enough to attract attention, since it soon forms extensive mats or beds in favorable localities.

Though the year of discovery is not generally given in the publications cited, the time of publication is covered by ten years for places as widely separated as Rochester, Painesville, Detroit, and Chicago. This is about seventy years after the first notice by Barton and Nuttall by the Delaware. The distribution between these places and the seaboard and between one another, if in any way connected, must be ascribed to other causes than that of steady accretion of area along lines of natural or unaided seed distribution, however this may act in localities where a plant is once established. Nor are the places mentioned so connected by water communication that plants of this character would be likely to traverse the spaces in the reverse direction to the course of drainage, however this may aid when the direction of flow is in their favor. Yet they are on main lines of railway traffic, and to some extent of lake navigation, if these may have any connection with such seemingly sporadic dispersal of plants. That lines of railway are important factors in plant migration, especially for those of a weedy nature, is readily seen by one passing along their roadbeds. But there are evidently other means by which plants, whose seeds cannot be borne by currents of air, are able to cross widely intervening spaces. For those that grow in water or in the feeding places of migratory birds, seeds lodged in their feathers or in the mud that may cling to their feet is a plausible conjecture for dispersion. The transmission of undigested seed in the alimentary canal of birds is also the source of wide dispersion of plants. But when once established, as in the case of this plant in the Desplaines valley, which has now been under observation nearly twenty years, the natural flow of the water bearing plants or seeds that may be taken up by it becomes a means of the more effectual dissemination in a given area. A specimen collected in 1892 by Dr. W. S. Moffatt on the banks of Salt Creek at Elmhurst has upon the label the statement: "abundant locally, covering several acres of creek-bottom." This being higher up the stream than where I found it in 1890, from its abundance may have been an earlier station and the source of those at Western Springs. Dr. Moffatt in the same connection mentions its presence at Riverside where Salt Creek enters the Desplaines River.

The case with the third crucifer, *Sisymbrium altissimum* L., is somewhat different, as it doubtless came into this region from the northwest; it is given as *S. Sinapistrum* Crantz in Macoun's Catalogue among the additions and corrections to parts I–IV, published in connection with part IV. It had then (1890) been "introduced in a number of places along the Canadian Pacific Railway." The earliest date recorded is 1883, at Castle Mountain, Rocky Mountains. In 1886 it is mentioned as by Lake Superior; in 1889 at a station forty-five miles east of Toronto. The first authentic record I have for Chicago is an unnamed specimen received from Dr. Moffatt, collected at Forest Glen, 1893; it was soon after seen by him in the western part of the city. The first place mentioned is on the Chicago, Milwaukee, and St.

Paul railroad and can well account for the line of introduction. It soon spread to various localities in and around Chicago, though I did not see it in the locality where I reside till 1900. In 1903 I found it common by the side of the Lake Shore and Michigan Southern railroad at Dune Park, Ind., thirty-five miles east of here. It is a quite common weed in the waste grounds of Chicago now. In Beal's Michigan Flora the first date given for a locality is Benton Harbor, 1896. This is on the east side of Lake Michigan, nearly opposite Chicago. The entry is also made, "later in many localities." As the Gray's New Manual states that it is "locally abundant as a pernicious weed" it may be considered as quite generally spread throughout the northern parts of the United States and the southern part of Canada. Since Britton and Brown give it a place as a ballast plant at New York, there may also be other centers of migration from eastern harbors, but the main line has evidently been from the northwest.

The spreading of this weed has been quite rapid, gaining a large area in about twenty years. It produces seeds in great abundance. As I have observed it the height does not generally exceed 5 to 8 dm., that is, not very tall as one might infer from its specific name, though the stature is more or less influenced by the character of the soil. When crowded by its own kind or by other growths it may be very slender and but little branched, but with ample room it is bushy-branched, the diameter equaling or exceeding the height, or of a somewhat globular form, like a tumble-weed. Whether it actually functions as such I have seen no case, but the shape is one that suggests that it could be easily rolled by the wind if loosened from the ground by any means. These are the possibilities of a tumble-weed.

CHICAGO, ILLINOIS

ADDITIONS TO THE PLEISTOCENE FLORA OF NORTH CAROLINA*

By Edward W. Berry

In a previous paper the writer enumerated thirty-eight species. mostly forms which still exist, from the Pleistocene deposits of North Carolina.† Considerable new material, for the most part unstudied as yet, has since been obtained, from which the following have been selected for enumeration at the present time.

Juglandales

Hicoria aquatica (Michx. f.) Britton

Salix sp., Berry Journ. Geol. **15**: 340. 1907.

Additional material has made possible the certain correlation of the specimen previously listed as a willow with this species of hickory. In the modern flora it is a denizen of low river banks and swamps from Virginia to Florida and westward in the Gulf region to Texas. It has not hitherto been found as a fossil,

Station 850, Neuse River.

Fagales

Quercus michauxii Nutt.

This occurrence is based upon fragments of leaves and characteristic acorn cups. In the modern flora it inhabits low, wet situations from Delaware to Florida and westward, but has not been previously obtained in the fossil state.

Station 850, Neuse River.

Ranales

Liriodendron Tulipifera Linné

Berry, Amer. Nat. **41**: 695. 1907.

Winged carpels of this species were recently recorded by the writer from the Pleistocene of Alabama, but leaves have not been previously recorded from American strata younger in age than the Cretaceous, although the genus is common in the Arctic and Eura-

* Illustrated with the aid of the Catherine McManes fund.

† Berry. Journ. Geol. **15**: 338–349. 1907.

sian Tertiary. The present record is based upon abundant and characteristic leaves collected by Dr. L. W. Stephenson from a clay lens in the sands of the Wicomico formation, one and one-fourth miles east of Weldon. One of the specimens is shown in Fig. 1.

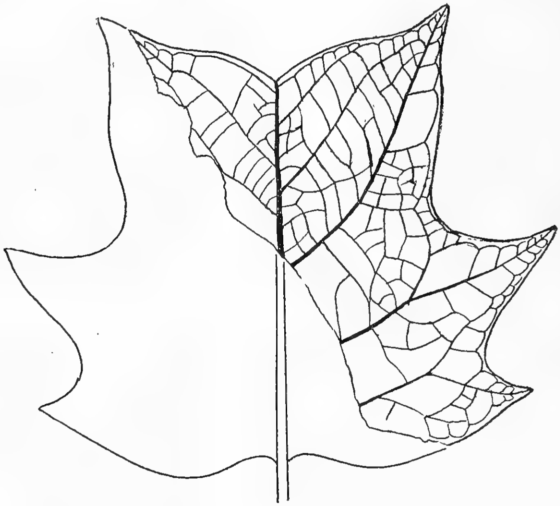


FIG. 1. *Liriodendron Tulipifera* Linné, from the Pleistocene of North Carolina.

Rosales

CERCIS CANADENSIS Linné

Penhallow, Amer. Nat. **41** : 446. 1907.

The accompanying figure (Fig. 2) shows a characteristic leaf of this species which comes from one and one-fourth miles east of Weldon. It has been previously recorded by Penhallow from the famous interglacial deposits of the Don valley near Toronto and in the modern flora it is said by both Britton and Small to range northward to southern Ontario. Both Sargent and Sudworth give its normal northern range as New Jersey and southern Michigan from which points it ranges southward to Florida and Mexico. It is essentially a warm temperate type, most of its near relatives being subtropical in habitat. Like the present species in this country *Cercis siliquastrum* Linné of southern Europe has been found in the interglacial deposits of France.

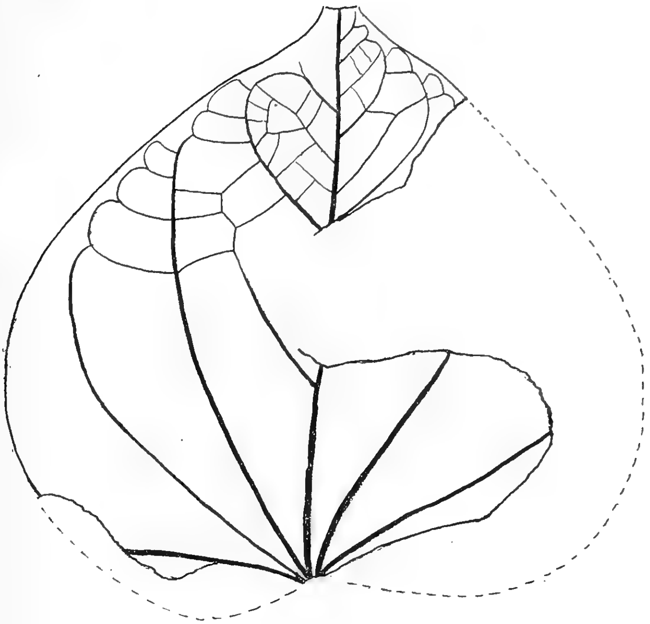


FIG. 2. *Cercis canadensis* Linné, from the Pleistocene of North Carolina.

Ericales

VACCINIUM ARBOREUM Marsh

Berberis sp., Berry Journ. Geol. **15**: 343. 1907.

Additional material shows that what was formerly listed as doubtfully referable to *Berberis* is unquestionably the foliage of this species of *Vaccinium*. It is sometimes removed from the latter genus and placed in the genus *Batodendron* of Nuttall. In the modern flora it ranges from North Carolina to Florida and westward to eastern Texas and up the Mississippi to southern Illinois.

Station 850, Neuse River.

JOHNS HOPKINS UNIVERSITY,
BALTIMORE, MARYLAND

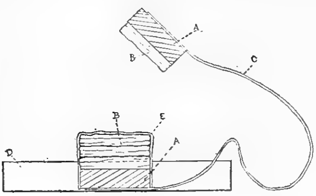
HERBARIUM NOTES *

By Paul C. Standley

In mounting a considerable number of plants recently the writer had occasion to notice a number of common defects in labels and in herbarium specimens — defects which could easily be remedied by a little care and forethought on the part of the collector; some of these are discussed in the following notes.

Labels should never be printed on stiff paper. Such paper is certain to curl up at the corners and edges unless it is kept under pressure until dry. True, if the corners do curl at first they are usually flat on the sheet after they are thoroughly dry, but they will always be loose and likely to be torn or still further loosened if anything happens to catch on them. It is preferable to use paper that is thin and will not curl away from the sheets when it is wet.

The size, too, deserves consideration. The largest labels that I have seen are about 2¾ by 5¾ inches and some of the specimens which they accompanied had to be broken to keep them from covering parts of the labels. Such pieces of paper require too much time for pasting on the sheet and are not necessary if the labels are filled in by hand, no matter how large a hand the collector may write, and are still less necessary when all the data are printed in. The size most generally used seems to be about 4¼ by 2⅛ inches.



While neatness of labels is always desirable, other ornamentation than the necessary wording is superfluous. This applies to ornamental borders and all advertising of the scenic attractions of the locality in which the plants were collected.

The type used should be plain. The most conspicuous parts of the label should be the name of the state in which the collection was made and the name of the plant. These things are not of so much importance in a small herbarium but when working with

* Illustrated with the aid of the Catherine McManes fund.

a large number of specimens in one of the larger herbaria they will save a great deal of time.

Typewritten labels are not desirable unless black indelible ink is used. The purple and blue ink that is ordinarily used on typewriter ribbons will fade so much in eight or ten years that it will be impossible to read it.

Of course there is every variation in the quality of the specimens themselves, due in part to the climatic conditions of the locality in which they were secured (and very largely to the pressure under which they were dried). The preservation of the original color of the plants is always desirable but not always possible with thick and fleshy specimens, with certain plants in which peculiar chemical changes take place in drying, or in very damp climates.

Here in New Mexico the making of good specimens is a very simple matter providing the proper kind of plants can be found. It is often unnecessary to change the driers for small plants or those which contain little moisture. Some of our best specimens have been made in the following manner: First a drier is placed upon the table ; on this is laid a sheet of drying paper upon which the plant is placed; over this another drier, then a sheet of corrugated paper such as is used in packing glassware, etc. ; over this another drying paper and specimen, or if one prefers another drier and then the sheet; and so on until a bundle of sufficient size is formed. This is then strapped and thrown out in the sunshine upon the sand and left for several days. It is necessary to tighten the straps occasionally but no other attention is needed unless a rain should come. Excellent specimens can be made in this way, even of the cacti and other fleshy plants. Of course this method is practicable only in a dry region where there is an abundance of hot sunshine. In the mountains frequent changes of driers are necessary.

Most plants which contain considerable moisture will be blackened and consequently ruined if the bundles containing them are placed in the sun and heated to a high temperature before the driers have been changed at least once. If the driers themselves are heated before the plants are placed between them the heat does not seem to blacken the plants and hastens their drying appreciably.

Too large and too generous specimens are an abomination when it comes to mounting them. It is best to use drying papers a little smaller than the standard size of herbarium sheets; then there will be no difficulty in getting the specimens upon the sheets. Sometimes one receives specimens so large that they must be almost ruined in trimming them down to the size of the mounting paper.

If a sheet contains more material than can be conveniently mounted upon an ordinary herbarium sheet it necessitates the writing of a new label or else the throwing away of the surplus material. The second course is perhaps the better, for it is very seldom that one cares for two sheets of one collection. If one sheet is properly filled it should, except in rare cases, contain material enough for the study of a plant.

Besides the use for corrugated paper mentioned above we have found it useful in mounting. When we are gluing plants upon the sheets we lay a piece of the corrugated paper over the glued plant, corrugated side down, and then a drier upon this, continuing in this manner until we have a pile of sufficient height to be placed somewhere and weighted until the glue has thoroughly dried. The corrugated paper, because of its corrugations, has less surface to stick to the plant and holds it in contact with the mounting paper just as well as the driers or sheets of pasteboard would do.

The accompanying figure shows an end view of a piece of apparatus that we have found very useful for moistening straps in strapping herbarium specimens. It was designed and made by Mr. O. B. Metcalfe, who was formerly student assistant in botany here. *AA* are pieces of wood about 3½ inches long and 1⅛ inches wide; to these is riveted a strip of galvanized iron *C*, which is T-shaped at the ends so as to cover the blocks of wood; upon the wood are tacked two or three layers of ordinary felt drying paper, *BB*; in order to make the paper last longer it is covered with a piece of cloth of medium thickness, *E*. The apparatus is then placed in a small tin pan, *D* (the lid of a baking powder box will do), containing a little water. The straps are picked up with a pair of forceps used in applying them to the sheets, and while held in the forceps are laid on the moistened lower pad, while the upper one is pressed down upon it. In this way the straps can be moistened very rapidly and one soon learns to regulate the amount of water in the pan so that they will get just the right amount of moisture.

HERBARIUM OF THE NEW MEXICO AGRICULTURAL COLLEGE

SHORTER NOTES

THE CEDAR OF LEBANON. — I have read the compilation of notes on *Cedrus Libani* in TORREYA, and as usual in similar publications botanists alone are made to figure. William Lithgow, a Scotch traveller, visited the Lebanon Grove in 1611 and found twenty-four trees much burnt in one grove, and spoke of another of seventeen trees nine miles west.

One of the first trees planted in Britain *is* at Bretby, Derbyshire, planted in 1676. The late Sir J. D. Wolff, "Rambling Recollections," Vol. 2, p. 18, seems to have known Rustem Pacha (spoken of by J. D. Hooker) who told him that he replanted the Lebanon Grove with young trees from the Brussels Botanical Garden! (This ought to be easily verified.)

Professor Marquand's tree at Princeton had a fine growth and lots of cones a year or two ago, but remains quite pyramidal (see Downing's 1859 ed.).

JAMES MACPHERSON

TRENTON, NEW JERSEY

SUBMERGED WILLOWS. — My attention was called during the past summer to an interesting illustration of the tenacity with which our common willows cling to life. An artificial lake was formed in my vicinity last year by damming a small brook, making a lake nearly a mile long and fifty feet deep at the deepest point. Part of the valley which was covered by the water was occupied by a thicket of willows. These were left standing with the belief that they would soon rot away and disappear, and were covered so that their topmost branches were five or six feet below the surface of the water. During the past summer the lake was drained to allow repairs upon the dam. The willows had at this time been under water for seventeen months without once being exposed to the air. At the end of the first week they were distinctly green with a new growth of leaves, and in less than two weeks were in full leaf. Apparently, but for the filling of the pond a second time, they would have continued their growth from the point * at which they had been interrupted nearly a year and a half before, and would have been little the worse for the experience.

HENRY C. BEARDSLEE

ASHEVILLE SCHOOL,
ASHEVILLE, N. C.

SOME CROCUSES GROWN IN A NEW YORK ROOM. — Temperature variable; daytime about 70° F.; night almost that of outdoors. Soil loam and sand. Planted October 31, 1908. Twelve bulbs — nine unnamed and three of the Sir Walter Scott variety. They were planted in an unglazed clay pot 8″ in diameter, 3″ deep and placed under a desk in the coolest part of the room. In about five weeks they were set in a south window which received direct sunlight for about five hours of the day. For several weeks the leaves of the nine unnamed bulbs grew rapidly and the bud sheaths looked promising, then growth ceased and the leaves turned yellow at the tips. The Sir Walter Scott plants showed almost no evidence of growth. So after five or six weeks in the window, the entire dozen were deemed failures and they were banished to their former corner under the desk. There they were neglected, save for an occasional drink. After having been in that subdued light for about four weeks, a bud was discovered on one of the Sir Wafter Scott crocuses. It opened on February 9, 1909, and in a few days was followed by a second blossom. The second Sir Walter Scott began to bloom February 20, 1909, and had three blossoms. The third has at present, March 5, 1909, two thrifty looking buds.

GRACE L. MORRISON

TEACHERS COLLEGE

* The condition of the willows at the time they were submerged — whether in leaf or only in bud — would be of interest. — EDITOR.

New Stations for European Plant Immigrants. — In my field work for the past few months in eastern West Virginia, making extensive economic botanical collections, I repeatedly inquired for any plants from which brooms were made, and was shown a wild specimen of *Cytisus scoparius* (L.) Link, by a native who informed me that it was sometimes used to make "snow" brooms. The plant was growing on an old deforested hillside, one mile east of Pickens, Randolph County, and was 200 yards or more from any path or cultivated field, with no evidence of previous habitations. None of the natives had a common name for this plant, and few had noticed it, except a German, who was acquainted with the plant in Europe. He informed me that it was called "Ginster" in the old country. The range of *Cytisus scoparius* is given as Nova Scotia and the coast region of Massachusetts, Delaware and Virginia, where it is often used as a sand-binder.

Close to the *Cytisus*, I found several specimens of *Ulex europaeus* L. This was called "thistle" by the natives, doubtless on account of its excessively prickly character. The range of *Ulex* is given from southern New York to eastern Virginia near the coast, where it is cultivated as noted under the above species. I have not found these plants elsewhere in the state.

Specimens of both species are preserved in the botanical department of the Field Museum of Natural History.

Huron H. Smith

Field Museum of Natural History,
Chicago, Illinois

PROCEEDINGS OF THE CLUB

February 24, 1909

The Club met at the Museum of the New York Botanical Garden at 3:30 P. M. In the absence of the President and both Vice-Presidents, Mr. Fred J. Seaver was called to the chair. Eight persons were in attendance.

After the reading and approval of the minutes of the meeting for February 9, the following names were presented for membership: Mrs. Pamela Eakin, 38 Oakwood Avenue, Arlington, N. J., and Miss Gertrude L. Cannon, 1786 Clay Avenue, New York City.

The announced scientific program was then presented:

"*Collecting Fungi in Jamaica*," by Dr. W. A. Murrill.

This paper has been published in full in the February Journal of the New York Botanical Garden.

"*Cypripedium in the Light of its Segregates*," by Mr. G. V. Nash.

Mr. Nash exhibited living plants and herbarium specimens illustrating the four segregates now recognized by orchidologists, and formerly considered as parts of the genus *Cypripedium*. These segregates are: *Cypripedium*, *Selenipedium*, *Paphiopedilum* and *Phragmipedium*. These divide themselves into two groups. In the first group are *Cypripedium* and *Selenipedium*, characterized by the usually long, leafy stem and broad, flat, thin, many-nerved leaves which are convolute in vernation, and the withering perianth persistent on the ovary. In *Cypripedium* the ovary is 1-celled, and the seeds elongate with a thin testa. This genus is of north temperate distribution, its representatives, about 30 in number, being found in North America, Europe, and Asia.

The other genus of this group, *Selenipedium*, has a 3-celled ovary, and the seeds nearly globose with a crustaceous testa. This is found from Panama to northern South America and is rare. It contains only 3 species, which are seldom seen in cultivation.

The second group is at once recognized by the conduplicate vernation of its long, narrow, fleshy, strap-shaped leaves, and the deciduous perianth. The flowers are borne on scapes, which are rarely somewhat leafy below. To this group belong the remaining two genera, *Paphiopedilum* and *Phragmipedium*. In the former the ovary is 1-celled and the sepals imbricate in the bud. The most evident character, however, differentiating this at once from *Phragmipedium*, is in the lip, which has the margin of the opening straight not infolded. The scape is also commonly 1-flowered, the exception being with more than one. There are some 50 species known in this genus, which is entirely Old World, being generally distributed in tropical Asia and the Malay region.

The genus *Phragmipedium* is entirely New World, occurring in northern South America and Panama. It contains in the neighborhood of a dozen species, and is at once separated from *Paphiopedilum* by the character of the lip in which the margin of the opening is marked by a broad infolded portion. In addition to this the ovary is 3-celled and the sepals valvate in the bud; the scape, moreover, bears several, sometimes many, flowers.

We have then in the New World three of the genera, two, *Phragmipedium* and *Selenipedium* not known elsewhere, and *Cypripedium* which it shares in distribution with the Old World. The only strictly Old World genus is *Paphiopedilum*.

The meeting adjourned at 4:30 P. M.

PERCY WILSON,
Secretary

OF INTEREST TO TEACHERS

COLLEGE ENTRANCE BOTANY (CONCLUDED)

SPECIFICATIONS OF THE TOPICS TO BE STUDIED

Part I. The General Principles of (A) Anatomy and Morphology, (B) Physiology and Ecology

A. ANATOMY AND MORPHOLOGY.

The Seed. Four types (dicotyledon without and with endosperm, a monocotyledon and a gymnosperm); structure and homologous parts. Food supply; experimental determination of its nature and value. Phenomena of germination and growth of embryo into a seedling (including bursting from the seed, assumption of position and unfolding of parts).

The Shoot. Gross anatomy of a typical shoot; including the relationships of position of leaf, stem (and root), the arrangement of leaves and buds on the stem, and deviations (through light adjustment, etc.) from symmetry. Buds, and the mode of origin of new leaf and stem; winter buds in particular. Specialized and metamorphosed shoots (stems and leaves). General structure and distribution of the leading tissues of the shoot; annual growth; shedding of bark and leaves.

The Root. Gross anatomy of a typical root; position and origin of secondary roots; hair-zone, cap and growing-point.

Specialized and metamorphosed roots. General structure and distribution of the leading tissues of the root.

The Flower. Structure of a typical flower, especially of ovule and pollen; functions of the parts. Comparative morphological study of four or more different marked types, with the construction of transverse and longitudinal diagrams.

The Fruit. Structure of a typical fruit. Comparative morphological study of four or more marked types with diagrams.

This comparative morphological study of flowers and fruits may advantageously be postponed to the end of II, and then taken up in connection with the classification of the Angiosperms.

The Cell. Cytoplasm, nucleus, sap-cavity, wall.

As to the study of the cell, it is by no means to be postponed for consideration by itself after the other topics, as its position in the above outline may seem to imply, but it is to be brought in earlier, along with the study of the shoot or root, and continued from topic to topic. Although enough study of the individual cell is to be made to give an idea of its structure (a study which may very advantageously be associated with the physiological topics mentioned first under B), the principal microscopical work should consist in the recognition and study of the distribution of the leading tissues.

B. Physiology and Ecology.

Rôle of water in the plant; *absorption* (*osmosis*), *path of transfer, transpiration, turgidity and its mechanical value, plasmolysis.*

Photosynthesis; *Dependence of starch formation upon chlorophyl, light, and carbon dioxide; evolution of oxygen,* observation of starch grains.

Respiration; *need of oxygen in growth, evolution of carbon dioxide.*

Digestion; *Digestion of starch with diastase,* and its rôle in translocation of foods.

Irritability; *Geotropism, heliotropism* and *hydrotropism.*

Growth; *localization in higher plants; amount in elongating stems; relationships to temperature.*

Fertilization; sexual and vegetative reproduction.

Although for convenience of reference, the physiological topics are here grouped together, they should by no means be studied by themselves and apart from anatomy and morphology. On the contrary, they should be taken up along with the study of the structures in which the processes occur, and which they help to explain; thus — photosynthesis should be studied with the leaf, as should also transpiration, while digestion may best come with germination, osmotic absorption with the root, and so on. The student should either try, or at least aid in trying, experiments to demonstrate the fundamental processes indicated above in italics.

Modifications (metamorphoses) of parts for special functions.

Dissemination. Cross-pollination.

Light relations of green tissues; leaf mosaics.

Special habitats; Mesophytes, Hydrophytes, Halophytes, Xerophytes; Climbers, Epiphytes, Parasites (and Saphrophytes), Insectivora.

The topics in ecology (particularly the first four and in part the fifth), like those in physiology, are to be studied not by themselves, but along with the structures with which they are most closely associated, as cross-pollination with the flower, dissemination with the seed, etc. The fifth may most advantageously be studied in G in Part II.

In this connection field-work is of great importance, and, for some topics, is indispensable, though much may be done also with potted plants in green-houses, photographs, and museum specimens. It is strongly recommended that some systematic field-work be considered as an integral part of the course, coördinate in definiteness and value as far as it goes with the laboratory work. The temptations to haziness and guessing in ecology must be combated.

Part II. The Natural History of the Plant Groups, and Classification

A comprehensive summary of the great natural groups of plants, based upon the thorough study of the structure, reproduction and adaptations to habitat of one or two types from each group, supplemented and extended by more rapid study of other forms in those groups. Where living material is wanting for the latter, preserved material and even good pictures may be used, and a standard text-book should be thoroughly read. The general homologies from group to group should be understood, though it is not expected that these will be known in detail.

In general, in this part of the course, it is recommended that much less attention be given to the lower and inconspicuous groups, and progressively to the higher and conspicuous forms.

Following is a list of recommended types from which, or their equivalents, selection may be made :

A. ALGAE. *Pleurococcus. Sphaerella, Spirogyra, Vaucheria, Fucus, Nemalion* (or *Polysiphonia* or *Coleochaete*).

B. FUNGI. Bacteria, *Rhizopus*, or *Mucor*, Yeast, *Puccinia* (or a powdery mildew), Corn Smut, Mushroom.

Bacteria and yeast have obvious disadvantages in such a course, but their great economic prominence may justify their introduction.

C. LICHENS. *Physcia* (or *Parmelia*, or *Usnea*.

D. BRYOPHYTES. In Hepaticae, *Radula* (or *Porella* or *Marchantia*). In Musci, *Mnium* (or *Polytrichum* or *Funaria*).

E. PTERIDOPHYTES. In Filicineae, *Aspidium* or equivalent, including, of course, the prothallus.

In Equisetineae, *Equisetum.*

In Lycopodineae, *Lycopodium* and *Selaginella* (or *Isoetes*).

F. GYMMOSPERMS. *Pinus* or equivalent.

G. ANGIOSPERMS. A monocotyledon and a dictoyledon, to be studied with reference to the homologies of their parts with those in the above groups ; together with representative plants of the leading subdivisions and principal families of Angiosperms.

Classification should include a study of the primary subdivisions of the above groups, based on the comparison of the types with other living (preferably) or preserved material. The principal subdivisions of the Angiosperms, grouped on the Engler and Prantl system, should be understood.

The ability to use manuals for the determination of the species of flowering plants is not considered essential in this course, though it is most desirable. It should not be introduced to the exclusion of any part of the course, but should be made voluntary work for those showing a taste for it. It should not be limited to learning names of plants, but should be made a study in the plan of classification as well.

The preparation of an herbarium is not required nor recommended except as voluntary work for those with a taste for collecting. If made, it should not represent so much a simple accumulation of species as some distinct idea of plant associations, or of morphology, or of representation of the groups, etc.

The recent report of Gifford Pinchot, chief forester of the United States, shows that about 700,000 trees were planted last year on forests in Nebraska, Kansas, Colorado, New Mexico, Arizona, Utah, Idaho, and California. There are now growing at the planting stations more than 2,200,000 trees, which will be ready for planting in 1909. Sufficient seed was sown in the spring of 1908 to produce 4,600,000 seedlings.

For the *Bulletin of the New York Botanical Garden* issued February, 1909, Addison Brown has written an interesting account of the Elgin Botanical Garden, created by Dr. David Hosack, and its relation to Columbia College. The *Bulletin* also contains a paper on the North American Gill Fungi with a simple key that will be very helpful to many readers of TORREYA. Each of the above contributions is also issued separately by the New York Botanical Garden.

At the first annual conference of the governors of New England one session was devoted to the planting of trees. Forest trees were discussed, but especial interest was shown in orchard trees. New England, with its convenient markets, low land prices, and large proportion of hilly country not well suited to farming, could easily rank first in the production of apples, if the business were conducted with the energy characterizing western agricultural enterprises and guided by up-to-date methods.

Mycologia, the new journal issued from the New York Botanical Garden, contains the following on the chestnut canker which Dr. Murrill has earlier described for TORREYA: It is well known that practically all of the chestnut trees in and about New York City have been killed within the past few years by the chestnut canker, *Diaporthe parasitica;* but the number of trees destroyed has been only very roughly estimated. Through the efforts, however, of Mr. J. J. Levison, arboriculturist of the parks of Brooklyn, who has made a careful survey of Forest Park, it is now known that 16,695 chestnut trees were killed in the 350 acres of woodland in this park alone. Of this number, about 9,000 were between eight and twelve inches in diameter, and the remaining 7,000 or more were of larger size.

A report has been made by the Commission which was appointed by the Association of American Agricultural Colleges and Experiment Stations in 1906, to consider various matters relating to the expenditure of public funds. The members of the commission are David Starr Jordan, Stanford University, chairman; Whitman Howard Jordan, of Geneva, New York, secretary; Henry Prentiss Armsby, State College, Pennsylvania; Gifford Pinchot, Washington, D. C., and Carroll Davidson Wright, Clark College, Massachusetts. Among other recommendations are the following:

1. Every effort should be made to promote the training of competent investigators in agriculture both in the agricultural, and, so far as practicable, in the non-agricultural, colleges and universities, and their training should be as broad and severe as for any other field of research.

2. The progress of agricultural knowledge now demands that agricultural research agencies shall deal as largely as possible with fundamental problems, confining attention to such as can be adequately studied with the means available.

3. The work of research in agriculture should be differentiated as fully as practicable, both in the form of organization and in the relations of the individual investigator, from executive work, routine teaching, promotion and propaganda, and should be under the immediate direction of an executive trained in the methods of science who should not be hampered by other duties of an entirely unlike character.

4. An advisory board is suggested consisting of members appointed by the Secretary of Agriculture and by the Association of American Agricultural Colleges and Experiment Stations, respectively, which shall confer with the Secretary of Agriculture regarding the mutual interests of the department and the stations and shall consider the promotion of agricultural investigation in general.

NEWS ITEMS

Edward Valentine Hallock, president of the Society of American Florists, died March 3, 1909, at his Long Island home.

The University of Michigan has recently received a gift of ninety acres of land to be used as a botanical garden and arboretum.

In the departments of biology, L. L. Woodruff, of Yale, has been promoted to assistant professor, and R. W. Hall, of Lehigh, to full professor.

Mr. Patrick H. Lawlor, a well-known arboriculturist died recently at Flushing, Long Island. Many of our rare shade trees were first imported by Mr. Lawlor.

M. Louis Mangin has been made a member of the Paris Academy of Sciences, in the section of botany, succeeding M. Van Tieghem, who has been elected permanent secretary.

The new chief of the Bureau of General Statistics and Agricultural Information in the International Institute at Rome is Dr. C. C. Clark, of the United States Department of Agriculture.

Further coöperation is planned between the government and the University of Wisconsin. This will include the cultivation of medicinal plants including related investigation and research work.

Since Dr. George H. Shull's return from Europe, where he was studying scientific and economic plant breeding, he has gone to California to resume his work on Mr. Burbank's methods and results.

As the result of the North American Conference on the Conservation of Natural Resources, held in Washington last week, all nations are to be asked to send delegates to an international conference on conservation, to be held at The Hague.

The fifth summer school session of the University of Washington, opens June 22, at Friday Harbor, Washington. Courses are offered in elementary and in field botany. The tuition fee is but $13, making the entire charges for board, etc., for the six weeks only $45.

The Station for Research at Agar's Island, Bermuda, will be open for about seven weeks this summer. There are accommodations for a limited number of instructors or research students in either zoölogy or botany. Members of the expedition may leave New York on one of the steamers of the Quebec Steamship Company's Line, either the middle of June, or, if more convenient, about the first of July. For further information address Professor E. L. Mark, 109 Irving Street, Cambridge, Mass.

The next annual session of the Biological Laboratory of the Brooklyn Institute of Arts and Sciences located at Cold Spring Harbor will be held during the months of July and August, 1909. The regular class work will begin on July 7, and continue for six weeks. The Laboratory offers courses in zoölogy and botany, and facilities are promised to independent investigators; excursions and evening lectures form additional features of interest. The laboratory fee is $30; board will be furnished students for $5 a week. For further information address Dr. Charles Davenport, Cold Spring Harbor, Long Island, New York.

The following illustrated lectures will be delivered in the lecture hall of the museum building at the New York Botanical Garden, Bronx Park, New York City, on Saturday afternoons, at 4:00 o'clock:

April 24. "A Winter in Jamaica", by Dr. William A. Murrill.

May 1. "Spring Flowers", by Dr. Nathaniel L. Britton.

May 8. "How Plants Grow", by Dr. Herbert M. Richards.

May 15. "Evergreens: How to Know and Cultivate Them", by Mr. George V. Nash.

May 22. "Collecting Seaweeds in Tropical Waters", by Dr. Marshall A. Howe.

May 29. "Vanilla and Its Substitutes", by Dr. Henry H. Rusby.

June 5. "The Selection and Care of Shade Trees", by Dr. William A. Murrill.

June 12. "The Ice Age and Its Influence on the Vegetation of the World", by Dr. Arthur Hollick.

June 19. "Haïti, the Negro Republic, as seen by a Botanist", by Mr. George V. Nash.

June 26. "Some American Botanists of Former Days", by Dr. John H. Barnhart.

July 3. "An Expedition up the Peribonca River, Canada", by Dr. Carlton C. Curtis.

July 10. "Collecting Experiences in the West Indies", by Dr. Nathaniel L. Britton.

They will close in time for auditors to take the 5:34 train from the Botanical Garden Station, arriving at Grand Central Station at 6:04 P. M.

OTHER PUBLICATIONS

OF THE

TORREY BOTANICAL CLUB

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(1) BULLETIN

A monthly journal devoted to general botany, established 1870. Vol. 35 published in 1908, contained 608 pages of text and 40 full-page plates. Price $3.00 per annum. For Europe, 14 shillings. Dulau & Co., 37 Soho Square, London, are agents for England.

Of former volumes, only 24-34 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. 28–35 three dollars each.

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

(2) MEMOIRS

The MEMOIRS, established 1889, are published at irregular intervals. Volumes 1–11 and 13 are now completed; Nos. 1 and 2 of Vol. 12 and No. 1 of Vol. 14 have 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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115 W. 68TH STREET
NEW YORK CITY

Vol. 9 May, 1909 No. 5

TORREYA

A Monthly Journal of Botanical Notes and News

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

JEAN BROADHURST

JOHN TORREY, 1796–1873

CONTENTS

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THE TORREY BOTANICAL CLUB

OFFICERS FOR 1909

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Matter for publication should be addressed to

JEAN BROADHURST

Teachers College, Columbia University

New York City

TORREYA

May, 1909

Vol. 9. No. 5.

REPRODUCTION BY BUDDING IN DROSERA*

In August, 1907, young plants were found growing from old leaves of *Drosera rotundifolia* (Fig. 1) in the propagating houses of the New York Botanical Garden. At first they were thought to be seedlings but further observation showed that they had no cotyledons, no nepionic leaves like those of seedlings, no roots with one exception (Fig. 5), while they bore glandular foliage leaves like those of the adult plant except in size. Hence it was evident that the young plants were produced from the budding of the old tissue. In some cases the leaves upon which they grew were green and apparently normal; in others, brown and decaying.

Microtome sections through the point of connection between the young plant and the parent tissue (Figs. 2 and 3) showed no union between the vascular tissue of the parent plant and that of the young plant. A differential stain (Haidenhain's iron haematoxylin) showed the difference between the vigorous tissue of the young plant and the disintegrating tissue of the parent plant very clearly, but Delafield's haematoxylin showed no such distinction.

In each case, the stem of the young plant gave rise to five or six leaves before the root appeared as a lateral outgrowth. The root had a red apex and was diageotropic until it had passed beyond the margin of the old leaf, when it bent downward into the sphagnum in which the original plants were growing. In one case only (Fig. 5) was a root observed on the under (non-glandular) surface of the leaf. Later, leaf-petioles and one flower-stalk (Fig. 6) that had accidentally been broken from a plant were found to be proliferating in a similar way.

This growth from an inflorescence is noteworthy because so

* Illustrated with the aid of the Catherine McManes fund.

[No. 4, Vol. 9, of TORREYA, comprising pages 65–88, was issued April 8, 1909.]

FIG. I. *Drosera rotundifolia*, showing a young plant growing from leaf.

few examples have been reported (Kupfer, Mem. Torr. Bot. Club **12**: 224. 1907; Robinson, Plt. World 8: 131. 1905). Plan-

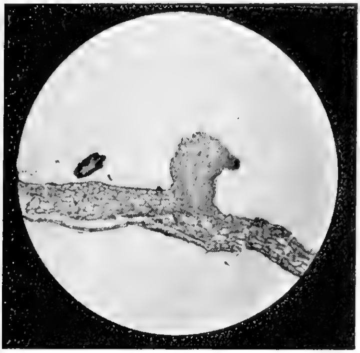
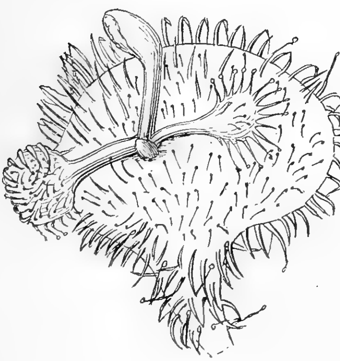


FIG. 2. Photomicrograph of section through an old leaf in region from which young plant is developing.

FIG. 3. Photomicrograph of section through a leaf petiole which bears a well differentiated plantlet. There is no connection between either of the vascular bundles of the petiole and the vascular tissue of the young plant.

chon (Ann. Sci. Nat. III. **9**: 84. *pls. 5 and 6.* 1848) described and figured flowers of *Drosera intermedia* which had passed into a chloranthic condition. The petals and the valves of the ovary



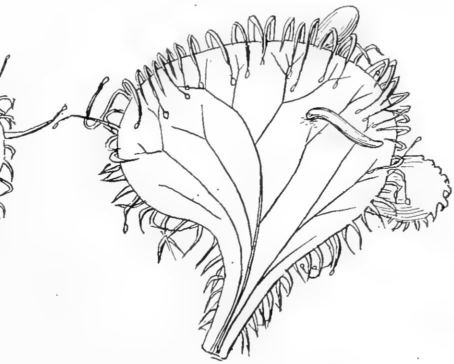


FIG. 4. Leaf upon which young plant is growing.

FIG. 5. Dorsal surface, showing root protruding.

were provided with stipules, bore glands, and were circinate in vernation. Leavitt (Rhodora **7**: 14. 1905) described a similar aberrant form of *Drosera rotundifolia* but neither observer recorded the development of young plants from the flower-stalks.

To determine whether it was necessary that a leaf should be in connection with the parent plant in order to proliferate, two leaves cut from a mature plant were placed on sphagnum in a moist chamber September 7. One month later a bud was seen upon the surface of one leaf. Three months from the date of beginning

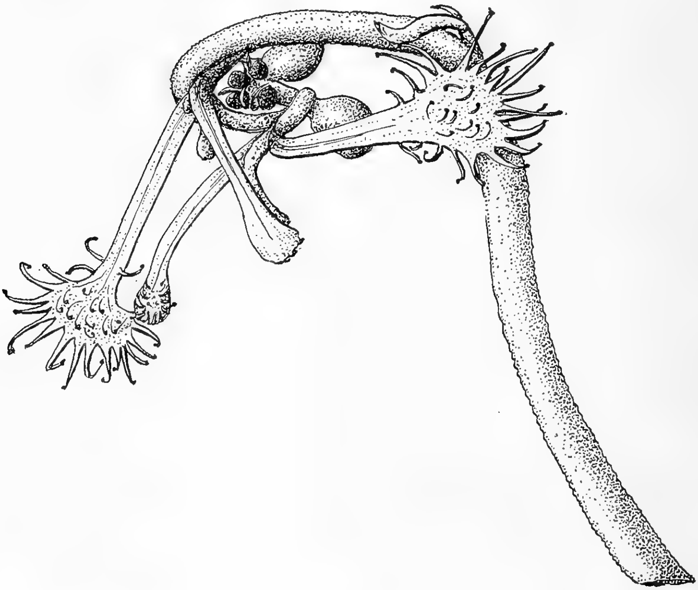


FIG. 6. Flower stalk from which two young plants are growing.

the experiment (Dec. 3) the parent leaf was still green, the leaflets of the young plant were like those of the adult, except in size, and the internodes of the stem were proportionately long, but no root had developed. At the end of four months (Jan. 3) a root was observed which had grown laterally from the base of the stem, while the parent leaf had entirely decayed. This was repeated with four leaves with practically the same results. A portion of a leaf was able to produce a new plant as readily as an entire leaf. Leaves placed with the gland-bearing surface downward in the moist chamber did not produce buds, and all the buds which appeared upon leaves still attached to a plant were upon the upper or ventral side of the leaf.

Nitschke (Bot. Zeit. **18**: 57. 1860) described reproduction by budding in plants of *D. rotundifolia* growing in their native bogs. He observed that while the bud-formation from the leaf surface occurred throughout the summer it was especially frequent in the fall. The buds always developed from the upper side of the leaf. He compared the plant arising from the bud with the seedling and noted that the bud-plant had only a stem-root while the seedling had numerous roots at the base. The first leaves of the bud-plant resembled the mature leaves while the seedling had cotyledons each with a single stoma, and nepionic leaves without glandular hairs. Both the bud-plant and the seedling were caulescent during their first year's growth and attained their rosette form at the beginning of the second season, though bud-plants produced in spring in some cases gained the rosette form during the summer. The first leaves made an acute angle with the stem but the angle made by succeeding leaves increased until it became 90° and the rosette form was reached. Drought tended to hasten the production of the rosette form, while fully developed plants placed under moss produced elongated axes like those of their early form.

Grout (Am. Nat. **32**: 114. 1898) noted adventitious buds on the leaves of *D. rotundifolia*, also the occurrence of glandular hairs a short distance from the base of stems of young plants. The latter observation corresponds with a statement made in Nature (**15**: 18. 1876) that plants of *D. rotundifolia* exhibited at the Chester (England) Society of Natural Science showed elongated axes which produced leaves and glandular hairs alternately.

Similar proliferation of the leaf tissues of *D. intermedia* was recorded by Naudin (Ann. Soc. Nat. II. **14**: 14. *pl. 1. f. 6.* 1840). Two plants developed between the mid-vein and margin of the leaf which had rosettes of leaves like those of the mature plant. The lower surface of the budding leaf was perfectly intact and there was no indication of a root.

The appearance of buds upon leaves of *D. longifolia* was reported by Kirschleger (Bull. Soc. de France **2**: 723. 1855).

Winkler (Ber. d. Deutsch. Gesell. **21**: 105. 1903) noted reproduction in *D. capensis* as arising not from latent embryonic tissue but from ordinary epidermal cells at the apex or near the petiole of the leaf, or upon the petiole itself.

Goebel (Einleit. i. d. exp. Morph. d. Pflanz. 196. *f. 97.* 1908) describes and figures a portion of a leaf of *D. binata*, a species whose leaves fork into two long segments. If a part be cut away and placed in a moist chamber it develops adventitious shoots, which have leaves like those of *D. rotundifolia* instead of being like the parent plant in form. This is the only species so far observed, in which young plants which arise by proliferation from mature tissue, develop leaves different from those of the adult. The question arises as to whether *D. rotundifolia* is not near to the antecedent form in structure while *D. binata* may be the result of the greatest modification, so that it is still in a state of variation and hence reverts to the *D. rotundifolia* type.

An allied form of reproduction which occurs in *D. pygmaea*, a native of southern Australia and New Zealand, is described by Goebel (Flora **98**: 324. 1908). The leaves are arranged in a rosette like those of other species but they are peculiar in having a peltate form and little chlorophyll, the work of assimilation being carried on chiefly by the petioles which are fleshy, contain much chlorophyll, and have stomata. At the close of the vegetative period, in the latter half of October in cultivated plants, numerous brood-bodies which resemble the gemmae of *Marchantia* appear in the center of the rosette. Each is borne upon a slender hyaline stem, the turgid cells at the apex of which set up such a tension that the brood-bodies are easily broken off by the animals which pass over them or by the rain. These small (0.730 mm. by 0.515 mm.), heart-shaped brood-bodies show dorso-ventral differentiation, the under side being smooth while the upper side is rounded into a horse-shoe-shaped cushion. There are stomata on both sides and a vascular bundle runs from the point of attachment to the center of the brood-body. The tissues are rich in starch, fat, and other reserve foods. The anlage of the new plant lies in the hollow at the base and may develop immediately after separation from the parent plant if conditions are favorable, drought being the most serious hindrance. The first leaves are peltate like those of the adult while the nepionic leaves of the seedling are simpler in form. Goebel believes that the origin of the brood-body is from a leaf anlage which explains their appearing alternately with the foliage-leaves, also the development of a slender vascular strand. It is more difficult to correlate particular parts. At first one is inclined to homologize the blade of the foliage-leaf with the brood-body and the petiole of the foliage-leaf with its stem. However the petiole of the leaf is more strongly developed than the blade, while the stem of the brood-body is less developed. Stipules which appear very early in the formation of the leaf have no homologue in the brood-body. The foliage-leaf is curved so that the apex is directed inwards while the brood-body remains upright. The brood-body develops early from the leaf-anlage and its stem must be regarded as a new structure, the function of which is the dissemination of these reproductive bodies. The part homologous with the foliage-leaf is a group of cells which arises on the inner side of the anlage. No axial buds have been observed in the inflorescence of *D. pygmaea* so it seems reasonable to regard the brood-bodies as new structures which do not arise from axial buds.

From the above observations it is seen that reproduction by budding occurs in *D. rotundifolia*, *D. intermedia*, *D. longifolia*, *D. binata*, and if the brood-bodies of *D. pygmaea* be taken as aborted leaves, the reproduction is by budding in that case also. In each species except *D. binata* the first leaves of the young plant resemble those of the adult. In *D. rotundifolia* at least, the resulting form is the same whether the young plant arises from a leaf still attached to the plant, a leaf cutting, or a flower-stalk removed from the plant.

Whether this is regarded as regeneration or not, depends upon the definition of regeneration which is accepted. Morgan (Regeneration, 23. 1901) says, "The word Regeneration has come to mean in general usage not only the replacement of a lost part but also the development of a new, whole organism, or even a part of an organisn, from a piece of an adult, or of an embryo, or an egg." Goebel (Einleit. i. d. exp. Morph. d. Pflanz. 136. 1908) expresses his idea of regeneration as the phenomenon of completion or restoration of a plant body after injury without regard to the manner in which it occurs. Pfeffer (Phys. of Plts. trans. by Ewart, **2**: 167. 1903) states that "only those cases ought to be designated as regeneration in higher plants in which the new parts formed after injury or loss exactly resemble in number and position the organs that have been removed." McCallum (Bot. Gaz. **40**: 98. 1905) recognizes three forms of regeneration as follows: "(1) The part removed is entirely restored by the growth of cells immediately below the cut surface; (2) there is no growth of embryonic tissue at the wounded surface, but at a greater or less distance from it the organization of entirely new primordia which develop organs which replace those removed; (3) the organ removed is restored by the development of already existing dormant buds." Dr. Kupfer (Mem. Tor. Bot. Club **12**: 196. 1907) says "The word regeneration ought to be limited to those cases in which an organ is formed, *de novo*, at a place or under conditions in which it would not normally be formed."

In the broadest sense of the term this form of reproduction in *Drosera* may be termed regeneration, but since it may occur on portions of the plant which are still attached to the main axis, without the apparent stimulus of injury, it seems better to place it in the category of plants that reproduce by budding than as an example of regeneration. However it is an illustration of a principle which much of the work on regeneration teaches, that the different forms of reproduction in plants may be arranged in a scale of slight gradations.

WINIFRED J. ROBINSON

NEW YORK BOTANICAL GARDEN

JUGLANDACEAE FROM THE PLEISTOCENE OF MARYLAND *

BY EDWARD W. BERRY

Some years ago a very complete account of the Pleistocene flora of Maryland was given by Dr. Hollick † who enumerated

* Illustrated with the aid of the Catherine McManes fund.

† Hollick, Maryland Geol. Surv., Pliocene and Pleistocene, 217–237, pl. 67–75. 1906.

about forty species of plants from deposits of this age in that state. Among these there were five members of the family Juglandaceae represented by leaflets of *Juglans*, *Hicoria*, and possibly *Pterocarya* (although the latter is doubtfully determined), and a small poorly preserved nut of *Hicoria*.

Remains of *Hicoria*, both leaflets and nuts, have proved to be very common in such of our Pleistocene deposits south of the terminal moraine as have been exploited. *Juglans*, on the other hand, has thus far proved to be exceedingly rare.

I am indebted to Dr. F. H. Knowlton, of the U. S. National Museum, for the privilege of describing the present exceptionally well preserved specimens which were collected from the Talbot

formation, about one mile south of Chesapeake Beach in Calvert County by William Palmer.

Hicoria glabra (Mill.) Britton.

Several extremely well preserved specimens of the fruit of this species were collected some of which are shown in figs. 1–5. These bring out very well the pear-shaped outline, the indehiscent husk, and the thick shell which characterize the modern fruits of this species and from which the fossils are indistinguishable. This species has been found fossil at a number of localities. The writer has recorded it from both Virginia * and North Carolina ; † Mercer reports numerous specimens from the celebrated cave deposits at Port Kennedy, Pa. ; ‡ and the leaflets described by Hollick § from the Maryland Pleistocene as *Hicoria pseudoglabra* may well belong to the same species. This comparative frequency of occurrence in the Pleistocene would seem to indicate that it was exceedingly abundant. Its presence in these deposits can hardly be attributed to more favorable opportunities for preservation since other hickories like *Hicoria minima* and *Hicoria aquatica* inhabit wetter situations and would seem to be equally well situated for interment in river and estuary swamp deposits.

As previously mentioned, the genus *Hicoria* is abundant in the Pleistocene, additional American records being those of *Hicoria pecan*,|| *Hicoria ovata*,¶ *Hicoria aquatica*, ** and *Hicoria alba*. †† The latter is found in the remarkable Interglacial deposits of the Don Valley near Toronto, Canada, and enables us to form somewhat of an estimate of the time involved in the geological changes of the Quaternary, since with the exception of the occasional carrying and burying of the nuts by squirrels, the normal rate of migration which includes the factors of seed dispersal and rate and time required to grow to bearing age, is comparatively slow in this family.

Juglans nigra Linné.

The single nut of this species which was found is shown in fig. 6. It is identical with the smaller nuts of the modern tree. The husk was entirely rotted away and the surface largely smoothed before entombment, the rugosities of the shell being partially eliminated. It seems probable that the tree which bore

* Berry, Torreya **6** : 89. 1906.

† Berry, Journ. Geology **15** : 340. 1907.

‡ Mercer, Journ. Acad. Nat. Sci., Phila. (II) **11** : 277, 281. 1899.

§ Hollick, loc. cit. 221. *pl. 72. f. 1, 16, 17.*

|| Lesq., Am. Journ. Sci. **27** : 368. 1859.

¶ Mercer, loc. cit. 279. Berry, Journ. Geology **15** : 340. 1907.

** Berry, Torreya **9** : 71. 1909.

†† Mercer, loc. cit. 281. Penhallow, Trans. Roy. Soc. Can. **10**[4] : 73. 1904; Amer. Nat. **41** : 446. 1907.

the present specimen grew at some distance from its final resting place and that after a period of desiccation it was brought down by some temporarily swollen stream to the estuary where it finally became water-logged and deposited.

Remains of *Juglans* are not abundant in the Pleistocene deposits and so far as I know nuts have not heretofore been described from our American Pleistocene. In Europe the *Juglans tephrodes* Unger of the Pliocene persists in the Lower Pleistocene of the Netherlands: *Juglans regia* Linné is recorded from a number of Pleistocene localities in France, Italy, and Germany; and fruits practically identical with the present species and described as *Juglans nigra* var. *fossilis* by Kinkelin * occur in the Upper Pliocene of Germany. Both genera have a long and interesting geological history, the records of *Juglans* antedating those of *Hicoria* by a considerable interval of time, since the first recorded species of the former are found in strata of Mid-Cretaceous age while the latter has not been found as yet until toward the close of the Upper Cretaceous.

JOHNS HOPKINS UNIVERSITY,
BALTIMORE, MARYLAND

PROCEEDINGS OF THE CLUB

MARCH 9, 1909

The meeting was called to order at the American Museum of Natural History at 8:30 P. M., with Dr. E. B. Southwick in the chair. About fifty persons were present. After the reading and approval of the minutes of the preceding meeting, the resignation of Mr. E. L. Rogers was read and accepted. The Club then listened to a very interesting lecture on "Ferns" by Mr. Ralph C. Benedict. The lecture was illustrated by lantern slides made from photographs taken by the speaker.

The meeting adjourned.

PERCY WILSON,
Secretary

MARCH 31, 1909

The meeting was held at the Museum of the New York Botanical Garden at 3:30 P. M., with Dr. J. H. Barnhart in the chair.

* Kink., Senckenb. Abhandl. **29**[3]: 237. *pl. 30. f. 8, 9.* 1908.

Sixteen persons were in attendance. After the reading and approval of the minutes of the preceding meeting, the scientific program was presented. The following abstracts were prepared by the authors:

"Exploration in the Everglades", by Dr. J. K. Small.

"I was accompanied on my recent expedition by Mr. J. J. Carter, of Pleasant Grove, Pennsylvania.

"The principal undertaking of the expedition was the exploration of the group of keys forming the southwestern extension of the everglade reef or chain of islands. This group, extending westward from near Camp Jackson for about ten miles and thence southwestward for about eight miles, dies out in the everglades eighteen miles from Cape Sable. It is popularly known as Long Key, and has furnished the basis of much misunderstanding among the native Floridians and superstition among the Seminole Indians.

"While awaiting the arrival of baggage delayed in transit from the north, we took occasion to visit some of the upper Florida Keys, including the group of Ragged Keys, making notes of observations and complete collections of the plants inhabiting them. Our main object was to determine whether or not Soldier Key and the Ragged Keys really belong to the Florida Keys, from the standpoint of their structure and vegetation. The fact that these islands are members of the Florida Keys was demonstrated in the affirmative by evidence furnished by their coral structure and tropical vegetation. Thus Soldier Key is to be considered the most northern member of the Florida Keys. A glance at a map of that region will also indicate that it is separated from the two islands lying north of it by about five miles of water, including a natural channel. The two islands just referred to, namely, Virginia Key and Key Biscayne, are generally included among the Florida Keys; but a previous study of their structure and vegetation proved them to be merely detached portions of the narrow coastal peninsula, which thus ends at the historic Cape Florida. Soldier Key consists of several acres of partially sand-covered coral-rock with both herbaceous and woody vegetation, the number of species growing there amount-ing to about five dozen. The Ragged Keys lie about five miles south of Soldier Key and consist of about six islands, the majority of them being larger than Soldier Key.

"The first attempt to reach Long Key was defeated by the high water in the everglades caused by recent rains. While waiting for the water to subside, we visited Key Largo and spent several days exploring the southern portion of that key for a distance of about fifteen miles. We found a considerable original forest about the middle of the key, where four species of cactus were quite common, two spreading opuntias, one spine-armed and one spineless, and two climbing forms, one, a *Cereus*, with three-angled stems, the other, a *Harrisia*, with fluted stems. The leaf-mould in the forest was very deep, in some places covering the coral-rock for a depth of one or two feet, but curiously enough, herbaceous vegetation was almost, if not completely, absent, and places where humus-loving orchids should have grown were barren. In such places the only visible plant not a shrub or tree was the climbing fern, *Phymatodes exiguum*, a tropical American plant known from the United States only on Key Largo. On parts of the key where the forest had been cleared off several plants were found evidently lately introduced from other parts of the tropics.

"The rains having become less frequent and a steady dry southeast wind having set in, Long Key was reached, and a supply-camp established on the eastern end, from which point exploring trips were made to different localities.

"On the most distant island visited we found another tree to add to the arboreous flora of the United States. Returning we crossed portions of the three larger islands which form the backbone of the group, exploring both the pinelands and such hammocks as had not been burned out by recent fires. The flora of the pinelands was both rich and interesting, but that of the small hammocks turned out to be rather disappointing as compared with that of the hammocks twenty miles to the northeast. The larger hammocks certainly contained a more varied flora than the smaller ones, but the fires had been so recent that not a plant could be found in a condition to collect. The second journey was made along the northern side of the largest key for more than half its length. The everglades seem to be lower on the northern side than on the southern, for we found them submerged, and when the depth of the water prohibited further progress we gradually worked across the key towards the south, and returned to the supply-camp across the higher prairies. A third journey was made along a course close to the southern side of the largest key for eight or nine miles to the west, and then up through the narrow intersecting prairie into the everglades on the north side directly west of the point where we were forced to turn south on the second journey. We then returned to the supply-camp, crossing the largest key through both pinelands and hammocks.

"The last day of the Long Key expedition was devoted to work on Royal Palm Hammock and the two smaller islands adjacent to its western side. Royal Palm Hammock is remarkable for thegrowth of palms (*Roystonea regia*), from which it takes its name. These trees are visible across the open everglades almost as far as the eye can reach, and curiously enough this species of palm is confined to this island, with the exception of two plants which grow on the small key which lies near its western side and a very few plants which exist on a key about two miles directly east. Royal Palm Hammock is also noted as being the only locality in the United States where several tropical American epiphytic orchids grow naturally.

"We were surprised to meet with a number of plants, both herbaceous and woody, characteristic of more northern or cooler parts of the country. Among the woody plants the more conspicuous were the laurel-leaved greenbrier (*Smilax laurifolia*), Ward's willow (*Salix longipes*), sweet bay (*Magnolia virginiana*), Virginia creeper (*Parthenocissus quinquefolia*), persimmon (*Diospyros virginiana*), French mulberry (*Callicarpa americana*), and buttonbush (*Cephalanthus occidentalis*). The most interesting of these was the sweet bay, which occurred in diminutive forests, the plants assuming the form of a tree and ranging from one to three feet tall. Their trunks were characteristically buttressed, with a diameter of several inches at the base, tapering to about one half an inch a foot above. The diminutive trees bore both flowers and fruit.

"Our last field work was done on the Vaccas Keys, Crawl Keys, and Grassy Key. We secured a good collection of the plants inhabiting these islands, including some additions to our flora, and a view of the remarkably dense growth of the palm, *Thrinax floridana*, which is well worth a trip there to see."

"Notes on North American Pondweeds", by Mr. Norman Taylor.

"A short historical review of previous treatments of the genus *Potamogeton* shows that Morong (1893) credited 37 species to North America, while Pflanzenreich (1907) lists 42 species and scores of varieties. The forthcoming part of the North American Flora will contain descriptions of only 36 species. A decidedly conservative tendency in the conception of specific limitations accounts for the difference in the number of species, and this is based on a more or less fixed adherence to the principle that in *Potamogeton* fruit characters are the only ones of any real stability.

"The usual characters that have been used by monographers and their relative value for taxonomic purposes, was discussed. As an example of the variability of the group, a series of specimens showing every gradation between the lanceolate leaves of *P. Richardsonii* and the orbicular ones of *P. bupleuroides* was shown, and the contention was advanced that in all probability the three species *P. Richardsonii*, *P. perfoliatus*, and *P. bupleuroides* were in reality one aggregate species with trifling differences."

Discussion followed by Dr. Barnhart, Dr. Rydberg, and the speaker.

The meeting adjourned at 4:30 P. M.

PERCY WILSON,
Secretary

REVIEWS

Ward's Trees*

The little book, which follows the three volumes on Buds and Twigs, Leaves, and Inflorescences and Flowers, is of course designed primarily for use in England; yet, it will prove helpful in

* Ward, H. Marshall. Trees: A Handbook of Forest Botany for the Woodlands and the Laboratory. Vol. IV. Fruits. Pp. 154. *f.* 147. 1908. Cambridge, University Press (Putnam's, New York).

this country, especially to the teacher of general botany. The key is simple, and despite its broken character, owing to the interpolation of many illustrations, can be used easily by any one really interested in trees; it is based upon the fruits as the sub-title indicates. The list of trees included, does not, of course, agree with similar lists of American trees; this is noticeably true of the oaks (5 species) and the maples (3 species). The greatest value to Americans is in the general chapters on fruits (pp. 3–55) in which the distinctions between seed and fruit, and between the various kinds of fruits, is told in a very readable way. The illustrations will prove very helpful for general demonstration purposes; one very great advantage over most illustrations is the care with which the seed attachment is shown.

Jean Broadhurst

OF INTEREST TO TEACHERS

Biology in Summer Vacations

In the preliminary report on the high school course in biology prepared by the New Jersey Science Teachers' Association,* suggestions are given for observations during the summer vacation. They are divided into the studies possible at the seaside, on the mountains, in gardens, etc. The questions suggested by Dr. Harper in the July (1908) Torreya may be too difficult for most of the high school pupils, but some of them, at least, can be used. Will not some teacher, who is in touch with his botany or biology classes again in the fall, send us a report of what he has been able to do in this line? We hear much claimed for biology because it is such a vital subject, in close touch with the child's life. *Can* we in one year give the high school pupil enough to interest him in any such problems and can we enable him to carry them out independently during the summer? Or is it mere talk? Will not some of our teachers try it this summer? Reports upon work of this kind would be more convincing than pages on "educational biology" as to what we can rightfully

*Committee: Mr. G. H. Trafton, Passaic, Chairman; Prof. J. Nelson, Rutgers College, and Miss S. Streeter, Jersey City.

claim for biology or botany and also, as to what we must gracefully yield as wholly beyond high school possibilities.

JEAN BROADHURST

Professor C. S. Gager has an illustrated article on some physiological effects of radium rays in the *American Naturalist* for December, 1908.

The March *Bulletin of the Torrey Botanical Club* has a study of winter buds with reference to their growth and leaf content by Emmeline Moore. This interesting article is illustrated with growth curves and many line drawings of bud sections. The same number contains also an article on some aspects of the mycorhiza problem by Benjamin C. Gruenberg.

The *Journal of Biological Chemistry* for December, 1908, contains an article on *Ibervillea Sonorae*, specimens of which are growing in the New York Botanical Garden. The authors, Miss Julia T. Emerson and Mr. William W. Walker, discuss the plant's chemical composition and its toxicity. One swollen stem that has been lying on a board in a museum case since 1902 still sends up yearly shoots bearing leaves and tendrils.

The parasitic fungi of *Aleyrodes citri*, a serious scale pest of the orange groves in Florida and other southern states, have been recently fully described and illustrated by Mr. Howard S. Fawcett, of the Florida Agricultural Experiment Station; the study was made from an economic standpoint, for the "greatest success in the use of fungi to combat insect pests seems to have been attained in Florida, where proper conditions of temperature and moisture are present."

The *Botanical Gazette* for January, 1909, has an illustrated article by Robert Greenleaf Leavitt on homoeosis, in which is discussed the translocation of characters, such as abscission from the petiole to the petiolules in the horsechestnut, the subdivision of the pinnae as in the frond as a whole in the Pierson and other ferns, and several other phases of homoeosis, the complete or partial translocation of foliage characters to the flowers or *vice versa*, and the omission of one of the alternative generations as in some ferns, where the tips of the pinnae may be converted into prothallia bearing archegonia and antheridia.

The *New York Tribune* for February 14 reports that "a buried prehistoric forest on the New Jersey coast, near the Sandy Hook military reservation, has been discovered by army engineers while boring for an additional water supply. When the test pipes were down nearly four hundred feet, through strata of red clay, shale, and white sand, a broad strata of wood was found. At one point the borers reported that they went through twenty feet of wood, which they think was a tree trunk still remaining upright. Investigations are being made in the interest of archaeology. If a forest flourished where the sand dunes are now, it is believed it was covered with sand by the action of the sea until buried."

The Calaveras National Forest, the famous grove which contains about 1,400 giant sequoias over six feet in diameter is described in *Science*, March 19. The grove also includes many very large sugar pines, yellow pines, white firs, and cedars. Most of the larger sequoias have been named for famous generals, statesmen, or for states. The Father of the Forests, now fallen, has a basal diameter of over forty feet. Some of these trees contain as much lumber as fifteen acres of ordinary timberland. The first Calaveras bill was introduced some four years ago; the present bill is one of the last signed by President Roosevelt.

Loco-weed, the cause of extensive losses of live stock in the western United States, has been recently investigated by A. C. Crawford (Bull. 129, U. S. Bureau of Plant Industry). Having proved its toxic powers, which was doubted by some investigators, Mr. Crawford next found that the toxicity remained after boiling and was also easily proven in the ash of the plants under examination. In the experiments with animals it was noticed that a "close analogy exists between the clinical symptoms and pathological findings in barium poisoning and those resulting from feeding extracts of certain loco plants. Small doses of barium salts may be administered to rabbits without apparent effect, but suddenly acute symptoms set in analogous to what is reported on the range," and finally "barium was found in the ash of many 'loco' plants in amounts sufficient to account for the symptoms."

The author mentions that in other localities the toxic action may be due to substances other than barium, and explains the contradictory results previously obtained as follows:

"Loco plants grown on certain soils are inactive pharmacologically and contain no barium. In drying certain loco plants the barium apparently is rendered insoluble so that it is not extracted by water, but can usually be extracted by digestion with the digestive ferments.

"The barium to be harmful must be in such a form as to be dissolved out by digestion.

"In deciding whether plants are poisonous it is desirable not merely to test the aqueous or alcoholic extract, but also the extracts obtained by digesting these plants with the ferments which occur in the gastro-intestinal tract."

NEWS ITEMS

At Munich Dr. P. Renner has been made curator of the cryptogamic herbarium.

The University of Minnesota has been given over 2,000 acres of land for experimental forestry.

L. Lancelot Burlingame has been advanced to assistant professor of botany at Stanford University.

Columbia University is contemplating establishing a course in forestry, with the degree of forest engineer.

The Smithsonian Institution has recently received from Captain John Donnell Smith a second herbarium consisting of over seven thousand fern sheets.

Professor William Stuart, of the Department of Horticulture, University of Vermont, has accepted an appointment in the U. S. Department of Agriculture.

Dr. H. Metcalf, who has been traveling in Italy collecting resistant varieties of rice, has resumed his work in this country at the Bureau of Plant Industry.

The biology department of Princeton University has received about ten thousand specimens of mosses and hepatics from Dr. Per Dusen and Dr. Hj. Mäller, of Sweden.

The British Science Association is to meet at Winnipeg, August 25 to September 1. Reduced rates from points east and west, with side trips in Canada, are being offered.

Mr. B. E. Dahlgren, formerly connected with the American Museum of Natural History, New York, is now in Jamaica, making studies for a series of models of representative tropical plants for the Field Museum of Natural History, Chicago.

Dr. M. H. Boyè, a prominent chemist, died in March. Though far from the most important of his discoveries, readers of TORREYA may be most interested in his process of refining cotton seed oil (1845) thus securing the well-known colorless oil instead of the former blackish thick liquid.

The New York Botanical Garden offers from the income of the Caroline and Olivia E. Stokes Fund for the Preservation of Native Plants the following prizes for essays not exceeding 5,000 words: (*1*) $40.00, (*2*) $25.00, (*3*) $15.00. The essays must be typewritten in duplicate and must reach the Garden not later than June 20, 1909.

Professor F. S. Earle reports through *Science* that the Cuban administration has demanded the resignation of the staff of the Cuban Agricultural Station — a repetition of the Cuban football policy followed to satisfy the office seekers. Among the men thus unjustly displaced are the following botanists whom Professor Earle "heartily recommends to any institutions having vacancies" in their lines: Dr. H. Hasselbring, botany; Prof. Wm. T. Horne and Mr. J. S. Houser, vegetable pathology; and Prof. C. F. Austin and Mr. C. F. Kinman, horticulture.

OTHER PUBLICATIONS

OF THE

TORREY BOTANICAL CLUB

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(1) BULLETIN

A monthly journal devoted to general botany, established 1870. Vol. 35 published in 1908, contained 608 pages of text and 40 full-page plates. Price $3.00 per annum. For Europe, 14 shillings. Dulau & Co., 37 Soho Square, London, are agents for England.

Of former volumes, only 24-34 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. 28–35 three dollars each.

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

(2) MEMOIRS

The MEMOIRS, established 1889, are published at irregular intervals. Volumes 1–11 and 13 are now completed; Nos. 1 and 2 of Vol. 12 and No. 1 of Vol. 14 have been issued. The subscription price is fixed at $3.00 per volume in advance. The numbers can also be purchased singly. A list of titles of the individual papers and of prices will be furnished on application.

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

Correspondence relating to the above publications should be addressed to

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BY

JEAN BROADHURST

JOHN TORREY, 1790–1873

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EXPERIMENTS UPON DROSERA ROTUNDIFOLIA AS TO ITS PROTEIN-DIGESTING POWER

By Winifred J. Robinson

A repetition, with some extensions, of a part of Darwin's exhaustive series of experiments on the digestive power of the leaves of *Drosera rotundifolia* was undertaken with the purpose of ascertaining whether the purer proteins now available would give any different results from those obtained by Darwin with tissue fragments or crude protein materials, solid and liquid. The experiments were carried on at the New York Botanical Garden under the direction of Professor William J. Gies, of the College of Physicians and Surgeons of Columbia University.

The plants used were collected in the bogs near Lakewood, N. J., in July, 1907. They were planted in sphagnum at the propagating house of the New York Botanical Garden, where they were kept continuously except when certain of their number were brought to the laboratory of the garden for a short time for observation.

The proteins used were prepared at the College of Physicians and Surgeons under the direction of Professor Gies with the exception of the nucleoprotein, which was extracted from compressed yeast by Professor Gies's method, in the laboratory of the New York Botanical Garden.

To insure accuracy in the records of the experiments a diagram of the arrangement of the leaves of the plant was made in each case, the point on a leaf where a protein particle was placed being indicated on the diagram by an ink spot. Observations of the plants brought to the laboratory were made at intervals of from ten to thirty minutes during the first half day,

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while those allowed to remain in the propagating house were examined daily.

Dry Egg-white *

Particles of dry white of egg were placed upon all the leaves of a plant on October 13, 1907. The tentacles curved slowly but at the end of 24 hours were tightly closed over albumen particles. At the end of three days the albumen had entirely disappeared and was no doubt pretty thoroughly digested.

In the use of such crude products as egg-white, as was the case in practically all of Darwin's *Drosera* experiments, the possible influence of salts and other non-protein compounds in the materials employed, is ignored. In the remaining experiments, accessory substances, such as inorganic salts and extractives, have had no influence, for they were completely eliminated from the protein samples in the course of their preparation.

Acidalbumin

Acidalbumin particles were placed upon all the leaves of a plant on October 13, 1907, but the response was slight, and the albuminate remained at the end of three days.

Alkali Albuminate

Alkali albuminate particles were placed upon the leaves of a third plant, October 13, 1907, with a result similar to that in the case of the acidalbumin.

The results of the foregoing experiments show that egg albumen causes a response of the tentacles and ultimate digestion, while the acidalbumin and alkali albuminate both cause a much less vigorous response. The plants upon which the experiments were tried were just ready to enter the resting stage so it is hardly fair to say that they would not more readily digest the acidalbumin and alkali albuminate if the plants had been in prime condition. It is possible, of course, that the prior separation of saline matters and other impurities from the albuminates, removed an effective digestive stimulus.

* This was the only crude product employed. All others were chemically pure.

Edestin

Particles of crystalline edestin were placed on each leaf of a single plant on October 13, 1907. The response of the plant was very slow, and at the end of 24 hours the edestin granules showed no apparent change. Gradually, however, they were dissolved and at the end of three days had disappeared.

Fibrin

Small shreds of fibrin * were placed upon a leaf August 26, 1907, at 2:30 P. M., the plant being kept in the laboratory under a bell-jar, with tubulure, for observation. At the end of 4 hours the tentacles had curved inward and, after 19 hours had elapsed, the particles had been carried from the margin to the center of the disc. At the end of 67 hours a part of the fibrin remained, with the tentacles still slightly closed over it.

On August 26, 1907, small shreds of fibrin were placed on one leaf of each of three plants, which were left at the propagating house; 24 hours later the tentacles were tightly closed over the fibrin in each case. They remained closed through the sccond day, when they expanded fully. The fibrin had been partially dissolved. Some of the tentacles on two of these leaves were closed over insects. Fibrin was then placed upon the other tentacles, and these continued to be closed after those which digested the fibrin had expanded again.

In an experiment begun October 13, 1907, shreds of fibrin were placed on all the leaves of one plant; 24 hours later the response was slight but at the end of 3 days the fibrin had dissolved.

The results of these experiments show that fibrin, as pure as it can be prepared by the best methods, is dissolved and digested when placed upon leaves of *Drosera rotundifolia.*

Tendomucoid

Small particles of tendomucoid were placed upon two leaves of the same plant, September 18, 1907, and soon dissolved, the glistening drop of solution remaining some time upon the leaf.

* Given special care in purification. Ash content was only 0.4 per cent.

On September 23 the experiment was repeated with similar results.

On October 13 the experiment was again repeated. This time the plant was kept in the laboratory under a bell-jar, with tubulure, and the drop of dissolved mucoid disappeared, hence it was inferred that digestion had occurred at the end of three days.

Yeast Nucleoprotein

September 10 particles of yeast nucleoprotein were placed upon a leaf of a plant in the laboratory. The tentacles slowly closed over it and remained closed three days.

On September 11 the experiment was repeated with the difference that the nucleoprotein was moistened with distilled water before it was used. The result was like that of the preceding experiment. The nucleoprotein became dark-colored in each experiment before it disappeared.

From the response of the tentacles and the disappearance of the nucleoprotein it was inferred that digestion had slowly taken place.

Tendocollagen

Fragments of collagen fibers from tendon were placed upon three leaves of one plant. The tentacles bent but did not close tightly. No change in size or appearance of the collagen particles was observed during four days.

The experiment was repeated September 23, upon a young leaf, with a result similar to the above.

September 27 and October 13 the experiment was repeated upon mature leaves, the result in each case being a bending of the tentacles within half an hour with no further change, hence the response may be attributed to contact stimulus rather than to digestion.

Ligament Elastin

Particles of ligament elastin were placed on a leaf of a plant in the laboratory August 26, at 2:30 P. M. Observations were made at intervals of half an hour during the first four hours, but no response was noted. Daily observations showed no response at the end of a week. On the same day elastin was placed on several leaves of each of two plants in the propagating house. No change was noted in three days.

On September 3 nine leaves of a single plant in the propagating house were washed with distilled water, after which particles of elastin which had been moistened with distilled water were placed upon them. No movement of the tentacles was observed during six days. On the same day particles of elastin which had been moistened with dilute Liebig's meat extract were placed upon two leaves of a plant in the propagating house. Observations were made on three successive days, but no change was seen. (Note the negative results with creatin recorded in the next section of this paper.)

On September 4 particles of elastin moistened with distilled water were placed upon eleven leaves of a plant in the laboratory; three hours later a slight bending of the tentacles was noted. The following morning all the tentacles had recovered, without effect on the elastin. On the same day particles of dry elastin were placed upon nine leaves of a single plant in the laboratory. After three hours a slight bending of the tentacles nearest the elastin was noted, but, after an interval of twenty hours, all the tentacles had recovered. There was no effect on the elastin.

On October 13 the experiment was repeated in the laboratory with similar results.

Elastin, then, is not digested by the leaves of these plants.

Creatin

Creatin particles were placed upon three leaves of one plant, September 18, in the propagating house. They dissolved but caused no bending of the tentacles. The drops of fluid were present on the leaves for five days, but had disappeared entirely by the ninth day.

On September 23, the experiment was repeated upon one leaf of each of four plants. The creatin dissolved within an hour and a beadlike drop remained for three days on each tentacle upon which the creatin had fallen. No bending of tentacles nor other response occurred.

In Darwin's experiments with meat, creatin (and presumably the other nitrogenous extractives of meat) had seemingly no influence.

General Conclusions

The results of these experiments indicate the ready digestibility of dry egg-white, fibrin, tendomucoid, and nucleoprotein. Acid-albumin, alkali albuminate, and edestin were digested, but somewhat less readily than the products first named. Collagen and elastin appeared to be entirely indigestible. Even when moistened with meat extract the elastin particles failed to undergo digestive alteration. Creatin did not cause bending of the tentacles.

These observations cannot be directly compared with Darwin's because Darwin dealt with mixtures or crude products.

The proteolytic enzymes of *Drosera* are, like those of other organisms, able to digest some proteins and unable to digest others.

New York Botanical Garden

SPECIES OF GYMNOSPORANGIUM IN SOUTHERN ALABAMA

By R. E. Stone

While connected with the Alabama Agricultural Experiment Station I became interested in the distribution of certain fungi, especially species of *Gymnosporangium*. The presence of several species of cedar as well as many species of the Pomaceae would indicate that many species of the genus *Gymnosporangium* might be found.

Up to the present time the species reported for Alabama are: *Gymnosporangium macropus* Link, *G. globosum* Farl., *G. Clavipes* C. & P., *G. flaviforme* Atk., and *G. Nidus-avis* Thax. All of these are reported as occurring on *Sabina virginiana* (L.) Antoine.

The presence of *Chamaecyparis thyoides* (L.) B.S.P. and also of *Amelanchier canadensis* (L.) Medic. and *Aronia* (L.) Ell. lead me to believe that *Gymnosporangium biseptatum* Ellis or *Gymno-*

sporangium Ellisii Berk. might be found. Also the presence of *Sabina barbadense* (L.) Small would indicate that *Gymnosporangium bermudianum* Earle might be collected in the state.

For this reason I made a collecting trip into southern Alabama early in March, 1908, for the purpose of gathering material. In order to become acquainted with *Gymnosporangium bermudianum* as it occurs on its host, *Sabina barbadense*, I went first to Biloxi, Miss., the type locality for this species.

While on the trip I discovered some new combinations.

New Hosts

Gymnosporangium macropus Link, on *Sabina barbadense* (L.) Small (new host).

Collections were made at Biloxi, Miss., March 3, 1908; Coden, Ala., March 6, 1908; Bayou Labatre, Ala., March 8, 1908.

At Biloxi, Miss., the *Gymnosporangium macropus* and *Gymnosporangium bermudianum* were found growing on the same tree.

Gymnosporangium globosum Farl., on *Sabina barbadense* (L.) Small (new host).

Collections were made at Biloxi, Miss., March 3, 1908, and Bayou Labatre, Ala., March 6, 1908.

On this trip the gap in the known distribution of *Gymnosporangium bermudianum* was partly filled out by collections made at Bayou Labatre, Ala., March 6, 1908, and at Spring Hill, Ala., March 8. The collections of this species are complete enough now to enable us to say that it occurs all along the Gulf Coast from Florida to Louisiana. The species probably extends west to Texas and perhaps farther.

Perhaps the most important collections, as far as extending the known range of certain species is concerned, were those of the two species of *Gymnosporangium* found on the white cedar, *Chamaecyparis thyoides* (L.) B.S.P. As stated previously, the presence of the white cedar and both *Amelanchier canadensis* and *Aronia arbutifolia* gave the requisite conditions for either one or both of the two species to be found. However since neither had been collected in the south my hope of finding them was small indeed.

On March 8, 1908, while collecting in a swamp between Mobile, Ala., and Spring Hill, a suburb of that place, I secured some very fine specimens of *Gymnosporangium Ellisii* Berk., on *Chamaecyparis thyoides* (L.) B.S.P. The same day I secured at Spring Hill a very good specimen of *Gymnosporangium biseptatum* Ellis, on the same host. As I was in a hurry at the time, in order to get out of a storm, I did not fully appreciate the find until I had returned to my laboratory at Auburn, Ala. I have not had another opportunity to secure more of this material.

Now neither of these species has been collected farther south than New Jersey. It would seem improbable that such a wide gap as this, from New Jersey to Alabama, would occur in the distribution of either of these species, especially when the white cedar occurs all along the coast between these points and the alternate host plants are usually found in the same localities, at least the range given in the various manuals would seem to show this. It is probable that both of these species, *G. biseptatum* and *G. Ellisii* occur all along the whole coast from Maine to Texas. Careful search, I am sure, would fill in the gap in the known distribution if not extending it.

Summing up the situation for Alabama we can report the following species of *Gymnosporangium.*

Gymnosporangium macropus Link on *Sabina virginiana* (L.) Antoine. *Sabina barbadense* (L.) Small (new host).

Gymnosporangium globosum Farl. on *Sabina virginiana* (L.) Antoine. *Sabina barbadense* (L.) Small (new host).

Gymnosporangium flaviforme Atk. on *Sabina virginiana* (L.) Antoine.

Gymnosporangium Clavipes C. & P. on *Sabina virginiana.* (L.) Antoine.

Gymnosporangium Nidus-avis Thax. on *Sabina virginiana* (L.) Antoine.

Gymnosporangium bermudianum Earle on *Sabina barbadense* (L.) Small.

Gymnosporangium biseptatum Ellis on *Chamaecyparis thyoides* (L.) B.S.P.

Gymnosporangium Ellisii Berk. on *Chamaecyparis thyoides* (L.) B.S.P.

Specimens of *G. globosum* and *G. macropus* on *Sabina barbadense* as well as specimens of *G. biseptatum* and *G. Ellisii* have been deposited in the following herbaria: Prof. A. B. Seymour, Cambridge, Mass.; Dr. J. C. Arthur, Purdue University, Lafayette, Ind.; Prof. S. M. Tracy, Biloxi, Miss.; Prof F. E. Lloyd, Alabama Polytechnic Institute, Auburn, Ala.; Dr. E. M. Wilcox, Pathology Herbarium, University of Nebraska, Lincoln, Nebr.

I still have a few good specimens of *G. Ellisii* in my own collection.

I am still greatly interested in securing specimens of both *G. biseptatum* and *G. Ellisii*, especially from the region between New Jersey and Alabama and west to Texas, and any information of such collections would be greatly appreciated.

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FOSSIL EUPHORBIACEAE, WITH A NOTE ON SAURURACEAE *

BY T. D. A. COCKERELL

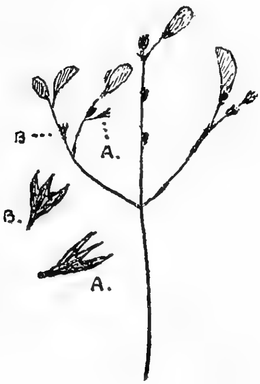
Up to the present time, no Euphorbiaceae have been described from the American Tertiaries, although from their present abundance and wide distribution there can be no doubt that they have long existed on this continent. Most of the plant-bearing strata are very poor in herbaceous forms, but Florissant is more fortunate in this respect, and has already yielded us a number of low-growing genera not elsewhere known fossil. Among the recently gathered materials I have been glad to find a couple of species which appear to be certainly Euphorbiaceous.

Acalypha myricina sp. nov.

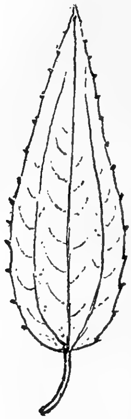
Leaf lanceolate, the blade about 22 mm. long and 8 broad, on a short curved petiole; general form very much as in *A. gracilens* Gray; surface densely glandular-pitted; margin with very short blunt dark-colored gland-teeth; three prominent nervures, running nearly parallel. The figure shows the details better than they can be described.

* Illustrated with the aid of the Catherine McManes fund.

The reference to *Acalypha* seems safe; but there is a possibility that the plant may be a *Croton* of the type of *C. tiglium* L. In *Croton tiglium* the shape, margin, and venation are all different from those of the fossil, and I do not know of any *Croton* which matches it better.



Croton furcatulum Ckll.
A, *B*, calyces (enlarged).



Acalypha myricina Ckll.

Hab.—Miocene shales at Florissant, Colorado, Station 13 B (*W. P. Cockerell*, 1908). It occurs on a slab with a beautiful branch (bearing thirteen leaves) of *Myrica drymeja* (Lx.) Kn. The *Acalypha* leaf is superficially like that of some species of *Myrica*.

Croton (?) **furcatulum** sp. nov.

Represented by a slender twig, 15 mm. long, giving rise to three slender branchlets as shown in the figure, these about 11 mm. long. The central branchlet supports small dark sessile objects, which appear to be buds or calyces, at 4.5 and 8 mm. from the base, and terminates in a small calyx, below which arises a long-oval or elliptical leaf (no doubt originally a pair), on a petiole about 3 mm. long; at the base of this leaf is a dark object which may be another calyx. The lateral branchlets fork at a distance of 6 mm. from their origin, giving rise to a pair of branchlets supporting calyces and leaves as shown in the figure. The calyces have long pointed lobes, apparently three in number.

The general appearance of the plant is suggestive of *Euphorbia* (in the old sense), but the calyces are much more like those of *Croton* or *Crotonopsis*. The species of *Croton* differ materially in the arrangement of the flowers, but among the scanty materials at my command I have not found one agreeing with the fossil. Possibly *C. monanthogynus* Michx. is as near to it as anything.

Hab.— Miocene shales of Florissant, Colorado, Station 14 (*S. A. Rohwer*, 1907).

Tithymalus Willistoni sp. nov.

Some time ago I was informed by Dr. Williston that seeds of a plant almost identical with the well-known "Snow-on-the-Mountain" had been found in the Loup Fork Beds of Kansas, but had not been described. Through the kindness of Mr. H. T. Martin, I have been able to examine some of these, taken from the interior of a skull from the Loup Fork at Long Island, Kansas. As preserved they are perfectly white, and as Dr. Williston stated, they almost exactly agree with the seeds of *Tithymalus marginatus* (Pursh) Ckll. The sculpture is practically the same and the only difference I notice is that they are larger and more robust, 4½ to 5 mm. long, and the larger ones 5 mm. in transverse diameter. The suture on one side is very evident. On some of the seeds, the reticulated sculpture has become almost obsolete, but evidently by wearing, as others show it very strongly. This fossil species may be called *Tithymalus Willistoni.*

Fossil Saururaceae?

The Saururaceae constitute a small family allied to the Piperaceae, with three genera. *Saururus* has one species in eastern North America and one in Asia. *Houttuynia* is Asiatic and *Anemiopsis* is represented by a single species living in damp alkaline spots in the western United States. Evidently the group is a waning one, and it might be expected that it would occur more abundantly in the Tertiary strata. It has not been recognized as such in our western Tertiaries, but *Piper Heerii* Lx., an unfigured species from the Eocene at Golden, Colorado, may belong there. According to Lesquereux, *P. Heerii* is exceedingly like *P. antiquum* Heer, a fossil from Sumatra. This *P. antiquum*, in the shape and venation of the leaf, agrees excellently with *Houttuynia*, and probably belongs to that genus.

REVIEWS.

Coulter and Patterson's Practical Nature Study*

The writer once heard from T. C. Mendenhall the story of his first impulses to a scientific career; and that history has always remained with him as instructive and valuable because suggestive of what the elementary school may do for the progress of science. Mendenhall said that when he was a boy in a country school in Ohio, his teacher took pains to perform with her scholars simple experiments in natural philosophy for the purpose of arousing their curiosity, opening their eyes, and stimulating their minds. One of these experiments was to place a coin in the center of a basin, arrange the scholars around in such positions that the coin was concealed from every eye by the rim of the basin, and then to pour in water until, no one having moved in the least, the coin became visible to all. At another time the schoolroom was darkened, light was admitted through a small aperture, so that the camera obscura effect was obtained, and the images of children playing outside were thrown in their natural colors on the opposite wall of the room. These simple exhibitions powerfully stirred young Mendenhall's imagination. The result, as everyone knows, was a career of service in the advancement of science, the conduct of government surveys, and the administration of great educational institutions.

It is highly important that considerable numbers of people form the habit of finding out things for themselves, with respect to the processes of nature. As a custom of the race this is not an old habit, only about three hundred years old; yet its effects are those which most — at least most visibly — distinguish our age from every age that has gone before.

The school may assume a favorable relation to the growth of science considered as human endeavor. Boys and girls may be awakened by the contact with nature which we give them, as Mendenhall was awakened, and thus the numbers of those dealing with nature in an original way to the end of bringing its forces into our employ may be augmented.

* Coulter, John M., Coulter, John G., and Patterson, Alice J. Practical Natuer Study on an Agricultural Basis. A manual for the use of teachers and normal students. Pp. ix + 350. 1909. Appleton & Co., New York. $1.35.

On the contrary it is possible by means of highly organized scientific courses in schools to kill, to a very thorough deadness, interest in natural history and natural philosophy. The writer ventures to express the opinion, long entertained and now, through much inquiry among young men issued from the schools, become a conviction, that the type of school physics course at present in vogue often has this effect. The falling off in the election of physics by college students since the general adoption of an elaborate entrance requirement in physics is well known. As for botany, an experienced college examiner in this subject told the writer that candidates in botany could be grouped into three classes. The first passed with honors: they came from well-equipped schools where the subject was thoroughly *done*. The second group merely passed. The third got in. The college electives in botany, this professor continued, were manned from classes two and three, the most satisfactory students coming from the latter. Boys perfectly "prepared" never afterwards appeared upon the field.

Such considerations as the foregoing, and the possibility of the untoward effect suggested above, would seem to be enough to command attention among scientific leaders to the problem of school science even in the lowest grades. Unhappily there are some who have frowned upon the movement to keep alive in school children the "tentacles of inquiry". Regarding nature study as at best "the efflorescence of the sciences" they have bidden the grade teacher (salaried at $400) come to the university for scientific training. They have neither inquired into conditions in order to organize instruction suited to the exigencies of the case, nor used their superior endowments of knowledge and advantage of prospective in coöperation with schoolmen seeking a betterment. But most happily there are some eminent examples of the leader of science alive to the opportunity for wide service. The activity of these men must eventuate not only in the enrichment and improvement of school curricula, but also, as has just been suggested, in an acceleration of the science process itself. The names of several eminent Americans instantly occur to everyone in this connection.

Lately Professor Coulter of Chicago has appeared as one of the authors of a work aimed directly at the solution of the nature study problem.

The work is styled "practical" and the basis is agricultural. The field is, therefore, that of the rural school, or at least of the schools of communities in which agricultural interests predominate. How far the outlines for school-room use and the specimen studies will apply beyond the limits of this field, cannot be foretold. But there is no doubt, whatever, that the *principles* enunciated are valid for every variety of local condition. The treatment is especially noteworthy and should have wide attention. The reviewer hopes that its influence may be extensive. Could these pages be broadly disseminated among teachers, supervisors, and superintendents the effect for good would be immediate and distinct; and the fog which so often envelops the subject would begin to dispel.

The book is in four parts: the first deals with the mission, the dangers, and the principles of nature study; the second contains a topical outline in nature study and typical lesson plans; the third is devoted to rural school outlines and subject matter for both biological and physical nature study; and in part four are found chapters on bird study, school gardens, general misconceptions, and evolution.

The second part represents the course as given in the Training School of the Illinois State Normal University. Though definite in character and designed to give specific aid to teachers who are called upon to handle the subject with little previous training, yet they are not indicative of any belief on the part of the authors that all nature study material should be so prescribed as to manner of treatment.

The authors think that the time has come for extensive experiment by trained teachers working in the light of certain evident principles. They insist that the teacher has the right to the last word.

The utilitarian trend of present-day education is reflected in the subjects of study from the first to the last grade — food, clothing, shelter, domestic animals, the plants of garden and lawn, insect friends and enemies of man, thermometers, stoves, pumps, water systems, weather, soils, the selection, cultivation and marketing of corn, etc., etc. Wild nature, however, is not neglected. General principles of life and of inorganic nature are developed in such measure as the grade of advancement will allow. In the eighth grade the study becomes distinctly scientific in form on the side of plant study, for under the word "Botany" appears "observation of the gross anatomy of types of algae, fungi, liverworts, mosses, ferns, conifers, monocots, and dicots."

In the minds of these authors there is no confusion of nature sentiment, nature fancy, and nature study. The relation of literature to nature study, and of nature study to science and to agriculture are sanely and firmly grasped. Nature study is always to share the scientific spirit, in so far as science is a method of problem solving. Sentiment, the love of nature, which belongs of right to all healthy minded people, should be present as an atmosphere. But it alone is not nature study. Neither is nature study diluted botany, zoölogy, physics, etc. Poetry may be an aid; imaginative treatment is often a help when it does not substitute interest in fancy for interest in nature. But above all we must be clear to the fact that *truth itself when clearly discerned is very attractive.*

The intellectual results which the authors believe may be looked for are: A sustained interest in natural objects and the phenomena of nature; independence in observation and inference; some conception of what an exact statement means; some conception of what constitutes proof. Their hopefulness is born of experience with the children themselves. It is surprising and gratifying say they—and the reviewer's experience agrees—to see how rapidly young children learn to hold steadily to what they have seen and to state it without exaggeration or verbiage. "Whole systems of belief and lines of conduct have been constructed upon a basis of claimed fact which a child in the grades, trained in nature study, could he understand the terminology, would reject without hesitation. An injection of such children in large numbers into any metropolitan community would work a revolution."

The actual treatment of nature study materials is, as above stated, largely utilitarian — necessarily so, since nature study in this scheme leads to elementary agriculture — but the authors' ideal outcome for all the training given by the school through this medium is so broad and so fine that at once the whole system is raised above the merely industrial and acquisitive plane. In the light of this ideal, nature study becomes, let us dare to suggest, something better than an "efflorescence of the sciences" — as one eminent man of science phrased it to the present writer. The authors believe firmly in the attainability of this ideal; and with good reason, as experiments in some parts of the middle west are already beginning to demonstrate. Even those who have looked with some contempt upon the nature study movement will probably be able to discern in the following picture the delineation of a condition highly to be desired: "We do not want our country boys," say the authors, "to become merely efficient farmers who have learned to do certain things that they may make more dollars. We want them to be men who realize the larger applications of the laws and principles they are following, men who see and discriminate, who grasp situations, who think for themselves, and who have an abiding interest and enthusiasm for their profession, looking upon their fields, orchards, and meadows somewhat as laboratories in which to work out experiments to the end that they may do their work more profitably and enjoyably. We would have them men who take a keen pleasure not only in making their soil more productive, and in raising better crops and stock, but quite as much in making the home and its surroundings and the life within it more comfortable, more interesting, and more beautiful."

Robert G. Leavitt

New York State Normal School,
Trenton, New Jersey

PROCEEDINGS OF THE CLUB

April 13, 1909

The Club met at the American Museum of Natural History at 8:30 p. m. and was called to order by Mr. Charles Louis

Pollard, who presided in the absence of the president and both vice-presidents. The attendance was twenty-five.

Mr. Norman Taylor, chairman of the field committee, asked that authority be given him to issue a circular letter requesting the members to vote relative to the continuance of the field meetings. The Club voted that this authority be given.

The announced paper of the evening on "Botanizing on the Headwaters of the Saskatchewan and Athabasca Rivers" * was then presented by Mr. Stewardson Brown. The lecture was illustrated by lantern slides.

Adjournment followed.

Percy Wilson,
Secretary

April 28, 1909

The meeting was held at the New York Botanical Garden, with Dr. Tracy E. Hazen in the chair. Sixteen persons were present. The minutes of the meeting of April 13 were read and approved.

Dr. William A. Murrill, chairman of the cryptogamic section of the committee on the local flora, made a report in which the following suggestions were submitted:

(1) The publication of keys and lists of local species for field use; (2) the preparation of a map of the territory included; (3) coöperation with other botanical clubs within or bordering on this territory; (4) coöperation with the field committee in the selection of suitable places for excursions and the care of cryptogamic material collected on these excursions; (5) the use of a given space in Torreya for notes upon and additions to the local flora; (6) a joint meeting at an early date with the phanerogamic section of the committee on local flora.

Mr. Norman Taylor, chairman of the field committee, reported the results of a post-card vote on the continuance of the Club's field meetings as follows:

Non-committal or equivocal (mostly out of town members)	38
For total discontinuance	9
For discontinuance during July and August only	20
For permanent continuance	28
Total number of votes received	95

* Mr. Brown has promised an illustrated paper based upon this lecture for later publication in Torreya.

In view of this showing, it was decided to continue the field meetings through July and August, as usual.

On motion, the Club voted to endorse the application of Miss Winifred J. Robinson for a grant of $200.00 from the Herrman Fund of the New York Academy of Sciences.

The scientific program consisted of a discussion of "The Cactuses of the West Indies" by Dr. N. L. Britton.

The speaker referred to the distribution of cacti in the West Indian Islands and the regions inhabited by them; these are mostly on the southern side of the larger islands, where the rainfall is very low and where these plants are very abundant, certain portions of the southern side of eastern Cuba and of Jamaica being actual cactus deserts. On the smaller islands the cacti grow less abundantly and mainly at low altitudes. The genus *Rhipsalis* forms an exception to the general xerophytic distribution, its species growing on trees and cliffs in relatively moist regions. Southern Florida contains several species similar to some of those growing on the Bahamas and in Cuba or identical with them. After a preliminary description of the plants the meeting adjourned to the propagating houses of the New York Botanical Garden, where specimens of living cacti, including nearly all the known species of the West Indies, were exhibited and described.

PERCY WILSON,
Secretary

FIELD NUMBERS FOR THE TORREY CLUB EXCURSIONS

The chairman of the field committee has started a series of field numbers to be used on the days that the Club holds its excursions. These will run continuously during the entire season. Those members who care to number their collections in accordance with this set of field numbers will have the opportunity to collate specimens thus numbered with notes which will subsequently be published in TORREYA. It is planned to publish all the determinations of special interest, but no attempt can be made to print the determinations of the common and widely dispersed plants.

NORMAN TAYLOR,
Chairman

OF INTEREST TO TEACHERS

College Entrance Botany

In *School Science and Mathematics* for February Mr. Franklin T. Jones, of Cleveland, Ohio, opens anew the discussion of high school work for the college boy and for the boy who is not going to college. Some entrance papers (September, 1908) are given and the question is asked, "In what respects would a teacher do differently in preparing students for these examinations than if he were giving them what he considered best in preparing them for life?" While some claim that the best preparation for life is not accepted by college people as the best preparation for college and that teachers are forced to eliminate the vital part of the various subjects in order to fill college entrance requirements, Mr. Jones pertinently asks: "Are not such assertions more or less preposterous on the face of them? Are we, as teachers, ready to confess that we cannot do pretty much as we please in shaping the details of our courses, and that, with such freedom, we are therefore (if we accept the judgment of some of our highest educational authorities) really making failures of our chosen work? Is not our practice and our theory better than it was even ten years ago, and are we not on the up path rather than the down? It seems . . . that it is about time for us science teachers to champion strongly what we *are* doing, or else as we have almost perfect freedom to do, on our own individual initiative, change to the best thing."

The examination questions given in botany in this particular case are far from indicating a desire to demand preparation along a line that is "far from life".

Entrance Examination in Botany

Columbia College, September, 1908

Note. — Time: Two hours, ten minutes of which will be devoted to an oral examination. The certified notebook on the laboratory work must be submitted at the examination.

1. What structures of the leaf are of advantage in photo-synthesis? Explain in what way each one is of service.

2. What is the cause and mechanism of the curvature of tendrils?

3. How is the root protected against injury? How does it absorb materials from the soil? What other functions does it perform?

4. Make a sketch of the important stages in the life of a fern, labeling the various parts.

5. In what respects does the seed of a Monocotyledon usually differ from that of a Dicotyledon?

6. Mention the agencies that promote the distribution of plants, with illustrations of the adaptive features. What factors control the association of plants upon the earth?

7. Give the characteristics of six families of seed plants that you have studied.

Popular Science Monthly for March contains an illustrated article on the influence of radium rays on a few life processes of plants by Professor C. Stuart Gager and a history of botany at St. Louis by Dr. Perley Spaulding.

The April *Popular Science Monthly* is a Darwin number with numerous well-written articles on Darwin, his theories, and his relation to the various sciences; the one dealing directly with botany is by Professor N. L. Britton.

The *Review of Reviews* for April has several illustrated articles of botanical interest: one on soil erosion in the south by W. W. Ashe, a second giving the "truth about dry farming" by C. M. Harger, and a third on saving America's plant food by G. E. Mitchell.

An article on the existence of non-nitrifying soils is to be found in *Science* for March 26. The authors, F. L. Stevens and W. A. Withers, report that 44 per cent. of the samples tested in North Carolina failed to nitrify, thus showing that all soils have not the power to convert organic or ammoniacal nitrogen into nitrate nitrogen, *i. e.*, to nitrify.

Science, for April 16, describes a series of large tanks now being constructed at Cornell University. They are specially designed to help solve the problems related to soil productiveness, such as: effects of the continuous use of large amounts of mineral fertilizers upon the physical and chemical properties of the soil, and upon the bacterial flora and bacterial activity; changes that occur in a series of years when soils gradually deteriorate or improve; effect of different methods of soil treatment upon the loss of lime in the drainage water; loss of potassium and other substances occasioned by manuring with lime; loss of soluble salts caused by clean cultivation; extent to which soils under field conditions are renewed by accession of the lower soil to the plowed surface.

Professor Otis W. Caldwell, of the University of Chicago, has an article on "The Course in Botany" in the January *School Science and Mathematics.* The whole article is well worth reading by all teachers of botany. A suggestive full-year course is suggested for high schools. The principles that, according to Professor Caldwell, should determine the course will be seconded by all. They are: (1) "The materials selected for use in the course should have *appreciable significance* to the students. . . . This appreciable significance may be found in a knowledge of practical use of materials, a general understanding of life problems, appreciation of the aesthetic aspects of plant life, desire for knowledge, or a knowledge of the basis of agriculture or other industrial pursuits. (2) The materials must be of value for general knowledge by the public. There is a general culture value in knowing plant life, and the time has come when knowledge of the activities of plants and the part they perform in modern life is a part of the body of knowledge people must have in order to be properly intelligent as to their environment. (3) The materials of the course should be organized into a series of natural sequences to make possible the development of the problem-solving attitude of mind, and to carry this series long enough really to give some facility and efficiency in thinking."

NEWS ITEMS

The new keeper of the Kiel Botanical Institute and garden is Dr. Ernst Küster, of Halle.

After the Alaska-Yukon-Pacific Exposition (1909) is over, the forestry building is to be given to the University of Washington.

Dr. Charles E. Bessey, dean of the industrial college of the University of Nebraska, has been made head dean of the University.

A biological station is to be established at Devil's Lake, North Dakota, under the charge of Professor M. A. Brannon of the State University.

Mr. J. R. Johnston, of the Bureau of Plant Industry, has recently returned from Cuba, where he has been studying the bud-rot of the cocoanut.

Field classes in the Arnold Arboretum, Boston, are to be conducted this spring by M. J. G. Jack, for those interested in native and foreign trees and shrubs of New England.

The agricultural colleges and experiment stations of Europe are to be visited this summer by Professor F. L. Stevens, of the North Carolina College and Experiment Station.

Among the instructors of the Oklahoma Agricultural College affected by the Board's summary and wholesale dismissal of April, 1908, are Professor O. M. Morris, botany and horticulture, and Professor E. E. Balcomb, agriculture.

McGill University at the opening of McDonald College will confer the degree of LL.D. upon two members of the United States Department of Agriculture: Hon. James Wilson, Secretary, and Mr. Gifford Pinchot, Chief Forester.

The Luther Burbank's Products Company which, according to the March Torreya, was to distribute Mr. Burbank's new varieties, was not successfully launched. Mr. Burbank will still, fortunately, continue the distribution of his new varieties.

Dr. George T. Moore, formerly connected with the Department of Agriculture, has accepted the newly created professorship of plant physiology and applied botany in the Henry Shaw School of Botany at Washington University at St. Louis.

The Marine Biological Laboratory, situated at Woods Hole, Mass., gives the usual six-week courses beginning June 30. The courses in botany are in morphology and taxonomy ; each course requires the full time of the student ; the fee is $50. The laboratory is open the entire summer to investigators.

Professor George L. Goodale, of Harvard University, with which institution he has been connected for more than thirty years, will retire this June from active service. Mr. Oakes Ames, for several years actively connected with the Harvard Botanical Garden, has, since the resignation of Professor Goodale, been made director of the Garden.

The George Washington Memorial Association is initiating a movement to erect in Washington a great memorial building in recognition of George Washington's expressed desire to promote institutions for the general diffusion of knowledge. The building "will contain a great hall or auditorium and rooms for large congresses" besides "rooms for small and large meetings, office rooms and students' research rooms."

A James Fletcher memorial fund is being collected by the Ottawa Field-Naturalists' Club. The suggestions as to the form it shall take are a fountain, a statue, and a bust or portrait in appropriate places in Ottawa, and a bursary at some Canadian University. Contributions may be sent to the Secretary-Treasurer of the memorial committee, Mr. Arthur Gibson, Central Experiment Farm, Ottawa.

The University of Colorado is going to establish a summer laboratory for botany and zoölogy at Tolland, Colorado. The laboratory will be in charge of the regular instructing staff of the university, and there will be courses in elementary biology, plant anatomy, plant taxonomy, and ecology. The location of the laboratory, altitude 8,889 feet, will allow students to study conveniently the plants and animals of all the different life zones from plains to alpine heights.

The bronze memorial tablet reproduced below has been placed in the New York Botanical Garden fern herbarium, which, as a tribute to Professor Underwood, is to be called the Underwood Fern Herbarium.

OTHER PUBLICATIONS

OF THE

TORREY BOTANICAL CLUB

(1) BULLETIN

A monthly journal devoted to general botany, established 1870. Vol. 35 published in 1908, contained 608 pages of text and 40 full-page plates. Price $3.00 per annum. For Europe, 14 shillings. Dulau & Co., 37 Soho Square, London, are agents for England.

Of former volumes, only 24-34 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. 28–35 three dollars each.

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

(2) MEMOIRS

The MEMOIRS, established 1889, are published at irregular intervals. Volumes 1–11 and 13 are now completed; Nos. 1 and 2 of Vol. 12 and No. 1 of Vol. 14 have 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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NEW YORK CITY

Vol. 9 July, 1909 No. 7

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A MONTHLY JOURNAL OF BOTANICAL NOTES AND NEWS

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

JEAN BROADHURST

JOHN TORREY, 1796–1873

CONTENTS

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Matter for publication should be addressed to

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New York City

TORREYA

July, 1909

Vol. 9 No. 7

THE TYPE AND IDENTITY OF DRYOPTERIS CLINTONIANA (D. C. EATON) DOWELL*

By Ralph Curtiss Benedict

The problem as to the type and identity of *Dryopteris Clintoniana* (D. C. Eaton) Dowell is concerned with two questions: first, as to the material on which the original material was based; second, the identity of this material.

In a recent paper attention was called to the fact that some doubt exists regarding both these questions. As noted at that time, the material in the Yale herbarium identified by Eaton as his *Aspidium cristatum* var. *Clintonianum*, comprises two specimens of *Dryopteris cristata* × *marginalis* as well as several sheets of what is now known as *D. Clintoniana*, but does not include anything collected by Judge G. W. Clinton, in whose honor the fern was named, and whose collection was cited in the original description.

Through information contained in a letter from Mr. G. E. Davenport to Miss Margaret Slosson, it was learned that the original "Clinton" fern had been deposited in the Museum of Natural Science at Springfield, Mass. Thanks to the courtesy of the Springfield Botanical Society, in whose care the specimen was placed, an opportunity was given to examine it, together with a letter of Judge Clinton's concerning it. The letter — said by Mr. Davenport to have been written to John Lewis Russell — reads as follows: "This *Aspidium* troubled me. I could not reconcile it with *A. Goldianum* and it seemed a wide departure from *A. cristatum*. So I sent it to Eaton. Prof. E. answered that he had received it from divers botanists who labelled it *A. Goldianum*, but that he regarded it as a form of *A. cristatum*.

[No. 6, Vol. 9, of Torreya, comprising pages 109–132 was issued June 1, 1909.]

* Illustrated with the aid of the Catherine McManes fund.

At my instance, he named it *cristatum* v. *major* — this accounts for label (in pencil) *a* — the filling up is his. He afterwards to my surprise and gratification, named the form for me in the Manual, and so I also furnish the label marked *b.* — G. W. C.

See sheet no. 2 for label *b.*"

Sheet no. 1 with label "a" and the letter just quoted is shown in Figure 1. Sheet no. 2 is doubtfully the same as the other, and as Professor Eaton did not see it, need not concern us in the present nquiry. Both sheets — according to Mr. Davenport's letter — were left by Mr. Russell to Mrs. M. L. Owen, who afterwards deposited them with the Springfield society.

At the time the description was first published — 1867 — Prof. Eaton had for comparison (presumably), in addition to Judge Clinton's specimen, the following sheets, which with three later collections are to be seen in his herbarium to-day in the var. *Clintonianum* cover:

(without name) "Serpentine quarry, New Haven, Connecticut. 1855. Oct. E. [= *Dryopteris cristata* × *marginalis*]."

"*Aspidium cristatum*, Swz. var. *Clintonianum*. Hudson Co., Novæ Caesareæ, in paludubus coll. D. C. E. 1862—6—16."

"*Aspidium cristatum*, Swz. v. *Clintonianum*, D. C. E. Newark, N. J. Wm. Prower — 1865."

"*Aspidium cristatum* — Sw. — v. *Clintonianum*, D. C. E. Utica, New York. J. A. Paine, Jr., 1865. 'Low swampy woods.'"

"*Aspidium cristatum*, Sw. v. *Clintonianum*, D. C. E. Central New York. J. A. Paine, Jr. 1865."

Of these, all but the first cited correspond to the form now commonly known as *Dryopteris Clintoniana*.

The Clinton label "a" reads as follows:

a. Ex Coll. G. W. Clinton
Aspidium cristatum
var. major
Please fill up & return
Buffalo, New York.
Height of frond 29 inches

The words "*cristatum* var. *major*" are in Eaton's writing. The "Please fill up and return" is in pencil, also the words "Height of frond."

FIGURE I. The original Clinton specimen.

The original description and comment are as follows:

"*Aspidium cristatum* var. *Clintonianum*. (In A. Gray Manual of Botany Edition 5. 665. 1867.)

Frond in every way larger (2½°–4° long); pinnae oblong-lanceolate, *broadest at the base* (4′ –6′ long, 1′ –2′ broad) deeply pinnatifid, the *divisions* (8–16 pairs) crowded or distant, *linear-oblong*, obtuse, obscurely serrate or cut-toothed, the basal ones sometimes pinnately lobed; veins pinnately forking, the lowest anterior veinlets bearing *fruit-dots near the midvein;* indusium orbicular with shallow sinus, smooth and naked. Swampy woods, New England to New Jersey, New York (G. W. Clinton, &c.), and westward. July.

Rootstock stout, creeping, chaffy (like the stipes) with large bright brown scales. A showy Fern, unlike any European form of *A. cristatum*, and often mistaken for *A. Goldianum*."

As thus drawn, the description is apparently based both on the Clinton specimen, and on other material, presumably that cited above. The Clinton specimen probably contributed the maximum number of pinnulae as given (16)—the other material, the shape of the pinnae, "broadest at the base," and the minimum number of pinnulae (8). As a matter of fact, the pinnae of the Clinton specimen are not broadest at the base, but are mostly of equal width toward the middle or even broader there. This character, together with the numerous pinnulae—in so-called *D. Clintoniana* rarely as many as 12–14—the numerous sori per pinnula (mostly 8–9), and the general cutting relate the original Clinton fern to *Dryopteris Goldiana* rather than to *D. cristata* or its so-called variety, Professor Eaton's opinion to the contrary notwithstanding. Positive proof of this relationship is to be found in the cell-structure of the indusia which are unmistakably of the *Goldiana* type, and not to be confused with those of *D. Clintoniana* so-called. That the specimen represents straight *D. Goldiana* is unlikely. It seems more reasonable to consider it as probably a cross, perhaps with the *D. Clintoniana* of recent authors. An illustration of a leaf collected by Mr. Macy Carhart near Lodi, N. J., and identified as this cross, is included for comparison (Figure 2). Further evidence that the Clinton speci-

FIGURE 2. *Dryopteris Clintoniana* × *Goldiana* Dowell.

men may be a hybrid is to be found in its sporangia which are nearly all abortive. The few full-sized ones seem to have developed only sterile-looking spores.

But whatever the exact identity of the original Clinton fern, it is clearly different from the *D. Clintoniana* of common usage and the question as to which form may properly bear this name remains for consideration. Under ordinary circumstances, the citation of Judge Clinton's collection together with the fact that the plant was named in his honor would be sufficient to establish as type the single Clinton specimen seen by Eaton and now at Springfield. In the present case, however, the description agrees less with this specimen than with others in the Eaton herbarium. Indeed the origin of the single character which appears to have been derived exclusively from the Buffalo plant — that of the maximum number of pinnulae per pinna — is open to question. In unconformably divided leaves such as are those in question, unless a minimum dimension is agreed upon beforehand, two observers are likely to arrive at very different estimates as to the number of any given part. Furthermore it is not at all impossible that Eaton may merely have "filled in" the label as requested and returned the plant to Judge Clinton, afterwards basing his description on material present in his own herbarium. The facts then seem to justify the somewhat paradoxical treatment of rejecting the Clinton specimen as type of *Dryopteris Clintoniana*, and fixing if possible upon one of Eaton's early specimens of the fern we know now as this species.

The rules suggested by the Nomenclature Commission of the Botanical Club of the American Association for the Advancement of Science in the "Propositions relating to the amendment and completion" of the Vienna rules and recently published in the Bulletin of the Torrey Club (**36**: 55–74. 1909) seem applicable at least in part, to the present case. Under Proposition 8, No. 3°, is the following statement: "In default of an original specimen, that represented by the identifiable figure or (in default of a figure) description first cited or subsequently published, serves as type."

In Eaton's Ferns of North America, Volume 2, plate 66, figures 6, 7, 8, and 9 show respectively a pinna, a pinnule, an indusium, and a spore of "*Aspidium cristatum* var. *Clintonianum*." The pinna unmistakably belongs to a leaf of the sort ordinarily identified as *D. Clintoniana*, but is not like those of Judge Clinton's collection. The leaf illustrated is presumably in the Eaton herbarium to-day, and if it can be determined by the figure, should serve as the type. Rules 1° and 2° are inapplicable owing to the exclusion of the Clinton specimen. For purposes of completeness, an amended description of *Dryopteris Clintoniana* is here included.

DRYOPTERIS CLINTONIANA (D. C. Eaton) Dowell

Aspidium cristatum var. *Clintonianum* D. C. Eaton in A. Gray Manual of Botany, Edition 5: 665. 1867.

Rootstock horizontal, the crown unsymmetrical, with low spreading juvenile sterile leaves, and taller more erect fertile ones, up to 4 feet in length: lamina broadly oblong, acuminate, the pinnae mostly acuminate or long-acute, usually broadest at the base, deeply divided, the divisions oblong, mostly slightly falcate, 8–12, rarely as many as 14 per pinnula (counting those with more than 2 sori, or on sterile or sparsely fertile fronds, those 8 mm. or more long): sori mostly 6–8 per pinnula, the indusia glabrous, with heavy radial ribs, the cells mostly narrow, the walls all very sinuate.

Type in question.

The problems in connection with *Dryopteris Clintoniana* are not ended with the fixing of a type. It appears to be in some respects an extremely variable plant, and a study of a wide range of material with a view to determine the limits of this variation is desirable. Its behavior in hybridization also offers an interesting field for study and affords moreover evidence as to its distinctiveness in addition to that derived from its own characters, for the hybrids, when compared with the corresponding crosses of *D. cristata*, maintain for the most part the well-marked differences of the parent forms. But perhaps the best evidence of the distinctiveness is found in the occasional finds of sterile or partially sterile intermediates between the two species, the only intermediates to be found as far as my experience goes. Description of this hybrid is best delayed until *D. Clintoniana* shall have been more carefully studied. Credit for its recognition belongs to Dr. Philip Dowell.

In conclusion, I wish to thank Professor A. W. Evans, the Springfield Botanical Society, Miss Margaret Slosson, and Dr. Philip Dowell for favors received in connection with work on this paper.

COLUMBIA UNIVERSITY

AMBER IN THE LARAMIE CRETACEOUS*

BY T. D. A. COCKERELL

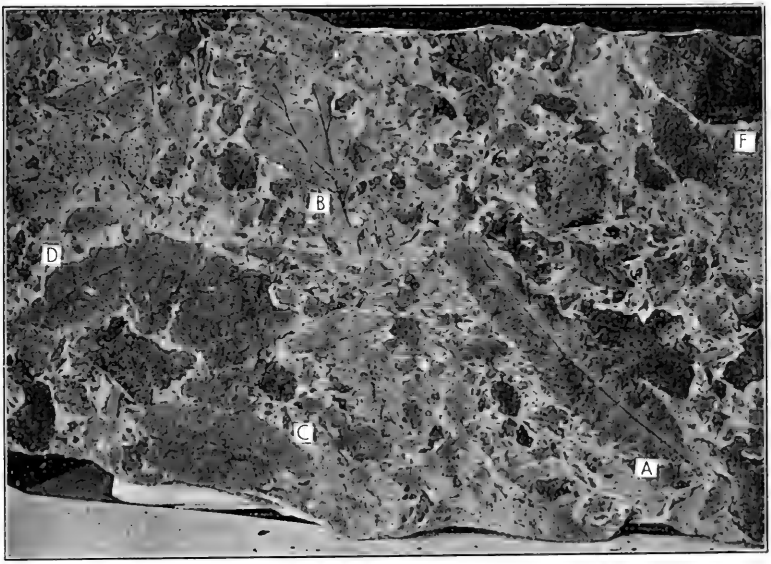
Recently, with the help of my wife and a number of students, I have been investigating the flora of the Laramie Cretaceous at Marshall, Boulder County, Colorado. This locality produces much of the coal used in Boulder, and has long been known to palaeobotanists, having furnished important materials to Lesquereux many years ago. Perhaps the most interesting thing found is a small piece of amber,† embedded in the solid rock. It measures about eight millimeters by five and a half, and is translucent orange-brown, darker than Baltic amber. It is practically insoluble in alcohol; a small fragment left in it over night was scarcely if at all diminished. In ether it eventually becomes opaque and friable. In TORREYA, January, 1907, Mr. E. W. Berry gave a very interesting account of the occurrence of amber in the Cretaceous beds of the Atlantic coast region; it now appears that this substance is widely distributed in our Upper Cretaceous, and it may be possible that somewhere it will be discovered in large quantities. The discovery of large pieces of Cretaceous amber would be an event of the highest importance, as there seems to be no reason why they should not contain plant remains and insects. Cretaceous insects are exceedingly desirable at the present time, to throw light on the evolution of

* Illustrated with the aid of the Catherine McManes fund.

† In using the term amber for the fossil resin of the Laramie strata, it is only intended to imply that it is a transparent fossil resin, with all the appearances of the substance known as amber. It is of course not the product of the same tree as the Baltic (typical) amber; indeed, judging from the accompanying foliage, it is very probably not even the product of a conifer.

existing groups; while it is possible that flowers and fruits, could they be found as they are in Baltic amber, would bring about great changes in our conception of some of the Cretaceous genera.

The material containing the amber is a bluish-gray rock, full of plant remains, in the immediate vicinity of the coal. We did not find it in place, but were able to examine a large quantity thrown out on the dump of a coal mine a short distance east of Marshall. The principal plants in this rock were as follows:*



Slab containing fossil plants of Laramie age, Marshall, Colorado; collected by Miss Ruth DeLong and Mr. Ralph Morrill. *A*, *C*, *Ficus navicularis* Ckll. (variable). *B*, "*Platanus*" *rhomboidea* Lx. *D*, "*Platanus*" *raynoldsii* Newby. *F*, *Dombeyopsis obtusa* Lx.? (Note the absence of coniferous remains in the specimen.)

1. *Ficus gaudini* Lx. (*uncata* Lx.). The large leaves are abundant; possibly much of the fossil wood so common at Marshall may belong to this species, but we have made no sections.

2. **Phragmites laramianus** n. sp.; *P. oeningensis* Lx., Tertiary

* Since writing the above account, we have found quantities of amber *in the coal* at Marshall. Much of it was looked over for insects, but so far without success. None of the pieces is large. — April 26.

Flora, pl. viii, f. 1. This is the most abundant species in the deposit. The leaves are broad, and very obtuse at the apex, herein differing from *P. falcata* Kn. of the Yellowstone Laramie and the living *P. phragmites*. It does not seem possible to refer this to *P. oeningensis* A. Br. of the European Upper Miocene ; it is no doubt much nearer to *P. alaskana* Heer, but Heer's plant, so far as positively known, had narrower leaves.

3. *Anemia supercretacea* Hollick. Previously known from the Laramie at Florence, Colorado. First found at Marshall by Paul Haworth. Our specimens run a little larger than Hollick's, but appear to be otherwise quite identical ; the pinnules are entire. The plant may possibly be a variety of *Anemia haydenii* (*Gymnogramma haydenii* Lx., 1872), which appears to be distinctly different from *A. subcretacea* (Sap.) Gard. & Ett., as originally figured by Saporta. In the genuine *subcretacea* the pinnules are shorter than in *haydenii*, and more irregularly and remotely toothed. *A. perplexa* Hollick seems to me much more like *A. subcretacea*, differing only in the shorter and more broadly cuneate pinnules. Some of the material figured under *A. perplexa* has entire pinnules, and might just as well represent the Marshall plant.

No conifers were identified, though a very imperfect fragment in a piece of coarse sandstone may possibly belong to *Sequoia*.

Cinnamomum affine Lx. and *Juglans leconteana* Lx. were found associated at a different place, whether separated by any noteworthy interval of time I do not know. They appear to come from a higher level.

Sequoia longifolia Lx., which is such a characteristic fossil of the beds above the coal at Austin's Bluff, Colorado Springs, has been recorded from Marshall, but we did not find it, unless the dubious fragment just referred to belongs there.

UNIVERSITY OF COLORADO.

SOME MOULDS FROM PENNSYLVANIA

By David R. Sumstine

In the study of the moulds of North America, the following species have been observed in Pennsylvania. An enumeration of these species may interest mycologists.

Fischer * divides the Mucorinae (Mucorales) into four families, Mucoraceae, Mortierellaceae, Chaetocladiaceae, and Cephalidaceae. No species of the second family have yet been found in our state.

Mucoraceae

Mucor mucedo Linnaeus

This species is widely distributed on horse manure and can readily be cultivated on a decoction of horse manure, on potato, and on bread. It is seldom found on fruits.

Mucor racemosus Fresenius

Found on boiled potatoes, on bread, and on horse manure. It can be cultivated on bread and on potato.

Mucor piriformis Fischer

The specimens referred to this species agree fairly well with the description of Fischer † except the size of the columella and of the spores. In my specimens the columella is pear-shaped 117–150 μ high and 50–117 μ wide at the broadest part. The spores are broadly elliptical, 13–16 μ long and 10–13 μ wide. The spores germinate in the mineral liquid used by Van Tieghem and Le Monnier. ‡ A number of attempts to germinate them in water proved a failure.

The plants grew on the dung of deer, were cultivated on bread, on boiled potato, and on cornmeal.

Phycomyces nitens (Agardh) Kunze

Usually found on oily substances and may be cultivated on ground flaxseed and on cornmeal.

* Fischer, Krypt. Flor. v. Deutschland, etc., 175–177. 1872.

† Fischer, *loc. cit.*, 191.

‡ Van Tieghem et Le Monnier, Ann. Sc. Nat. V. Ser. T. 17 : 267. 1873.

Spinellus fusiger (Link) Van Tieghem

Found on various species of *Mycena.*

Spinellus macrocarpus (Corda) Karsten

This species is also found on species of *Mycena.* Attempts to cultivate this and the former species were unsuccessful.

Sporodinia grandis Link

This is a ubiquitous mould growing on decaying fungi. It has been found on various species of mushrooms.

Rhizopus nigricans Ehrenberg

This is the most common species of the moulds. It grows on all kinds of decaying vegetable matter. It can easily be cultivated and assumes very interesting forms. Occasionally several sporangia appear on one sporangiophore. Peculiar thickenings occur frequently in the sporangiophores. The spores germinate in water.

Thamnidium elegans Link

The habitat of this species is on the manure of the tiger and of the horse. It has been cultivated on orange, on bread, on carrot, in Pasteur's solution with gelatine.

The manure of the tiger was obtained from the Pittsburgh Zoo.

Circinella umbellata Van Tieghem et Le Monnier

Grows on the manure of the tiger and of the horse, usually in company with *Thamnidium elegans.* Cultivated on orange, on bread, and in Pasteur's solution with gelatine.

Chaetostylum fresenii Van Tieghem et Le Monnier

This species was found growing among other moulds on an old decaying *Polyporus.*

Pilobolus crystallinus (Wiggers) Tode

Rather abundant on horse manure.

CHAETOCLADIACEAE

Chaetocladium brefeldii Van Tieghem et Le Monnier

Grows parasitically on other mucors on horse manure. It was also found on *Phycomyces nitens* growing on flaxseed meal.

Cephalidaceae

Piptocephalis repens Van Tieghem

Very common among other moulds on horse and dog manure. It is parasitic on other moulds.

Pittsburgh, Pennsylvania

SHORTER NOTES

A New Name.—**Pentstemon Metcalfei** Wooton & Standley, nom. nov.

P. puberulus Wooton & Standley, Bull. Torrey Club **36**: 112 4 Mr 1909.

Not *P. puberulus* M. E. Jones, Contr. Western Bot. **12**: 64. 1908.

Prof. A. A. Heller kindly called our attention to the fact that the name *P. puberulus* was used last year by Mr. Jones. We had Mr. Jones' paper at hand at the time of naming the plant but had neglected to examine it for new species of *Pentstemon.*

E. O. Wooton

Agricultural College, New Mexico

A "Weeping" Spruce.—Some weeks ago Miss Helen Stewart brought to Teachers College a specimen of a curious spruce tree which was collected about one hundred miles north of Winnipeg. The Indian guides call it the "Unknown Tree," and claim that it is the only one in existence. The tree is described as about sixty feet high, with the lower branches at least twenty feet from the ground; the strikingly pendulous branches are six or more feet long, slender, and themselves but little branched. About the same time a specimen was taken to the New York Botanical Garden; the rather indefinite description of the locality indicates that the two specimens came from the same place, and possibly from the same tree. Dr. Britton has pronounced it a "weeping" spruce, probably *Picea canadensis;* the twigs are thicker than usual (due perhaps to its peculiar habit of growth) but the sterigmata indicate *P. canadensis.*

Jean Broadhurst

REVIEWS

West and West's Monograph of British Desmidiaceae. Vol. III*

In their third volume of the British Desmidiaceae, W. and G. S. West have nearly completed the genus *Cosmarium*, fifty species of which were already taken up in the latter part of volume two. In this third volume one hundred and seventy three species with their several varieties are taken up and illustrated by thirty plates (65–95), partly colored. The general plan of the earlier volumes is followed: synonymy, description, distribution, and general notes under each species. One new species, *Cosmarium entochondrum*, is described, also thirteen new varieties. In addition several new forms are described and a number of changes of rank and position made.

The figures are excellently drawn and in many cases show front, vertical, side, and basal views of the same specimen. The colored figures show the arrangement of the chloroplasts and pyrenoids in a number of species. In a very few cases variations of ornamentation are definitely shown.

The volume shows our great lack of knowledge of the sexual phases of the life history in this group, the number of species with zygospores being but 15 per cent. of the total and in some of these the zygospores are not mature. In a group as variable as the Desmidiaceae this lack of the sexual characters is all the more felt in determining the true relationships of apparently very similar forms.

This volume will do much to help the study of this genus, which has been difficult on account of the great number of species and the scattered literature.

JOSEPH A. CUSHMAN

PROCEEDINGS OF THE CLUB

MAY 11, 1909

The meeting was held at the American Museum of Natural History with Vice-president Barnhart in the chair. Ten persons were present.

* West, W. and West, G. S. Monograph of British Desmidiaceae. Vol. III. 1908. Ray Society. Dulau and Co., London.

Resignations were accepted from Miss Lenda Tracy Hanks, Miss Helen D. Nelson, and Mr. Arthur Smith.

The scientific program of the evening consisted of a lecture by Dr. William A Murrill on "Edible Fungi", illustrated by specimens and by lantern slides.

Mushrooms were discussed from the popular side as objects of interest and as valuable relishes. The development and cultivation of the common field mushroom were briefly described. Poisonous species and their effects were described with care, and comparisons were made with edible species liable to be confused with them.

Fresh specimens of four early species were exhibited: the glistening ink-cap, *Coprinus micaceus*, which appeared the last week in April; the shaggy-mane, *Coprinus comatus*, which appeared about May 10 (unusually early for this species); *Pleurotus sapidus*, a relative of the oyster mushroom, just beginning to appear on old logs and stumps; and the morel, *Morchella*, which occurs on the ground in woods during May.

Lantern slides were used to illustrate the more important local species of edible fungi, beginning with agarics found on lawns and in fields, such as species of *Agaricus*, *Lepiota*, *Coprinus*, *Hypholoma*, and *Marasmius*. Species occurring on the ground in woods were next discussed, including *Lactaria*, *Russula*, *Tricholoma*, *Clitocybe*, and other important genera of gill-fungi. Wood-loving forms comprise a number of important species that are abundant and much used, such as *Armillaria mellea*, *Hypholoma perplexum*, *Pleurotus ostreatus*, *Pleurotus sapidus*, *Coprinus micaceus*, and *Collybia velutipes*.

Other groups of fungi containing edible species, were illustrated by *Clavaria*, *Hydnum*, certain tender forms of *Polyporus*, several species of *Boletus*, and a number of species of *Lycoperdon*. All species of coral-fungi and puffballs were recommended for food, provided the specimens were tender, young, and fresh.

Adjournment followed.

MARSHALL A. HOWE,
Secretary pro tem.

OF INTEREST TO TEACHERS

Secondary School Agriculture

The March number of *School Science and Mathematics* has an article by D. O. Barto on problems in secondary school agriculture which is interesting to teachers of nature study in the grades and to teachers in the high school. The lack of success in the grades is explained as follows:

"It must not be forgotten that agriculture is largely a science study. It requires some knowledge of the principles of many sciences, and the ability and interest to apply them intelligently. These conditions of scholarship can be expected only in pupils of a certain breadth and maturity of development and comprehension seldom found in the elementary grades.

"A pupil can make little headway in the study of agriculture unless he knows something of physiography, geology, botany, zoölogy, physics and chemistry. It is not a question of whether he has studied these sciences before he takes up agriculture whether he pursues them as separate subjects or learns them as he studies agriculture. The important thing is that some knowledge of these other subjects is indispensable to any serious and effective work in the study of agriculture, and this is a qualification that can hardly be expected to be attained in the elementary grades.

"There is much valuable work that is scientific and agricultural that may be done — should be done — in the elementary grades when we have teachers prepared for it. But agriculture is an applied science. It has won its way only by demonstrating to the farmer that it could be made of practical service to him. As a school study its value and usefulness will largely depend upon the results that can be obtained from the application of principles of science, and this work will demand a sustained interest that young children cannot furnish."

With regard to the conditions in the secondary schools much of the above is true, especially where the work is placed in the lower high school years. Mr. Barto, however, gives in this article some encouraging results of work being done in Illinois.

A key to the common winter trees about Milwaukee which is not so local as the title indicates appears in the April *School Science and Mathematics.* The author, I. N. Mitchell, has made the key simple enough for high school pupils.

Dr. John M. Coulter has an article on teaching botany in the April *School Science and Mathematics* in which the current conditions are discussed under the headings of the prepared teacher, economic botany, biological grouping, and the point of interest.

The April *Journal of the New York Botanical Garden* contains three illustrated articles which will prove interesting to the general reader: one on the fern collections of the Garden by Ralph C. Benedict, another on East Indian economic plants written by Percy Wilson, and an account of some experiments on the effect of the soil of the Garden hemlock grove upon seedlings by Winifred J. Robinson.

Viewing the government as a teacher, Mr. L. B. Stowe, in the *Outlook* for April 17, enumerates the scientific principles demonstrated within the past few years, and gives interesting concrete illustrations. Those of special interest to us are connected with forest and staple crop protection and with improved methods of farming, such as following the contours of the hill in plowing a hillside instead of plowing straight across the slope.

The April *Plant World* contains two papers which were read at the Baltimore meeting of the American Association for the Advancement of Science: one on overlapping habitats as observed in Mexico by Francis E. Lloyd; and another by W. M. Crocker and L. I. Knight on the effect of illuminating gas upon the flowers of both cut and growing carnations, and the losses sustained by florists through defective pipes, even where chemical tests failed to reveal the presence of gas.

The University of Colorado has recently issued a botanical number as the first number of its sixth volume of studies. The magazine, which should prove interesting to all botanical students in that region, is illustrated, and contains papers by the members of the biological staff on the "botanical opportunity in Colorado", on the mesa and foothill vegetation, especially with relation to physiography and climate, with the distribution of conifers and deciduous trees, and a bibliography and history of Colorado botany.

Dr. O. F. Cook in discussing the history of the cocoanut palm says: "It has long been thought that the cocoanut palm presents a perfect example of adaptation to a littoral environment, but this idea is delusive. The tough outer rind which is popularly supposed to have been developed as a protection against sea water is really to guard the cocoanut when it falls, and give it favorable conditions for germination. Cocoanuts require a certain amount of salt in the soil, but this condition is satisfied by soils in some interior localities as well as on the seacoast. Considerable sunshine is also needed. This, however, is met better in arid regions than by a coastal habitat and the care with which the milk is protected would argue in the same direction. Far from being a wild plant the cocoanut does not appear to thrive long away from human beings and in spite of the supposed diffusion of the tree by oceanic currents no instance of the kind is known."

A freak dandelion, *Taraxacum taraxacum* (L.) Karst., is described by M. P. Somes in the April *American Botanist:*

"In place of the scape which all self-respecting dandelions rear aloft, this 'freak' had a stem, amply provided with leaves — not in whorls, if you please, but alternate. The tip of the flower stalk was bifurcate and bore two heads, rather smaller than the average but perfect in other respects. Near the base of the stem to still further emphasize the abnormality was an auxiliary peduncle tipped by an immature head. There were several plants with this leafy stem habit and all very similar in the forked flower stalk. The soil was an ordinary black earth quite moist but in no way noticeably peculiar and six feet away in the same soil were normal plants of the same species. A friend, who is somewhat severe in his strictures regarding the activity of taxonomists and the resulting multiplicity of synonyms, suggests that I describe this form as a new species and call it *T. paradoxa.* However it may be of interest to some to know that *Taraxacum taraxacum* (L.) Karst. (*T. officinale* Weber, *T. dens-leonis* Desv. etc., etc.) does not always have a scape nor is its inflorescence always a single head."

The April *Bulletin of the Torrey Botanical Club* contains a very interesting article by George E. Stone on the power of growth of ostrich ferns (*Onoclea Struthiopteris* Hoffm.). Young fronds which forced their way through a concrete (rolled tar and gravel) border, about three inches thick, and so hard that a "heavy stroke from a sledge-hammer makes little or no impression upon it," initiated some experiments to show the great force exerted by the young ferns. A lever, weights, and a round piece of wood "of the same dimensions as the undeveloped cluster of fern fronds" constituted the apparatus. The pressure required to break through the concrete in ten to fifteen days, the time usually required by the ferns was 264 pounds in 10 days and 189 pounds in 13 days, Mr. Stone estimates that the work actually accomplished by the ferns is at least 35 atmospheres, and refers to Pfeffer's corn root record of 24 atmospheres, and Clark's squash experiment where a squash developed under a weight of 5,000 pounds, but which, however, represented a cell pressure of but 2–3 atmospheres.

The report of the American Chemical Society, made by the committee appointed to coöperate with the National Conservation Committee, contains some facts of botanical interest, as shown by the following extracts: "In forestry also, the influence of the chemist is distinctly felt. The sprays, used for destroying noxious insects, are chemical preparations. The manufacture of wood alcohol is a chemical process, which may be either wasteful or economical. Turpentine is now produced wastefully, but the waste can be diminished by careful refining, and furthermore, the chemist can aid in discovering substitutes for it. Substitutes for tan bark are also to be sought for by means of chemical investigations. Another distinctly chemical operation is the preparation of wood pulp for paper making, a process which is now wasteful in the highest degree. It is estimated that for every ton of pulp now made by the sulphite process more than a ton of waste material is allowed to drain away into our streams. How to make this material useful is a chemical problem, and so also, in great part, is the investigation of other, now useless fibers, which may replace the more valuable wood. The preservation of wood from decay is still another art in which chemistry is predominant.

"In preserving the fertility of our land, chemistry has an important part to play. Our knowledge of fertilizers, of the food on which crops can thrive, is entirely chemical so far as accuracy is concerned, and must be applied in accordance with chemical principles. A fertilizer which is useless, and therefore wasted on one soil, may be needed on another. Certain fertilizers, like the Stassfurt salts, Peruvian guano, the Chilean nitrates, and phosphate rock are limited in quantity, and their future exhaustion must be considered now. What shall replace them in the future? Already processes have been devised for fixing the nitrogen of the atmosphere and rendering it available for plant food. Saltpeter and other nitrates can be and long have been made from waste materials such as old mortar and animal refuse. The phosphatic slags have been mentioned in connection with metallurgical processes. These sources of fertility are important, but greater still is the source found in our municipal sewage. The problem of its salvage has been worked out in some localities, but in the United States the people are only beginning to be aroused to its importance. Enormous masses of material, easily available for fertilizing purposes, now drain into our rivers or directly into the sea. Another question, now under investigation, is the possibility of using our common feldspathic rocks in fine powder, to replace the potassium withdrawn by plants from the soil."

Vol. 9 August, 1909 No. 8

TORREYA

A MONTHLY JOURNAL OF BOTANICAL NOTES AND NEWS

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

JEAN BROADHURST

JOHN TORREY, 1796–1873

CONTENTS

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TORREYA

August, 1909

Vol. 9 No. 8

RHIPSALIS IN THE WEST INDIES *

By N. L. Britton

Rhipsalis is a genus of leafless jointed cacti, with round, angled, or flat branches and small flowers, consisting of numerous species, mostly natives of tropical America, but a few species occur in eastern tropical Africa and the widely distributed *R. Cassutha* grows also in Ceylon. In this Old World distribution the genus differs from all other cacti, the family being otherwise American in distribution, except for several Opuntias, which have become naturalized in southern Europe and northern Africa.

These African species are of great interest from the standpoint of geographic distribution because they are the only cacti native in any part of the Old World. From the large preponderance of species in America it seems certain that the ancestors of the African kinds must have been transported from the American tropics to those of Africa in past geologic time, and the method of transportation, unless there was land connection between the continents, can only be guessed at. There are many genera in other families of plants common to the American and African tropics, however, and this indicates the probability of former land connection, over which their ancestors might have spread by well-known natural means.

The genus was established by Gaertner (Fruct. & Sem. **1**: 137. 1788), the type species being *R. Cassutha* Gaertn. Adanson (Fam. Pl. **2**: 243. 1763) had previously proposed the generic name *Hariota*, for presumably the same species (Plumier, Plant. Amer. 190, *pl. 197. f. 2*), and this figure is cited by Linnaeus (Syst. ed. 10, 1054. 1759) under *Cactus parasiticus*, but Linnaeus at the same place, and before his citation of Plumier's figure,

[No. 9, Vol. 7, of TORREYA, comprising pages 133–152, was issued July 1, 1909.]

* Illustrated with the aid of the Catherine McManes Fund.

cites Sloane, Jamaica, *pl. 224. f. 3 and 4*, which is a species of *Vanilla*, probably *V. Eggersiana* Rolfe. Inasmuch as Adanson did not typify *Hariota* binominally, and as the type of *Cactus parasiticus* L. is a *Vanilla*, it would appear that the name *Hariota* must be passed over, although it was taken up by Dr. Otto Kuntze (Rev. Gen. Pl. 261. 1891), and the species of *Rhipsalis*

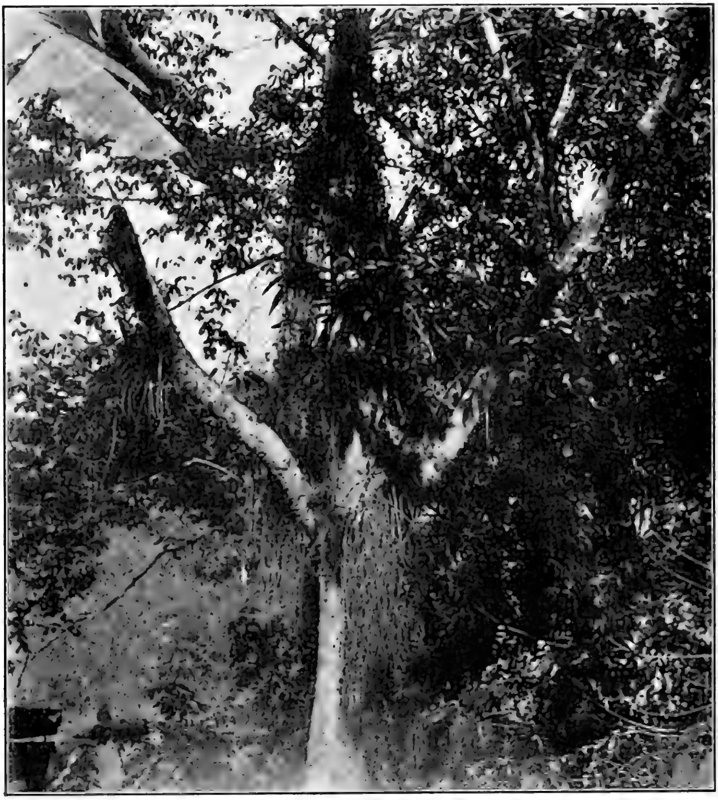

FIG. 1. *Rhipsalis Cassutha* Gaertn. Near Utuado, Porto Rico. Photographed by Dr. Marshall A. Howe.

known to him transferred to it. Through Linnaeus's blunder of uniting two widely different plants, which he knew only from illustrations, we are apparently prevented from using the name *Hariota*, and the next oldest available generic name is *Rhipsalis*.

The species of *Rhipsalis* are mainly epiphytic, drooping from trees, though sometimes found on cliffs, and they are mesophytes rather than xerophytes, inhabiting moist or wet regions. Some of them bear spines or bristles at the areoles of young shoots, which usually fall away early, leaving the mature plants quite unarmed, but a few South American species bear spines even when mature. Their flowers are whitish, yellowish, or pink, often almost rotate when widely expanded, the perianth-segments few, the perianth-tube short or none; the stamens are few or numerous and shorter than the perianth; the fruits are globular or oblong, white or yellowish berries with a watery pulp full of small seeds.

Three species are now known from the West Indies, which may be classified as follows:

Joints terete, slender (*Eurhipsalis*). 1. *R. Cassutha.*
Joints flat (*Phyllorhipsalis*).
  Joints 4–6 cm. wide; flowers 15 mm. long; berry oblong. 2. *R. alata.*
  Joints 1–2.5 cm. wide; flowers 6 mm. long; berry subglobose.
  3. *R. jamaicensis.*

1. **Rhipsalis Cassutha** Gaertn. Fr. & Sem. **1**: 137. 1788.

Cassytha filiformis Mill. Gard. Dict. Ed. 8. 1768. Not L.
Cactus parasiticus Lam. Encycl. **1**: 541. 1783. Not L.
Cactus pendulus Sw. Fl. Ind. Occ. **2**: 876. 1800.
Cactus caripensis H.B.K. Nov. Gen. **6**: 66. 1823.
Cereus caripensis DC. Prodr. **3**: 467. 1828.
Rhipsalis parasiticus DC. Prodr. **3**: 476. 1828.
Cactus fasciculatus Willd. Enum. Suppl. 33. 1813.
Rhipsalis parasitica Haw. Syn. Pl. Succ. 187. 1812.
Rhipsalis fasciculata Haw. Suppl. 83. 1819.
Rhipsalis cassythoides G. Don, Gen. Syst. **3**: 176. 1834.
Rhipsalis dichotoma G. Don, Gen. Syst. **3**: 176. 1834.
Rhipsalis undulata Pfeiff. Enum. 156. 1837.
Rhipsalis Hookeriana G. Don, Gen. Syst. **3**: 176. 1834.
Hariota parasitica Kuntze, Rev. Gen. Pl. 262. 1891.

Plant often 1 m. long or longer, much branched, light green, pendent from trees or on cliffs, the branches flexible; flowers 6–8 mm. long; petals about 4, ovate, obtuse; stamens about 9. [FIGURE 1.]

TYPE LOCALITY: Not cited.

Illustrations: Gaertn. *loc. cit. pl. 28. f. 1*; Hook. Exot. Fl. **1**: *pl. 2*; Lodd. Bot. Cab. *pl. 865*; Bot. Mag. *pl. 3079, 3080*; DC. Pl. Grasses, *pl. 59*.

Distribution: Cuba: Matanzas (*Rugel 767; Britton & Shafer 450*); Madruga (*Britton & Shafer 788*); Calicita near Cienfuegos (*Combs 470*); vicinity of San Luis, Oriente (*Pollard & Palmer 356; Maxon 4012*). Haiti: Port Margot to Corneil (*Nash 228*); La Brande to Mt. Balance (*Nash & Taylor 1660*). Porto Rico: Yauco (*Garber 63; Sintenis 3823*); between Aibonito and Cayey (*Heller 516*); near Aibonito (*Underwood & Griggs 488*). Jamaica: near Rio Grande Ford, Cuna Cuna Trail (*Fredholm 3207*); Belvidere (*Harris 7646*); vicinity of Castleton (*Maxon 836*); Moneague (*E. G. Britton 2956*). San Luis Potosi, Mexico, to Costa Rica, Colombia, Bolivia, Venezuela, and Brazil. Tropical Africa. Mauritius. Ceylon.

The young shoots are often quite bristly, but the mature plant becomes smooth; flowers are sometimes developed before the bristles fall away. In the West Indies the plant has not been observed by me at a greater altitude than about 500 meters.

2. **Rhipsalis alata** (Sw.) Schum. Fl. Bras. **4**^{2}: 288. 1890

Cactus alatus Sw. Prodr. 77. 1788.

Cereus alatus DC. Prodr. **3**: 470. 1828.

Rhipsalis Swartziana Pfeiff. Enum. 131. 1837.

Hariota alata Kuntze, Rev. Gen. Pl. 262. 1891.

Rhipsalis Harrisii Gürke, Monats. Kakt. **18**: 180. 1908.

Pendent from trees and on rocks, sometimes 5 meters long, with several long branches; joints broadly linear, lanceolate or linear-oblong, often constricted at the middle or above it, bluntish at the apex, decurrent below into a stipe-like base, rather fleshy, bright green, about 1 mm. thick, 2–4 dm. long, 4–6 cm. wide, the midvein prominent and stout, the margins crenate-undulate, the lower crenations 1–2 cm. long, the upper ones 4–8 mm. long, the main lateral veins ending in the sinuses; flowers yellowish-white, about 15 mm. long; petals 10, lanceolate, acutish, the outer slightly longer than the inner, erect and nearly parallel; stamens numerous, about one half as long as the petals; style slender, about three times as long as the five linear stigmas; berry ovoid, rounded at both ends, yellow-green, 1 cm. long. [Figure 2.]

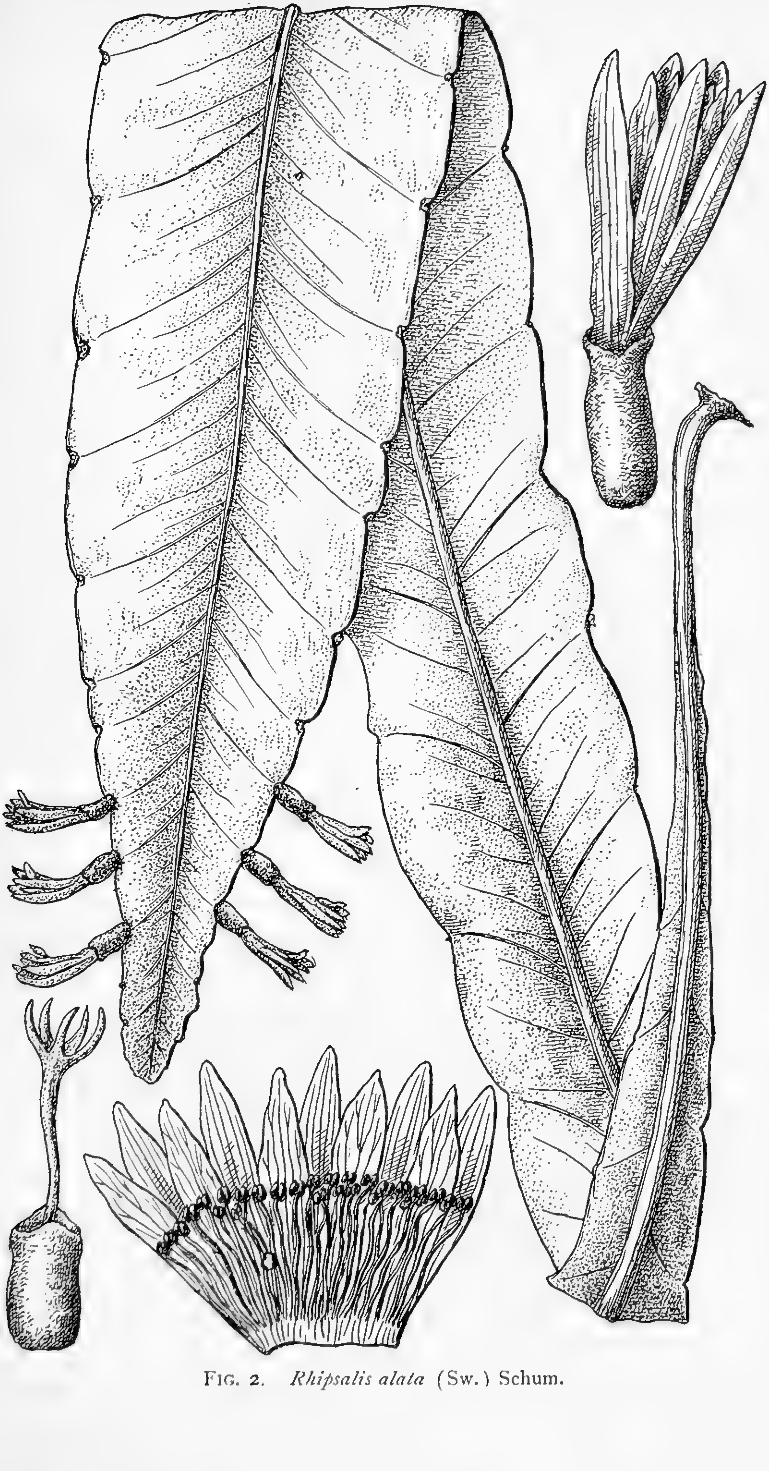

FIG. 2. *Rhipsalis alata* (Sw.) Schum.

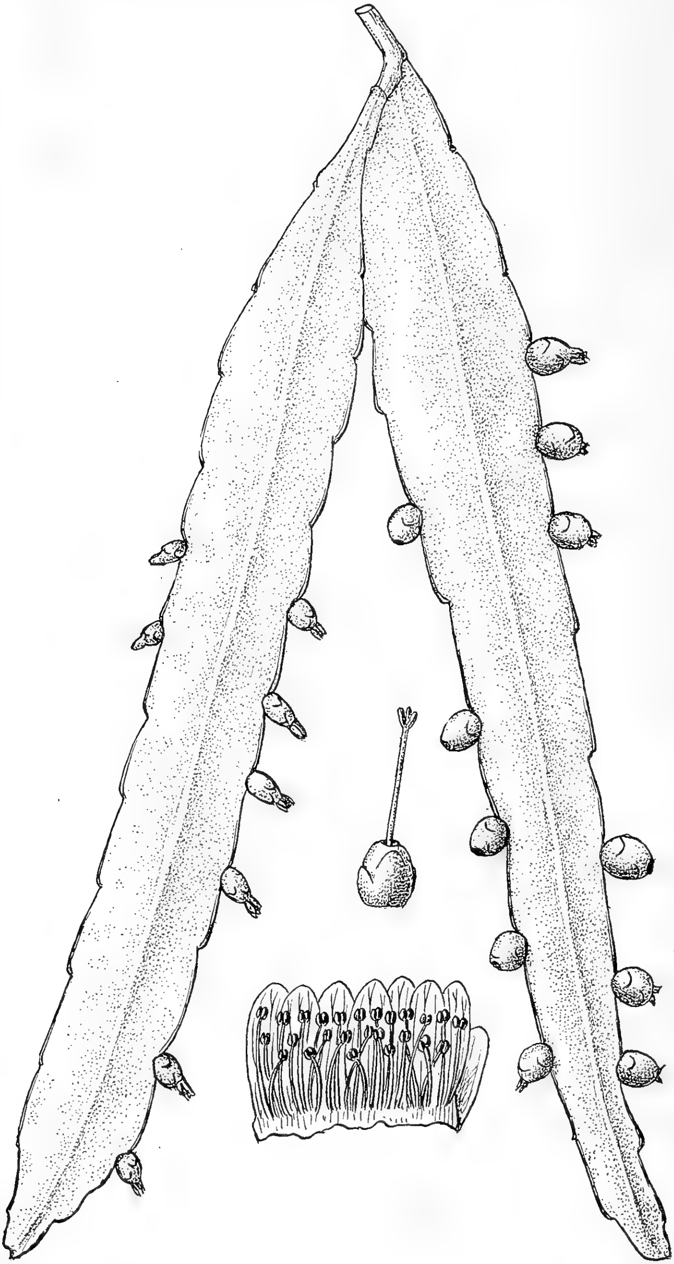

Fig. 3. *Rhipsalis jamaicensis* Britton & Harris.

Jamaica: Woodstock, near Newmarket, Westmoreland (*Britton 1583; Harris 9995*); Belvidere, Hanover (*Harris 7619*); Kempshot, Hanover (*Britton & Hollick 2408*); Mandeville, Manchester (*Britton 3751*). The plant flowers in autumn.

This species has been misinterpreted by authors, commencing with Grisebach (Fl. Br. W. I. 302. 1860) and the name *alatus* applied to the other somewhat similar plant of Jamaica to be described below. I have satisfactorily identified it from Swartz's description, and by the aid of a tracing of a type specimen preserved in the herbarium of the British Museum of Natural History, kindly sent at my request by Mr. A. B. Rendle, and Professor Urban informs me that the Swartz specimen preserved in the Stockholm Herbarium is also certainly this species.

The name *Rhipsalis alata* is to be found incidentally mentioned under *Cereus alatus* in Steudel, Nomencl. ed. 2, **1**: 333, published in 1841, without any description of the plant referred to, and is therefore a hyponym to be disregarded.

3. **Rhipsalis jamaicensis** Britton & Harris, sp. nov.

Pendent from trees, the young shoots quite bristly, the older joints smooth; plant 3–10 dm. long, the main axis angular; joints 1–4 dm. long, 1–2.5 cm. wide, dull green, about 2 mm. thick, the apex bluntish, the base narrowed into a stipe 1–6 cm. long, the margins low-crenate; flowers yellowish green, about 6 mm. long, the petals about 7, oblong to oblanceolate, not very widely expanding, obtusish; ovary oblong, with a few scales; stamens 20–24; style much longer than the three oblong stigmas; berry globose, white, 6–8 mm. in diameter. [Figure 3.]

Jamaica: Troy, Cockpit Country (*Britton 511*, type); vicinity of Troy (*Maxon 2813*); near Montpellier (*E. G. Britton 2863*); Bath to Cuna Cuna Gap (*Britton 3502*).

In "Gesamtbeschreibung der Kakteen.," p. 636, the late Professor Schumann, erroneously describing this plant as *Rhipsalis alata*, refers the Costa Rican *Rhipsalis coriacea* Polak. Linnaea **41**: 562, 1877, to it as a synonym. This species is, perhaps, its closest relative, but after growing the two side by side at the New York Botanical Garden, I am convinced that they are distinct.

Visitors to the New York Botanical Garden will find the collection of *Rhipsalis* in Range 1, House No. 7, of the public conservatories.

NOTES ON THE FLORA OF CENTRAL AND SOUTHERN DELAWARE

By Charles S. Williamson

So little is known of the flora of central and southern Delaware, that the following notes on specimens collected by members of the Philadelphia Botanical Club, during the summers of 1907 and 1908, may be of interest.

The first trip was taken by Messrs. Brown, Van Pelt and B. Long on September 21, 1908. Its purpose was to find a good location for the Symposium of 1909. The vicinities of Townsend and Millsboro were visited.

The Symposium was held at Georgetown, July 4 to 9. The attendance was very small, there being at no time more than five and on the first and last days only two botanists present. There were no formal meetings, but many interesting plants were found.

The afternoon of July 4 was spent on "the Hammock," about two miles east of Georgetown.

Other botanizing grounds visited in the vicinity of Georgetown were, Morris Pond, a large mill dam about eight miles east of our headquarters, Milton and the salt marshes beyond, Laurel and Bethel, Rehoboth, and Ellendale.

On July 20 Messrs. Van Pelt and Long visited Milford and Ellendale and collected many plants that had been overlooked or that were not in bloom on July 9.

On August 20 the same gentlemen, with Mr. E. B. Bartram, made a trip to Middletown and Smyrna, hoping to find *Alnus maritima* within the club limits. In this they were not successful, but they did find several plants that were new to the herbarium.

Finally, on August 29 I revisited several of the localities at which we had collected during the Symposium.

Pinus Strobus L. Rare, observed only east of Milton.

Pinus echinata Mill. Between Georgetown and Laurel.

Pinus taeda L. Abundant everywhere.

Taxodium distichum (L.) L. C. Rich. Between Bethel and Laurel; a number of trees, one at least four feet in diameter. No fruit seen.

Chamaecyparis thyoides (L.) B.S.P. Bethel, Millsboro. Not common.

Potamogeton pulcher Tuckerm. Morris Pond.

Naias gracillima (A. Br.) Morong. Pond north of Rehoboth. Mill pond at Milford.

Erianthus compactus Nash. Hammock east of Georgetown.

Manisuris rugosa (Nutt.) Kuntze. Ellendale; abundant along railroad ditches and in damp meadows. Hammock east of Georgetown.

Andropogon argyraeus Schultes. Dry sand, Rehoboth. Millsboro.

Paspalum plenipilum Nash? Georgetown and Ellendale.

Amphicarpon Amphicarpon (Pursh) Nash. Ellendale, very abundant.

Brachiaria digitarioides (Carpenter) Nash. Millsboro.

Sacciolepis gibba (Ell.) Nash. Borders of pond north of Rehoboth. Millsboro.

Chaetochloa magna (Griseb.) Scrib. Near Smyrna Landing.

Heleochloa schoenoides (L.) Host. Smyrna Landing.

Sporolobus Torreyanus (R. & S.) Nash. Ellendale.

Gymnopogon ambiguus (Mx.) B.S.P. Ellendale.

Eragrostis refracta (Muhl.) Scrib. In water, east of Georgetown.

Cyperus microdontus Torr. In field east of Georgetown. Smyrna Landing.

Cyperus pseudovegetus Steud. Damp soil, Georgetown and Ellendale.

Eleocharis mutata (L.) R. & S. In water, common in eastern Delaware.

Eleocharis Robbinsii Oakes. Morris Pond and Milford.

Eleocharis tortilis (Link) Schultes. In a wood east of Georgetown. Millsboro.

Eleocharis Torreyana Boeckl. Ellendale and Milford.

Eleocharis melanocarpa Torr. Ellendale.

Scirpus subterminalis Torr. Morris Pond.

Rynchospora macrostachya Torr. Milford.

Rynchospora axillaris (Lam.) Britton. Ellendale.

Eriocaulon Parkeri Robinson. Morris Pond, Milford, Rehoboth and Millsboro.

Arisaema pusillum (Peck) Nash. Millsboro.

Juncus repens Michx. Georgetown, Ellendale, and Smyrna, in ditches.

Helonias bullata L. Milford.

Melanthium Virginicum L. East of Georgetown.

Gyrotheca tinctoria (Walt.) Salisb. The Hammock east of Georgetown.

Pogonia diviricata (L.) R.Br. One fruiting specimen found July 21, 1908, at Ellendale in a meadow a few hundred yards east of the town. Rather abundantly in bloom in the same meadow on June 21, 1909.

Tipularia unifolia (Muhl.) B.S.P. Rather common in a woods about two miles east of Georgetown. In full bloom July 5, 1908.

Gyrostachys simplex (A. Gray) Kuntze. Rehoboth; more common than *G. gracilis* (Bigel.) Kuntze.

Gyrostachys praecox (Walt.) Kuntze. Hammock east of Georgetown. Marsh east of Milton.

Blephariglottis lacera (Mx.) Rydberg. The Hammock, Georgetown.

Populus heterophylla L. Townsend.

Myrica cerifera L. Common around ponds.

Hicoria villosa (Sarg.) Ashe. Milton.

Alnus maritima (Marsh.) Muhl. Rather common. Milford (in bloom July 20), Morris Pond. West of Bethel and Millsboro mostly on the borders of ponds.

Castanea pumila (L.) Mill. Near Noxontown Pond, Middletown.

Quercus nigra L. Very abundant everywhere but no fruit seen in 1908.

Quercus Michauxii Nutt. Georgetown.

Polygonum Careyi Olney. Abundant along roadside east of Georgetown.

Polygonum Opelousanum Riddell. Ellendale and Georgetown.

Silene alba Muhl. Near Smyrna Landing.

Cabomba Caroliniana A. Gray. Milford, in stream flowing through the town. Perhaps an escape but very abundant and luxuriant.

Itea Virginia L. Milford.

Prunus angustifolia Mx. Between Milford and Ellendale and at Noxontown Pond.

Cracca spicata (Walt.) Kuntze. Dry roadsides, Georgetown and Laurel.

Stylosanthes riparia Kearney. Near Georgetown.

Meibomia viridiflora (L.) Kuntze. Georgetown, Milford and Van Dyke.

Meibomia stricta (Pursh) Kuntze. Common in dry fields, Milford, Ellendale and Georgetown.

Lespedeza striata (Thunb.) H. & A. Rehoboth and Ellendale.

Lespedeza Stuvei Nutt. Laurel (not in bloom), Rehoboth, in bloom.

Lathyrus myrtifolius Muhl. Near Milton.

Clitoria Mariana L. Along roadside between Milford and Ellendale.

Galactia regularis (L.) B.S.P. Common.

Galactia volubilis (L.) Britton. Georgetown and Laurel, along dry roadsides.

Dolicholus erectus (Walt.) Vail. Georgetown and Laurel, along dry roadsides.

Oxalis corniculata L. Smyrna and Ellendale, along roadsides.

Linum striatum Walt. Leaves all or nearly all alternate, common east of Georgetown.

Polygala cymosa Walt. Very abundant in the hammock east of Georgetown. Along railroad south of Ellendale.

Polygala ramosa Ell. Very abundant in meadow with *Pogonia* and along the railroad east of Ellendale.

Polygala incarnata L. Along roadsides, Georgetown and Rehoboth.

Polygala Mariana Mill. Georgetown and Ellendale, in both damp and dry soil.

Polygala lutea L., *P. cruciata* L., and *P. Nuttallii* were also common.

Crotonopsis linearis Mx. Common in both damp and dry soil, in meadows and in woods at Ellendale and Georgetown.

Rhus Toxicodendron L. Laurel, along roadside.

Kosteletzkya Virginica (L.) A. Gray. Salt marsh east of Milton, Rehoboth.

Hypericum adpressum Bart. Ellendale.

Hypericum virgatum Lam. Very abundant in Ellendale, and in the Hammock, Georgetown.

Triadenum petiolatum (Walt.) Britton. Milford, Morris Pond and Millsboro.

Elatine Americana (Pursh) Arn. Near Noxontown Pond. Some of the plants are very large, forming rosettes eight inches in diameter.

Viola Brittoniana Pollard? Rehoboth, leaves very leathery.

Rhexia aristosa Britton. Abundant in ditches along railroad east of Ellendale.

Ludwigia sphaerocarpa Ell., *L. linearis* Walt. and *L. hirtella* Raf. Abundant at Ellendale and in the Hammock. Georgetown.

Myriophyllum pinnatum (Walt.) B.S.P. Morris Pond.

Hydrocotyle umbellata L. and *H. verticillata* Thunb. Borders of pond south of Rehoboth.

Pyrola secunda L. Milford.

Chronanthus Virginica L. Common.

Sabbatia campanulata (L.) Torr. In the meadow east of Ellendale.

Gentiana puberula Mx.? One clump (not quite in bloom) along railroad south of Ellendale. The rough stems, long calyx and corolla lobes and stamens free, even in the bud seem to designate this species. On the trip of June 21, 1909, a large number of plants, which may be this species, were noted in the meadow with the Pogonia.

Bartonia Virginica (L.) B.S.P. and *B. lanceolata* Small. Ellendale. The latter more common, growing as a twining vine.

Limnanthemum lacunosum (Vent.) Griseb. Rehoboth.

Limnanthemum aquaticum (Walt.) Britton. Morris Pond and Milford.

Apocynum pubescens R. Br. Near Georgetown.

Apocynum Milleri Britton. Bethel.

Asclepias rubra L., *A. decumbens* L., and *A. variegata* L. were found near Georgetown and *A. verticillata* L. at Rehoboth.

Acerates Floridana (Lam.) Hitchc. Along railroad south of Ellendale.

Vincetoxicum hirsutum (Mx.) Britton. Near Noxontown Pond.

Physostegia Virginiana (L.) Benth. Roadside east of Georgetown. Perhaps introduced.

Stachys Atlantica Britton. Ellendale.

Koellia aristata (Mx.) Kuntze. Dry roadsides, Georgetown.

Gratiola sphaerocarpa Ell. Ellendale and Milford.

Gerardia linifolia Nutt. Ellendale, and in the hammock, Georgetown.

Pedicularis lanceolata Mx. Townsend.

Utricularia juncea Vahl. Millsboro.

Utricularia resupinata B. D. Greene. Milford. Abundant. In bloom July 20.

Utricularia inflata Walt. Below the dam Morris Pond.

Utricularia radiata Small. Common in ditches. Georgetown and Ellendale.

Utricularia cleistogama (A. Gray) Britton. In the hammock, Georgetown.

Utricularia fibrosa Walt., *U. gibba* L., *U. subulata* L., and *U. purpurea* Walt., also occurred at Morris Pond. The last was common in the railroad ditches south of Ellendale.

Tecoma radicans (L.) D.C. Common especially at Rehoboth.

Ruellia parviflora (Nees) Britton. Not uncommon on the edges of thickets at Rehoboth.

Oldenlandia uniflora L. Millsboro and Rehoboth. Plants much taller than those found in New Jersey.

Galium pilosum punctulosum (Mx.) T. & G. Sandy roadsides Georgetown.

Viburnum subtomentosum. Near Noxontown Pond.

Lobelia elongata Small? Millsboro.

Lobelia paludosa Nutt. Along railroad east of Ellendale.

Lobelia Canbyi A. Gray. Very abundant at Ellendale and the Hammock at Georgetown.

Lobelia puberula Mx. Georgetown and Ellendale.

Chondrilla juncea L. Smyrna Landing.

Elephantopus nudatus A. Gray. Sandy woods, Georgetown, Rehoboth and Millsboro.

Sclerolepis uniflora (Walt.) Porter. Very common in ditches, Ellendale and the Hammock, Georgetown.

Heterotheca subaxillaris (Lam.) Britt. & Rusby. Millsboro. Very abundant between Georgetown and Laurel. One specimen east of Georgetown.

Boltonia asteroides (L.) L'Her. Ellendale and Georgetown.

Pluchea foetida (L.) B.S.P. One colony in the dune hollows north of Rehoboth.

Coreopsis rosea Nutt. Ellendale, Milford and Rehoboth. Plants smaller than New Jersey specimens.

Senecio tomentosus Mx. Common, Georgetown, Ellendale and Rehoboth.

Carduus Virginianus L. One specimen along roadside east of Georgetown with the *Heterotheca;* perhaps like that plant common further west.

Specimens of all the plants mentioned, except *Carduus Virginianus* L. are deposited in the Herbarium of the Academy of Natural Sciences, Philadelphia.

Girard College.

THE GENERIC NAME WEDELIA

By T. D. A. Cockerell

The receipt of Mr. Standley's admirable revision of the Allionaceae of the United States called up a question as to the propriety of using *Wedelia* as the name of a genus in that family. *Wedelia* Loefl., Iter. Hisp. 180. 1758, is clearly a hyponym, since it includes no named species. According to the Index Kewensis, combinations under *Wedelia* occur in Linn. Syst. ed. 10, 890, but Dr. Barnhart has kindly looked up this reference, and finds that Linné cites Loefling, but does not so much as mention his generic names. In the meanwhile, *Wedelia* Jacq., Enum. Pl. Carib. **8**: 28. 1760, was proposed for a genus of Compositae which is current to-day, with very many species. *Wedelia* Loefl., Reise 240. 1766, had an assigned type, the *Allionia incarnata* L., but this is several years subsequent to Jacquin's publication.

The type of *Allionia* Loefl., L., Syst. ed. 10, 890. 1361 (1759) is *A. violacea* L., as Mr. Standley states. *Wedelia* Loefl., in the Allioniaceae, is thus left nameless, and *Wedeliella* is herewith proposed. The species, with references to the pages of Mr. Standley's work (Contr. U. S. Nat. Herb. XII, part 8, 331 et seq. 1909) are as follows:

Wedeliella cristata: Wedelia cristata Standley, p. 331.

Wedeliella glabra: Wedelia glabra (Choisy) Standley, p. 332.

Wedeliella incarnata: Wedelia incarnata (L.) Kuntze, Standley, p. 332. Type of genus.

Wedeliella incarnata anodonta: Wedelia incarnata anodonta Standley, p. 333.

Wedeliella incarnata villosa: Wedelia incarnata villosa Standley, p. 333.

Wedeliella incarnata nudata: Wedelia incarnata nudata Standley, p. 334.

I am greatly indebted to Dr. N. L. Britton and Dr. J. H. Barnhart for advice and reference.

REVIEWS

Walton's Wild Flowers and Fruits *

This practical guide to the wild flowers and fruits follows the earlier popular books in arranging the plants in color groups. Much time is saved, however, in finding the name of a plant, by the addition of a series of easy and ingenious chart or diagram keys — one for each color group. These keys are based upon such characters as the manner of growth (climbing, upright, etc.) the flower and leaf arrangement, the number of petals, and the presence of thorns. The keys and the flower descriptions are

* Walton, G. L. Practical Guide to the Wild Flowers and Fruits. 12mo. Pp. 198. 1909. J. B. Lippincott Company, Philadelphia. $1.50.

framed in the simplest language ; the glossary itself contains but sixty-one terms, and among these are included such common words as annual, head, herb, and stamens. About four hundred flowers and one hundred fruits are thus simply described in detail sufficient for identification. Provisions are made for those least learned in botanical terms, and it is possible to trace the flowering dogwood successfully, even if the four large white bracts are considered petals — as they often are by the uninitiated. Sometimes it seems as if this simplified method were carried to the extreme ; the flowering dogwood may again be mentioned here, for the keys do not make it possible to find the name if one uses the true flowers, which are surrounded by these white bracts. Objections might also be made to the use of the word sepals for all the perianth parts of some of the Liliaceae. The illustrations add but little to the value of the book, and some (such as the line drawings of the yellow clover, pine sap, and hobblebush) may prove a hindrance.

Yet, these are after all minor points. The book is by far the easiest, simplest, and quickest guide to wild flowers. It is so simple that a child of twelve can readily learn to use the keys and name the common flowers of his neighborhood. The book must also prove a boon to the many people who are interested in plants and their names, but who do not have the time and the patience to work over the somewhat technical keys of our manuals of botany, and to whom simple and compound pistils, placentae, and hypogynous or inferior insertions are insurmountable difficulties. High school pupils should be introduced to this popular key, for it may prove the long-desired connection between the work of the school room and a lasting interest in botany.

Jean Broadhurst.

PROCEEDINGS OF THE CLUB

May 26, 1909

This meeting was held at the museum of the New York Botanical Garden and was called to order at 3 : 30 P. M. by President Rusby. Thirty-four persons were present. After the reading and approval of the minutes of the preceding meeting, the scientific program was presented, the first contribution being made by the president, Dr. H. H. Rusby, who spoke on "The Earliest Spring Flowers in the Vicinity of Charleston, South Carolina."

The speaker's remarks were based on observations made between March 16 and March 23 at Summerville, which is about twenty-two miles northwest of Charleston. This town is located upon a ridge, said to be of limestone and elevated only a few feet above the surrounding flats. Most of the country about is covered with pine timber, but there are numerous low swampy places filled with dense thickets formed of various trees, shrubs, and vines. There is also considerable deciduous forest growth intermingled with the pines. By a careful comparison of the state of vegetation there in March with that of New York and vicinity in May, it was concluded that there was a difference of eight or nine weeks this year in the progress of the season, though it is probable that in an ordinary year the difference would be about seven or eight weeks.

Summerville is noted for the existence there of Dr. Shepard's tea-gardens, the only tea plantation conducted on a commercial scale in this country. There are now about 100 acres of plantation in productive operation there, from which 12,000 to 15,000 pounds of tea are sold annually. Success has been obtained through an extensive series of experiments with all the known varieties of the tea plant. No attempt is made to compete with the Orient in the cheaper grades of tea but in the more highly prized grades, the Summerville product is already taking a leading rank.

The plants collected were discussed and exhibited in groups, the first comprising the earliest-flowering kinds. The yellow jessamine (*Gelsemium*) was everywhere abundant, forming thickets difficult of penetration and loading the air with fragrance. Growing with it were several species of *Smilax*, then sending up their young crisp shoots, which are there known as "wild asparagus" and are said to be used as a substitute for that vegetable. They have large tuberous rhizomes, collectively known as "bamboo brier." Some of the more fleshy starchy kinds of these tuberous rootstocks were used as food by the Indians. One of the early-flowering plants was a bloodroot, segregated by Professor Greene from its northern ally as *Sanguinaria australis*. *Hexastylis arifolia* was rather common on sandy slopes. The close-creeping *Rubus trivialis* grows everywhere along the roadsides, with its handsome large flowers scarcely elevated above the low grass. Two strikingly different Houstonias occur, *H. minor*, which closely resembles *H. caerulea*, and *H. rotundifolia*, which has the habit of *Veronica officinalis*. *Thyrsanthema semiflosculare* (*Chaptalia tomentosa*) was of peculiar interest to the speaker on account of its resemblance to related species which he had collected in tropical America. *Pinguicula lutea* is common on partly shaded wet sand. In similar, though drier places, grew the yellow-flowered *Chrysogonum virginianum*.

The second group of plants discussed included those inhabiting low sandy grounds which are perhaps technically swamps, though usually dry. The most interesting of these plants is the at length climbing and extremely variable *Viorna crispa*, with its beautiful nearly white or light blue somewhat fragrant flowers. Several handsome shrubs are found in this association and also an *Oxalis*, which is apparently *O. Martiana*.

The aquatic and semi-aquatic plants observed included, in part, *Ranunculus hispidus*, *Senecio lobatus*, *Callitriche heterophylla*, *Cardamine pennsylvanica*, and *Sarracenia flava*. The last is abundant in open grassy swamps and gives them a yellow hue when in full bloom.

The shrubs and trees of the region included *Malus coronaria*, always growing singly in swamps, *Amelanchier Botryapium*, *Aronia arbutifolia*, *Ilex glabra*, *Ilex decidua*, and a great abundance of *Myrica cerifera* of very large size. *Viburnum obovatum*, often seen near streams, is known locally as the "possum haw." *Viburnum cassinoides* and *Azalea canescens* were also observed. *Symplocos tinctoria* is very different in habit from the tropical representatives of the genus. A very handsome juniper, of low, broad, cypress-like habit, is perhaps *Juniperus barbadensis*. Doubtless the two most elegant shrubs of the swamps were *Leucothoe axillaris* and *Pieris nitida*, both of which grow in dense clumps, and have dark heavy foliage and an abundance of waxy white flowers. *Vaccinium australe* takes the place there of our *V. corymbosum* and closely resembles that species. Another species, probably *V. tenellum*, was in flower at the time, as were two species of *Prunus*.

Other plants collected were *Silene caroliniana*, *Podophyllum peltatum*, *Linaria canadensis*, and a peculiar and abundant *Trillium*, which is possibly *T. ludovicianum*, though far out of its recorded range, if really belonging with this species.

Dr. Britton, in discussing Dr. Rusby's paper, referred to the popular belief among the fruit-growers of Delaware that the spring advances northward at the rate of thirteen miles a day — a belief that would seem to be supported by Dr. Rusby's observation that there is a difference of seven or eight weeks in the progress of the season between Summerville and New York City.

The second paper on the scientific program was by Dr. J. A. Shafer on "Botanizing in Cuba." The following summary is from an abstract prepared by Dr. Shafer:

"I was landed from a New York steamer at Nuevitas on January 22, and arrived at La Gloria, my first headquarters, late the following evening.

"A chain of islands extends along the north coast of Cuba, from Nuevitas to Cardenas, separated from the mainland by a series of bays and channels forming an inner passage for small sailing craft. Through some sixty-five miles of this one passes mangrove-fringed shores before reaching Port Biaro.

"La Gloria, one of the oldest and most prosperous of the American colonies, is situated four and one-half miles inland from the port above mentioned, across a low palmetto-covered savanna. The village with its surrounding citrus plantations, is situated in a dense, mostly primeval forest composed of a great variety of tropical trees, their tops bound together with many kinds of woody vines and supporting on their trunks and branches many orchids, of which some fifteen or eighteen species were collected — also bromeliads in great numbers and of several varieties; two cactuses are ever present, a creeping snake-like night-blooming *Cereus* and the graceful pendent *Rhipsalis*, called by the colonists "mistletoe." Undershrubs and ferns are few in number and variety, and herbaceous plants are scarce. This wooded region, of very low altitude, here extends about one-fourth of the way across the north and south axis of the island and is separated from the barren, palm-covered savanna to the south by a ridge of limestone hills, known as Sierra Cubitas. The Cubitas Mountains, as these hills are called by the Americans, were visited and the mouth of a grand cavern in the eastern part afforded an ideal place for camping. The hilltops are clothed with about the same species of trees that comprise the forest of the fertile lowlands but they are stunted and less numerous and one at first wonders how any plants could grow on this perforated rock. Epiphytes were less numerous but bromeliads were sufficiently abundant to be used as fodder for our horses in the total absence of suitable grasses. Several depressions, called passes, which in the rainy season are water-courses, are especially interesting, being rich in ferns, peperomias, and various other shade-loving plants.

"One of the objects of this expedition was to ascertain whether the flora of northeastern Cuba had any relation to that of the adjoining Bahamas, which islands have been the subject of extensive floristic investigations by Dr. Britton and others; but in the region just described there seems to be little or no relationship.

"Cayo Guajaba, one of the chain of islands already referred to, none of which seem to have been visited by botanists heretofore, probably on account of the difficulty of access, was examined at several points and was found to possess a very different flora from that of the mainland south of it, many of the species being Bahamian. This island is about fifteen miles long, nearly half as wide, of a limestone formation, and rather rough, its hills probably reaching an altitude of two hundred feet. It is uninhabited save by billions of insects and some wild hogs and deer; a drove of wild horses also is said to exist there, as there is considerable grass upon the island.

"Cayo Sabinal, the largest and easternmost of these islands, appears on some maps as a peninsula; at the present time it is separated by a narrow artificial canal, but its southern side is made up of a series of mangrove islets, which in dry seasons are separated only by salinas. The higher northern portion is of a flat limestone formation, the inner portion covered by a forest of small trees, largely pigeon plum, *Coccolobis laurifolia* Jacq. Poison wood (*Metopium Metopium*) is also very abundant. Interior salinas, which are irregular in outline and of various extent, are usually fringed with *Conocarpus*, much of which is arborescent. Other openings, of red soil, are largely made up of cat's-claw, *Pithecolobium*, and toward the westerly end some very regularly outlined openings, varying from a few feet in diameter to several acres in extent and often containing a pool of fresh water, are occupied almost entirely by large palmettos ; still other openings, small but deeper, support pond-apple, *Anona*, which trees, when the water has subsided sufficiently to expose their short thick trunks, are very grotesque in appearance. At a place near the center of the island large numbers of *Fuscraea* were observed in the dense forest; a thick columnar cactus, often twelve feet high and probably a *Cephalocereus*, was frequently seen but never in large numbers. Several species of palm occurred frequently but no royal palms were seen on any of these islands. The Sabinal was reached from Nuevitas, at which headquarters were made for several weeks, with the aid of an open sail boat, in which two- or three-day trips were taken.

"North of Nuevitas, the railroad to Camagüey passes through many miles of barren palm-covered savannas, through which an occasional stream passes, whose winding course can readily be made out by the fringe of green trees, overtopped by the graceful heads of the royal palm. From Camagüey to Holguin, a distance of about one hundred and fifty miles, one passes alternately through stretches of dry savannas, rich dense woods, or fertile pastures.

"Holguin, of historic as well as commercial importance, is a typical Cuban city of the better type. It is situated on a plateau encircled by a series of irregular mountains of eruptive rock, much burnt over, red and barren to look upon, but when they are examined it is found that the gullies and rocky places are clothed with dense masses of low spiny shrubs, in great variety and unlike most of the things seen in the regions already mentioned. A pretty palm, seen only on these hills, is at times very conspicuous, as is also a columnar cactus; and an *Agave* often occupies the summits. Singularly enough, the largest of the very few trees met with on these hills was a single specimen of mahogany. The surrounding region for several miles is a rocky savanna or palm barren in which but one species of palm, a *Copernicia*, is very abundant. Many of the shrubs of the mountain-sides occur here also and the frequent springs, rich swales, and resultant streamlets are occupied or surrounded by groups of trees, shrubs, and some herbaceous plants not seen elsewhere; these pass on and join broader river valleys, covered with rich woods, royal palm groves or fertile plantations. Flanking these eruptive formations are several series of limestone hills, the intervening valleys being fertile woodland or barren palm-covered savannas.

"Gibara on the coast north of Holguin was visited and the mouth of the bay examined. The flora here as a whole is similar to that of other localities of a like nature, but as in the case of all the others it was found to have some prominent element not seen elsewhere. Here the tall slender stalks of *Papaya Carica* were very peculiar, their small leafy tops high above the surrounding scrub, among which it was sparingly scattered, giving it very much the appearance of tall slender palms noted elsewhere.

"Cacocum and Alto Cedro, stations on the Cuba railway, were given a hurried examination.

"Paoso Estancia, toward Santiago on the Cauto River, was made the last place from which extensive explorations were carried on. The river, which is the largest in Cuba, here passes between high bluffs made up of stratified limestone and clay or sand. It has many turns, with gravelly bars and sandy or muddy banks, and many things can be found here. The surrounding country is a dense forest with a great variety of species; from here, too, one can see the pine-covered tops of the Sierra Nipe, and an interesting but rough region of some fifteen miles is traversed in getting to them. Much of it is a dense forest of very large timber; in all of it is a region in which much of value could be found were sufficient time devoted to it, but my time now was limited and only the Pinales of the mountain tops were given consideration. The pine trees are scattered over a very red earth, said to be good iron ore, and often reach a height of seventy-five feet or more, with trunks two feet in diameter. Among them are a number of peculiar shrubs and a small tree of the huckleberry family, not seen elsewhere. The wiry grass is frequently burnt over, making small herbaceous species, if there were any, seem very scarce.

"Antilla, the new seaport, was reached on the afternoon of the fourth of May, and the next day I crossed to the village of Sartia, situated on the inner east side of the narrow channel to the ocean where a little collecting was done; the next morning both sides of the channel were explored for some distance around the ocean end of both shores. On the western shore I was fortunate in finding several specimens of the large tree cactus already secured by Dr. Britton on the south coast of Cuba. One of them was fully twenty-five feet high with an equal spread, its spiny trunk having a diameter of two feet."

After a discussion of Dr. Shafer's paper by Dr. and Mrs. Britton, Dr. Rusby, and others, adjournment followed.

MARSHALL A. HOWE,
Secretary pro tem.

NOTICE FROM THE FIELD COMMITTEE

Members are urged to verify for themselves the times of departure of the trains given in the circular of meetings for July and August. On July 17, when an excursion to Pocantico Hills was held the time of departure was ten minutes earlier than the advertised time, owing to a recent change in the time-table. Members intending to go on the Belmar trip will have to be guided by any change the railroad company may make in the time-table. If there is any change, the party will take the train that leaves as near as possible to the time advertised in the field meeting circular.

NORMAN TAYLOR,
Chairman.

NEWS ITEMS

Joseph E. Kirkwood, Ph.D., Columbia, 1903, has been appointed assistant professor of forestry and botany in the University of Montana. He was formerly professor of botany in Syracuse University and for a time a botanical investigator for the Continental-Mexican Rubber Company.

Mr. William T. Horne, who was fellow in botany in Columbia University in 1903–'04, has resigned his position as chief of the department of plant pathology of the Cuban Agricultural Experiment Station and has accepted an appointment as assistant professor of plant pathology in the University of California.

Tropical Life announces a prize of fifty pounds sterling for an essay embodying research work directed towards ascertaining exactly what changes (together with their causes and whether these changes occur during the fermentation process only or while being dried) take place in the cacao bean between the time that it leaves the pod until it is shoveled into the bag for export. For further information those interested may address the editor of *Tropical Life*, 112 Fenchurch St., E. C. London.

The joint field meeting of the Vermont Botanical and Bird Clubs was held July 6 and 7, with headquarters at Burlington. The sessions were planned to fit in between the two most important days of the Champlain Tercentenary Celebration. The first day was occupied with an excursion to Ausable Chasm, New York. In the evening a short business meeting was held in the Museum of the University of Vermont. Wednesday morning the party went by trolley to Ethan Allen Park, then tramped through the woods down to Eagle Bay, and along the lake shore back to Burlington. In the afternoon, the party, somewhat reduced in number, visited the very interesting High Bridge region, and the *Woodwardia* pond at Fort Ethan Allen, Colchester. Both days were cool, and such unusual July weather contributed much to the enjoyment of the forty persons in attendance.

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BY

JEAN BROADHURST

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TORREYA

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THE RUBBER PLANTS OF MEXICO*

By H. H. Rusby

Until within a few years, there was but a single known source of commercial rubber in the entire republic of Mexico. Now two species are contributing regular supplies, and a third, to be specially considered here, is likely soon to become a very important factor in this industry. Mexico thus becomes one of the most important of the world's rubber-producing countries.

That other sources remain to be developed is very certain, since the families Euphorbiaceae, Moraceae, and Apocynaceae, which comprise most of the rubber-yielding plants, are abundantly represented in the Mexican flora. The same may be said of the Sapotaceae, the family that yields gutta percha, chicle, and balata.

The first of the rubber-producing plants mentioned above is *Castilla elastica*, the Central American rubber tree known also as the Mexican rubber tree or "hule," in all but recent literature. So abundant is this tree in one locality, that it and its railroad station are known as El Hule. This tree also yields rubber in the West Indian Islands. It is a near relative of the *Ficus*, yielding the East Indian rubber, to which its product bears considerable resemblance. On the other hand, it is not related to the *Hevea*, which yields the superior Para or Amazon rubber. The *Castilla* becomes a large tree, some authors state up to six feet in diameter, and lives to a great age. Owing to the destructive methods of collecting its latex, the exportation of Mexican rubber declined from $160,000 in 1882–3 to $47,000 ten years later, and the government was faced with what threatened to be

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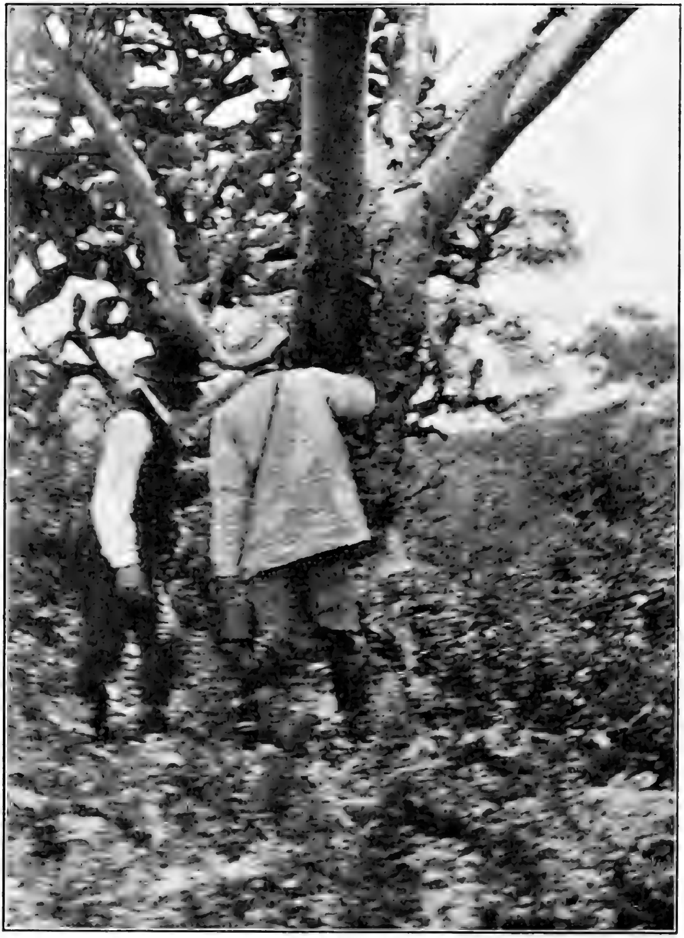
* Abstract of a lecture delivered before the Torrey Club, February 9, 1909. Illustrated with the aid of the Catherine McManes fund.

the practical extermination of the tree. It therefore not only established rules for the method of collection, but offered a handsome subsidy for the planting of the trees. This is one of the most satisfactory of rubber trees for cultivation. It grows well

Collecting milk from a tree that bears more than 40 wounds from previous collections.

up to an altitude of 1,500 feet and requires a well-distributed rainfall of at least 100 inches, and good drainage. The seeds must be planted very soon after collection, as they do not long retain their vitality. At one year old the tree is about three feet high, and collection can commence when it is from five to seven years of age. Although a number of trees can often be found in proximity, the species can by no means be classed as gregarious. The milk, after collection, must be coagulated artificially. This is mostly accomplished by boiling in water, which causes the rubber to separate as a superficial crust; it is then dried and hardened by rolling. The same result is sometimes obtained by merely mixing the milk with water and allowing it to stand. Sea water acts much better than fresh water. Sometimes the coagulation is accomplished by means of adding citric or sulphuric acid. The yield of rubber is nearly one half of the weight of the latex, and the rubber is of only medium quality.

The second variety of rubber to be considered is produced in a region where all the conditions are opposed to those of the well-watered *Castilla* region, namely, the high and dry table-land of the northwestern district. Owing to the high degree of radiation, this region differs also in being subject to a great variation of temperature by day and night, respectively, yet it can be regarded as a hot district. During midday the heat is often extreme. It is excessively dry, the amount of rainfall, even in the short rainy season, being but moderate. Except for some large yuccas, and a few leafless species, trees are almost wanting, and the shrubs are mostly low and stunted. Among these shrubs occurs one which has been described before in TORREYA, namely, *Parthenium argentatum;* it is an important rubber-yielder, and therefore called "guayule," the Indian equivalent for "wild rubber." It is a low shrub of some two or three feet in height, of robust and densely branching habit, and somewhat gregarious. The stem is rarely so thick as the wrist and branches from the base, the branches being rather short and stout. This shrub is of very slow growth, requiring probably forty or fifty years to reach its full size. It is as yet too little known to enable us to say how many years it must grow before it will yield sufficient rubber to be worth harvesting, but this is believed to require fifteen years or more. Little is known about its natural methods of reproduction, but it appears to propagate sparingly, in the desert, from seeds. The prospects for a new crop of rubber within a human generation, when all the shrubs of a district have been uprooted, are therefore very poor. Advantage has been taken of this peculiarity by those engaged in exploiting it, to bring about a monop-



Examining a tree that has been improperly cut. (Dr. Rusby at the left, Dr. Altamirano, Director Nat. Med. Institute of Mexico, at right.)

oly. Having purchased all the most important guayule lands, they offered to purchase the shrubs collected from the outlying districts. The price, at first $10 per ton, has been advanced to

$130, a price so high as to tempt the collectors to uproot it, a process which is certain to exterminate it except on the company's own lands.

When it was first suggested that rubber could be obtained from this shrub, a member of the daisy family, the greatest incredulity was encountered, and the enlisting of capital in the enterprise was a matter of extreme difficulty. At present, the total capitalization of the interests engaged in this enterprise is said to be about $130,000,000, and there is every prospect that even on this great scale, the business will be very profitable.

The collection of this variety is by a method unknown elsewhere in the rubber industry. By it the entire woody portion of the plant is finely ground, and the rubber extracted by liquids from the dust.

The third, and what we may call the new variety of Mexican rubber, is also unique as to its character, and the methods employed in preparing it. It is produced by the *Euphorbia elastica*, and is therefore a near relative of the Para rubber.

This tree inhabits a region intermediate in location and climatic character between those producing the two previously described varieties, namely, the hilly country where the western edge of the table-land breaks down into the coast slope, at an altitude mostly of from 5,000 to 7,000 feet. The climate of this region might be called subtropical. The banana and orange grow here, but only exceptionally produce fruit. Some poor apples are grown and corn is the staple agricultural product. Although there is a long dry season, the rainy season is long enough, and its rains abundant enough, to produce the crops without irrigation, for the most part.

This *Euphorbia* will not grow on the alluvial plains, but only on the rough rocky hillsides, where the drainage is good. Its arborescent associates are Randias, Acacias, Convolvuli, and a number of Cactaceae. It is a gregarious species, the branches often interarching over considerable areas, although many smaller trees and shrubs are intermingled. It is a rather small tree, the trunks usually less than two feet in diameter, and the height usually under fifty feet. Its branches and branchlets are rather few and massive, there being a dearth of fine twigs. It is therefore not very leafy and does not afford much shade. The leaves are mostly crowded at the ends of the branchlets, and are oblong, thick and smooth, and about six inches in length by one to one

A thick growth of Palo Amarillo trees, about 40 to the acre.

and a half in breadth. The bark is thick and rather succulent, at first smooth and of a light or yellowish green color. That of the trunk and large branches soon exfoliates in large, very thin, papery, translucent sheets of an orange-yellow or orange-red color, which impart a shaggy appearance, and a color that has given the tree its vernacular name "palo amarillo," or yellow trunk, which becomes also the commercial name of this variety of rubber. The flowers appear in January, or there-about, before the appearance of the new leaves, and the fruits mature in June and July. The seeds, which are much like those of the castor-oil, contain about 50 per cent. of a fatty oil, which can be pressed out, and is good for soap-making.

As soon as the bark is wounded, a milky juice exudes which is very irritant and capable of producing violent inflammation of the eyes if it enters them, as it is quite liable to do in spattering when the tree is cut. A part of this latex soon coagulates, but the coagulum is soft and curdy, rather than tough and elastic, like that of most rubber milks. Rather more than half of it does not coagulate at all, except as a result of drying out. The coagulated portion contains the rubber, about ten per cent. of the entire weight, but with it there is more than twice as much resin. It is this intimate mixture of resin with the rubber that compels a resort to different processes for the manufacture of this rubber from those which apply elsewhere in the rubber industry. The separation has to be effected by solvents, and by the aid of special machinery. Nevertheless, the cost is inconsiderable, and the business bids fair to be very profitable.

The great value of this tree as a rubber-producer lies in its abundance over large areas, and the proximity of the trees to one another, facilitating collection of the milk, as well as the ease with which it can be propagated, and the rapidity of its growth. All that is necessary for propagation is to thrust the newly cut branches into the soil, where they practicallly all grow. From them the tree reaches its full size in from five to seven years. These considerations appear to justify the opinion that if all other sources of rubber were to fail, this one could probably supply the world's entire requirements.

It may be added that this and several similar species form a peculiar division of the genus which will in all probability be elevated to generic rank. It is said that one known as the "palo colorado," or red trunk, growing in the northern part of the palo amarillo region, and mingled with the latter species, is probably another member of this group.

The properties of the palo amarillo rubber are peculiar. Taken by itself it is of only medium quality, but mixed in suitable proportion with other varieties, especially with Para rubber, it markedly improves them.

TWO NEW FOSSIL PLANTS FROM FLORISSANT, COLORADO*

By T. D. A. Cockerell

Polypodiaceae

Hypolepis coloradensis n. sp.

Pinnules about 2 ½ mm. long, oblong or obtusely subtriangular, connected basally, and bearing two to four large round marginal sori, which as preserved are very dark in color. In general structure and appearance, the plant closely resembles *Hypolepis repens* (L.) Presl, as figured by Shimek in Bull. Lab. Nat. Hist. Univ. Iowa, IV (1897), pl. v, f. 4. The more usual forms of *Hypolepis* have only one or two sori to the pinnule, but no doubt the earlier condition is one in which they are numerous, as in *Adiantum.*

Habitat. — Miocene shales of Florissant, Station 14; fragments only. The genus is to-day common in the West Indies and Central America.

Caesalpiniaceae

Bauhinia pseudocotyledon n. sp.

Leaf circular in outline, or nearly so, 16 mm. long and 18 broad, as preserved dark in color, apparently thick; the median sinus about 6 mm. long, its sides, except apically, very close together; venation indistinct, but with a lens it is possible to see clearly a mid-vein running to the sinus, and two strong laterals, as shown in the figure; petiole short, about 2 mm., twisted to one side. From its dark color, apparent thickness, and obscure venation, I thought at first that this was a cotyledon, probably of *Ipomoea*, possibly of some Sterculiaceous plant related to *Pentapetes.* A closer scrutiny shows, however, that the venation will not accord with these. In the seedlings there appears to be

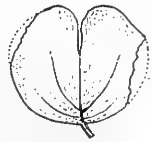
* Illustrated with the aid of the Catherine McManes fund.

morphologically no mid-vein, and when one is present it consists of the two inner laterals united, which diverge before reaching the sinus. All this is quite different from the condition in *Bauhinia*, with which the fossil accords.

Habitat. — Miocene shales of Florissant, 1908. The genus occurs as far back as the Cretaceous (cf. Berry, TORREYA 8 : 218).

I have sometimes remarked on the absence of Neotropical elements in the Florissant shales. The two plants now described

Hypolepis coloradensis Ckll.



Bauhinia pseudocotyledon Ckll.

are apparent exceptions to this, but I believe that they did not invade North America from the south, but belong to a flora which formerly flourished in the north, and has now been pushed southward by changes in the climate. What I mean when I speak of the absence of Neotropical elements at Florissant, is that I do not find genera or families which there is reason to believe *originated* in South America. Dr. Knowlton, in his interesting discussion of the Tertiary flora of the Yellowstone (Monog. U. S. Geol. Surv. XXXII, pt. 2, p. 778) remarks that "the Tertiary flora appears to have originated in the south, while the present flora is evidently of more northern origin." I think that on the contrary, there is much reason for thinking that the Tertiary flora originated in the north, and has (so far as it has survived), to a considerable extent, since *travelled south.* (For a discussion of the same question as applied to animals, see *Nature*, Aug. 6, 1908, p. 318.)

UNIVERSITY OF COLORADO

ADDITIONS TO THE FLORA OF THE BLACK HILLS OF SOUTH DAKOTA

By Stephen Sargent Visher

During the first half of August, 1908, a collection of about three hundred species of the ferns and flowering plants of the northern Black Hills was made for the State Museum. Upon reference to Saunders' Ferns and Flowering Plants of South Dakota[1] and to Rydberg's Flora of the Black Hills[2], it is believed that some eight species are new to the state; some eight additional new to the Hills, though known from the eastern part of the state; five are recorded from the northern part of the Hills for the first time, though they were collected near Custer in the southern part; and five more rare species are mentioned from new localities in the hills. In the list the species believed to be new to the state are indicated by an asterisk, those known from other parts of the state are followed by (eastern) if from the eastern part, or by (Custer), (Lead), etc., if from other localities in the Hills.

The collection was identified with the kind assistance of Dr. J. M. Greenman at the Field Museum of Natural History, Chicago.

Woodsia scopulina D. C. Eaton. Rocky Mountain Woodsia.

This fern was found to be quite abundant in protected niches in rocks near Roubaix. (Rare in Black Hills.)

Pteris aquilina L. Bracken fern.

Locally abundant in woods on Custer's Peak. (Custer.)

Eleocharis intermedia (Muhl.) Schultes. Matted spike-rush.

Common on moist ground near Rapid City. (Eastern.)

* *Scirpus Torreyi* Olney. Torrey's bullrush.

Common in marsh near Roubiax.

* *Juncus balticus* Willd. Baltic rush.

Rare, Rapid City.

* *Juncus acuminatus* Michx. Rush.

Rare, in marsh, Rapid City.

[1] D. A. Saunders, Bulletin 64, U. S. Experiment Station, South Dakota.

[2] P. A. Rydberg, Contrib. U. S. Nat. Herb. **3**: 463–536. *pl. 17–20.* 1896.

Juncus xiphioides montanus Engelm.

Found in Spearfish Canyon. (Custer.)

* *Salix Scoulerana* Barrett. Scouler willow.

Frequent, forming trees, in deep woods, well up on Custer's Peak.

* *Alsine longipes laeta* Watson.

On hills south of Rapid City.

Sanguinaria canadensis L. Bloodroot.

Abundant in the shady gulches near Whitewood. (North-eastern.)

Melilotus alba Desr. White clover.

M. officinalis (L.) Lam. Sweet clover.

Both of these clovers are now extensively naturalized near Rapid. (Eastern.)

Hedysarum americanum (Michx.) Britton. Hedysarum.

Also near Roubaix. (Rockford.)

* *Ceanothus ovatus* Desf. Oval-leaved red-root.

Abundant in woods near Whitewood. Although this and the next are recorded by Rydberg, they are not included in the catalogue.

Vitis vulpina L. Riverside grape.

Common near Roubaix. (Eastern.)

Malva rotundifolia L. Cheese mallow.

Naturalized near Rapid City. (Eastern.)

Viola arenaria DC. Sand violet.

Abundant on rocks near Bucks and in Spearfish Canyon. (Rapid.)

Pastinaca sativa L. Wild parsnip.

Escaped in Box-elder Canyon. (Rapid.)

Pyrola rotundifolia L. Round-leaved wintergreen.

In wooded ravines near Whitewood. (Lead.)

Pterospora andromedea Nutt. Pine drops.

Abundant in woods on Custer's Peak and in Spearfish Canyon. (Rapid.)

Dodecatheon Meadia pauciflorum Durand. Shooting star.

Rare, on hills. Rapid City. (Custer.)

Stachys aspera Michx. Rough hedge nettle.

On moist ground in Box-elder Canyon. (Custer.)

Mimulus luteus L. Yellow monkey-flower.

Abundant on a springy slope in Elk Canyon. (Lead.)

Symphoricarpos occidentalis Hook. Wolfberry.

Frequent along Box-elder Creek, on plain near Underwood. (Eastern.)

* *Lonicera utahensis* Watson. Low honeysuckle.

Rare, on deep cool woods in Elk Canyon near Runkle.

Sicyos angulatus L. Burr cucumber.

In thickets along Rapid Creek near Rapid. (Eastern.)

Erigeron annuus (L.) Pers. Sweet scabious.

Common in "Red Valley" near Blackhawk. (Eastern.)

* *Arnica pumila* Rydberg.

Fairly common on dry slopes west of Rapid City and near Mystic.

CARNEGIE LABORATORY, TUCSON, ARIZONA

THE 1909 SYMPOSIUM AT STAMFORD, NEW YORK

From the point of view of the specimen hunter, the symposium held this year at Stamford, Delaware County, July 3–10, will not be considered a successful event as the number of "rare finds" readily accessible was scanty. From the view-point of those interested in ecologic and phytogeographical problems the week spent in the mountains will be remembered with pleasure.

Generally speaking the area covered during the week is the northwestern outpost of that part of the Catskills which lies within the range prescribed by the club's preliminary catalog of 1888. The town itself is about 1,800 feet above sea-level, and it is nestled in a natural basin. The depression is fringed with mountains, the highest of which is Mt. Utsayantha, credited with an elevation of 3,365 feet. Within three miles of the town the headwaters of the western branch of the Delaware river take their origin, and as it runs through the town the stream is scarcely more than a tiny brook. In this same height of land, but flowing in the opposite direction, the headwaters of Schoharie creek originate. This ultimately flows into the Hudson, via the Mohawk.

The club herbarium contains practically no material from Delaware County. And the percentage of plants which may be expected to grow in this region and do not, and those which grow contrary to expectation, is wholly conjectural. During the week spent in the area, and through the kind coöperation of the members attending the meeting a collection of the flowering plants was secured which may be considered fairly representative of the flora at that time. Dr. Philip Dowell did much discriminating in the collection of hybrid ferns, and as the country about Stamford is particularly rich in these interesting plants, much valuable information on the subject will be preserved as a permanent record.

It is not possible at this time to publish the determinations of the plants collected during the week, but following out the notice printed in TORREYA for June, whatever of special interest may turn up in the collection will be commented upon later. There was a rather slender attendance at the symposium.

NORMAN TAYLOR

NEW YORK BOTANICAL GARDEN

OUR CITY PARKS IN THE HUDSON–FULTON CELEBRATION

THE BOTANICAL GARDEN, BRONX PARK *

In coöperation with the Hudson-Fulton Celebration Commission, specimens of all the native trees of the Hudson River Valley growing in the grounds of the New York Botanical Garden will be marked temporarily with a large letter "H." Inasmuch as nearly all the wild trees of the valley are growing within the grounds, either wild there, or planted in the arboretum and along the driveways, this illustration of the trees which might have been seen by Hudson and his company in 1609 will be nearly complete. While the number of individuals of most kinds in the Hudson Valley has been greatly reduced by clearing land for cultivation and by lumbering operations, it is not likely that any species native to the valley has been exterminated within its bounds.

* Reprinted by permission from the *Journal of the New York Botanical Garden* for August, 1909.

Another feature will be a Guide Book to the grounds, buildings and collections of the Garden to which will be appended a descriptive list of the native trees of the Hudson River Valley written by Mr. Norman Taylor, an assistant curator; this list will give a short popular account of each of the kinds of trees and a number of them will be illustrated by reproductions of photographs. This document will be issued as a Bulletin of the Garden and distributed to all members and to all institutions with which the Garden has exchange arrangements.

The question has been asked if any of the large trees of the Hudson River Valley were in existence in 1609. The most likely illustrations of this are the large white oaks (*Quercus alba*) which are found in many places, some of them approximating four feet in trunk diameter, or perhaps even larger. The slow growth of this tree after its first hundred years of life would make it probable that some of these monsters were at least saplings before the end of the sixteenth century. The average increase in diameter of the white oak as calculated from the thickness of annual wood rings of trees cut on Staten Island some years ago, is 0.18 inch up to the age of 47 years. Subsequently, the layer of wood annually laid on is much thinner. Observations on the largest white oak within the grounds of the Garden, growing in the woods south of the Museum Building along the path leading to the waterfall near a cluster of sweet birches show that its circumference, measured July 30, 1909, at four feet above the ground, is 11 feet and 2 inches; its diameter is, therefore, about 42½ inches and its radius 24¼ inches; allowing for the thickness of the bark the radius of wood is about 20 inches. A little piece was taken out from the side of this tree with a sharp chisel and the wound made carefully covered with tar. The number of wood layers to the inch as revealed by this experiment is 16, the average thickness of the layers being thus 0.062 inch. From these observations and other data it is estimated that the average thickness of the annual wood layer of the white oak in trunks up to 42½ inches in diameter is approximately 0.09 inch, which would indicate that this individual tree is about 220 years old. It would, therefore, seem that white oaks with a wood-radius of from 25 to 27 inches would be 300 years old.

A third feature of the coöperation will be an illustrated lecture on the native trees of the Hudson River Valley to be delivered at the Museum Building of the Garden on the afternoon of Saturday, October 30, at four o'clock.

N. L. Britton

BOROUGHS OF BROOKLYN AND QUEENS *

Through the courtesy of Commissioner Michael J. Kennedy, the different species of trees have been labeled in Prospect Park, from the Plaza to the Willink Entrance; in Bedford Park; in Highland Park, and in Tompkins Park. An additional small enameled sign has been hung on those labeled trees that were indigenous to the Hudson River Valley in 1609. The special label reads: "This species is a native of the Hudson River Valley."

TORREY BOTANICAL CLUB FIELD MEETINGS

The field committee will hold no meetings on September 25 or October 2, on account of the Hudson-Fulton Celebration.

October 9. — Special excursion for fungi. — Party will meet at museum building of the Botanical Garden at 2 p. m., where they will be met by the guide, Dr. W. A. Murrill.

October 16, Fort Lee to Hackensack, N. J. — Party will meet at the west 130th Street Ferry at 3 p. m. Return as desired. Guide, Miss Broadhurst. Cost of trip, 20 cents.

October 23. — Special excursion for fungi. Party will meet at the Jerome Avenue entrance to Woodlawn Cemetery at 2 p. m., where they will be met by the guide, Mr. F. J. Seaver. Cost of trip, about 20 cents.

October 30, Wingdale, N. Y. — Train leaves Lexington Avenue Station (N. Y. Central, Harlem Division), at 8:52 a. m. Returning train leaves at 4:36 p. m. Bring lunch. Cost of trip, $3.25. Guide, Mr. Taylor.

* Reprinted from the announcement prepared by the committee on science, history and art of the Hudson-Fulton celebration commission.

Note. — Members are urged to verify times of departure of trains owing to possible changes in time-tables. The excursion on October 30 will be the last of the season.

THE FIELD COMMITTEE,
NORMAN TAYLOR, Chairman

OF INTEREST TO TEACHERS

INSTRUCTIONS FOR RECORDING OBSERVATIONS ON FOREST TREES

Under the direction of the chief forester, Mr. Pinchot, the government Forest Service has issued a leaflet of instructions for recording observations on the leafing, flowering, and fruiting of forest trees. A sample sheet (form 416) is reproduced below. These are obtainable at the forestry department and should appeal to many now occupied in a desultory observation of the seasonal changes. In the schools, the flower, leaf, and fruit charts and records kept by some teachers would gain an added interest if these sheets were used, and the pupils knew of the government's recognition of the practical value of such work.

Form 416.

SPECIES ....

Period covered by observations..

Name of observer..

Residence..
(State) (County) (Town)

General character of country. — *Mountains ; foothills ; plains ; river valley; seacoast.*

Situation of trees. — *Level; slope* (*north, east, west, south*) *; hilltop ; river bottom ; soil* (*sandy, clayey, heavy, light, deep, shallow, moist, dry*).

(Please check the words which apply to your particular locality and to the trees observed.)

Approximate elevation above sea level..

Location of nearest Weather Bureau station...

State if season was wet or dry, early or late, etc. ....

	Date		Date
1. *Swelling of buds*	....	8. *Beginning of leaf falling*	....
2. *Bursting of buds*	....	9. *Ending of leaf falling*	....
3. *Beginning of leafing out*	....	10. *Beginning of seed ripening*	....
4. *General leafing out*	....	11. *General seed ripening*	....
5. *Beginning of blossoming*	....	12. *Beginning of seed falling*	....
6. *General blossoming*	....	13. *General seed falling*	....
7. *Change in color of foliage*	....		....

14. *Quantity of seed* ....

15. *Quality of seed* ....

General remarks ....

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Professor W. W. Rowlee of Cornell University has been appointed chief examiner in botany on the college entrance examination board for next year.

A large collection of desert plants is still on exhibition in front of the main entrance to the Bronx Park conservatories. Those who have not yet seen this unusual garden will be surprised at the brilliant flowers exhibited by some of the plants. One of the so-called "century-plants" is also in bloom, bearing a flower stalk nearly twenty feet tall.

NEWS ITEMS

Dr. N. L. Britton left New York August 18 on the *Lusitania*, for a short visit to England.

Mr. W. W. Eggleston has recently completed a month's collecting trip in western Kentucky.

Georgia has appropriated $10,000 for educational work at farmers' institutes in the state.

A new agricultural college and research institute has been opened at Coimbatore in British India.

John Putnam Helyar (B.S. Vermont, 1909) has been appointed instructor in botany in the University of Vermont.

Dr. W. A. Murrill of the New York Botanical Garden spent July collecting mushrooms in Virginia.

Professor Winthrop John VanLeuven Osterhout (A.B. Brown, 1893; Ph.D. California, 1899), of the University of California, has accepted a call to Harvard as assistant professor of botany.

Professor Emil Hansen, the physiological botanist, died in August, at the age of sixty-seven. Professor Hansen was best known for his work on microörganisms and alcoholic ferments.

Mr. Charles Louis Pollard, chief curator of the Museum of the Staten Island Association of Arts and Sciences, and Mr. George P. Englehardt, of the Brooklyn Children's Museum, have returned from a collecting trip in North Carolina.

Benjamin F. Lutman (A.B. Missouri, 1906; Ph.D. Wisconsin, 1909), recently assistant in botany in the University of Wisconsin, has accepted a position as assistant botanist in the Vermont Experiment Station.

The new College of Agriculture of the University of the Philippines, opened June last with a registration of about sixty. E. B. Copeland is dean and professor of botany; H. Cuzner is professsor of agronomy.

Edward Murray East (B.S. Illinois, 1900; Ph.D. Illinois, 1907), of the Connecticut Experiment Station, New Haven, has been appointed assistant professor of experimental plant morphology in Harvard University.

Burton Edward Livingston (B.S. Michigan, 1898; Ph.D. Chicago, 1901), of the department of botanical research of the Carnegie Institution of Washington, has accepted an appointment as professor of plant physiology in Johns Hopkins University.

Miss Winifred J. Robinson of Vassar College has just returned from the Hawaiian Islands where she spent the summer collecting ferns. The larger islands were visited and extensive collections were made, special attention being paid to the tree ferns.

Marshall Baxter Cummings (B.S. Vermont, 1901 ; Ph.D. Cornell, 1909), recently assistant in horticulture at Cornell, has been appointed professor of horticulture in the University of Vermont to succeed Professor William Stuart, who goes to the Department of Agriculture in Washington.

Among the delegates sent by various American colleges and universities to the Cambridge (England) Darwin Celebration were the following botanists: Professor W. G. Farlow, American Academy of Arts and Sciences, Boston, Professor J. M. Coulter, University of Chicago, and Mr. C. F. Cox, president of the New York Academy of Sciences.

Dr. J. L. Coulter, professor of agricultural economics in the University of Minnesota, Dr. H. C. Taylor, professor of economics in the University of Wisconsin, and Dr. C. F. Warren, Jr., professor of farm management in Cornell University, have been asked by Dr. E. D. Durand, the census director, to coöperate with him in work on the census schedules.

The University of Wisconsin has created a new department of plant pathology, and has appointed as professor in charge Dr. Lewis Ralph Jones of the University of Vermont. Professor Jones is a native of Wisconsin and after studying at Ripon College, was graduated from the University of Michigan, Ph.B., 1889, Ph.D., 1904; he came to the department of natural history in the University of Vermont in 1889, and has been professor of botany since 1893, and botanist of the Vermont Experiment Station since 1890. During this period he has carried on research work in the bureau of plant industry in Washington, and in Europe. In addition to gaining a high reputation as a teacher, he has occupied a field of wide service in Vermont in developing the work of the Vermont Botanical Club and the state forestry department, in securing for the University the Pringle Herbarium with Dr. Pringle as a curator, and recently in organizing a new department of teaching. As a public-spirited citizen and as an instructor he holds a secure position in the esteem and affection of the students and the people of the state. Professor Jones will remain in Burlington until January, and enter on the work of his new appointment at the beginning of the second semester.

Lectures will be delivered in the lecture-hall of the Museum Building of the Garden, Bronx Park, on Saturday afternoons, at four o'clock, as follows:

Sept. 25. "Native Trees of the Hudson River Valley," by Dr. N. L. Britton.

Oct. 2. "Some Floral and Scenic Features of Porto Rico," by Dr. M. A. Howe.

Oct. 9. "The Flora of the Upper Delaware Valley," by Mr. George V. Nash.

Oct. 16. "Collecting Fungi at Mountain Lake, Virginia," by Dr. W. A. Murrill.

Oct. 23. "Autumnal Wild Flowers," by Dr. N. L. Britton.

Oct. 30. "Some Plant Diseases: Their Cause and Treatment," by Mr. Fred J. Seaver.

Nov. 6. "The Reclamation of the Desert in San Bernardino Valley, California," by Dr. H. H. Rusby.

Nov. 13. "The Hudson River Valley before the Advent of Man," by Dr. Arthur Hollick.

The lectures will be illustrated by lantern-slides and otherwise. They will close in time for auditors to take the 5:34 train from the Botanical Garden Station, arriving at Grand Central Station at 6:03 P. M.

The museum building is reached by the Harlem Division of the New York Central and Hudson River Railway to Botanical Garden Station, by trolley cars to Bedford Park, or by the Third Avenue Elevated Railway to Botanical Garden, Bronx Park. Visitors coming by the Subway change to the Elevated Railway at 149th Street and Third Avenue.

OTHER PUBLICATIONS

OF THE

TORREY BOTANICAL CLUB

(1) BULLETIN

A monthly journal devoted to general botany, established 1870. Vol. 35 published in 1908, contained 608 pages of text and 40 full-page plates. Price $3.00 per annum. For Europe, 14 shillings. Dulau & Co., 37 Soho Square, London, are agents for England.

Of former volumes, only 24-34 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. 28–35 three dollars each.

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

(2) MEMOIRS

The MEMOIRS, established 1889, are published at irregular intervals. Volumes 1–11 and 13 are now completed; Nos. 1 and 2 of Vol. 12 and No. 1 of Vol. 14 have 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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NEW YORK CITY

Vol. 9 October, 1909 No. 10

TORREYA

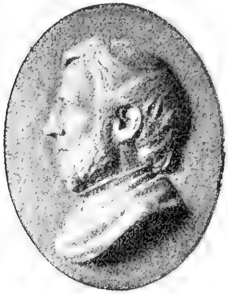
A Monthly Journal of Botanical Notes and News

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

JEAN BROADHURST



JOHN TORREY, 1796–1873

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TORREYA

October, 1909

Vol. 9 No. 10

STUDIES IN THE OPHIOGLOSSACEAE — III: KEY TO BOTRYCHIUM IN NORTH AMERICA: GROUP OF B. TERNATUM

By Ralph Curtiss Benedict

The present paper is in completion of the series begun about a year ago, when keys to *Ophioglossum* in the United States and to the *lanceolatum* group of *Botrychium* for all North America were published. As was the case in those keys, the present key includes some forms which may not deserve recognition as species, but which are included in the hope that more information may be forthcoming as to their status. Some of the characters given here may prove inconstant, and the forms distinguished by them would then need to be reduced, but on the other hand, further field study may bring to light additional reasons for regarding others as distinct.

It is scarcely necessary to call attention to the fact that our present knowledge of these plants is almost entirely due to Dr. Underwood's pioneer work with them. This is true whether or not one accepts his conception of species, since there can be no question that he has indicated the more distinctive forms, whatever standing they may eventually be accorded. The recognition accorded them in the present treatment is based on a study of a large amount of material, and, I believe, will be found to be justified by the facts at hand.

In order that the group may be treated here as completely as were the other two, the characters by which it is to be distinguished from the *lanceolatum* group are reprinted from the second paper as follows:

"Group of *B. ternatum:* Bud hairy, common stalk hypogean,

[No. 9, Vol. 9, of Torreya, comprising pages 177–196, was issued September 27, 1909.]

short, usually less than one-quarter the height of the plant: spores maturing from July to October (three exceptions)." (*Sceptridium* Lyon.)

The following are included in the key: *B. obliquum*, *B. dissectum*, *B. silaifolium*, *B. californicum*, *B. decompositum*, *B. Coulteri*, *B. Schaffneri*, *B. Matricariae*, *B. pusillum*, *B. biternatum*, *B. Jenmani*, *B. alabamense*, *B. Underwoodianum*.

The above order is probably about as near an approach to a natural order as can be devised for so complex a group. The main divisions are for the most part as indicated in the key which follows:

Segments more or less deeply lacerate into linear often forking teeth (Vermont, Massachusetts, and Long Island, west to Indiana and south to Virginia and Kentucky).
2. *B. dissectum* Spreng.

Segments entire, crenulate or serrulate, not deeply divided.

- Tips of the penultimate divisions elongate, much larger than the lateral segments (New England to Wisconsin, south to Alabama and Arkansas, also in Jamaica).
1. *B. obliquum* Mühl.
- Tips of the penultimate divisions ovate to deltoid or fan-shaped to reniform, usually about as broad as long, the lateral segments mostly similar in shape and size.
  - Segments mostly acute or acutish (Northern and Western States, Mexico).
    - Plants usually rather large, lamina 7–20 cm. long, 10–30 cm. broad.
      - Lamina stalk usually 5 cm. or more long, plant not excessively fleshy, often very slender.
        - Segments mostly 5–45 mm. long, 2–20 mm. broad, few smaller.
          - Spores maturing from July to September.
            - Segments mostly oblong to ovate, margins crenulate or only coarsely serrulate (North Atlantic States and westward, Alaska to California).
3. *B. silaifolium* Presl.
            - Segments narrower, cuneiform, oblong or lanceolate, outer margins mostly sharply and finely serrulate (Mexico). 4. *B. decompositum* Mort et Gal.
          - Spores maturing from May to June, segments mostly elliptic to rhombic, expanded, plants lax (California).
5. *B californicum* Underwood.
        - Segments all small, 2–5 mm. long, 1–5 mm. broad (Mexico),
6. *B. Schaffneri* Underwood.
      - Lamina stalk short, 1–4 cm. long, plant very stout and fleshy (Montana and Wyoming to Oregon). 7. *B. Coulteri* Underwood.
    - Plants normally smaller, lamina 2–4.5 cm. long, 3–7 cm. broad.
      - Lamina stalk not more than 2 cm. long, plants stout (Mexico).
8. *B. pusillum* Underwood.

Lamina stalk 2–8 cm. long (Northern States).

9. *B. Matricariae* (Schrank) Spreng.

Segments mostly rounded apically, cuneiform to lunulate (Southern States and Jamaica).

Spores maturing from February to April.

Bud with a few scattered hairs, lamina sessile or nearly so, segments mostly fan-shaped (Southern States).

10. *B. biternatum* (Lam.) Underw.

Bud densely hairy, lamina stalked, segments mostly oval or ovate (Jamaica). 11. *B. Jenmani* Underwood.

Spores maturing from July to October.

Plants slender, lax, segments cuneiform to lunulate (Southern States). 12. *B. alabamense* Maxon.

Plants rather stout, segments spatulate to ovate (Jamaica).

13. *B. Underwoodianum* Maxon.

Form differentiation in the group seems to correspond in most cases to the broader differences in climatic conditions as is indicated by the distribution accredited to some of the associated species. This differentiation, however, has apparently not proceeded exactly the same in different groups. *B. obliquum*, as recognized here, includes both the northern *B. obliquum* (in a more limited sense), the southern *B. tenuifolium*, and a Jamaican plant. The first two comprise extremes differing sharply from each other,* but which appear to be connected by all manner of intermediates in form and distribution. For the Jamaican plant I have been able to find no constant differences other than size.

In the *B. silaifolium* line on the other hand, not only are the extremes in form distinctly marked, but there seems to be a discontinuity in distribution as well, and no real intermediates are known. The line includes six forms in the eastern region. In the north are *B. silaifolium* (*B. obliquum* v. *intermedium* of authors), and *B. Matricariae*, the latter perhaps only a local alpine adaptation. In the Southern States we have *B. biternatum* and *B. alabamense*, differing both in form and in time of fruiting, and in Jamaica the parallel pair *B. Jenmani* and *B. Underwoodianum*. Further collections, for example in Cuba, may complicate the synopsis of these plants, but at present they seem very deservedly distinct.

* *B. obliquum*: segments somewhat contracted, the margins revolute, obscurely crenulate.

B. tenuifoliam Underwood: segments expanded, thin, the margins plane, sharply serrulate or denticulate.

B. dissectum is of very doubtful validity and is probably to be associated with *B. obliquum*. *B. silaifolium* does not seem to develop the *dissectum* form. Gilbert's var. *oneidense* is a peculiar form * which seems to belong with *B. obliquum* although not typical.

The western forms are not nearly as well known as the eastern ones. More complete material may modify their grouping considerably, either by reducing their number, or possibly even by adding to it. Additional material is greatly to be desired with such notes as habitat, time of fruiting, and altitude.

New York Botanical Garden

SEEDLINGS AND ADVENTITIOUS PLANTS OF DROSERA

By Robert Greenleaf Leavitt

In Torreya for May, 1909, Miss Winifred Robinson published some interesting notes on bud-derived individuals of *Drosera rotundifolia* L.; the extraordinary growths springing from upper leaf surfaces while the leaves were still in organic union with the parent plant, and arising even from a flower stalk which had been broken off. References were also made to the literature of the subject; Nitschke's description of seedlings of the above species was cited. The conclusion is reached (p. 95) that "in each species except *D. binata* the first leaves [of adventive plants] resemble those of the adult." It is inferred (p. 89) that seedling foliage of *D. rotundifolia* is different from that of adventives.

Formerly I had for several years various species of *Drosera* in cultivation, raising seedlings or adventives, and often both, from the following species: *D. rotundifolia* L., *D. capillaris* Poir., *D. brevifolia* Pursh, *D. intermedia* Hayne, *D. linearis* Goldie, *D. filiformis* Rafin., *D. filiformis* var. *Tracyi* McFarl., *D. capensis* L., *D. indica* L. and *D. binata* Labill. (with *D. dichotoma* Banks & Solander, if this is distinct). I have seedlings of *D. uniflora* Willd. of Chile. Stages which might be termed adolescent, or

* Penultimate divisions broad, oblong (narrow and lanceolate in typical *obliquum*), the tips broad, usually rounded or blunt, the segments full, the margins plane, more or less finely and irregularly crenulate or bluntly denticulate. (Known from Massachusetts to Illinois.)

perhaps even nepionic, were found on herbarium specimens of other species.

With regard to seedlings of *D. rotundifolia*, of which I have examined many specimens, it seems to me that Nitschke's report is not at all representative. His examination was evidently incidental and the description is cursory. I have found the first foliage leaf blade circular, the five marginal tentacles provided with glands, the disc glands five, the whole entirely Droseraceous. The earliest foliage differs from that of the adult in size, in number and complexity of tentacles, but in no other essential respect that I can see.

When the seed has fallen far down in the moss and the seedling has struggled up to the light, defective leaves may be expected, due to poor illumination. Such were probably those found by Nitschke.

The first leaves of adventives differ, in my observation, only in being more advanced as regards size of blade and number and complexity of tentacles. Their more progressive condition is doubtless due to better food supplies. Were one to experiment with smaller and smaller leaves as sources of adventives, probably the tentacles could be carried back to the stage found in seedlings.

Goebel's observations on *D. binata* (cited p. 94) give rise to the question whether the early rotund leaves of this curious Australian species — the mature leaves of which are sometimes more than a foot high, and as many as six-pronged — may not be near the original form in the genus. I have sought to answer this question from a rather careful survey of the (about) eighty-five species in the genus, from the geographical distribution of the various types of leaf figure, and from a study of developmental stages. The whole matter is palpably speculative. By far the most probable supposition is, however, that a roundish blade was the original type, from which on one side came the elongated forms like *D. filiformis*, and from which on the other came the auriculate leaves of the section Ergaleium, and the "two-forked" one of *D. binata*.*

* See Reversionary Stages Experimentally Induced in *Drosera intermedia*, Rhodora 5 : 265 (1903).

It is rather interesting to find that Darwin considered this question, and made a diametrically opposite guess. He thought *D. binata* primitive, and the original type of leaf in *Drosera* as elongated.* He did not perceive that these two suppositions are incompatible. The so-called "two-forked" leaf of *D. binata* is not forked — except in the variety *D. dichotoma*, where the lateral arms are often once or twice branched — but the prongs of the leaf are really upturned extremities of an enormously widened blade, this being the very antithesis of the condition in *D. filiformis* (of that in *Byblis* and *Drosophyllum* also).

The round blades exhibited by both seedlings and adventives in this species are probably reversions to a rotundifoliate ancestor. They appear on mature plants, replacing the "full character" leaves, when the plants are long subjected to a weakening process.

Adventives of *D. binata* do not always show reversionary first leaves, however. Buds on flower stalks and roots, being well nourished, generally produce plants the first leaves of which are crescentiform or fully binate; *i. e.*, of the adult type. This is acceleration of development occasioned by abundant food supply.

The tentacles of youthful leaves of all species are more interesting than the leaf-shapes. A type of marginal tentacle with the gland ventrally, rather than terminally, situated excited my curiosity, for I found it in almost all species studied in their infancy, even when the adult had nothing corresponding to it (*e. g.*, *D. binata*, *D. linearis*, *D. intermedia*, *D. capensis*, *D. filiformis*).† In modified form it is found in adult *D. rotundifolia*, *D. capillaris*, *D. uniflora*, and some other round-leaved species. Its presence in other species is plainly atavistic.

The youthful leaves of *D. intermedia*, *D. capensis*, and *D. linearis* are all round-bladed at first, thus differing from the adult leaves, which are spathulate in *D. intermedia*, linear or linear-lanceolate in *D. capensis*, and linear in *D. linearis*. In *D. filiformis* of Massachusetts nepionic leaves occurred distinctly spathulate and with atavistic marginal tentacles.

In seedlings and adventitious plantlets from leaves and flower

* Insectivorous Plants, p. 292. (Authorized Edition, Appleton.)

† This form of tentacle is described in Rhodora, *l. c.*, p. 270.

stalks of *D. filiformis* var. *Tracyi* from Georgia, and in seedlings of *D. indica*, I failed to find leaves differing in form or in marginal tentacles from the adult. The tentacles of course were somewhat simpler, but the type was the same. *D. indica* is an oriental caulescent plant with very slender linear leaves.

In conclusion: my observations are to the effect that in all species the earliest foliage leaves are possessed of characteristic Droseraceous features. In this sense, these early leaves are like the adult foliage. Any recapitulation is within the limits of the genus. Cases of deficient organization, or malformation, are excluded.

Secondly, in seedling and adventive *D. intermedia*, in adventive *D. linearis*, in seedling and adventive *D. capensis*, I found reversion to a round blade, in adventive *D. filiformis*, to a spathulate form; and in most species an atavistic condition of the marginal tentacles appears in the youthful leaves.

Thirdly, adventives may differ even within the same species, according to food supply. But in the species studied by me seedlings and adventives from small portions of the adult, as fragments of leaves, flower stalks, and roots, were found to be essentially alike as regards leaf shape and as regards the character of the marginal tentacles.

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LOCAL FLORA NOTES — I

By Norman Taylor

Under the above title it is proposed to bring before the members of the club problems that are in need of further elucidation. Being primarily problems of distribution they fall more within the province of the active members of the club as a whole than they do upon any one individual, whose precise knowledge of such data must necessarily be limited by the material at hand.

From results already tabulated it becomes increasingly certain that many species credited to all or part of the local flora range, either do not occur at all, or else, occur in such out-of-the-way and little-known localities that collections from them have failed to find their way into herbaria where they may constitute a permanent record. The desirability of filling in such gaps before the encroachment of the cities destroys the opportunity for work of this character is apparent to all.

Members of the club or others interested are invited to send to the writer any stations for the plants to be discussed presently, that will throw light on the problems stated, and full acknowledgment for material thus submitted will be made. In order that the record of any station may be permanent it is essential that a specimen be placed in the club herbarium. Specimens thus deposited will always serve as a basis for a list of plant stations. They will also put at rest any doubts of subsequent workers who are at liberty to take on trust or not a printed list of plant stations, but are obliged to reckon with specimens actually collected from them. It also minimizes the often unavoidable errors in the determination of difficult or critical species. Only plants collected within the local flora range * are desired, and any notes made on distribution are understood to apply exclusively to this area.

The list follows :

PINACEAE

1. *Pinus resinosa* Ait. No specimens from the range. In Bull. Torrey Club 3 : 45, a station at Inwood, New York City, is recorded. Beyond this no stations are recorded so far as known, except Luzerne and Wayne counties, Pa. In the state herbarium at Albany there are specimens from Greene and Columbia counties. It has been impossible to verify the Inwood record, and the question arises Does it occur between this and the upper Hudson region ? Also, if it is in Luzerne and Wayne counties in Pennsylvania, why not in Lackawanna and also in Delaware county, N. Y.? According to recent treatments it occurs throughout New York and the upper part of Pennsylvania.

* The local flora range as prescribed by the club's preliminary catalog of 1888 is as follows : All the state of Connecticut ; Long Island ; in New York, the counties bordering the Hudson valley, up to and including Columbia and Greene, also Sullivan and Delaware counties ; all the state of New Jersey ; and Pike, Wayne, Monroe, Lackawanna, Luzerne, Northampton, Lehigh, Carbon, Bucks, Berks, Schuylkill, Montgomery, Philadelphia, Delaware, and Chester counties in Pennsylvania.

2. *Pinus pungens* Michx. f. There are no specimens from the range, the nearest being from Lancaster county, Pa. In Britton, Cat. Plants of N. J., 301, the following record is given: "Hunterdon Co., abundant one mile east of Sergeantsville." Reasoning from the general distribution given in recent works the tree should be found in the upper northwestern counties of New Jersey and southward through western Jersey and adjacent Pennsylvania. Has any one specimens from this territory?

3. *Pinus virginiana* Mill. Its New Jersey distribution is about as the books give it, but Miller & Young in Cat. Plants of Suffolk Co., L. I., credit the tree to that county. There are no Long Island specimens in the collections, and the question is whether it really grows there or whether it once grew there and has been eliminated, or whether the original identification was wrong. Some recent treatments credit the species to Long Island and others do not.

4. *Pinus Taeda* L. There is a single specimen from the range in the Columbia University herbarium marked simply "S. Jersey." It is not credited to the range in the Preliminary Catalog of the Club, in Britton Cat. of Plants of N. J., but in the Handbook of the Flora of Philadelphia and vicinity it is recorded from "Near Cape May." Does it occur north of the Cape May region? Specimens growing in the Botanical Garden have flourished several years, so on the score of temperature the upper pine barren country should not prove a barrier, and the plant may well occur north of Cape May.

5. *Larix Laricina* (Du Roi) Koch. Specimens in the collections bring this species down to Stockholm, Passaic Co., and Newton, Sussex Co., N. J. In the Cat. of Plants of New Jersey are the following more southerly stations: New Durham, Warren Co.; Closter, Bergen Co.; Budd's Lake, Morris Co.; Oxford Furnace, Great Meadows, and Green's Pond, Warren Co. Specimens are desired from any of these localities or to the south of them, so that its present southerly distribution in New Jersey may be determined.

6. *Tsuga canadensis* (L.) Carr. The most southerly station represented in the collection is the New York Botanical Garden.

There are numerous references to stations in New Jersey that are directly west of this or to the south of it, but no specimens from New Jersey are in the collections. How far south in New Jersey and adjacent Pennsylvania does the hemlock grow? General works credit the plant from Nova Scotia to (in the mountains) Alabama.

7. *Picea Mariana* (Mill.) B.S.P. Specimens in the collections show this growing only north of a line drawn from Litchfield, Conn., to Tannersville, Monroe Co., Pa. General works and numerous references in local floras seem to show that the tree grows south of this. How far south? Does it grow along the Palisades, or anywhere else in northern New Jersey?

8. *Abies balsamea* (L.) Mill. Specimens in the collections exclude this tree from the range except in the Catskills. General works and local floras credit it with a more southerly distribution, particularly in the mountains. How far down the Hudson Valley may it be found? Does it occur in the Pocono region? In New Jersey?

9. *Thuja occidentalis* L. West Point and the Highlands of the Hudson are the two most southerly localities represented in the herbaria. Most of the local floras and all the general works say that the plant grows at least in upper New Jersey. Has anyone specimens south of the above stations either in New Jersey or Pennsylvania?

Sparganiaceae

1. *Sparganium minimum* Fries. The only specimens of this plant in the collections are from Green Pond, N. J. The lately issued treatment in North American Flora gives Labrador to New Jersey, etc. Are any stations known for it in the Catskills, and is the plant localized at Green Pond, so far as the local flora range is concerned?

2. *Sparganium angustifolium* Michx. (*S. simplex angustifolium* of the manual). A line drawn from Canaan, Conn., to Green Pond, N. J., represents the southern limit of distribution as shown by the collections. The North American Flora treatment of the species gives the distribution thus: "Newfoundland to Connecti-

cut, Pennsylvania, etc." What Pennsylvania stations are known? How far south in New Jersey does the species come?

3. *Sparganium lucidum* Fernald & Eames. Specimens in herbaria from only two stations: Cypress Hills, L. I., and Southington, Conn. Any extension of the range is desirable. North American Flora says Massachusetts to New York, etc.

Zannichelliaceae

1. *Ruppia maritima* L. All the specimens in the collections come from maritime or sub-maritime localities. Is it known up the Hudson, Connecticut, Delaware, or Raritan rivers? If so how far up (accompanied with notes on the freshness or brackishness of the water, rise and fall in the tide)?

2. *Potamogeton Oakesianus* Robb. The only stations represented in herbaria are Wading River and Cold Spring Harbor, L. I.; and Stephen's Creek, Atlantic Co., N. J. North American Flora gives the range of this as Maine to New Jersey, etc. An extension of the local range up the Hudson Valley and in northern New Jersey is desirable.

3. *Potamogeton natans* L. This species is not known south of Budd's Lake, N. J., and it may not be found much south of this. Recent studies have shown that *P. natans* is not the widely dispersed plant it was once thought to be. Has any one a record of its occurrence in southern New Jersey and adjacent Pennsylvania? Does it grow on Long Island?

4. *Potamogeton lateralis* Morong. Within the range of the club the only specimen is from Salisbury, Conn. It should be found in other places, although no record exists, so far as known, of other stations for the plant. Has anyone seen it elsewhere?

5. *Potamogeton augustifolius* Berch. & Presl. No specimens are in the collections from south of a line drawn from Philipsburg, N. J., to Rockland Lake, N. Y. The range given in North American Flora shows that the plant is found as far south as Florida. It should turn up in several localities in New Jersey and Pennsylvania.

6. *Potamogeton Robbinsii* Oakes. The only specimen is from Park River, Hartford, Conn. With a general range from Maine

to Pennsylvania it seems unlikely that this is the localized plant our collections would seem to indicate. Has any one seen it in northern New Jersey?

7. *Potamogeton confervoides* Reich. North American Flora gives the range for this species as New England to New Jersey and Pennsylvania. The only specimen in the collection was taken from Forked River, N. J. Are there no intermediate stations?

8. *Potamogeton crispus* L. In North American Flora the range includes the legend, "Obviously introduced from the Old World." This was based on the fact that all the specimens at hand come from near some city. Years ago this plant was thought to be indigenous to America. Has anyone seen plants in waters remote from civilization where the chances of its introduction are negligible?

9. *Potamogeton lucens* L. Specimens show that this plant thrives all along the Atlantic seaboard, except that within our range the specimens restrict it to Connecticut. This restriction is undoubtedly false, but there are no visible proofs to the contrary.

10. *Potamogeton Vaseyi* Robb. In North American Flora this plant is stated to grow from Maine to southern New York, etc. The only specimen we have is from Greenwood Lake. Is it found in the other lakes of upper New Jersey? In Rockland Lake or the Hudson?

11. *Potamogeton perfoliatus* L. Of all the pond weeds this species has been found nearest to salt water. It grows near Piermont on the Hudson, where there is a rise in the tide of 3½–4 feet. Has it ever been found well within the influence of salt water? The water at Piermont is almost fresh.

NEW YORK BOTANICAL GARDEN

SHORTER NOTES

FASCIATION IN THE JAPAN HONEYSUCKLE. — Six examples of fasciation were found this fall in the Japan or Chinese honeysuckle, *Lonicera Japonica*, Thunb. The number of cases seen would indicate that fasciation is not unusual in this species; but no earlier mention of it having been found, a brief statement is given below. The vine upon which they occur covers with a luxuriant growth one corner of the huge rock in the garden at Teachers College. The flattening is very apparent for a varying distance (8 to 15 inches) from the tip of the branch. Several inches below — where the branch shows the usual cylindrical shape — the apparently normal base of the fasciated branch is sometimes found to be but one fork of a previous but less conspicuous fasciation. In two cases the lower fasciation is two feet or more from the tip of the branch. The lower part of the branch, even when normal in shape, may bear three or even four leaves at a node; the middle nodes commonly bear six or eight, whorled or arranged in a spiral at the nodes; and near the tips ten or more leaves may be counted at each node. The tips of the branches have two or more growing points, each surrounded by its own cluster of leaves; they are apparently healthy, and two have an independent growth of three inches.

Jean Broadhurst

A New Grass Endemic in Jamaica. — During a visit of Dr. Forrest Shreve to the Blue Mountains of Jamaica, West Indies, he found on Sir John Peak, at an elevation of 2,000 meters, a large grass growing in dense tufts, and covering rather extended areas, almost to the exclusion of other vegetation. It seems strange that so conspicuous a grass should remain undiscovered until his visit. Its discovery is especially interesting, as it adds not only a hitherto unknown species to the genus *Danthonia*, but brings this genus into the flora of Jamaica, it being before this unknown in the island. It is also the only known native species of the tribe Aveneae on the island.

The genus *Danthonia* comprises something over one hundred species, spread over the warm and temperate regions of both hemispheres. Of this number more than one half belong to southern Africa. A number are found in the Andes of South America, and in North America there are ten or a dozen species.

Following is a description of this interesting grass, which I take pleasure in associating with the name of Dr. Shreve, who first discovered it. The type specimen was collected by this gentleman on May 7, 1906, at the place mentioned above, and is in the herbarium of the New York Botanical Garden. Mr. Wm. Harris, Superintendent of the Public Gardens at Jamaica, also secured it later at the same place.

Danthonia Shrevei Britton, sp. nov.

A densely tufted perennial, with rigid thick coriaceous leaves, and a short contracted terminal panicle. Stems erect, simple, smooth and glabrous, excepting at the puberulent apex, 6–10 dm. tall; leaves numerous in the tufts, mostly on the innovations, those on the stem 2 or 3; sheaths straw color, those at the base short and broad; ligule a scarious ring 0.5 mm. wide; blades elongated, involute, the lower surface very rough, especially toward the apex, usually hirsute near the base but otherwise glabrous, the upper surface glabrous; panicle 4–10 cm. long, the axis and erect appressed branches puberulent; spikelets few, on short puberulent pedicels; empty basal scales acuminate, smooth and glabrous, the first scale scarious, 1-nerved, a little shorter than the second which is green with scarious margins, 5–7-nerved, and 9–10 mm. long; flowering scales with a hairy callus, 1–1.5 mm. long, the body of the scale, exclusive of the awns and callus, 5–7 mm. long, 9–11-nerved, appressed-hirsute toward the base, glabrous elsewhere, the teeth running out into awns 4–6 mm. long, the central awn spreading at right angles or nearly so, 1–1.5 cm. long.

George V. Nash

REVIEWS

Ward's Trees *

In this last volume, as in the others of the series, only English trees are included. Readable chapters on stems, branching, bark, climbing plants, and non-typical shoots form the first part of the book. The second includes shrub and tree keys based on shape and habit characters, as illustrated by the following extracts: (1) *Crown expanded and depressed, forming an umbrella-like or mushroom-like head on the elongated stem;* (2) *bark orange or sienna and cast in large scales in the upper part of the stem;* (3) *cones erect or outstanding;* (4) *leaves isolated and extended in*

* Ward, H. Marshall. Trees: A Handbook of Forest Botany for the Woodlands and the Laboratory. Vol. V. Form and Habit. Pp. 308. f. 209. 1909. Cambridge University Press (Putnam's, New York).

flattened fan-like horizontal spray; and (5) *bark . . . cast in strips or plate-like scales.*

As these extracts indicate, this volume is intended for field use; and should prove helpful in England. The large number of American trees not included would of course make it rather puzzling to a beginner here. The illustrations will many of them prove useful in any botanical class room, however; a large number are new and show details and express relationships not given in the books accessible to the average teacher.

The third part of the book contains a brief illustrated key for tree and shrub seedlings which is very interesting and makes one wonder if such a thing is feasible in America with our wealth of deciduous trees.

Jean Broadhurst

TORREY BOTANICAL CLUB FIELD MEETINGS

October 23. — Special excursion for fungi. Party will meet at the Jerome Avenue entrance to Woodlawn Cemetery at 2 p. m., where they will be met by the guide, Mr. F. J. Seaver. Cost of trip, about 20 cents.

October 30, Wingdale, N. Y. — Train leaves Lexington Avenue Station (N. Y. Central, Harlem Division), at 8:52 a. m. Returning train leaves at 4:36 p. m. Bring lunch. Cost of trip, $3.25. Guide, Dr. E. B. Southwick.

Note. — Members are urged to verify times of departure of trains owing to possible changes in time-tables. The excursion on October 30 will be the last of the season.

The Field Committee,
Norman Taylor, Chairman

OF INTEREST TO TEACHERS

Botanical Supplies in City Public Schools

At a recent conference at the New York Botanical Garden Dr. Arthur Hollick presented some interesting data * with reference to the destruction of wild flowers as indicated by the list of supplies for high schools and training schools.

* Reprinted, in part, by permission from the *Journal of the New York Botanical Garden*, June, 1909.

In the list for 1907 some thirty species were included, all of which should be protected. Agitation of the subject resulted in the elimination of a majority of these from the list for 1908, but a number yet remain. Following is a list of these with the number of specimens supplied during the school year 1907–8, and the cost of each item :

	No. of Specimens Supplied.	Cost.
Aspidium marginale Sw.	431	$21.30
Polypodium vulgare L.	425	31.50
Salomonia biflora (Walt.) Britton	318	26.50
Aquilegia canadensis L.	36	1.05
Geranium maculatum L.	500	8.75
Eyrthronium americanum Ker.	1,100	19.25
Gentiana crinita Froel.	1,600	40.00
Arisaema triphyllum (L.) Torr.	288	8.40
Caltha palustris L.	1,800	31.50
Cypripedium acaule Ait	180	11.25
Trillium sp.	2,500	62.50
Wild orchid sp.	36	1.80
	9,414	$263.80

Steps are being taken to substitute cultivated for wild flowers wherever possible and the farm and grounds of the recently established Parental School on Long Island are being in part planted and developed with that end in view, so that the Department of Education may grow and distribute as many as possible of the items of botanical supplies required in the public schools.

Dr. Hollick suggested that if those who are interested in the matter of the preservation of our wild flowers would write to the Board of Education, asking that everything possible be done to eliminate wild flowers from the list of supplies, it would have the effect of hastening the end in view.

The September *Journal of the New York Botanical Garden* contains a very interesting and well-illustrated article on the protection of shade trees against fungi by Dr. W. A. Murrill. Even high school pupils will find this practical article very readable.

The Mariposa grove of Sequoias was threatened by fire during the latter part of August. Several square miles of forest adjoining Yosemite Park were devastated, but the work done by the United States troops prevented the fire from reaching the big tree grove.

Bailey's Cyclopedia of American Agriculture, the fourth volume of which was recently issued, makes a valuable addition to any biological department. For ready reference it is as invaluable as the Cyclopedia of Horticulture, and it unfortunate that the price prevents every teacher of botany from having one in the school library.

The diseases of deciduous forest trees are described in a recent bulletin (No. 149, Bureau of Plant Industry) by Dr. Hermann von Schrenk and Mr. Perley Spaulding. The pamphlet, which is well illustrated, includes a large number of tree diseases. As is usual in such government publications, remedies and methods of preventing the spread of the diseases are fully described. The blight of the white pine form two smaller circulars by Mr. Spaulding (circulars 35 and 38); this is considered rather serious as we are now dependent upon the *second* growth of white pine.

Plant preservation advocates in America have never met the warm encouragement that the Surrey (England) officials offer in order to put a stop to the serious damage done by persons uprooting ferns and wild plants growing in hedgerows and on commons, etc. The County Council of Surrey has made the following by-laws: "No person shall uproot or destroy any ferns or other wild plants growing in any road, lane, roadside waste, wayside bank, or hedge, common, or other public place, in such a manner or in such quantities as to damage or disfigure such road, lane, or other place. Provided that this by-law shall not apply to persons collecting specimens in small quantities for private or scientific use. A person offending against this by-law shall be liable to a penalty not exceeding £5."

A western newspaper says that "Texas and Oklahoma bid fair to reap a rare stroke of good fortune from the unprecedented hot weather. Dr. W. D. Hunter, government entomologist in charge of the southern field crops, has issued a bulletin to the effect that the terrific heat has killed more than 99 per cent. of the boll weevils in Texas and Oklahoma, and that the heat and dryness of the season everywhere has brought out the small cotton plants and caused the bolls to open earlier than ever before. 'As a consequence,' Dr. Hunter states, 'if the farmers will accept the opportunity nature has provided, hasten the picking of the crops, uproot and burn the plants, there is no possibility that many weevils will be left. In fact, if the cotton plants should be destroyed generally in Texas by the middle of September, there would be no boll weevils whatever in Texas next year.'

"The importance of this statement will be appreciated when it is considered that the boll weevil has cut down the cotton crops more than one half, and in many parts of the state more than two thirds, while in other localities cotton raising has been abandoned altogether."

The New York *Tribune*, October 4, says that "practical unanimity exists throughout the cotton regions of Louisiana in favor of burning cotton stalks and clearing the fields before November 1. Mass meetings, attended by both white planters and negro tenants, have been held in many sections, and pledges exacted to conform to suggestions from government entomologists as to forestalling the boll weevil ravages next planting season. Effective work by federal agents has brought a change of sentiment in favor of modern methods in fighting the cotton pest, and this winter will find few hibernating places for the weevil."

The chestnut tree canker which has twice been presented by Dr. William A. Murrill in TORREYA, is the subject of a pamphlet by Dr. Haven Metcalf and Mr. J. Franklin Collins (Bulletin No. 141, part V., Bureau of Plant Industry). Emphasis is placed upon the destruction of infected trees, and a "campaign of education" advised. To aid in this the "Department of Agriculture will coöperate in the following ways: Specimens from suspected trees sent in by any person will be promptly examined and the presence or absence of the disease reported. Typical specimens showing the disease (with the fungus previously killed by soaking in formalin to insure against any infection from this source) will be sent upon application to any inspector, forester, pathologist, or other State or experiment station officer, to any nurserymen or orchardist growing chestnuts, or to any botanist or teacher of botany. So far as the supply permits lantern slides and photographs will, upon application, be loaned for special lectures, exhibits, etc., to the officers of States, experiment stations or colleges. By these means the inspectors first, and then the general public, may become familiar with the appearance and work of the disease in localities that it has not yet reached, and when it does appear may be able to recognize it before it is too late to take efficient measures against it."

The pamphlet further states that "bark disease may be confidently looked for in any orchard or nursery in the United States that contains chestnut trees. All such places should therefore be rigidly inspected at the earliest possible date" as at present "there is nothing in sight that promises even remotely to check its spread into new territory except the general adoption of the measures advocated in these pages. It cannot be argued that because of its apparently recent origin and rapid spread it will soon disappear of itself. Such diseases as pear-blight and peach yellows have been in the country for more than a century and show no sign of abating except when actively combated by modern quarantine methods. Nor can any conclusions be drawn from the fact that chestnuts in the Southern States have suffered from a disease during the past twenty years, since, as already stated, that is a totally different thing from the bark disease."

NEWS ITEMS

Professor T. D. A. Cockerell, of the University of Colorado, has recently returned from Europe where he made some valuable collections.

Dr. Leigh Hunt Pennington (A. B., University of Michigan, 1907; Ph.D., 1909) has been appointed instructor in botany at Northwestern University.

During Professor L. H. Bailey's absence from Cornell this year, Professor Herbert J. Webber will act as director of the College of Agriculture.

Yale University has recently received from Mrs. Morris K. Jesup \$100,000 to establish the Morris K. Jesup chair of agriculture in the Forestry School.

Mr. Lee I. Knight (A.B., University of Illinois), formerly a member of the botanical staff of the University of Illinois, has been made associate professor of botany at Clemson College, South Carolina.

TORREYA has not previously announced the death of M. J. Iorns (Ph.D., Cornell), for several years horticulturist of the Porto Rico Experiment Station at Mayaguez; he died of typhoid fever in San Juan in May.

The United States Bureau of Plant Industry has recently had several noted visitors: Dr. Oskar Loew, formerly with the Porto Rico Experiment Station; Dr. H. T. Güssow, of the Experiment Station at Ottawa; and Mr. Aaronshon, director of the experiment station in Palestine.

At the University of Maine the following appointments have been made: G. E. Simmons (M.S., Ohio State University) and M. E. Sherwin (M.S., Missouri), assistant professors of agronomy; and W. R. Palmer (B.S., Oregon Agricultural College), instructor in horticulture.

OTHER PUBLICATIONS

OF THE

TORREY BOTANICAL CLUB

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(1) BULLETIN

A monthly journal devoted to general botany, established 1870. Vol. 35 published in 1908, contained 608 pages of text and 40 full-page plates. Price $3.00 per annum. For Europe, 14 shillings. Dulau & Co., 37 Soho Square, London, are agents for England.

Of former volumes, only 24-34 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. 28–35 three dollars each.

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

(2) MEMOIRS

The MEMOIRS, established 1889, are published at irregular intervals. Volumes 1–11 and 13 are now completed; Nos. 1 and 2 of Vol. 12 and No. 1 of Vol. 14 have been issued. The subscription price is fixed at $3.00 per volume in advance. The numbers can also be purchased singly. A list of titles of the individual papers and of prices will be furnished on application.

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

Correspondence relating to the above publications should be addressed to

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BY

JEAN BROADHURST

JOHN TORREY, 1796–1873

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New York City

TORREYA

November, 1909

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CAR-WINDOW NOTES ON THE VEGETATION OF THE DELAWARE PENINSULA AND SOUTHERN VIRGINIA

By Roland M. Harper

For some reason not altogether obvious, the flora of those parts of the eastern United States where either *Pinus Taeda* or *Pinus echinata* is the most abundant tree is rather uninteresting, as it consists of comparatively few and widely distributed species; and such regions are consequently not much frequented by botanists and not often described in botanical literature. Of this character is a considerable part of the Piedmont region of the Carolinas and Georgia, the summits (not the slopes or gorges) of the Carboniferous plateaus of Alabama, and those parts of the coastal plain which are outside of the ranges of *Pinus rigida*, *P. palustris*, and *P. Elliottii*; particularly in the neighborhood of Chesapeake Bay, and in northwestern Alabama, northern Mississippi, western Tennessee, southeastern Arkansas, etc.* In all these regions there are indeed some limited areas of seacoasts, swamps, rock outcrops, or other more or less exceptional geographical features which serve to diversify the flora and break the monotony, but in the prevailing short-leaf pine forests there is little to attract a botanical collector. Nevertheless, the vegetation of such places deserves to be studied just as much as that of the more favored regions where there is more excitement in the way of rare plants to be had.†

The pine-barrens of New Jersey and those of the southeastern states have been celebrated botanizing grounds for a century or more; but in the corresponding regions between the Delaware

* See Torreya 7: 44–45; Science II. 25: 541. 1907.

† See Torreya 6: 45. 1906; 8: 156. 1908.

[No. 10, Vol. 9, of Torreya, comprising pages 197–216, was issued October 26, 1909.]

and Roanoke Rivers there seem to be very few typical pine-barren plants, or other species, which are not more common elsewhere. It is not surprising therefore that comparatively little has been published about this region (outside of Dismal Swamp and vicinity) by botanists.

About two years ago (Bull. Torrey Club **34**: 351–377) I mentioned the principal sources of information about the flora of that part of the coastal plain between the James and Savannah Rivers. That part between the James River and Chesapeake Bay is almost never mentioned in botanical literature, although John Clayton, one of the pioneer botanists of Virginia, resided in that region during most of the eighteenth century; *and for the Delaware peninsula, which is somewhat more accessible, there seem to be at present less than a dozen "local floras." †

Leaving out of consideration papers dealing only with seacoast vegetation, (which has very little in common with that of the interior, is governed by different laws of distribution, and is not dependent on the presence of a coastal plain at all), the following contain most of the available information about the flora of this peninsula. The arrangement is chronological.

1. (Occasional references to plants of Wilmington and vicinity, in the published correspondence of Muhlenberg and Baldwin, especially in 1811.) Darlington's "Reliquiae Baldwinianae", 1843.

2. E. Tatnall. Catalogue of the phaenogamous and filicoid plants of Newcastle County, Delaware. 112 pp. 1860.

3. W. M. Canby. Notes of botanical visits to the lower part of Delaware and the Eastern Shore of Maryland. Proc. Phila. Acad. **1864**: 16–19.

4. J. W. Chickering. (Flora of Salisbury and Ocean City, Md.) Field & Forest **3**: 154–155. June 1878.

5. W. M. Canby. (Notes on certain trees of the Delaware peninsula.) Bot. Gaz. **6**: 270–271. Oct. 1881.

6. C. S. Sargent. (Forests of Delaware and Maryland.) Tenth Census U. S. **9**: 511. 1884.

7. H. H. Rusby. A botanical excursion to Asateague Bay. Bull. Torrey Club **18**: 250–255. Aug. 1891.

* See Barnhart, Jour. N. Y. Bot. Gard. **10**: 178. 1909.

† In Britton's list of local floras (Ann. N. Y. Acad. Sci. **5**: 237–300. 1890) there are mentioned only two for Delaware (both for the vicinity of Wilmington), two for Maryland (both for the vicinity of Baltimore), and four for Virginia (two of these pre-Linnaean, another for the mountains in the southwestern part of the state, and the fourth a very brief and bare list of plants from a very unnatural locality on the coast).

8. T. H. Kearney. (Northern limits of "austroriparian" plants.) Contr. U. S. Nat. Herb. 5: 450–457. 1901.

9. H. L. Clark. Notes on Maryland plants. Rhodora 6: 176–177. Aug. 1904.

10. W. D. Sterrett. Report on forest conditions in Delaware. Del. Coll. Agric. Exp. Sta. Bull. 82. Dec. 1908.

11. C. S. Williamson. Notes on the flora of central and southern Delaware. Torreya 9: 160–166. Aug. 1909.

There is also considerable valuable information about this region in the reports of the Bureau of Soils of the United States Department of Agriculture, and in other geographical and geological literature, which it would hardly be worth while to mention in such a brief and superficial paper as this.

Having given credit to previous botanical explorers, I will now mention some of my own experiences in the region between the Delaware and Roanoke Rivers, on the way from New York to North Carolina in July, 1908. On July 18 I left the fall-line at Wilmington, Del., and, without getting off the train, went southward via the "Cape Charles route" nearly the whole length of the Delaware peninsula, a distance of about 200 miles, to Cape Charles, Va., where connection is made with the steamer for Norfolk. This route passes through all three counties of Delaware; Wicomico, Somerset, and Worcester in Maryland; and Accomac and Northampton in Virginia. On July 19 I traveled westward from Norfolk on the old Atlantic and Danville R. R. (now a part of the Southern Railway), passing through the counties of Norfolk, Nansemond, Isle of Wight, Southampton, and Greenesville, before crossing the fall-line near Emporia, about 75 miles from Norfolk.

The various kinds of country seen in this 275-mile journey through the coastal plain may be briefly described as follows. From Wilmington nearly to Townsend, a distance of 29 miles, the route is through the Cretaceous region, a direct continuation of the corresponding portion of New Jersey, which has been described by Hollick * as the "tension zone" and by Stone † as the Delaware Valley–West Jersey region. The topography here is moderately hilly, the soil is grayish and loamy, and the

* Am. Nat. 33: 3, 8, etc. Jan. 1899.

† Proc. Phila. Acad. 1907: 452–459. 1908.

forests are nearly all destroyed. Grass-lands are more prevalent than plowed fields, somewhat as in New England.

The Eocene is said to be scarcely exposed in New Jersey and Delaware, and from Townsend to Cape Charles the country is mapped by geologists as Miocene, like the pine-barrens of New Jersey. The Miocene strata do not form much of the soil, however, being nearly everywhere covered by the so-called superficial formations of Pliocene and later age. Going southward from Townsend the country becomes gradually more level and sandy, pines more prevalent, the proportion of cleared land less,* and the civilization and crops more southern in character, all apparently without any abrupt transitions. The peninsula is too narrow to permit any extensive development of streams and valleys, and as the railroad keeps pretty close to the divide most of the way the vegetation visible from the train is mostly of the upland type. Navigable streams were crossed near Seaford and Laurel, Del., and Salisbury and Pocomoke, Md. These all rise in sandy regions, and appear blackish, as swamp water always does when it is several feet deep. Between Clayton and Dover, where the soil is less sandy, at least one muddy stream was crossed. On the left side of the Nanticoke River near Seaford is a faint development of sand-hills, analogous to those of Southeast Georgia, where this feature is best developed.†

Pines were first seen just south of Dover ; and around Felton, about ten miles farther south, a faint suggestion of southern pine-barrens was noticeable. In the southern half of Delaware, which is much more sandy than the northern, most of the towns showed unmistakable evidences of recent growth and prosperity, like all the sandier parts of the southeastern states at the present time. The principal crops here seem to be corn, sweet and Irish potatoes, apples, peaches, and pears.

Of the country between Norfolk and Emporia there is little to be said except that it is comparatively level near the coast and moderately hilly toward the fall-line, and more or less sandy all

* Except that the Maryland part of the peninsula seems to be a little less sandy and a little more under cultivation at present than southern Delaware.

†See Ann. N. Y. Acad. Sci. 17 : 25-27. 1906.

the way. Although there are many fields of corn, cotton, sweet potatoes, peanuts, etc., in this part of the coastal plain, there was generally plenty of virgin forest in sight. More swamps and bogs were seen west of Norfolk than on the peninsula, but no true pine-barrens, or ponds, in either part of the journey.

The prevailing aspects of the vegetation in each region passed through can be inferred from the following lists, in each of which the species conspicuous enough to be recognizable from the train are divided first into trees, shrubs, and herbs, and then arranged as nearly as possible in order of frequency, as determined by the number of times each was seen. Species noted only once in a given region are omitted from these lists in most cases, however. The nomenclature used is that of Robinson & Fernald's Manual, 1908.

Civilization has of course destroyed most of the original vegetation by this time, but it probably has not greatly changed the relative frequency of the native species in that which remains.

In the Cretaceous region of Delaware the country is so largely deforested that the herbs visible from the railroad are mostly weeds, and therefore hardly worth mentioning. The commonest trees seem to be *Liriodendron Tulipifera*, *Liquidambar Styraciflua*, *Salix nigra*, *Castanea dentata*, *Quercus alba*, *Cornus florida*, and *Acer rubrum*.

As no distinct natural boundaries were recognized between Townsend and Cape Charles, I have subdivided this 170 miles of the journey arbitrarily by the two state boundaries crossed. This method, although not very scientific, brings out the gradual change of vegetation in going southward about as well as any other that might be selected.

Between Townsend and Delmar (which is on the boundary between Delaware and Maryland, as the name signifies), a distance of 68 miles, the following species were the most conspicuous:

Trees. — *Pinus Taeda*, *P. virginiana*, *Magnolia virginiana*, *Liquidambar*, *Nyssa sylvatica* (?), *Liriodendron*, *Castanea dentata*, *Salix nigra*, *Acer rubrum*, *Cornus florida*, *Quercus alba*, *Q. falcata*, *Q. Phellos*, *Diospyros virginiana*.

SHRUBS. — *Sassafras variifolium* (mostly a weed), *Alnus rugosa*.*

HERBS. — *Daucus Carota*, *Trifolium arvense* (these two introduced), *Asclepias tuberosa*, *Juncus effusus*, *Nymphaea advena*, *Pontederia cordata*, *Osmunda cinnamomea*, *Pteris aquilina*, *Lilium superbum*, *Plantago lanceolata*, *Lepidium virginicum*, *Cyperus esculentus* (the last three weeds).

According to Sargent (Tenth Census U. S. **9**: 511), in the sandy soil of southern Delaware the pines formed fully half of the original forest growth, which was long ago cut away and replaced by a second growth, which however consisted mostly of the same species. Sterrett, writing a quarter of a century later (Bull. **82**: 10–12, 17, 19), estimated that only about one-fourth of the area of Delaware is now wooded, and that there is practically no virgin forest in the state. He also states that "Originally the forests of Sussex County [the southernmost] were almost exclusively of hardwoods, but by culling and clearing them pine has gradually been established in every part of the county"; and again: "Lumbering the forests and clearing the land for agriculture have greatly increased the amount of pine and extended its range much farther north." The evidence on which these statements are based is not given, however, and one would probably make no serious error in assuming that *Pinus Taeda* and *Pinus virginiana* were always the most abundant trees in southern Delaware, as they seem to be at present.

In a distance of about 36 miles through Maryland the following species were each noted at least twice:

TREES. — *Pinus Taeda*, *Liquidambar*, *Quercus Phellos*, *Magnolia virginiana*, *Acer rubrum*, *Nyssa sylvatica* (?), *Taxodium distichum*, *Fagus grandifolia*, *Chamaecyparis thyoides*, *Quercus falcata*, *Diospyros*.

SHRUBS. — *Aralia spinosa*, *Alnus rugosa*, *Rhus copallina*.

HERBS. — *Nymphaea advena*, *Pteris aquilina*.

This list is too short to draw any important conclusions from, but the greater relative frequency of *Quercus Phellos*, *Taxodium*

* Some of the *Alnus* seen in Delaware and Maryland may have been the rare and local *A. maritima*, which I have not learned to distinguish under such conditions.

distichum, and *Aralia spinosa* in it as compared with the next above, and the scarcity of *Pinus virginiana* (which was seen only once in Maryland) seems to indicate more of a climax type of vegetation and therefore presumably a somewhat richer soil than the average for the Miocene portion of Delaware.

In Accomac and Northampton counties, Virginia, the following species prevail along and near the axis of the peninsula:

TREES. — *Pinus Taeda, Liquidambar, Pinus virginiana, Ilex opaca, Cornus florida, Quercus alba, Fagus, Oxydendrum arboreum, Acer rubrum, Quercus Phellos, Nyssa sylvatica* (?), *Quercus Michauxii, Pinus echinata, Magnolia virginiana, Quercus falcata, Q. nigra, Diospyros.*

SHRUBS. — *Myrica cerifera, Aralia spinosa, Alnus rugosa, Tecoma radicans, Rhus copallina, Clethra alnifolia.*

HERBS. — (None seen worth mentioning.)

The relative scarcity in this list, as compared with the two next preceding, of *Magnolia, Liriodendron, Salix, Taxodium, Chamaecyparis, Nymphaea*, and *Lilium* is doubtless due mostly to the narrowness of the Virginia part of the peninsula and the consequent scarcity of fresh-water streams and swamps. The *Cornus, Fagus, Aralia, Myrica, Quercus Michauxii, Q. nigra, Ilex, Oxydendrum, Pinus echinata*, and *Tecoma* on the other hand are decidedly more abundant in Virginia than in Delaware and Maryland, perhaps only because the center of distribution of each of these species lies farther south; especially in the case of *Oxydendrum* and *Quercus Michauxii* which have their northernmost known stations on this very peninsula. It should be noted in passing — though I am not yet prepared to explain the significance of the fact — that most of the ten species last mentioned are typical hammock plants in the southeastern states.

Between Pinner's Point (the railroad terminus just across the harbor from Norfolk) and Pleasant Shade, Va. (about eight miles west of Emporia), where metamorphic strata were first noticed, the following species were seen more than once.

TREES. — *Pinus Taeda, Liquidambar, Liriodendron, Quercus alba, Salix nigra, Pinus echinata, Taxodium distichum, Nyssa sylvatica biflora* (?), *Magnolia virginiana, Quercus falcata, Oxy-*

dendrum, *Cornus florida*, *Quercus Phellos*, *Acer rubrum*, *Ilex opaca*, *Diospyros*, *Fagus*, *Quercus marylandica*, *Nyssa aquatica*, *Quercus nigra*, *Betula nigra*.

SHRUBS. — *Arundinaria tecta*, *Myrica cerifera*, *Alnus rugosa*, *Rhus copallina*, *Clethra alnifolia*, *Tecoma*, *Phoradendron flavescens*, *Aralia spinosa*, *Ilex glabra*, *Vitis rotundifolia*, *Rubus cuneifolius*, *Prunus angustifolia* (the last two or three weeds).

HERBS. — *Senecio tomentosus* (a weed?), *Eupatorium rotundifolium*, *Chrysopsis graminifolia*, *Eupatorium capillifolium* (a weed), *Xyris* sp., *Pteris aquilina*, *Habenaria cristata*, *Polygonum Hydropiper*, *Daucus Carota* (these two introduced), *Juncus effusus*, *Rhynchospora inexpansa*, *Ambrosia artemisiaefolia* (a weed), *Verbascum Thapsus* (introduced), *Scirpus Eriophorum*, *Polygala lutea*, *Rhynchospora corniculata*, *Rhexia Mariana* (*?*), *Mesadenia atriplicifolia* (*?*).

This list differs from the three or four preceding in the absence of *Pinus virginiana*, *Chamaecyparis*, and *Castanea*, and the presence of *Arundinaria*, *Nyssa aquatica*, *Betula*, *Phoradendron*, *Ilex glabra*, *Senecio tomentosus*, and *Eupatorium rotundifolum*. *Taxodium*, *Liriodendron*, *Salix*, and *Alnus* seem to be more abundant west of Norfolk than on the peninsula, perhaps on account of the greater development of streams.

The following among the species observed from the car windows (or conspicuous by their absence) deserve a little more notice than has been given above. In a few cases notes made on the same trip, in the Piedmont region of Virginia, west of Emporia, have been drawn upon to make the data for certain species which are not confined to the coastal plain more complete.

Senecio tomentosus Mx. Common along the railroad in Nansemond, Isle of Wight, and Southampton Counties, Virginia, from about 12 to 63 miles west of Pinner's Point. I did not see it elsewhere on this trip, though C. S. Williamson (Torreya **9**: 166) has reported it as common in southeastern Delaware.

Oxydendrum arboreum (L.) DC. First seen near the southern edge of Accomac County, Virginia.

Aralia spinosa L. Not seen in Delaware, but common in

Somerset and Worcester Counties, Maryland, and still more so in the two peninsula counties of Virginia.

Polygala ramosa Ell. Noticed only once, and that in Southampton County, Virginia. (Several southern pine-barren plants seem to have their northern limits in this same general region, a little west of Dismal Swamp.)

Ilex opaca Ait. First noticed a little south of Bloxom, Accomac County, Virginia, and last about seven miles east of Emporia. In the "manual region" this species seems to be almost confined to the coastal plain, but farther south it is not so restricted.

Nymphaea advena Ait. Seen in most of the rivers and estuaries of Delaware and Maryland, but not at all in Virginia. Farther south it is not known in the coastal plain at all, its place being taken by other species of the same genus.

Magnolia virginiana L. First seen just north of Townsend, Delaware, apparently just about where the Miocene begins. Last seen in Brunswick County, Virginia, about 12 miles west of Emporia.

Castanea dentata (Marsh.) Borkh. Seen a few times between Kirkwood and Wyoming, Delaware, stopping just about where *Pinus Taeda* begins. Not seen elsewhere in the coastal plain on this trip.

Fagus grandifolia Ehrh. (Lately known as *F. ferruginea*, *atropunicea*, or *Americana*.) Not seen until after passing King's Creek, Somerset County, Maryland, strange to say. Thence rather common southward. Possibly this represents the var. *caroliniana* (Loud.) Fernald & Rehder (Rhodora 9: 114. 1907), to which is assigned a decidedly more southern range than the type.

Myrica cerifera L. Abundant in the two peninsula counties of Virginia, often attaining a height of ten or twelve feet. Common in the coastal plain west of Norfolk, to within about seven miles of Emporia.

Arundinaria tecta (Walt.) Muhl. Common in the coastal plain west of Norfolk, and seen once in Mecklenburg County, Virginia, fifty miles west of Emporia.

Taxodium distichum (L.) Rich. Seen twice in Somerset County, Maryland, and several times between Suffolk and Drewryville, Virginia. It seems to stop about twenty miles short of the fall-line in Virginia. Sterrett, Williamson, and others have reported it from southern Delaware.

Pinus virginiana Mill. First seen between Viola and Felton, Del., thence rather frequent to Cape Charles. It probably does not occur at all in the coastal plain south of Hampton Roads, however. In the Piedmont region of Virginia it begins to appear in Mecklenburg County, and occurs at infrequent intervals from there to the foot-hills of the Blue Ridge.

Pinus rigida was not seen at all on this trip, which is rather surprising in view of its reported abundance in New Jersey.*

Pinus Taeda L. Common from Dover, Del., to Emporia, Va., thence more scattered in Brunswick County (in the Piedmont region), and rather scarce in Mecklenburg County, where most of the specimens seen were second growth. Last seen between South Hill and Union Level, about 118 miles west of Norfolk.

Pinus echinata Mill. Seen once in Maryland, three times in the Virginia part of the Delaware peninsula, and eight or ten times between Norfolk and Emporia. As *Pinus Taeda* fades away this species becomes more abundant, and it is the prevailing pine in the Piedmont region.

Pinus palustris was not seen anywhere, though the conditions appeared very favorable for it in some places in Nansemond County, Virginia, and it was formerly reported farther north than that.†

* In this connection Vermeule's remarks on its occurrence in the southwestern part of New Jersey (Ann. Rep. State Geol. N. J. 1899 [Forests]: 97–98. 1900) are of interest.

† See Bull. Torrey Club 34: 375. 1907.

TERATOLOGICAL FORMS OF CITRUS FRUITS*

By S. B. Parish

Malformations as remarkable as are some of those which have been described and figured in the pomes, notably the pear, do not appear to have been noticed in the hesperidiums. But while these curious forms are of merely scientific interest, and are without economic importance, among oranges and lemons those most commercially valued are, teratologically considered, mere monstrosities.

The best lemons are varieties which habitually abort the ovules, and, therefore, bear seedless fruits, which are, for that very reason, preferred to those which are perfect and seed-bearing. There are also other, and objectional deformities to which the lemon is subject. The simplest of these is a roughening and thickening of parts of the rind, causing elevated longitudinal ribs, or sections, of greater or less breadth.

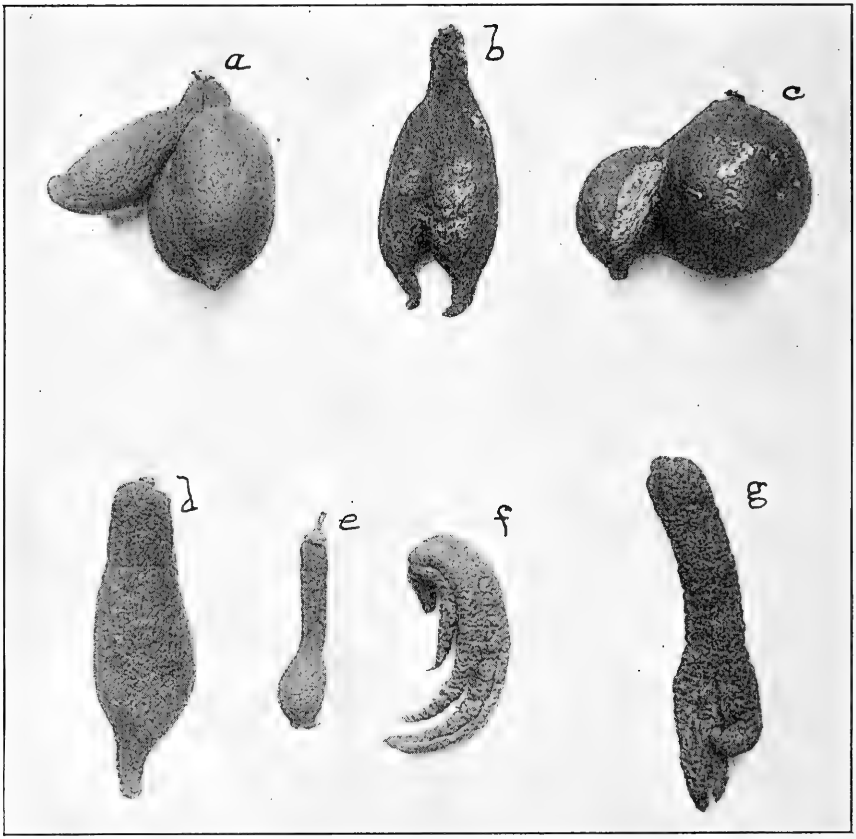
Occasionally the carpels themselves are more or less atrophied. This results in such forms as *d* and *e* in the accompanying figure, in which the vestiges of the carpels are contained in the bulb-like extremities of the fruit. In *f* and *g* are shown forms of still further degeneracy, in which the carpels have entirely disappeared, only the pericarp remaining, which is further deformed by fission.

Syncarpy, one of the commonest teratological conditions in fruits, is often exhibited by lemons. In specimens which have come under my observation it was confined to the coherence of only two individuals, but it is probable that a larger number may sometimes be involved. In some cases the coalesence is so complete that the proper outline of the fruit is little affected; more commonly the union is incomplete. Usually one member is not fully developed, as *a* and *c*, or both may be only imperfectly developed, as shown in *b*. Syncarpy also occurs in the orange, but more rarely than in the lemon.

The most esteemed varieties of the orange are also those which abort the ovules, and produce seedless fruit. This is the case with the navel, the choicest orange grown in California, which exhibits, in addition, a more pronounced teratological modifica-

* Illustrated with the aid of the Catherine McManes Fund.

tion. A navel is, in reality, the consolidation of two oranges, one rudimentary, whose atrophied remains occupy the distal extremity of the developed fruit. In the market are found only specimens in which the abortive orange is merely vestigial, and is entirely included within the rind of the developed one, its pres-



Syncarpy, atrophy, and fission in lemons.

ence being indicated by a small orifice, the so-called "navel." But among the "culls," which are rejected in packing, may be found abundant examples in which the secondary orange is more nearly normal, and is often more or less, occasionally entirely, exterior to the other. It may even contain a few reduced carpels with juicy cells, but is always wrinkled and corrugated. In other cases it takes the form of a cornute projection, which may be two or three inches in length.

However small the "navel" orifice may be it is point of weakness in the rind of the orange, and renders it peculiarly liable to "splitting." This is a term applied to the opening of fissures in the pericarp, whereby germs of decay are admitted to the interior. Orchardists are not agreed as to the causes which produce the tension within the orange, but the resultant ruptures often occasion a large percentage of loss in the crop.

San Bernardino, California

THE FATE OF A VIOLET, OR THE BENEFIT OF CLEISTOGAMY

By E. J. Hill

The efficacy of cleistogamy in the preservation of a species under adverse conditions of environment was well shown by a case which came under my observation a few years ago. The area now comprised in Hamilton Park, one of the smaller parks of Chicago, is but a block from where I have lived since 1885, and was familiar ground for botanical study and collecting for ten years previous. It was in part undisturbed prairie; in part wooded by a scattered growth of oaks and shrubs in the dryer portion. There was a low ridge of sand forming the southern part of the area, with an herbaceous flora common to low sand dunes. The remainder was wet or wettish prairie in which the sand was mixed with humus a foot or more in depth, making a black soil resting on the pure sand of the old lake bottom, akin to that of the low ridge. The property being for a long time in litigation was nearly all left vacant until used for the park, while the grounds contiguous had been largely taken for dwellings. The making of streets and construction of sewers served to drain the wet sections, and as commonly happened in such cases some of the plants of the dry ground moved into the drained portion to associate with, or supplant, the less resistant original occupants; and plots where *Cypripedium candidum*, *Viola blanda*, *V. lanceolata*, and the like once flourished were taken by *Phlox bifida*, *Viola pedata*, and their associates. The last mentioned did this on a large scale, and multiplying abundantly in the richer soil of the prairie, which held enough of sand for its nature, soon stocked the ground. Blooming profusely the showy flowers were doomed to be picked by the people living around, especially by the children. As more houses were built and population increased the case of the violets became more and more adverse. They were literally picked by the hundred by the eager visitors. This resulted in the extermination of the plant in a few years, and long before the ground was taken for the purpose of the park, about five years ago, not a bird-foot-violet could be found. Johnny jump-up, as the children called the plant, had succumbed to the predatory habits of the flower gatherers. Had it not been an exception to the usual custom of the genus in producing cleistogamous flowers, I should have expected a different result. This seems evident from the ability of the various species of blue violets, which abound in the woods and fields contiguous to the city, to hold their place notwithstanding they are picked annually in great numbers. The inconspicuous summer and autumn flowers, unknown to the vast majority of flower gatherers, and without attraction to such, provide the seeds for multiplying and perpetuating their kind. Hence I do not perceive any sensible diminution in their numbers when not subject to other causes than the gathering for bouquets.

CHICAGO, ILLINOIS

REVIEWS

Kükenthal's Cyperaceae-Caricoideae *

The volume of the Pflanzenreich issued on May 18 last, contains the first attempt to present descriptions and keys of all species of *Carex* and related genera occurring throughout the world. The work — a bulky volume of over 800 pages — is the result of many years' labor by the learned author Georg Kükenthal. It contains a very great amount of material of interest and value to all students of the genera dealt with, and will prove of great aid to American students.

* Das Pflanzenreich (38 Heft. IV. 20) Cyperaceae-Caricoideae by Georg Kükenthal. Pp. 384. f. 128. Wilhelm Engelmann, Leipzig, 1909. Mk. 41.20. (Issued May 18.)

The genera recognized are *Schoenoxiphium* with six species all natives of Africa; *Kobresia* with twenty-nine species mostly natives of Asia, two only reaching North America; *Uncinia* with twenty-four species, chiefly South American and Australasian, but with two or three species reaching tropical North America; and *Carex* with 798 species, some 282 of which are found in North America.

Of course, *Carex* is the genus with which North American botanists will be chiefly interested, and when one finds that fewer North American species are given than were recognized by Prof. Bailey more than twenty years ago, he becomes doubtful whether the learned author has adequately treated the genus as represented on this continent. This doubt is strongly increased when one notes the large number of North American species to which reference is made, but with which the author is not acquainted; and is certainly not lessened when one further notes the few specimens of many critical species seen by the author. The fact seems to be that the author's material of many North American species was hopelessly inadequate, and in many groups insufficient to enable him to properly understand them. In dealing with these groups it would naturally be expected that some slight attention would have been paid to the more recent treatments given them by American authors, but comparatively little has been. As a result we have such monstrosities as *Carex straminea* with nine recognized varieties and seven forms; almost all the varieties being more well-marked and more distinct from one another than are *Carex leporina* L. and the plant treated as *Carex petasata* Dew., which are recognized as distinct species! Similar but less pronounced unnatural arrangements are found in dealing with other species.

The main division, too, of the species is archaic in the extreme. Who would have believed it possible at the present time for an expert on the genus to divide it into groups depending on whether there were one or many spikes. Yet this is exactly the basis of the main division of the genus, and as a result we have species like *Carex exilis* Dewey, *Carex Fraseri* Andr., *Carex Geyeri* Boott, and many others torn from their natural relationships and put in as part of a mixture labeled "Primo-Carex Kükenthal." Of course it will be recognized that there are a good number of species with one spike which are very closely related, but such a group as is here created is as unnatural as it is needless.

The author, too, is bold indeed in at times reducing critical species to varieties of some other species more or less closely related, when he apparently has had no specimens of the species so treated at hand; nor has care always been taken to see that keys and group descriptions accord with description of species in the group. For example, *Carex subulata* Michx. is put in a group characterized by an enlarged style-base, but that species itself is described as without such a base. Again there are numerous species which it would be hard to key into the groups recognized by the use of the keys to the groups.

The strong and valuable features of the work to the American botanist are the manner in which the value of characters taken from the rootstock and lower part of the culm and from the style are emphasized and made use of. These are characters which have been too long neglected in this country, and if noticed will much simplify the study of some of the more difficult groups. The vast amount of synonymy collected will prove of great assistance, although it is very evident that it is neither entirely exhaustive nor altogether properly disposed of. The key characters in the smaller groups are generally arranged with care and differences between closely related species are sharply brought out. The descriptions too as a rule are full, although many more measurements should have been given. There are numerous excellent plates scattered through the volume and the printer's part of the work is thoroughly well done.

It may then in closing be said that as a first attempt at one of the most difficult tasks to which a botanist could apply himself, the work is worthy of high commendation indeed, but as far as the American species are concerned the author has unfortunately been much handicapped by lack of material, and has not made as much use as he might of American literature.

KENNETH K. MACKENZIE

PROCEEDINGS OF THE CLUB

October 12, 1909

The meeting was called to order at the American Museum of Natural History, with Vice-president Barnhart in the chair. There were 22 persons present. Resignations were accepted from Miss Mary H. Price and Miss Mabel Denton. Mr. Leon L. Cypress was elected a member of the Club.

The program of the evening consisted of an illustrated lecture by Dr. John Hendley Barnhart. The paper has been published with slight modifications in the *Journal of the New York Botanical Garden* for August, 1909, and will appear in the next number of Torreya.

Percy Wilson,
Secretary

OF INTEREST TO TEACHERS

Liverwort Types for Elementary Classes

By W. C. Coker

In the liverworts we find the first conspicuous appearance of alternation of generations in plants, and it is here that it behooves the teacher to bring his pupils to a clear understanding of this fundamental morphological fact. All teachers of experience know that here we arrive at the *pons asinorum* of botany, but we should see to it that no student is kept on the wrong side by any unnecessary narrowing of the way.

In looking for a type, then, to use in our elementary classes it seems to me of the utmost importance that one should be selected that shows this alternation of generation in the clearest and simplest manner — as little obscured as possible by complex morphology. Now, if we examine the text books that are at present being used or that have been used for the last twenty years we find that the liverwort type is *Marchantia*, as complex and difficult a plant as the group affords, and one as little suited for this use as could well be found. The complex thallus, the stalked and still more complex archegoniophores and antheridiophores (names repulsive enough to any student), the hidden antheridia, and the small sphorophytes with their delicate vestments difficult to demonstrate, make *Marchantia* a formidable object to the beginner. His mind becomes so crowded with detail that he is apt to overlook the fundamental relations.

Contrasted with *Marchantia* let us take such a type as *Pallavicinia.* In FIG. 1 is shown in the same section a longitudinal

FIG. 1. Cross-section of female gametophyte of *Pallavicinia Lyellii*, showing involucre, perianth, archegonium, and young sporophyte.

view of the young sporophyte and transverse view of the gametophyte. All parts are shown and their relations are absolutely clear. Take four such sections at different ages, beginning with the mature archegonium, and the whole subject of alternation is presented. The gametophyte is so simple that it can be understood at once and the sphorophyte is so large and conspicuous as to prepare the student for the next step. The male plant is equally simple, and the antheridia can be seen with the naked eye without any dissection. A cross-section of the male plant through an antheridium is shown in FIG. 2. The only deficiency of *Pallavicinia* is the absence of gemmae, but for the study of hese another thallose liverwort such as *Metzgeria* may be used. In this plant the gemmae are borne abundantly on the slightly incurved margins of the thallus.

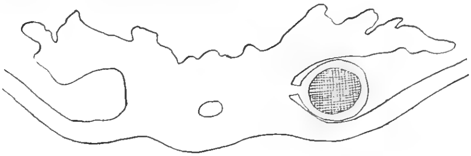


FIG. 2. Cross-section of male gametophyte of *Pallavicinia Lyellii*, showing an antheridium.

For the study of the capsule and the relations of its contents I have found nothing that approaches *Frullania virginica* in clearness. Here, the elaters extend the entire length of the capsule and alternate with single rows of spore mother-cells.

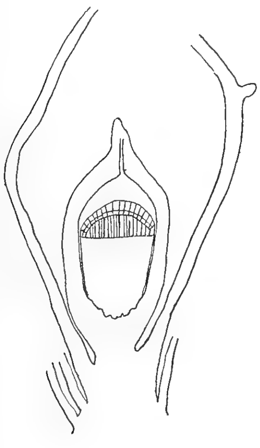


FIG. 3. Diagram of young sporophyte and surrounding parts of *Frullania virginica*.

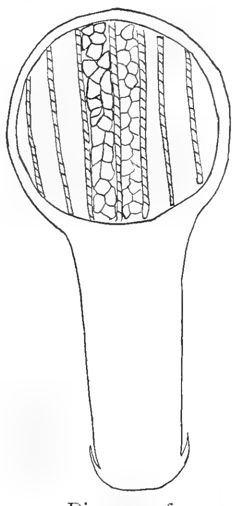


FIG. 4. Diagram of sporophyte of *Frullania virginica*. (Spores represented in two middle rows only.)

The homologous origin of these two elements is thus very clearly brought out, especially if a younger stage be studied. In FIG. 3 is shown a capsule of this species at an early stage. The spore-bearing portion is represented by a palisade of long undivided cells not yet differentiated into elaters or mother-cells. This section, when compared with FIG. 4, brings out clearly the structure of the mature capsule and the relation of its parts.

UNIVERSITY OF NORTH CAROLINA,
CHAPEL HILL, NORTH CAROLINA

More teachers should receive the monthly list of publications sent, without charge, to all who apply for it by the Division of Publications of the United States Department of Agriculture. This four-page announcement gives a long list of the latest circulars and bulletins on agriculture and economic plants, on forestry and soils; many of them are very useful as references in teaching botany, zoölogy, and nature study.

Science for October 22, 1909, contains a short article by Professor John W. Harshberger on the plant remains of Pompeii. A study of the plant specimens exhibited in the National Museum at Naples yields the following list, which Professor Harshberger says is doubtless incomplete, representing probably the plants to be found in the markets in August (the date of the eruption being August 24). The plants are almond, chestnut, filbert, pine seeds, and walnut; apple, carob, fig, grape, and pear; barley and millet; onion, garlic, bean, and lentil.

The basket willows, according to a recent Farmers' Bulletin (No. 34, United States Department of Agriculture), was introduced by some German immigrants into New York and Pennsylvania about sixty years ago. The most rapid spread is through the non-arid parts of the southwest, where at least three species are commonly grown.

The United States Forest Service, according to *Science*, is planning to introduce a number of the more important eastern hardwoods into California, and "will this year experiment with chestnut, hickory, basswood, red oak and yellow poplar or tulip trees. Small patches of these trees will be planted near the forest rangers' cabins on the national forests, and if these do well larger plantations on a commercial scale will soon be established on wider areas. There are over 125 different species of trees in

California, a number of which produce some of the most valuable varieties of lumber in the country. Although considerably over one half of the species are hardwood or broad-leaved trees, yet, with the exception of the exotic eucalyptus, there is not a single species of hardwood here ranking in commercial importance with the leading eastern hardwoods. Climatic conditions in many parts of California are favorable for the growth of a number of the valuable hardwoods, and the absence of these trees is due mostly to unfavorable factors of seed distribution."

Professor Milton Whitney, chief of the soils bureau of the Department of Agriculture, has recently issued a bulletin showing that the long-cultivated soils of the leading nations are not only producing greater crops than at any earlier period, but are producing much more than the comparatively new soils of the United States. The average wheat yields (1897–1906) were 32 bushels an acre in Great Britain, 28 in Germany, 20 in France, and barely 14 in the United States. In the last twenty-five years the average yields of wheat in Germany have increased from 18 to 30 bushels an acre, of rye from 15 to 25 bushels, and of oats from 28 to 55 bushels. Similar statistics for other countries sustain the same view, and a study of American crop statistics for the last forty years shows that there is no general decrease in yields. These statistics also show that the older states whose soils have been longest in use are producing the largest yields. Even the soils of New England have materially increased in yields of corn and wheat in forty years; but what is more remarkable, they are producing considerably heavier yields than the soils of the Mississippi Valley states (*e. g.*, wheat 18 bushels an acre against 13 bushels for the forty-year average).

Another recent article by James J. Hill in the World's Work makes an appeal for the conservation of the soil fertility, giving as an instance of this need the striking contrast between the soils of France and Spain. Both countries have been cultivated for a very long time. One of them is exceedingly fertile and is rich and prosperous. The other is chiefly sterile and is poor and unprosperous. While it is quite true that New England produces far more wheat by the acre than any western state, it is also true that New England contains many so-called abandoned farms which produce little or nothing. "The lesson, writ large on every field, is this: That it is not the length of time during which land has been cultivated, but rather the manner in which it has been and is cultivated, which determines its productiveness." For Mr. Hill points out that while the richest virgin soil is not so productive as the carefully tilled and fertilized soil of old settled places, a few seasons' cultivation suffices to exhaust either if their fertility is not replenished.

In discussing the "demonstration" work now being conducted in various states by the United States Department of Agriculture, the *Outlook* says: "It is not difficult to persuade the farmers of the desirability of increased crops, but it is difficult to persuade them that it can be done. Finally, one or more farmers in each district are persuaded to work a few acres in accordance with 'use as directed.' The demonstration farmer must do all the actual work himself. Therein lies the force of the argument. What he can do his neighbors will believe they can do. Each month specific instructions are sent to each demonstrating farmer. Each month, too, a local agent visits him and gives word-of-mouth instructions. Notice is sent to all the co-operating farmers to meet the agent on a given demonstration farm, where the crop and plans are exhaustively discussed. This is called a 'field school.' In these discussions it has been found with pathetic frequency that many small farmers had never fully complied with any of the essential rudiments of successful farming. Year after year they had gone on charging their perfectly avoidable failures to the land or the elements. One of the converts to the new farming thus frankly expressed himself at a public meeting in Alabama last year: 'I was born in a cotton-field and worked cotton on my farm for more than forty years. I thought no one could tell me anything about raising cotton. I had usually raised one-half a bale on my thin soil, and I thought that was all the cotton there was in it in one season. The demonstration agent came along and wanted me to try his plan on two acres. Not to be contrary, I agreed, but I did not believe what he told me. However, I tried my best to do as he said, and at the end of the year I had a bale and a half to the acre on the two acres worked his way, and a little over a third of a bale on the land worked my way. You could have knocked me down with a feather. This year I have a bale and a half to the acre on my whole farm. If you do not believe it, I invite you to go down and see. Yes, sir ; as a good cotton planter I am just one year old.' "

NEWS ITEMS

Mr. and Mrs. Norman Taylor are spending a few weeks in Santo Domingo in the interests of the New York Botanical Garden.

Dr. C. H. Shattuck, formerly associate professor of botany and forestry at Clemson College, S. C., has accepted a professorship in the University of Idaho.

Mr. W. W. Eggleston has been devoting several weeks to collecting and studying *Crataegi* in North Carolina, South Carolina, Alabama, Kentucky, and West Virginia.

Professor C. S. Hitchcock, of the Department of Agriculture, has recently returned from a summer spent in collecting and studying the grasses of the Yukon Valley, Alaska.

Mrs. Kellerman, widow of the late Professor William A. Kellerman, is offering for sale his valuable herbarium of flowering plants (60,000 specimens) and fungi (over 70,000 specimens).

At the Portland, Oregon, meeting of the Association of American Agricultural Colleges and Experiment Stations, Professor W. J. Kerr, president of the Oregon Agricultural College, was elected president of the Association.

The Gunnison tunnel, opened in Montrose County, Colorado, last September, by President Taft, diverts the course of the Gunnison River and provides sufficient water to irrigate 150,000 acres of land. This is the first project undertaken by the government reclamation service. The tunnel is six miles long, with a capacity of over 1,000 cubic feet a second.

Among the recipients of honorary degrees conferred at the inauguration of Dr. A. Lawrence Lowell as president of Harvard University, was Dr. John Christopher Willis, director of the Royal Garden at Ceylon, and a delegate from Cambridge

University. Dr. Willis has been giving a brief course of lectures at Harvard on some economic problems of tropical agriculture.

Dean H. H. Rusby made during the summer a two months' trip to the Pacific coast; Dr. Rusby attended the American Pharmaceutical Association at Los Angeles, aided Dr. Kebler (Bureau of Chemistry, United States Department of Agriculture) in inspecting the drug supplies of the western coast, and studied and collected indigenous drugs and economic plants for the College of Pharmacy.

A conference has been planned by Gifford Pinchot, United States Forester, to which are invited the heads of all universities, colleges, and schools in which technical forestry is taught. The conference which is to be held in Washington December 30 and 31 will consider the objects and methods of forest instruction, the organization and standards of educational work in the field of forestry, the coördination of the work of different institutions, and the needs of the Forest Service and other employers of forest graduates.

At the recent Darwin commemoration the honorary degree of D.S. was (according to *Science*) conferred upon the following botanists: Robert Chodat, professor of botany at Geneva; Francis Darwin, F.R.S., honorary fellow of Christ's College, and formerly reader in botany; Karl F. Goebel, professor of botany at Munich; Hermann Graf zu Solms-Laubach, professor of botany at Strassburg; Clement Timiriazeff, professor of botany in Moscow; Hermann Vöchting, professor of botany at Tübingen; Hugo de Vries, professor of botany at Amsterdam; and Charles René Zeiller, professor of paleobotany in the École des Mines, Paris.

The yearly winter meeting of the American Association for the Advancement of Science will be held in Boston, from December 27, 1909, to January 1, 1910. The sessions of the botanical section will convene under the Vice-Presidency of Professor D. P. Penhallow, and will alternate with the sessions of the Botanical Society of America, as at Chicago and Baltimore. An address will be delivered by the retiring Vice-President, Dr. H. M. Richards, of Barnard College, Columbia University, and there will be a symposium on the rôle of botanical gardens, as well as the usual papers.

OTHER PUBLICATIONS

OF THE

TORREY BOTANICAL CLUB

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(1) BULLETIN

A monthly journal devoted to general botany, established 1870. Vol. 35 published in 1908, contained 608 pages of text and 40 full-page plates. Price $3.00 per annum. For Europe, 14 shillings. Dulau & Co., 37 Soho Square, London, are agents for England.

Of former volumes, only 24-34 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. 28–35 three dollars each.

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

(2) MEMOIRS

The MEMOIRS, established 1889, are published at irregular intervals. Volumes 1–11 and 13 are now completed; Nos. 1 and 2 of Vol. 12 and No. 1 of Vol. 14 have 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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NEW YORK CITY

Vol. 9 December, 1909 No. 12

TORREYA

A Monthly Journal of Botanical Notes and News

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

JEAN BROADHURST

JOHN TORREY, 1796–1873

CONTENTS

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THE TORREY BOTANICAL CLUB

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New York City

TORREYA

December, 1909

Vol. 9 No. 12

SOME AMERICAN BOTANISTS OF FORMER DAYS*

By John Hendley Barnhart

A hundred and twenty years ago, when Richard Pulteney had written his "Historical and biographical sketches of the progress of botany in England", he put into his preface these apt words: "In tracing the progress of human knowledge through its several gradations of improvement, it is scarcely possible for an inquisitive and liberal mind, of congenial taste, not to feel an ardent wish of information relating to those persons by whom such improvements have severally been given: and hence arises that interesting sympathy which almost inseparably connects biography with the history of each respective branch of knowledge." And it is as true as ever, that, if one would understand the progress of science, he must study the personality of the men whose labors have resulted in that progress.

Our theme this evening, "Some American botanists of former days", is a very limited one. The term "American botanists" is intended in its narrow sense, as referring only to those whose scientific work has been accomplished, at least in part, within the bounds of the United States as they were before our recent period of expansion. And when we say "botanists of former days" we must in fairness omit all reference not only to workers now living but to all who would be living if they had not met with premature death.† By the latter limitation we exclude all specialists in

* Paper presented at the meeting of the Torrey Botanical Club, October 12, 1909. Reprinted with slight alterations from the Journal of the New York Botanical Garden, Vol. X, No. 116, August, 1909.

† As a matter of fact, no man is mentioned who did not die more than five years ago; and, if all of those mentioned were still living, the youngest would be about seventy years old.

[No. 10, Vol. 9, of Torreya, comprising pages 217–240, was issued November 18, 1909.]

plant morphology and physiology, fields of study which have seen their entire development, as far as this country is concerned, within the memory of the living. Even thus limited, the number of botanists worthy of mention on an occasion such as this is so large that we must necessarily omit altogether some who might reasonably be looked for; and we may as well admit that in doubtful instances our choice has been influenced by the facility with which we are able to illustrate* our remarks.

The earliest knowledge of North American plants was derived from the accounts of observant travelers and explorers, and from specimens and seeds carried to Europe by them and by traders. Living plants and seeds were grown in European gardens, and it was from material raised in this way that most of the early technical descriptions of American plants were drawn. The collectors possessed little or no botanical knowledge, and the scientists who studied the collections can not be classed as "American" in any sense.

The first settler of whose scientific attainments as a botanist we have positive evidence, was John Banister, a missionary in Virginia, who lost his life by falling from some rocks while on one of his collecting expeditions. In 1680, Banister sent a list of Virginian plants to John Ray, of England, who published it as an appendix to his Historia Plantarum in 1688. Fifty years had elapsed, however, before the appearance of a work dealing exclusively with North American plants, and nearly a century before the first botanical work was published in North America.

John Clayton, who came from England to Virginia in 1705, and was for 51 years clerk of Gloucester County, prepared a scholarly work on Virginian plants. Of course he lacked facilities for publication, and for the comparison of his plants with those previously described; his specimens and manuscripts were sent to Holland, where the flora was published under the editorship of Gronovius, whose blunders are to be found on nearly every page. Clayton's botanical exploration covered all of eastern Virginia, and extended through many years; even the year before his death, when he was about 87 years of age, he made a botanical tour through Orange County. All of the care-

* The paper was illustrated with lantern slides.

fully prepared manuscripts and collections left by him were destroyed by fire a few years later, during the Revolutionary War.

While Clayton was pursuing his explorations in Virginia, Cadwalader Colden was studying the flora of his great three-thousand-acre estate, "Coldenham", in the colony of New York. Dr. Colden was a very busy man, nearly always holding some public

FLORA VIRGINICA

Exhibens

P L A N T A S

Quas

V. C.

JOHANNES CLAYTON

In

V I R G I N I A

Obſervavit atque collegit.

Eaſdem

Methodo Sexuali diſpoſuit, ad Genera propria retulit, Nominibus ſpecificis inſignivit, & minus cognitas deſcripſit

JOH. FRED. GRONOVIUS.

PARS SECUNDA.

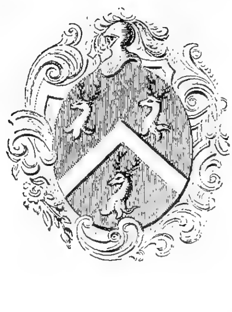
LUGDUNI BATAVORUM,

Apud CORNELIUM HAAK, 1743.

FIRST PAGE OF BANISTER'S CATALOGUE.*

office of importance, and at one time lieutenant-governor of the colony of New York; yet, with the aid, no doubt, of his gifted daughter, he found time to prepare a careful account of the native plants of Coldenham, and sent this to Linnaeus, who published it in the proceedings of the royal society of Upsala. This was the earliest local flora of any part of the present state of New

*This illustration was provided with the aid of the Catherine McManes fund.



Cadwallader Colden

CADWALLADER COLDEN, 1688–1776

York. The daughter, Jane Colden, commenced the preparation of a remarkably accurate flora of New York, of which the completed portion is preserved, in manuscript, in the Department of Botany of the British Museum.

Banister, Clayton, and Colden, as well as other early workers on the flora of North America, such as Catesby, Garden, Kalm, Vernon, and Kreig, were all Europeans by birth. The first native American botanist was John Bartram, a Quaker, who was born near Philadelphia in 1699. He published but little, and that little furnishes very slight evidence of his botanical attainments; but he was a correspondent of Collinson, Gronovius, and other famous European botanists of his day, and by the number and accuracy of the observations contained in his letters seems to have deserved their admiration. He traveled throughout eastern North America, from New York to Florida, collecting particularly seeds for his Old-World correspondents; but he is best remembered from the fact that he established, near Philadelphia, about 1730, the first botanic garden in America, and into this garden he gathered representatives of the largest possible number of native American plants. It was a small affair (the entire property comprised only five acres), and a part of the limited space was occupied by the house, built by his own hands; but the garden was a remarkable project indeed for those days, and is known to have contained many choice specimens.

William Bartram, son of John, is perhaps better known as a botanist, because of the fact that his account of his extended travels in the southern Atlantic states was published, and contains many important observations upon the plants of the regions explored by him. He maintained the garden established by his father, and after his death the property remained in the hands of owners who were deeply concerned in its preservation, for many years. During a short period of neglect, serious damage was done to the old garden, but within the past twenty years it has become the property of the city of Philadelphia, and is now a city park. Its collection of trees and shrubs has always been a notable one, and the old house is still in an excellent state of preservation.

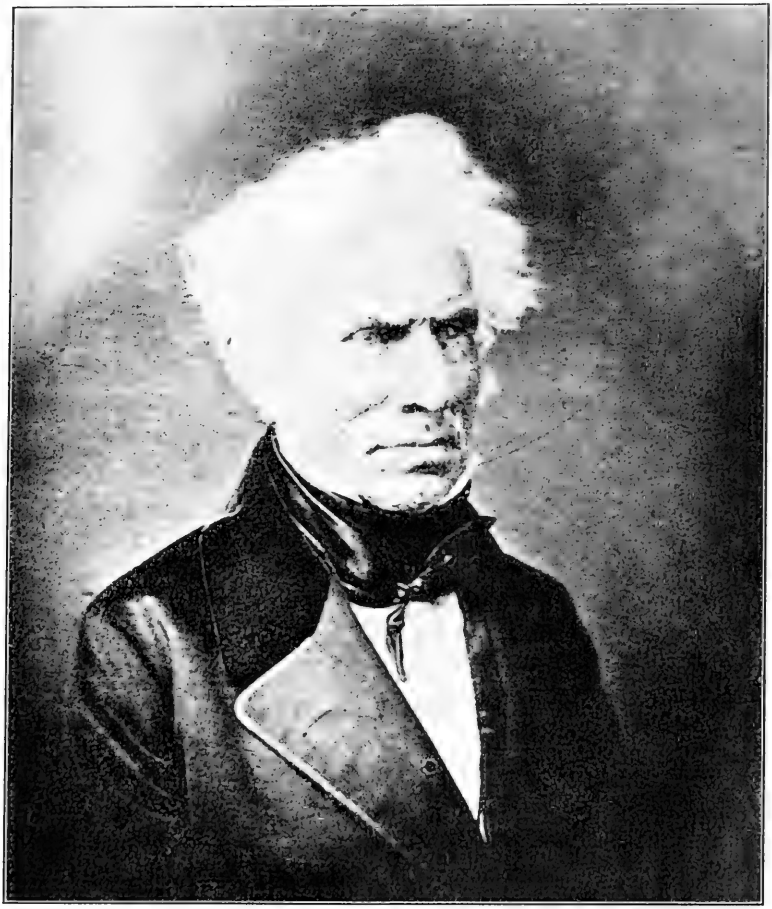
The second American botanic garden in North America was also near Philadelphia, and was established in 1773 by Humphry Marshall, a first cousin of John Bartram and, like him, a Quaker. The old garden has long since passed into a state of decay, but the house, built by Marshall with his own hands in 1773, is still in an excellent state of preservation. Humphry Marshall has the distinction of having written the first botanical work ever published in the United States, an account of our native trees and shrubs, printed at Philadelphia in the latter part of the year 1785.

One of the most remarkable of the early American botanists was Thomas Walter, a native of Hampshire, England, who went to South Carolina when a young man, married there, and settled on the banks of the Santee River. How he became interested in botany, how he was able to carry on his botanical work in such complete isolation from the rest of the scientific world, is quite unaccountable. However accomplished, it is an indisputable fact that he prepared a clear, succinct, and remarkably complete flora of the region about his home, which was published in London by John Fraser in 1788. Fraser was a collector who visited the southern states repeatedly, the first time as early as 1785; he was a personal friend of Walter's, and took the manuscript back with him upon his return from one of his earlier trips. Walter died in the same year in which his flora was published, less than fifty years of age, and was buried in the garden adjoining his home, where he is said to have cultivated many of the plants described in his Flora Caroliniana. His herbarium is preserved in the Department of Botany of the British Museum.

Our attention is now claimed by a small group of men who played an important part in the development of American botany. They were born, and died, in foreign lands, but they spent years in the active botanical exploration of the United States as then limited, and their labors resulted, in each instance, in the publication of a monumental work upon the North American flora.

André Michaux, a Frenchman, already well known for his botanical travels in Europe and the Orient, landed at New York late in 1785, and spent more than ten years in America, traveling throughout the known parts of the country from Hudson Bay to

Florida, and as far west as Kentucky and the Cumberland settlements. On his travels he was sometimes accompanied by his son, François André, who was only fifteen years old upon their first arrival. During all these years, although for a part of the



FRANÇOIS ANDRÉ MICHAUX, 1770–1855
(Daguerreotype, 1851)

time he was engaged upon a political mission for the French government, Michaux seems to have had in mind the accumulation of material for a general flora of North America, and when he returned to France in 1796 he carried with him an herbarium of North American plants such as had never before been brought together. His flora was edited by the famous French botanist, L. C. Richard, and published at Paris in 1803; meanwhile the man whose labors had made this great undertaking possible of accomplishment had lost life on the island of Madagascar.

The son, François André Michaux, revisited America in the years 1801–03, traveling through the then extreme west, Ohio, Kentucky, and Tennessee. He afterwards published an elaborately illustrated history of the forest trees of North America, and several other works relating to our flora; and, at his death, in 1855, he left to the American Philosophical Society a fund for the development of American arboriculture.

Frederick Pursh was a native of Saxony. He came to America in 1799, and spent nearly twelve years here, engaged much of the time in botanical collecting trips. He traveled principally on foot, and without companionship save perhaps that of a dog. According to his own statements, he was as far to the northeast as New Hampshire and as far south as the mountains of North Carolina, but as far as collateral evidence is concerned there is no proof that he was farther northeast than Vermont or farther south than southern Virginia; and, unfortunately, the reputation of Frederick Pursh for strict veracity is not of the best. In the course of his travels, however, he made the acquaintance of nearly all the botanists then living in this country, and was permitted to examine all the herbaria then existing here; and, upon his return to Europe, he found in England, where he made his home, several fine herbaria of North American plants. In England, in 1814, he published his flora of North America, which was the second (and last successful) attempt to comprehend in a single work descriptions of all known North American flowering plants. A few years later Pursh began the exploration of Canada, with a view to the preparation of a descriptive Canadian flora, but before this was accomplished he died, at Montreal.

Thomas Nuttall was an Englishman who, when he came to America in 1808, at the age of twenty-two, had no knowledge of botany, and received his first lessons in that science from Professor B. S. Barton, to whom he had applied for information concerning an unfamiliar plant. Yet he became a great enthusiast in the pursuit of botanical knowledge, and only ten years later he published his famous work on the genera of North American plants, which gave him a place in the first rank of the botanists of his day. Meanwhile he had made excursions to various parts of the country east of the Mississippi, and one far up the Missouri, utilizing the inclement winter seasons for working up his collections at Philadelphia. Nuttall continued botanical work in this country until 1841, when he returned to England, where he spent his remaining years, with the exception of a brief visit to Philadelphia in the winter of 1847–48.

By the time Nuttall's work on the genera of North American plants appeared, in 1818, there had sprung up two vigorous centers of botanical activity in this country, one at Philadelphia, the other at New York. In discussing these, we shall find it convenient to take up the Philadelphia group of botanists first. This was doubtless directly influenced by the earlier work of the Bartrams and of Marshall in that vicinity.

Henry Muhlenberg was a Lutheran clergyman, born in Pennsylvania, but educated in Germany. He did not take up the study of botany until he was nearly thirty years old, about 1782 or later. His home was at Lancaster from this time until his death in 1815, but he is mentioned here because his botanical associations were chiefly with the younger workers of Philadelphia. By his thorough work, his publications, his collections, and his correspondence with European botanists, he did much to advance the knowledge of our flora.

Dr. Benjamin Smith Barton, a native of Pennsylvania, who had received his medical education at Edinburgh and Göttingen, became a professor in the University of Pennsylvania in 1790, at the early age of twenty-four, and continued to occupy this chair until his death twenty-five years later. His position gave him much prestige, and his contributions to the advance of American botany are to be measured less by his published work than by the influence of his botanical lectures, and the sympathy and financial support given by him to other students, such as Pursh and Nuttall. His nephew, Dr. William P. C. Barton, also became a well-known botanist.

One of Dr. Barton's students, whose interest in botany seems to have been first aroused, however, by Humphry Marshall, was Dr. William Baldwin. Dr. Baldwin had already visited China before he received his professional degree in 1807, and within the next ten years he traveled extensively in the southern states, and as a surgeon in the United States Navy visited various South American ports. In 1819 he joined a government expedition for the exploration of the upper Missouri, and died before they were well under way. His published papers were few, but his notes and memoranda were very useful to contemporary workers, and his memory is kept green by the publication of a volume of his letters by his friend, Dr. Darlington.

Dr. William Darlington was another physician who enjoyed the inspiration of Barton's lectures, and in spite of his arduous labors as a member of Congress and in various other public and semi-public positions, devoted much time throughout a long life to botanical study. His flora of his home county of Chester, which went through three editions, was a model local flora which in some respects has never been surpassed. He was deeply interested in such subjects as those we are discussing this evening, and it was through his efforts and under his editorship that the literary relics of Bartram, of Marshall, and of Baldwin, were rescued from oblivion.

Lewis D. de Schweinitz was a Moravian preacher, a native of Bethlehem, Pennsylvania, where he spent most of his life. He was educated in part, however, in Austria and Germany; although his study of botany was begun before he left America, his first published work was in collaboration with Professor J. B. Albertini, of Niesky, in upper Lusatia. His chief interest was in cryptogamous plants, particularly fungi, and he was the first American specialist in this group of plants. Although his published works were few, they were fairly voluminous, and are of great importance.

The leader of the New York group of botanists was Dr. Samuel L. Mitchill. He was a naturalist of broad interests, and never published any botanical work of consequence, yet he exerted such a remarkable influence upon the young men he gathered about him that no student of the history of botany in this city could fail to recognize in him a great pioneer. When a handful of young enthusiasts gathered in 1817 to organize the Lyceum of Natural History, now the New York Academy of Sciences, the only candidate considered for president was their beloved professor, Dr. Mitchill, and he retained his interest in the institution until his death. At various times Congressman, Senator, and College Professor, his is a striking figure in the history of natural science in this vicinity.

A contemporary of Dr. Mitchill was Dr. David Hosack, a New York boy, a graduate of Princeton, who pursued his medical studies in Scotland and England, and while there acquired a taste for botany, and received some training in that science from William Curtis and Sir James E. Smith, the famous English botanists. Soon after his return to New York he established the first botanical garden in this city, a short distance north of where the Grand Central Station now stands. A hundred years ago this Elgin Botanic Garden was one of the show places of the city; in 1811 it was sold by Hosack to the State of New York, and three years later was granted to Columbia College. The grant did not require Columbia to maintain the Garden as such, and it was soon diverted from its former uses; with the later marvellous rise in value of real estate in that vicinity, it became the foundation of Columbia's prosperity.

Among the founders of the Lyceum were several young men particularly interested in botany, among them LeConte, Eddy, Knevels, and Torrey. Of this number Dr. John Torrey became most renowned in after years. His first important botanical work was performed as a member of a committee appointed by the Lyceum to prepare a flora of the region around New York City. This report, prepared chiefly by Torrey, was afterward published, and was the first of a long series of important works, which won for Torrey universal recognition as the foremost American botanist of his day. He was for many years a professor in the College of Physicians and Surgeons, and died at the age of 76, universally beloved.

As Torrey had been one of the young men drawn together by the magnetic personality of Dr. Mitchill, for the establishment of the Lyceum, so he was in turn the center of attraction for the group who, nearly sixty years later, founded the Torrey Botanical Club. The leading spirit in this later movement was William H. Leggett, who acted as editor of the Bulletin of the Club from its commencement in 1870 until his death in 1882.

One of the early botanists of the Lyceum was Professor C. S. Rafinesque, and we may as well refer to him at this point, although by nature and by fate he was a cosmopolitan. His father was a French merchant, his mother was of German extraction, he was born in a suburb of Constantinople and spent most of his early years in Italy. He was a precocious child, becoming familiar with various languages and more or less acquainted with various sciences at an early age. As a young man he spent several years in America; then several years in Sicily; in 1815 he returned to the United States, where he spent the remainder of his life. He was in many ways the most striking figure to be found in American botany; brilliant, but erratic; undervalued, misunderstood, and misrepresented by his contemporaries, yet deserving by his rashness and the superficiality of his work many of the harsh criticisms with which he was assailed. As professor in Transylvania University, he was the first resident botanist west of the Alleghenies. His later years were spent in Philadelphia, where he died in poverty and almost friendless. Most of his numerous publications might better never have been written, yet with the dross are occasionally to be found grains of pure gold, and the present generation is inclined to put a more just estimate upon the work of Rafinesque than has hitherto prevailed.

Amos Eaton was the first great popularizer of botany in this country, and in tracing back the history of any American botanist of the past century we are as likely as not to find that Eaton was, botanically speaking, his father or grandfather. Eaton was a teacher, and was always full of enthusiasm of such a contagious character that his pupils found it irresistible. Wherever he went he inspired others with the same interest in natural science that he felt himself. None of his predecessors could be compared with him in this respect except perhaps B. S. Barton, and Barton's personality was cold and formal when compared with that of Eaton. His manual, prepared specifically to meet the needs of the amateur, was popular for many years, and went through eight editions. The last eighteen years of his life were chiefly occupied with labors incident to the establishment and administration of the Rensselaer Polytechnic Institute, at Troy. Among the many inspired by him was Mrs. Almira H. Lincoln, afterwards Mrs. Phelps, whose text-book did so much to popularize the study of botany.

At this time there was no group of botanists in New England comparable to those in Philadelphia and New York ; yet at least two New England botanists of this period should be mentioned. One was Dr. Jacob Bigelow, author of a Boston flora which appeared in three editions. He was one of the most famous of Boston physicians, and lived to be nearly 92 years of age. The other was Professor Chester Dewey, well known for his work on the difficult genus Carex.

Another man who was doing remarkable work at about the same time was Stephen Elliott, of Charleston, South Carolina. Isolated from most other botanists, with meager facilities for the prosecution of scientific work, occupied much of the time with his duties as a member of the legislature of his state, he nevertheless published, at intervals, beginning in 1816, a descriptive flora of South Carolina and Georgia which challenges our admiration.

We now come to a new era in the development of American botany. Hitherto most American botanists had been interested in other natural sciences as well, and in so far as they had devoted their attention to botany they had covered essentially the same ground. Morphology and physiology were still in the background, but although taxonomy held the field, specialization was the order of the day.

The acknowledged leader of American botany during this period was Dr. Asa Gray. At first in New York, and later for many years at Harvard, he made a name for himself, as a man of sound scholarship, of broad culture, and of commanding personality. He seems, however, to have been jealous of his own preeminence, and to have discouraged successfully every possible rival in his chosen field. Few indeed, during a period of many years, were the Americans who ventured to differ with him upon any botanical matter on which he had expressed an opinion. His assistant at Harvard in his later years, and his successor, was Dr. Sereno Watson, a man of similarly scholarly attainments.

In one line, however, Gray had a worthy rival. Alphonso Wood possessed neither the talents nor the advantages of Asa Gray, but his class-book of botany always disputed with Gray's manual the right to popular approval as a working reference book upon the flora of the northeastern United States. Nor was Wood's work patterned after that of Gray; its first edition appeared several months earlier, and its later editions covered a considerably larger field, while the author always persisted in giving clear expression to his own views. Dr. Alvan W. Chapman, on the other hand, who wrote the well-known flora of the southern United States, was an author in little more than name, the absolute authority of Dr. Gray being recognized throughout the work.

During the years when Dr. Gray monopolized nearly all of the work on the taxonomy of flowering plants in this country, there arose a number of specialists in plant-groups in which he took little interest — for he realized that it was impossible for one man to cover all the ground — who, as a rule, coöperated with him in their work. Among the specialists in groups of flowering plants were M. S. Bebb, who did notable work with the willows, having at his home in Illinois a remarkable salicetum where he was able to compare the various species in a living state; George Thurber, best known to botanists as a grass student, although most of his time was devoted to editorial work in agriculture; and George Vasey, also a specialist in the taxonomy of grasses, and for years the botanist of the United States Department of Agriculture.

In ferns, the one prominent name was that of Daniel C. Eaton, for thirty years professor of botany at Yale; he was a grandson of Amos Eaton, whose wonderful influence upon American botany has been mentioned. Among moss students, we may refer to William S. Sullivant, who was the pioneer in the work upon this group of plants in this country, and Thomas P. James, who assisted Leo Lesquereux (of whom more later) in the preparation of the manual which is even now the only book of its kind for the identification of all then known American mosses. In the study of the Hepaticae, Coe F. Austin was the pioneer; his home, at Closter, New Jersey, was in a region peculiarly rich in its hepatic flora.

Among the specialists in Algae we may mention Dr. Francis Wolle, a Moravian clergyman, who published several books dealing chiefly with freshwater forms. Almost the only American student of lichens, for many years, was Professor Edward Tuckerman, of Amherst College. The most prominent mycologists of this period were Rev. M. A. Curtis, an Episcopalian clergyman, and Henry W. Ravenel, a planter, and since their work, as well as much of that of Schweinitz, was done in the southeastern states, the fungi of that region were better known forty years ago than those of any other part of the country.

As an example of the few palaeobotanical students of this period we may mention J. S. Newberry, geologist of several government exploring expeditions, state geologist of Ohio, and for twenty-four years professor in Columbia University. A unique position, as one who was at the same time a botanical horticulturist and a horticultural botanist, was occupied by Thomas Meehan, of Germantown, Philadelphia; his botanical work always betrayed his lack of scientific training, but contained much of permanent value.

The remarkable immigration to this country from central Europe during the thirties and forties, influenced largely by political conditions, had a pronounced effect upon American botany. Dr. George Engelmann, from Germany, became the pioneer of botanical work in the Mississippi valley, and established a botanical center at St. Louis which has been increasing in influence ever since. Dr. Leo Lesquereux, a Swiss, was for many years the foremost American student of fossil plants, and of mosses. Two men of German birth, Dr. Charles Mohr, of

Mobile, and Dr. Augustin Gattinger, of Nashville, became noted for their work upon the flora of their respective states.

In a discussion of American botanists, we must not overlook

CHARLES WILKINS SHORT, 1794–1863
(Daguerreotype, 1853)

those who are best known for field work, but of this class we can only mention a few. Perhaps the first person in this country to become noted for the excellence of the herbarium material distributed by him was Dr. Charles W. Short, of Kentucky. Dr.

Charles C. Parry is best remembered for his field work throughout the west, upon various government and private expeditions. H. N. Bolander and Thomas Bridges were among those who did notable work in the botanical exploration of California. But the prince of American plant collectors of former days was a modest Connecticut Yankee, Charles Wright, who devoted twenty years to work in the southwest, in Mexico, in China, and in Japan, and another ten years to the botanical exploration of Cuba.

Nor can we omit mention of those who, although busily engaged with other occupations, have found time to do valuable work upon the flora of the regions in which they have made their homes. Such a one, for instance, was Charles C. Frost, the shoemaker of Brattleboro, who had "more friends among the educated people of Europe than in his native village." Another such was John Williamson, of Kentucky, who with his own hands produced those beautiful etchings now so highly prized by American fern students.

The day of usefulness of amateur work in botany, such as that of Frost and of Williamson, has not passed. The limits of our topic forbid the mention of the names of the living, but even now there are farmers, and merchants, and professional men, who by devoting their leisure moments to serious study are notably advancing botanical science.

LOCAL FLORA NOTES — II

By Norman Taylor

Scheuchzeriaceae

1. *Triglochin palustris* L. There are no specimens of this from the area.* North American Flora, the manuals and other general works all credit this species with a range that includes at least the upper part of our area. Most of the local lists contain no mention

*The local flora range as prescribed by the Club's preliminary catalog of 1888 is as follows: All the state of Connecticut; Long Island; in New York, the counties bordering the Hudson Valley, up to and including Columbia and Greene, also Sullivan and Delaware counties; all the state of New Jersey; and Pike, Wayne, Monroe, Lackawanna, Luzerne, Northampton, Lehigh, Carbon, Bucks, Berks, Schuylkill, Montgomery, Philadelphia, Delaware, and Chester counties in Pennsylvania.

of the plant, but Hogsradt in his list of the plants found near Pine Plains, Dutchess Co., N. Y., says of it (in 1875) "very rare, only a single specimen in Sackett's Marsh." Has the locality any recent verification? The plant should grow in the Catskills but collections at hand do not show this.

Alismaceae

1. *Lophotocarpus spongiosus* (Engelm.) J. G. Smith. The most southerly point from which this plant has been collected is Hackensack River, N. J. In general works it is credited with a range from New Brunswick to Virginia. In Britton, Cat. of Plants of New Jersey, a single station, Camden, is cited. What is its distribution in New Jersey and northward? Has it ever been seen on Long Island?

2. *Sagittaria rigida* Pursh. As shown by the specimens in herbaria this plant is apparently more restricted in distribution than general works postulate it to be. So far as the local range is concerned it is not reported from north of Easton, Pa., or south of New Brunswick, N. J. This limitation of the range by our specimens is surely wrong. Stations north or south of these points will settle its local distribution.

3. *Sagittaria pubescens* Muhl. There are no specimens from the range in the collections. North American Flora credits it to New Jersey and the Handbook of the flora of Philadelphia and vicinity gives Bucks, Chester, and Northampton counties as stations. Specimens from any of these localities, particularly from New Jersey, are desired in order that its local distribution shall be permanently recorded in the club herbarium.

4. *Sagittaria cuneata* Sheldon. The local collectors are lacking in specimens of this. According to North American Flora it is found in Connecticut. Any specimens from this state or adjacent New York are desirable.

5. *Sagittaria Eatoni* J. G. Smith. We have no specimens from the range. North American Flora gives its general distribution thus "Massachusetts, Connecticut, and Long Island, New York." Smith * writes of seeing specimens from the shores

* Rep. Mo. Bot. Gard. 11: 150, 151.

of Long Island Sound. Has any one collected it recently from Long Island or Connecticut?

6. *Sagittaria borata* (Chapm.) Small. There are no specimens from the range. General works report it from Connecticut to New Jersey, etc. The Catalogue of New Jersey plants gives numerous stations, all of which it is desirable to permanently record in the club herbarium.

Elodeaceae

1. *Philotria canadensis* (Michx.) Britton. Princeton, N. J., is the only station represented in the collection. With a general range including territory from Quebec to Virginia, this localization is obviously untrue. Specimens from throughout the range are desired. So far as known the staminate flowers of this species are wanting, while in the other species they are known to occur. Has any one ever seen a staminate flower?

2. *Philotria Nuttallii* (Planch) Rydb. There are only three stations represented in the material at hand, and they are all near New York City. Generally speaking this species is more common than the preceding and its distribution within the range more diversified than the collections show.

Hydrocharitaceae

1. *Limnobium Spongia* (Bosc) Rich. There are no specimens from the range. In the Cat. Pl. New Jersey is the following record: "Monmouth [Co.]: Swimming River, rare. — Knieskom. Not recently collected, and not seen by me from the State." The general range given in North American Flora is from New Jersey and Ontario to Florida, etc. Has anyone recent specimens from any part of our range?

Araceae

1. *Arisaema Stewardsonii* Britton. The only specimen from the range was collected at Tannersville, Pa. Letters and notes are extant going to show its occurrence at other stations but there are no specimens to substantiate these claims. Recent notice of it at Plainfield, N. J., again unaccompanied by speci-

mens, may be grounds for assuming a wider distribution for *A. Stewardsonii* than is now shown by our material.

2. *Arisaema pusillum* (Peck) Nash. The only two specimens of this little known species were collected at the New York Botanical Garden and at Hewlet, L. I. Has any one been able to trace its distribution beyond that called for in the manual, viz., "Sunny bogs, southern N. Y."? It seems to be a very localized plant, or it may be a mere form of the widely dispersed *A. triphyllum* (L.) Torrey.

Lemnaceae

1. *Spirodela polyrhiza* (L.) Schleid. There are no specimens from the territory that lies north of New York City. A record exists of its being found at Pine Plains, Dutchess Co., N. Y. It should be found throughout our range but no permanent record, except those given above, is extant.

2. *Lemna trisulca* L. This almost cosmopolitan species is known only from West Goshen, Conn., so far as our range is concerned. Any specimens that will show its true distribution in the area will be welcome.

3. *Wolffia Columbiana* Karst. No specimens at hand were collected north of the region about New York City. With a general distribution of "Mass. to Ont., N. J., S. Car.," etc., it seems that our material does not adequately represent the distribution of the species within the range.

Xyridaceae

1. *Xyris fimbriata* Ell. The only specimens are from Atsion and Egg Harbor, N. J. In the Cat. of N. J. plants at least six other stations are given. From where else in New Jersey has this plant been found? So far as our range is concerned the plant occurs only in southern New Jersey, but our specimens fail to show how far north the plant is to be expected.

2. *Xyris montana* H. Ries. The most northerly station represented in the collections are among the Pocono Mountains of Pennsylvania. Between this and the southerly tip of New Jersey there is an hiatus. Where in the northern part of the pine barren region may the plant be found? Has it ever been found north of the Pocono country?

Eriocaulaceae

1. *Eriocaulon Parkeri* Robinson. In the appendix to the second edition of Britton's Manual, page 1067, this plant is reported as growing in tidal mud at Camden, N. J. Has any other station been discovered or is the plant a localized affair?

New York Botanical Garden

REVIEWS

Ramaley's Wild Flowers and Trees of Colorado *

Wild Flowers and Trees of Colorado recently issued by Professor Ramaley, of the University of Colorado, is most attractively illustrated with line drawings, and a varied and large number of half tones of plants and of plant habitats. The book, issued as the "only popular work of any kind dealing with Colorado plants", must surely serve the author's purpose: to interest the people of Colorado in its plants.

Believing that the trees are "the best plants to begin with in a study of vegetation", half of the book is devoted to forest formations and forest trees; a very simple key based upon leaf characters is included. The flowers cannot, of course, be exhaustively dealt with in the space allowed; but both text and illustrations are interesting, and some knowledge of plant names, and of plant ecology may be acquired in a very pleasant way.

Jean Broadhurst

Jennings's Botanical Survey of Presque Isle †

This important contribution to phytogeography deserves more than a passing notice, because it is a sample of a carefully prepared and a thoroughly digested piece of field exploration. The numerous full-page illustrations and charts which are reproduced in this bulky publication add very much to its value to the

* Ramaley, Francis. Wild Flowers and Trees of Colorado. A. A. Greenman, Boulder, Colo. Pp. 78. Illustrated. (For sale by G. E. Stechert & Co., New York.) $1.25.

*Jennings, Otto E. A Botanical Survey of Presque Isle, Erie County, Pennsylvania. Annals of the Carnegie Museum, Vol. V, Nos. 2 and 3, 1909. Pp. 289–421, pl. XXI–LI with 4 text figures.

student of botany and physiography. Under the caption "the physiographic origin of Presque Isle" Jennings describes the changes which have been produced in the conformation of the shore and hills by the slow action of the currents and waves of Lake Erie. He shows by a series of figures and in his description how the evolution of the island has taken place, the United States hydrographic charts made at various intervals in the past affording important data upon which to base a survey. The author shows how the development of the climax vegetation has been influenced by the physiographic changes that have taken place in the island. Under the heading "ecological structure and pevelopment of the vegetation" is presented a detailed account of the plant formations, and finally, a list of the 420 species, 18 varieties, and 1 hybrid collected at various times on Presque Isle. The reviewer believes that Jennings has subdivided the natural vegetation into too many formations. For example, the Lagoon-Marsh-Thicket-Forest Succession has been subdivided into the Populus-Salix Formation, the Potamogeton Formation, the Typha-Scirpus Formation, the Sabbatia-Linum Formation, etc. The treatment would have been much simplified if all of these formations (which are not formations as the reviewer understands them) had been grouped under one, viz., "the lake formation", and if the smaller areas of vegetation had been termed associations, or circumareas. Then, instead of describing the vegetation of each lagoon, separately and categorically, much space might have been saved and condensation made possible by referring to the lagoon where such and such a type of vegetation occurred naturally. These remarks are not made in a fault-finding spirit, but merely to suggest points where forthcoming papers of a similar character might be improved without impairing the scientific value of the work.

John W. Harshberger

PROCEEDINGS OF THE CLUB

October 27, 1909

This meeting was held at the New York Botanical Garden and was called to order at 3:30 P. M. by Dr. E. B. Southwick.

About forty persons were present. After the reading of the minutes of the preceding meeting, the scientific program was presented, the first contribution being made by Mrs. N. L. Britton, who spoke on "Arctic Mosses." The speaker's remarks were based on studies of mosses sent from the American Museum of Natural History to the New York Botanical Garden for determination. They were collected by Comm. Robert E. Peary in Grant Land in 1902, and by Dr. L. J. Wolf at Wrangle Bay, Lincoln Bay, and Grant Land in 1906. The Peary collection includes 62 bryophytes, of which 57 were mosses, representing 24 genera, and 5 were hepatics.

Specimens of flowering plants were also exhibited which have recently been acquired by the New York Botanical Garden through the courtesy of the Peary Arctic Club from the American Museum of Natural History.

The collection consists of herbarium specimens made on the late expedition of Comm. Peary to the North Pole and were collected mostly by Dr. J. W. Goodsell. While some of these were obtained on the northern coast of Labrador, the majority were collected on Grant Land, in the northern portion of Ellesmere Land, an island off the coast of Greenland. One of the packages contained specimens from perhaps the most northern locality where flowering plants have ever been found, while another is from Etah, the most northern habitation of man.

Since the subject of mosses was the principal topic of the hour, Dr. Murrill referred briefly to the genus *Dictyolus*, the species of which are found on living mosses. This genus belongs to the Chanterleae, a tribe of gill-fungi, and there are only two species known in North America, *D. muscigenus*, occurring from Greenland to South Carolina, and *D. retirugus*, known from Greenland, Alaska, Minnesota, and California. Both species are small and thin, grayish or brownish in color and have folded-like gills. *D.*

muscigenus may be recognized by its distinct stripe and dichotomous gills, while *D. retirugus* is sessile or subsessile with branched, reticulate gills.

Dr. N. L. Britton spoke of the three genera of Cactaceae, *Carnegiea*, *Pachycereus*, and *Cephalocereus*, and showed specimens of their flowers. The genus *Carnegiea*, dedicated to Mr. Andrew Carnegie and formerly known as *Cereus giganteus*, consists of a single species. Some of these plants attain a height of sixty feet and branch at from twelve to twenty feet above the ground. The flowers are funnel-form with a nearly cylindric tube, bearing a few broad triangular scales. *Pachycereus* blooms at a different season from *Carnegiea* and the perianth-tube is clothed with woolly hairs and bristles.

Cephalocereus which has many representatives in the West Indies and some in Mexico, derives its name from the fact that the top of the plant is hairy. At Key West, Florida, there is a colony of *Cephalocereus keyenses* which is related to some of the Cuban and Bahaman species. It is the only locality where this species is known to exist. As it is growing here on a Government reservation, it will most likely be preserved.

Mr. Roland M. Harper told of his experiences in the south from July, 1908, to July, 1909. A few weeks were spent at the Biltmore Forest School, North Carolina. Specimens were observed here of *Helonias bullata* and *Dalibarda repens* which are not listed in Small's Flora of the Southeastern United States. The former was reported several years ago by F. E. Boynton, while the latter was noticed by Dr. Homer D. House.

Six weeks were spent in Georgia particularly in the vicinity of Pine Mountains and among the sand-hills of the fall line region, where he found *Chamaecyparis thyoides* which has not previously been reported from the state. Specimens of *Chrysopsis pinifolia*, discovered by Elliott in 1815, and known only from one county, were collected and also a twining *Bartonia*. Together with a party of geologists, Mr. Harper made a trip of 260 miles on the Warrior and Tombigbee Rivers in Alabama, which occupied a period of ten days. Here he collected an *Equisetum* which resembles *E. arvense*, but is several hundred miles out of the range of that species. While in Florida studying peat for the State Geological Survey, he found several interesting plants, *Spartina Bakeri* which is very common but not mentioned in any flora, and an arborescent *Serenoa serrulata*, some plants of which attained a height of ten feet, and an undescribed species of *Prunus*. Mr. Harper explored the southern end of the Everglades following about the same route as that taken by Dr. Britton in 1904 and Dr. Small in January of this year.

After the scientific communications, Mr. Ernest D. Clark, 401 West 117th Street, New York City, was elected a member of the Club.

Dr. Southwick reported the finding of *Viola pedata* in flower, October 25.

Adjourned.

Percy Wilson,
Secretary

November 9, 1909

The meeting was held at the American Museum of Natural History with Vice-president Barnhart in the chair. Eighty-nine persons were present.

The scientific program of the evening consisted of a talk by Dr. Marshall A. Howe on "Some Floral and Scenic Features of Porto Rico." This was a semi-popular account of some of the more striking features of the native and introduced flora of the island and was illustrated by about a hundred lantern-slides, some of which showed, incidentally, many interesting topographic and scenic details of the Porto Rican mountains and sea coast. Special attention was given to the native palms and their economic uses. The photographs shown included, also, several of the cacti, which are much in evidence in certain places along the southern shore of Porto Rico and on the adjacent island of Culebra. In striking contrast with the xerophytic vegetation of the southern slopes are the mesophytic forests, now, unhappily, of very limited extent, on two or three of the highest mountains. The soil of the island is or has been very nearly all under cultivation, but in addition to the two or three comparatively small forested areas, there are, here and there, in various parts of the island, rocky hills where the native vegetation may be found under very nearly natural conditions. The sugar, coffee, and tobacco industries were also discussed and illustrated by the speaker.

Adjourned. PERCY WILSON,
Secretary

OF INTEREST TO TEACHERS

THE HIGH SCHOOL UNIT IN BOTANY

The report of the meeting of the committee of the North Central Association of Colleges and Secondary Schools appointed to define the unit in botany for the North Central Association of Colleges and Secondary Schools has not been given in TORREYA, although the meeting was held last June. The committee consists of over twenty members, and includes seven college or university professors, one city school superintendent, one normal school representative, and thirteen high school teachers.

A full year's work is required to fill the college entrance requirements; the year being defined as the equivalent of 180 periods of 45 minutes each, "in the clear," for the class room; double laboratory periods, which count as one recitation period, being recommended at least twice a week. The second year of high school is the earliest year for botany approved by the committee. It was decided that the high school course should include plant physiology, plant ecology, including field work, and work with the "lower forms" or cryptogams as well as the leading families of seed-bearing plants.

The informal discussion which followed the meeting suggests the following as the minimum preparation for the well-equipped high school teacher of botany: At least two years of botanical study including the morphology of the lower and higher plant forms, plant physiology, ecology, including a thorough knowledge of the flora in the region where taught, plant diseases, and a general course in bacteriology. Some work in zoölogy and physiography is also considered essential.

Thousands of acres of valuable timber land were destroyed by a forest fire in November in the region near Harper's Ferry. The states affected were Maryland, Virginia, and West Virginia.

Burned areas, the " natural " desert, and flooded districts have all been the subject of government investigation and experimentation; this year Pikes Peak adds another regional type to the list covered in experimenal forestry.

The reforestation of burned lands is being studied by the United States Forest Service in the Olympic National Forest in Washington. This forest — the scene of three severe fires — is one of those in which the burned area is so large that actual seed planting is necessary. Douglass fir (*Pseudotsuga Douglasii* Carr.), a tree common elsewhere in the state, has been selected for the test.

Pennsylvania, through the influence of the American Civic Association, has passed an act permitting the cities of the state to establish municipal forests. In many instances, cities may thus conserve and protect the water supply, promote the well-being of the citizens, and increase the municipal revenues. The cities, by the new law, are required to secure the approval of the State Commissioner of Forestry before buying the land; and the commissioner is required to make rules for the administration of such preserves.

K. F. Kellerman and T. R. Robinson (Bureau of Plant Industry) have recently conducted some experiments with nitrifying bacteria in North Carolina soils, which lead them to state that "nitrification, nodule formation upon certain species of legumes, and the litmus reaction are correlated." The results obtained, however, sustain the point (previously noted in Torreya in the abstract of similar work by Stevens and Withers) that nitrification is at a rather low ebb in North Carolina soils; yet nitrifying bacteria are generally present, and if supplied with suitable food would undoubtedly soon multiply sufficiently to cause a normal rate of nitrification.

The New York *Tribune* in a recent editorial remarks that in the enthusiasm for the policy of conserving natural resources many of the "most ardent advocates appear to have lost sight of the fact that, apart from the preservation of the forests, the entire movement lacks legal sanction, and that action by Congress is essential to its prosecution. The President has indicated his purpose to retain title to water rights, for instance, 'until the Congress shall have had an opportunity to act.' That opportunity will come with the approaching session, and there is grave question if Mr. Taft, earnest advocate of the movement though he be, will feel warranted in withholding from settlement lands containing water power after the coming session unless Congress acts affirmatively. Congress has never conferred on the Executive specific authority to withhold such lands, and it is only on the ground that a new problem has arisen that the President is now denying would-be settlers access and title to them." Though conservationists have "a sympathetic President, there is hard work for them to do in Congress. It is there that the test will come. Practically all the work done thus far is preliminary. No further step can be taken without definite legislative authority. Can Congress be induced to grant it?"

NEWS ITEMS

Mr. Charles E. Temple (A.B., Nebraska, 1906; A.M., 1909) has been made instructor in botany at the University of Michigan.

Mr. T. G. Bunting (B.S., Ontario, 1907) has been appointed instructor in horticulture at the New Hampshire College of Agriculture and the Mechanic Arts.

Professor Simon Schwendener, of the University of Berlin, will retire from his university duties, including the directorship of the University Gardens, this semester.

Dr. and Mrs. Howe sailed November 27 on the S. S. "Tagus" for Colon; they will spend five or six weeks collecting and studying the marine algae of the Panama region.

Professor Josephine E. Tilden, of the University of Minnesota, has been given leave of absence for a year for botanical research in New Zealand. Her courses at the University are being given by Mrs. Frederic E. Clements.

Professor William Bateson, who lectured recently in the United States on variation and heredity, has resigned the chair of biology in the University of Cambridge and accepted the directorship of the John Innes Horticultural Institution at Merton, Surrey.

The Field Museum of Natural History (Chicago) has recently secured the herbarium of Dr. J. T. Rothrock, which, as Dr. Rothrock was the botanist of the survey of the territories and an intimate of Dr. Asa Gray, Dr. Torrey, Dr. Thurber, and other early botanists, contains a large number of the types and co-types of western North America.

The sixty-first meeting of the American Association for the Advancement of Science, and the eighth of the "convocation week" meetings, will be held in Boston, December 27, 1909, to January 1, 1910, at the invitation of Harvard University and the Massachusetts Institute of Technology. The usual reduced railroad fares are offered. At ten o'clock, December 27, Dean W. C. Sabine, representing the President of Harvard University, and President R. A. Maclaurin, of the Massachusetts Institute of Technology, will deliver addresses of welcome, which will be answered by the President, Dr. David Starr Jordan. Tuesday afternoon Vice-President Richards will give his address: "The Nature of Response to Chemical Stimulation." About twenty-five affiliated societies are to hold meetings in Boston; among them are the Sullivant Moss Society, the Botanical Society of America, and the Society of American Bacteriologists.

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New names and the names of new genera and species are printed in **boldface** type.

THE TORREY BOTANICAL CLUB

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Meetings the second Tuesday and last Wednesday of each month alternately at the American Museum of Natural History and the New York Botanical Garden

PUBLICATIONS. Bulletin. Monthly, established 1870. Price $3.00 per year; single numbers 30 cents. Of former volumes only 24–33 can be supplied entire. Certain numbers of other volumes are available, and the completion of sets will be undertaken.

Memoirs. A series of technical papers published at irregular intervals, established 1889. Price $3.00 per volume.

Torreya. Monthly, established 1901. Price $1.00 per year.

All business correspondence relating to the above publications should be addressed to William Mansfield, Treasurer, College of Pharmacy, 115 W. 68th St., New York City.

OTHER PUBLICATIONS

OF THE

TORREY BOTANICAL CLUB

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(1) BULLETIN

A monthly journal devoted to general botany, established 1870. Vol. 35 published in 1908, contained 608 pages of text and 40 full-page plates. Price $3.00 per annum. For Europe, 14 shillings. Dulau & Co., 37 Soho Square, London, are agents for England.

Of former volumes, only 24-34 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. 28–35 three dollars each.

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

(2) MEMOIRS

The MEMOIRS, established 1889, are published at irregular intervals. Volumes 1–11 and 13 are now completed; Nos. 1 and 2 of Vol. 12 and No. 1 of Vol. 14 have 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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