TORREYA

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BY

NORMAN TAYLOR

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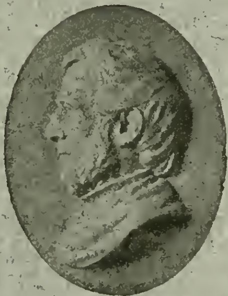

JOHN TORREY, 1796–1873

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THE TORREY BOTANICAL CLUB

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TORREYA

January, 1915.

Vol. 15 No. 1

NOTES ON THE DETERMINATION OF ROCKY MOUNTAIN CONIFERS

By Seymour S. Sharp

While working in a course in plant histology under the direction of Professor Aven Nelson two years ago, I found that the different species of the family Pinaceae occurring in the Central Rocky Mountain region could readily be separated merely on the internal structure of their leaves. Further study has led to the development of this paper.

In several instances, already, the key has proved of value in determining incomplete specimens in the Rocky Mountain Herbarium. Most of the species may be determined from a cross-section of a leaf merely by a hand lens, especially after one has become familiar with the terms used in the key and their significance. Cross-sections of dried leaves may be easily cut after boiling the leaves in water for a few minutes, and then putting them into 50 per cent. alcohol. Extremely thin sections are not at all necessary or advisable; in fact I have for my own amusement made determinations in the field (where it was not even necessary) with only a pocket knife and a hand lens. Not much variation occurs in leaves from a given species, but to avoid any possible confusion several leaves should be used. Particularly should sections be cut from four or five places along a leaf, so that typical sections may be secured. Since in some leaves not all the ducts will extend the full length of the leaf, this precaution becomes necessary. Fresh sections are sufficient for determination, but sections stained and cleared are much better. Fuchsin has been found to be a useful stain, since only the gross structure is necessary.

[No. 12, Vol. 14, of Torreya, comprising pp. 229–267, was issued 13 January 1915]

This means of determination serves also to show the close relations existing between doubtful species. These will be discussed more fully under the species involved. So far I have dealt only with the subfamily Abietineae, excluding in our range the genus *Juniperus*. Good sections of the latter are so hard to obtain that it is very doubtful if a practicable key for this genus can be constructed on the basis of leaf-structure. The keys and descriptions of the species of the Central Rocky Mountain region (as given in Coulter and Nelson's Manual) follow, with diagrams where necessary. For the nomenclature I have followed Sudworth, in his 1897 report on the "Arborescent Flora of the United States."

Family PINACEAE.

Leaves needle-like; fruit dry cones.	1. Abietineae.
Leaves scale-like or subulate; fruit (in ours) berries.	2. Cupressineae.

Subfamily ABIETINEAE.

Walls of the mesophyl intruded, giving the cells a lobed appearance.	1. PINUS.
Walls of the mesophyl not intruded.	
Stomata present on one side only.	4. PSEUDOTSUGA.
Stomata present on all sides.	
Leaf strongly 4-angled; bundle-sheath conspicuous.	2. PICEA.
Leaf strongly 4-angled; bundle sheath inconspicuous.	3. ABIES.

I. PINUS.

Cross-section triangular or wedge-shaped.	
Xylem of bundle not at all divided.	
Stomata present on all sides.	
All the resin ducts *usually* next to dorsal side (see descriptions).	1. *P. flexilis.*
One resin duct *usually* found in the angle between the ventral sides (see descr.).	2. *P. albicaulis.*
Stomata lacking on dorsal side.	3. *P. aristata.*
Xylem of bundle divided.	6. *P. ponderosa.*
Cross-section semicircular or crescentic.	
Xylem of bundle divided; ducts parenchymatous.	
Widely divided.	5. *P. Murrayana.*
Very slightly divided.	6. *P. ponderosa.*
Xylem of bundle undivided; ducts peripheral.	
Stomata *usually* more than 12.	4. *P. monophylla.*
Stomata *usually* less than 12.	4a. *P. monophylla edulis.*
Cross-section circular.	4. *P. monophylla.*

1. Pinus flexilis James, Long's Exp. 2: 34. 1823.

Tree 12–25 m. high, trunk 5–10 dm. in diameter, bark grayish; leaves in fascicles of 5, 4–7 cm. long; cones narrowly ovoid to subcylindrical, greenish or light brown, 8–15 cm. long; the scales unarmed, broad, slightly thickened at ends, opening at maturity. Limber Pine.

Rather common on ridges and slopes; 7,000–10,000 ft. (See note under *P. albicaulis*.)

2. Pinus albicaulis Engelmann, Trans. Acad. Sci. St. Louis 2: 209. 1868.

Very similar to the preceding; cones oval or subglobose, sessile, dark purple, 5–10 cm. long; the scales with thickened ends, remaining closed at maturity. White-bark Pine. (See also No. 1, *P. flexilis*.)

This and the preceding species are very closely related; in fact, Engelmann in Watson's Botany of California, II, makes *P. albicaulis* a variety of *P. flexilis*. In the cross-sections (see figures), *P. flexilis* usually lacks the resin duct in the angle between the ventral sides, although some of the specimens of this species appear to have it constantly. The two species can best be distinguished by their cones, the most noticeable and constant difference. Specimens without cones are readily confused.

3. Pinus aristata Engelmann, Am. Journ. Sci. II. 34: 331. 1862.

12–15 m. high, 4–7 dm. in diameter; leaves in fascicles of 5, submucronate, green, with a white glaucous stripe on each side; cones violet-brown, narrowly ovoid, 7–10 cm. long; scales with thickened rhombic ends, with small beak and tipped with a lanceolate-subulate often recurved awn. Bristle-cone Pine.

Subalpine; from Colorado south, and west to California.

This can be readily distinguished from the others of this group by the lack of stomata on the outer side, and the deeply sunken stomata on the ventral sides. Sometimes only one resin duct is present.

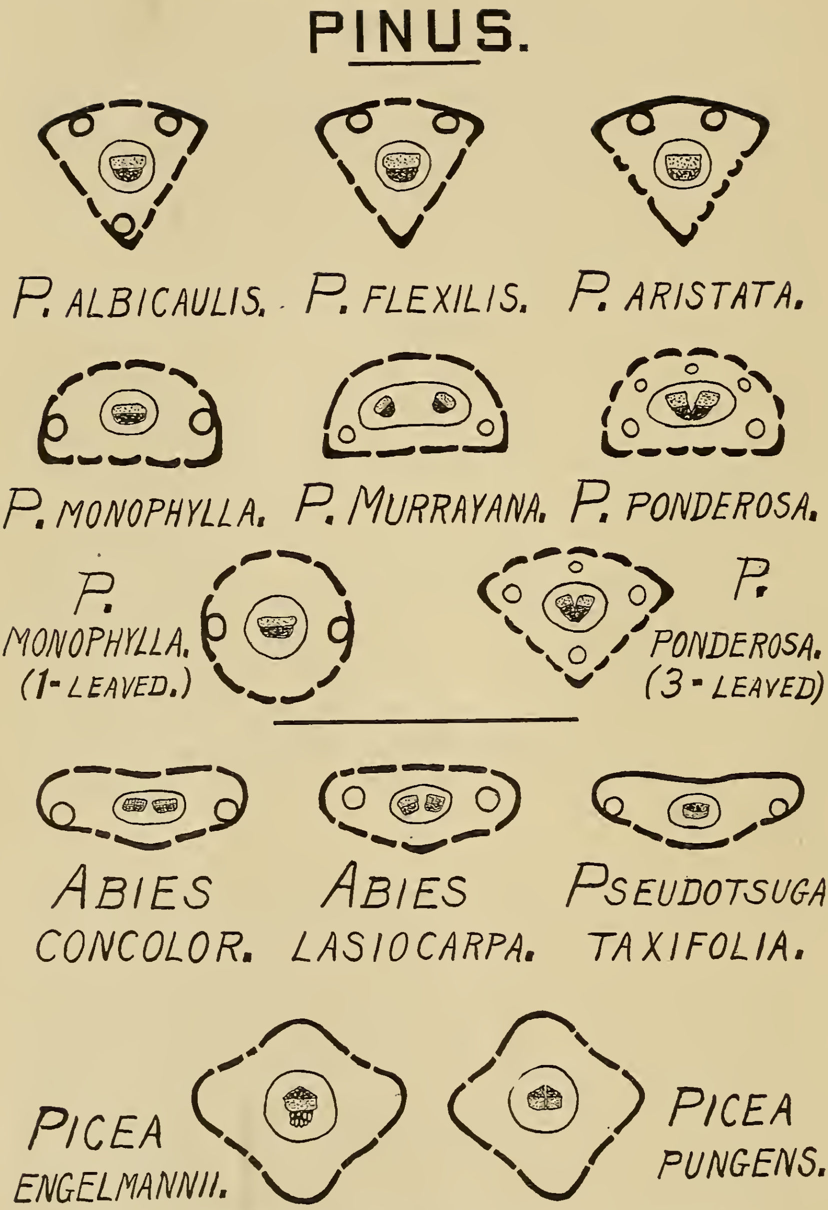

FIG. 1. Cross-sections of the leaves of some Rocky Mountain conifers.

4. PINUS MONOPHYLLA Torr. and Frem., Fremont's 2d Rep. 319, t. 4. 1845.

5–12 m. high, branched from or near the base; leaves single, in pairs, or (very rarely) in threes, 2–5 cm. long; cones sessile, subglobose, 4–6 cm. long; tips of scales thick, truncate, awnless; seeds large, brown, wingless, edible. Pinon or Nut Pine.

Texas, Colorado, Utah to Arizona.

The form in which all the fascicles contain 2–3 leaves should be referred to the variety *P. monophylla edulis.*

4*a*. PINUS MONOPHYLLA EDULIS (Engelm.) Jones, Zoe II. 1891.

Mr. Jones seems to have made proper disposition of this species in a report on the Flora of Utah, published in Zoe, 1891, reducing it to a variety of *P. monophylla.* Specimens of *P. monophylla* have been found in which there are actually more bundles with two leaves than with one, and these intermediate forms are frequent. *P. edulis*, therefore, seems to be a variety of *P. monophylla* in which all of the fascicles have two leaves (in very rare cases, three). So far as the sections of *P. edulis* and the two-leaved form of true *P. monophylla* are concerned, there is practically no difference. The variety *edulis* appears to have fewer rows of stomata than the species, but this character is not invariable. The sclerenchyma in the latter is often thicker than in the former, but not always.

The descriptions of the two trees, as given in Britton's "Trees of North America," coincide exactly, except for two points: in the description of *P. edulis* we find "leaves in sheathless fascicles of 2 or 3, triangular or nearly round, dark green, stout, 1.8 to 4 cm. long, entire," etc.; in the description of *P. monophylla* we find "leaves are solitary and round, rarely two or three in a sheathless fascicle, triangular, pale green and glaucous, round and stout, about 4 cm. long," etc. Now in the herbarium material that I have examined, numerous specimens of *P. edulis* may be found in which the leaves are "pale green and glaucous," in some cases as pale as, or even paler, than some of our specimens of *P. monophylla.* This differenc, therefore, does not seem to be fixed. I have already spoken of the intermediate leaf forms; because of which Mr. Jones reduced *P. edulis* to varietal rank. As these two unstable differences are the only definite ones given in the descriptions, there is no reason for keeping the later published one as a species distinct from the older. It is perhaps best to call the form in which all the leaves are in bundles of 2 or 3 a variety, *P. monophylla edulis* Jones, and to call the forms with single leaves the true species.

5. Pinus Murrayana Oreg. Com., in Murray Rep. Bot. Exp. Oreg. No. 740, t. 3. 1853.

Tall (15–30 m.) and slender; leaves semiterete, about 5 cm. long, in fascicles of two; cones small, adhering to the branches; scales armed with slender, sometimes recurved, prickles; seeds winged. Lodge Pole Pine.

Throughout the Rockies.

This species can readily be distinguished from *P. ponderosa* by the widely divided xylem, the xylem in *P. ponderosa* being but slightly divided.

6. Pinus ponderosa Douglas, in Lawson, Man. 355 (1836); Comp. Bot. Mag. 2: 111. 1836.

Usually a large tree, 25–40 m. high, 1–2 m. in diameter; leaves in fascicles of 2 or 3 (usually 3), 1–2 dm. long, crowded brush-like on ends of branchlets; cones 7–12 cm. long; scales thickened at the outer end, bearing a recurved prickle; seeds brown, winged. Rocky Mountain Yellow Pine.

Throughout the Rocky Mountains.

Distinguished from other species of this range by the xylem, which is slightly divided. This includes the so-called *Pinus scopulorum* (Engelm.) Lemmon, a species which is not essentially different.

II. Picea.

Xylem of bundle not at all divided; 6–10 large heavy-walled strengthening cells at one side of bundle, in addition to the ordinary tissue. 1. *P. Engelmannii.*

Xylem of bundle slightly divided by one or two rows of larger, thinner-walled cells; no additional strengthening tissue present. 2. *P. pungens.*

1. Picea Engelmannii (Parry) Engelm., Trans. Acad. Sci. St. Louis, 2: 212. 1863.

25–40 m. high, much dwarfed and shrub-like at high elevations; branchlets puberulent; bark light-reddish; leaves 2–3 cm. long, abruptly acute; cones oval or oblong, brown, about 5 cm. long. Engelmann Spruce.

Throughout the Rocky Mountain region from middle to high elevations.

In the fibro-vascular bundle of the leaves of this species, large, heavy-walled, sclerenchymatic cells are found, usually 6–10 in a cluster on the opposite side of the bundle from the woody tissue. This and the following species are difficult to distinguish from each other, except in the field, and in the case of specimens with fully developed cones. The above key has proved satisfactory, if some degree of care be taken in cutting and staining the sections.

2. Picea pungens Engelm., London Gard. Chron. 1879: 334. 1879.

Lower than the preceding, conical in growth; bark thick, smooth and gray; branchlets smooth and shining; leaves 2–3 cm. long, extremely sharp pointed; cones cylindrical, 6–10 cm. long, light brown. Blue Spruce.

Colorado, Wyoming, and Utah.

No additional strengthening cells are found in the bundles of the leaves of this species. The xylem of the bundle appears to be divided very slightly, almost imperceptibly, except under the higher powers of the microscope.

In both these species, it is often difficult to get sections showing resin ducts. Sections may be obtained showing two ducts in opposite corners, but most sections will lack this number. It is hoped that this means of distinguishing between the two species will be of value in herbaria, where our two species are so often confused.

III. Abies.

Resin ducts in middle of parenchyma.	1. *A. lasiocarpa.*
Resin ducts next to lower epidermis.	2. *A. concolor.*

1. Abies lasiocarpa (Hook.) Nutt., Sylva 3: 138. 1849.

20–30 m. high, with pale, thin, smooth, light-gray bark; leaves dark green, pointed; cones oblong-cylindrical, 6–7 cm. long, 3–4 cm. in diameter, purplish-brown; scales nearly orbicular or quadrangular, 12–20 mm. long and broad; seeds about 6 mm. long, with dark lustrous wings. Alpine Fir; Balsam.

Colorado and Wyoming to the Northwest.

In this species, the resin ducts are in the chlorophyl-bearing tissue, midway between the upper and lower epidermis.

2. Abies concolor (Gord.) Parry, Am. Nat. 9: 204. 1875.

25–50 m. high, with a diameter of 6–12 dm., and rough grayish bark; leaves mostly obtuse, pale green; cones oblong-cylindrical, 7–12 cm. long, 3–4 cm. in diameter, pale green or sometimes purplish; scales 25–30 mm. wide, about half as high; seeds 8–12 mm. long, brown, with rose-colored wings. White Fir.

Colorado to California and thence northward.

In this species, the two resin ducts are next to the lower epidermis.

Both these species have the xylem divided, distinguishing them (in addition to the position of the stomata) from the following genus, which has the xylem undivided.

IV. Pseudotsuga.

One species. 1. *P. taxifolia.*

1. Pseudotsuga taxifolia (Lam.) Britton, Trans. N. Y. Acad. Sci. 8: 74. 1889.

35–75 m. high, 1–4 m. in diameter, with thick, deeply fissured, brown bark; leaves flat, 15–25 mm. long; cones 5–10 cm. long, subcylindrical; bracts exserted, 3-pointed, giving the cones a fringed appearance; seeds 6 mm. long, on upper side reddish-brown, on lower flat and white, winged. Douglas Spruce.

Throughout the Rocky Mountains to the coast.

This genus may be easily distinguished from the species of *Abies* in our range in two ways: the stomata are found only on the lower surface, and the xylem of the bundle is undivided, while in *Abies* stomata are present on both surfaces, and the xylem is divided.

University of Wyoming,
Laramie, Wyo.

TWO PLANTS NEW TO THE FLORA OF LOUISIANA

By Paul C. Standley*

Only a few months ago the writer published an account† of the occurrence in southern Louisiana of a species of *Siphonanthus*, more commonly referred to *Clerodendron*. The specimens upon which the report was based were sent from Houma by Mr. E. C. Wurzlow. The same collector has forwarded to the U. S. National Herbarium, from the same region, specimens of a true *Clerodendron*, granting that this is a genus distinct from *Siphonanthus*.

Clerodendron bungei Steud. Nom. Bot. ed. 2. 1: 382. 1840.

Clerodendron foetidum Bunge, Mém. Sav. Etr. Pétersb. 2: 126. 1831. Not *C. foetidum* D. Don, 1825.

Illustrations: Curtis's Bot. Mag. *pl. 4880;* The Garden 5: *pl. 25.*

This species is not new to the United States, for in the second edition of Small's Flora of the Southeastern United States it is included in the appendix, its range being given as "in fields and thickets, Florida." Mr. Wurzlow states that it has become thoroughly naturalized in the alluvial portion of southeastern Louisiana, where it grows in waste land, in and about cultivated fields, frequently along fencerows. It is a perennial, 2 to 6 feet high, forming large clumps. The showy lilac purple flowers are borne in dense terminal corymbs 4 to 8 inches broad. The foliage possesses a very unpleasant odor, and on this account, as well as because of its tendency to spread, the plant is destroyed when it appears about dwellings.

The species was described from northern China and occurs also in Japan. It is sometimes cultivated as an ornamental plant in the southern United States and is said to be hardy as far north as Philadelphia.

Epidendrum conopseum Ait. Hort. Kew. ed. 2. 5: 219. 1813

In Small's Flora the range of this species is given as South Carolina and Florida to Alabama. Living specimens have been

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† Torreya 14: 22. 1914.

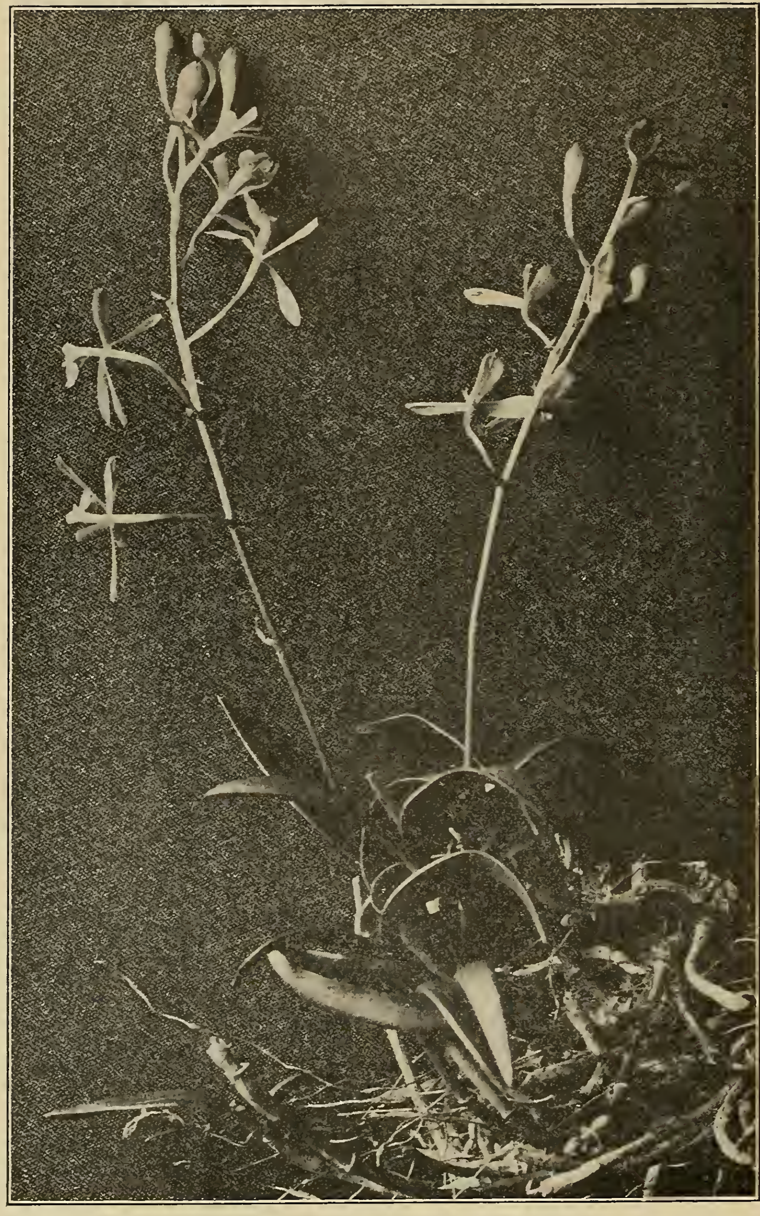

FIG. I. *Epidendrum conopseum* Ait.

received recently from Miss Eunice Treuil, of Junior, Plaquemines Parish, Louisiana, who reports it as plentiful upon live oaks. Nine species of *Epidendrum* are reported from the southeastern United States but all the others are confined to Florida. The genus includes a large number of epiphytic species which are widely distributed in tropical regions. This one is not a showy plant, with its small greenish flowers.

In Mohr's Plant Life of Alabama* the range of *Epidendrum conopseum* is said to extend to Mississippi, but upon what information this statement is based is not apparent. The only specimen in the Mohr Herbarium is from Alabama. Doctor Mohr states that the species is not rare in the coastal plain of Alabama, growing on magnolias and live oaks in dense damp woods.

The original description was based upon plants collected in Florida by William Bartram. The accompanying illustration is from a photograph made at Washington of plants forwarded by Miss Treuil.

Washington, D. C.

CHARACTERS OF HELIANTHUS

By T. D. A. Cockerell

Although *Helianthus*, as typified by the common sunflower, is a very easily recognized genus, there are many species which it is not so easy to place. Mr. S. F. Blake† has very recently given a table in which *Helianthus* is distinguished from its nearest allies as follows:

Pappus caducous, of paleaceous awns and rarely short squamellae; herbs. — *Helianthus* L.

Pappus more persistent (caducous in some Viguieras, *e. g.*, *V. mandoni* Sch. Bip.); awns often aristate; squamellae usually present; herbs or shrubs.

- Squamellae none, or narrow and acute; achenes usually densely villous; alternate-leaved usually glutinous shrubs. — *Flourensia* D.C.
- Squamellae present, mostly short, rounded, fimbriate; herbaceous or frutescent, very rarely resiniferous, often opposite-leaved. — *Viguiera* H.B.K.

* Contr. U. S. Nat. Herb. 6: 460.

† Proc. Amer. Acad., 49: 350. S. 1913.

L. H. Bailey's Standard Cyclopedia of Horticulture, Vol. 1, 1914, separates *Viguiera* from *Helianthus* as follows:

Achenes pubescent. *Viguiera.*
Achenes glabrous. *Helianthus.*

Nuttall, as long ago as 1821, described *Helianthus petiolaris* (a strictly typical *Helianthus*) as having the "seeds small, and spotted, covered with a silky and fulvous down." Among the perennial Helianthi, some (*e. g.*, *H. ciliaris* and *H. californicus*) have the achenes perfectly glabrous; others (*e. g.*, *H. subrhomboideus*) have them hairy. In *H. tuberosus* the achenes of the ray florets are sparingly hairy on the corners. In *H. procumbens* (from Bolivia) they are sparsely but evidently hairy, the hairs rather long.

I have not yet had occasion to study *Flourensia*, which seems sufficiently distinct; but *Viguiera* is and has been a source of confusion. I am greatly indebted to Dr. N. L. Britton for material of *V. helianthoides* H.B.K., collected near Matanzas, Cuba, Aug. 28, 1903 (*Britton & Wilson*). Dr. Britton notes that it is the "type species of the genus, from not very far from the type locality." Its principal characters are as follows:

Viguiera helianthoides H.B.K.

Peduncles very slender, broadening under heads; the same broadening is seen in *Helianthus decapetalus* var. *plenus* (the "double" garden variety, with brilliant orange heads, four inches across). Leaves thin, broad-lanceolate, acuminate, tapering below to a slender petiole; essentially three-nerved, the main lateral nerves making very acute angles with the midrib; very sparingly short-hairy above, conspicuously hairy below; margins entire, except for occasional obscure irregular notches. The broadest part of the leaf is near the middle, not far below it as in *H. petiolaris*. The venation, with the lateral nerves coming off at very acute angles, resembles that of *H. fascicularis*. The nervures leaving the midrib come off at about 45°, instead of being (at least the lower ones) nearly transverse as in *H. grosseserratus*. Involucral bracts in two series only; broad at base, with narrower ends; the apical part of outer bracts, though much narrower than the basal, more or less broadened; margins of bracts loosely white-hairy. The inner bracts are formed practically as the outer bracts of *H. annuus*. There may be three series of bracts, according to Millspaugh and Chase. Rays bright orange, with seven strong nerves; bifid at apex. (*H. californicus* has the rays bifid, and we have this year obtained a var. hort. *bifidus*, with the rays strongly bifid at apex, of the vinous type of *H. annuus*). Achenes black, mottled with gray; densely hairy, the hairs long and silvery. Corolla lobes of disc florets densely hairy. Disc bracts nearly parallel-sided, slightly narrowing toward the base (shape about as in *H. ciliaris*), without lateral lobes or teeth; ends ferruginous, sharply pointed, perhaps not folding over corollas in bud, in which case the character is a good one for separation from *Helianthus*. Pappus of disc florets of two very easily deciduous pointed scales, as in *Helianthus;* and two very persistent broad strongly fimbriate quadrate squamellae, entirely separate from the pointed scales. Rarely a squamella is bifid. Millspaugh and Chase* found that in Yucatan specimens (apparently representing a distinct subspecific form) the squamellae were nearly always connate with the long pointed scales.

It is on this last character, of the squamellae, that *Viguiera* is separated from *Helianthus*. I find, however, that the condition of the pappus-scales in various species of *Helianthus* has not been exactly described. The following notes will illustrate the conditions found:

H. orgyalis D.C. (In hort. D. M. Andrews, Boulder).

Disc florets with practically complete pappus crown, the lateral parts (squamellae) small, and attached to the others. Achenes of ray florets trigonal, with three pappus scales. The achenes are wholly smooth. Later, Dr. Britton sent me wild material collected in Miami Co., Kansas (*Oyster*), and it showed the same characters. On the characters of the pappus, this might be considered a *Viguiera*, but in other respects it is not allied to *V. helianthoides*.

H. maximiliani Schrad. (In hort. D. M. Andrews, Boulder).

Disc florets with two pappus scales, which may have lateral basal tooth-like processes, rudiments of attached squamellae. Ray achenes trigonal, with three equally developed pappus scales. Achenes glabrous.

H. ciliaris D.C. (Mesilla Valley, New Mexico, *E. O. Wooton*).

Disc florets with two short, pointed, rather broad pappus scales, their margins erose or toothed. Ray florets with two

* Plantae Yucatanae. Field Columbian Museum, Publ. 92 pp. 119–120. 1904.

pointed pappus scales, and two smaller ones. Achenes absolutely glabrous.

H. californicus D.C. (Ex hort. U. of California, Berkeley, *H. M. Hall*).

Disc florets with two long pointed pappus scales, no intermediate squamellae. Ray achenes trigonal, wholly without pappus scales, even in bud (ray florets without pistils). Achenes wholly glabrous.

H. procumbens Pers. (Bolivia, *O. Kuntze;* sent by Dr. Britton).

Disc florets with two long slender acuminate scales, and rudimentary and irregular intermediate squamellae; margins of pappus scales more or less erose or dentate. Achenes sparsely but evidently hairy, the hairs rather long.

H. pumilus Nutt. (Boulder, Colorado).

Disc florets with two long scales, very easily deciduous. Ray florets with four pappus scales, all large and practically equal, or two very small; the one on the outer side may have toothed margins. The ray florets have well developed pistils, but the long stigmatic branches are smooth. Achenes wholly glabrous.

H. aridus Rydb. (Boulder, Colorado).

The usual two scales on the disc florets, but most have also small accessory squamellae, often slightly attached to the long scales.

Thus the condition of the pappus-crown is very diverse, and it becomes extremely difficult to draw a hard line, on this character, between *Helianthus* and *Viguiera*. In the study of the pigments of *Helianthus*, I have recently discovered a remarkable character, which may be of value for taxonomy. The yellow or orange rays of many species, when immersed in liquor potassae (KHO), give a most brilliant scarlet color. The particulars are as follows:

H. pumilus rays turn orange vermilion, especially the basal half.
H. coloradensis rays turn bright scarlet.
H. fascicularis rays turn the same bright red; so also *H. utahensis*.
H. ciliaris rays give a good scarlet color.
H. procumbens rays turn entirely a very fine rich red.
H. subrhomboideus rays turn brilliant scarlet along the veins.

H. maximiliani rays turn brilliant scarlet on basal half; apical half deep orange, red along the veins.

H. orgyalis rays turn brilliant scarlet on rather less than basal half, apical half more or less red along veins.

On the other hand, the rays of *H. decapetalus* var. *plenus*, *H. annuus*, *H. petiolaris*, *Viguiera helianthoides*, *Taraxacum*, *Solidago*, *Rudbeckia* (golden glow), *Chrysopsis*, *Tragopogon*, *Ratibida* and *Grindelia* do not turn red at all with KHO. Rays of *Heliopsis scabra* turn deep orange, exactly the color of the orange flush on *Eschscholtzia* petals. *Helianthella quinquenervis* rays show no red. *Helianthus giganteus* (Highlands, N. C., *Mrs. Wm. Duane*) has the longitudinal veins reddened by the KHO, but there is no definite scarlet color; evidently there is a very minute quantity of the red-producing pigment.

A watery solution of reddened rays of *H. pumilus* is wine or cherry color; this color is completely discharged by nitric acid.

The red (anthocyanic) variety of *H. annuus* gives totally different reactions. The red parts of the rays turn green in KHO, and bright scarlet in acid. The green is due to the bluish or purplish (alkaline) state of the anthocyan pigment being modified by the presence of flavone, which is yellow with alkali.*

Thus lichens are not the only plants to be tested with chemicals in order to determine affinities. We find that most (not all) the perennial sunflowers, though apparently colored exactly like the others, really contain something very distinct. The type of *Viguiera*, so far as this character goes, falls with *H. annuus*, etc.

If the present rather unsatisfactory generic arrangement of the *Helianthus-Viguiera* series is changed, two courses are open. One is to merge all the species in a single genus, *Helianthus;* the other to restrict *Helianthus* to the annual species such as *H. annuus*, *lenticularis*, *cucumerifolius* and *argophyllus*, and refer the others to one or more distinct genera. On the latter basis, which seems preferable, *Viguiera* may be extended to

*I follow Miss Wheldale's interpretation of similar phenomena but H. H. Bartlett gives reasons for doubting her explanation. I found that on adding KHO to an acidulated extract of red sunflower rays a green color was produced, but the margins of the green area were clear blue-purple or lilac. This appears to support Miss Wheldale's theory.

cover part of what is now *Helianthus*, but it will not do to refer to that genus everything with squamellae, regardless of other characters. *Harpalium* Cass., 1818, which includes certain perennials, is older than *Viguiera* H.B.K., 1820. There are other names which may perhaps be rescued from the synonymy, but even if we grant the necessity for generic revision, it is as yet too early to say where the lines should be drawn and what names should be used. Mr. S. Alexander's root-characters for the perennials will certainly have to be taken into account. The new system should correspond to the actual relationships of the plants, and in order to establish it properly it will be necessary to consider the phylogeny of the whole group. For this purpose all characters are of interest, and all species, not excluding those of South America.

THE GALAX ODOR

By E. F. Andrews

Only those who are familiar with the *Galax aphylla* in its native habitat are likely to have had their attention called to the peculiar odor characteristic of this pretty little plant. None of the handbooks with which I am acquainted make any mention of it, and the only allusion to it that I have met with in botanical writings describes it as "a polecat smell"—which may well suggest a doubt to the minds of the initiated whether the writer himself had ever smelt a polecat. There is nothing sharp or pungent about the galax, like the knock-down odor of the polecat, and the misnomer, "skunk cabbage," sometimes applied to it in the Georgia mountains, was no doubt suggested by the malodorous reputation of the true skunk cabbage (*Symplocarpus foetidus*) and intended to emphasize the abominableness of the smell rather than to describe its quality. In the galax, it is a faint, sickly carrion scent, too vague and elusive to attract attention except where the plant occurs in large masses, as it always does in its favorite home on the shady slopes of the Southern Appalachians. On Lavender Mountain, in Floyd County, Georgia, where these observations were made, the presence of a galax bed is often advertised by the scent at a distance of from twenty to thirty paces.

The strength of the odor varies greatly at different times, and is often reduced to zero when drought, cold, or other unfavorable conditions impair the health and vigor of the plant—a fact which will account for the failure of many observers to detect it. Specimens when removed from the soil lose their odor in a short time, and for this reason, laboratory students and people who know the galax only through its popular use for decorative

FIG. 1. Bed of galax in bloom, Lavender Mountain, Ga.

purposes are not likely to become acquainted with its distinctive odor. I once packed carefully a number of vigorously growing, and equally vigorous smelling specimens with some of the mould in which they were rooted and sent them to the Agricultural Department at Washington for examination, but every trace of the smell had vanished by the time they reached there. It seems to reside principally in the leaves and is most perceptible in warm weather, when the plant is in its best condition. In winter and during periods of drought it is entirely absent. My records, extending at irregular intervals over two years (from July, 1912, to June, 1914) report no trace of it as late as the middle of May when the plant is in full flower, and this fact gives good ground for the inference that it has no connection with the process of fertilization. It is proper to state, however, that the years to which my observations refer—1912, 1913, 1914—have been phenomenally dry in this section, and under normal conditions the showing might have been different.

While strictly a shade-loving and moisture-loving plant, the galax never grows in swampy, undrained soil. It loves to be near the water, but not in it, and is seldom found on level land. Its favorite abode is on the steep, well-drained slopes of shady ravines, along the high, shelving banks of mountain streams, and in the crevices, or sometimes on the overhanging brow of rocky cliffs. Though technically an evergreen, the leaves, except in protected situations, turn a beautiful brownish red in winter and persist on the rootstock until the latter part of May, when they gradually shrivel up and give place to the young foliage of the season.

One of the popular names of the species, "beetle plant" suggests the inquiry whether its odor may not possess attractions for some "muck-raking" member of the beetle tribe whose visits might be in some way beneficial to the plant. To determine whether this was the case, I looked for beetles in every bed that I visited. The result was that in one, I found a fragment of a beetle shard and accidentally scared two of the insects out of a clump of grass near by; while once, and only once, I came upon a lonely tramp of a beetle running wildly about as if lost in a jungle of galax. As this experience is not sufficient to build a theory on, and the scent is apparently of no use in the process of fertilization, the part it plays in the economy of the plant has never yet, so far as I know, been explained.

Rome, Ga.

NEWS ITEMS

The trustees of Lafayette College have deposited at the Academy of Natural Sciences, Philadelphia, the herbarium of the late Thomas C. Porter.

The Brooklyn Botanic Garden has purchased the herbarium of Mr. John McCallum, consisting mostly of Long Island and Staten Island plants.

At the Philadelphia meeting of the Botanical Society of America the following officers were elected for 1915. *President:* J. M. Coulter, *Vice-President:* R. A. Harper, *Secretary:* H. H. Bartlett, *Treasurer:* Arthur Hollick, *Member of the Council:* W. F. Ganong.

At the same meeting the following officers of the Sullivant Moss Society were elected: *President:* A. W. Evans, *Vice-President:* Mrs. Annie Morrill Smith, *Secretary-Treasurer:* E. B. Chamberlin.

The officers of the American Fern Society for 1915 are as follows: *President:* C. H. Bissell, *Vice President:* J. Davis, *Secretary:* C. A. Weatherby, *Treasurer:* F. G. Floyd.

The Torrey Botanical Club

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A Monthly Journal of Botanical Notes and News

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BY

NORMAN TAYLOR

JOHN TORREY, 1796–1873

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THE TORREY BOTANICAL CLUB

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NORMAN TAYLOR
Brooklyn Botanic Garden
Brooklyn, N. Y

TORREYA

February, 1915.

Vol. 15 No. 2

NOTES ON PLANTS OF THE CHICAGO REGION

By E. J. Hill

However long one may have botanized in a given locality, or carefully gone over the ground, new plants will be met with from time to time. Some are migrants, and a strange plant is likely to greet the collector by railroad or wayside or in patches of waste ground at any time. The majority of these in inland regions are beside railroads, migration being favored by slow advance along the right of way or by seed dropped from cars loaded with grain or stock. Others native to the section may be of very limited range, closely restricted in that region to some particular locality and for this reason they may have been overlooked. One may have gone all around that special place many times, or been almost in contact with the plant, but not being exactly there has failed to see it. Such plants seem almost like newcomers. It may be that some of them are, since they are within the bounds of their general geographic range, but more or less local in habitat. Others can be credited to the recent marked development in the segregation of species, either in the making of new ones or, by more careful monographing, the separation of those that have been confused. The herbarium of many years' standing, as well as the open field, will become ground for exploration in this respect. Hence we are not likely soon to fail in work along systematic and taxonomic lines, and though the problem of new species may be overweighted, some, perhaps many, will doubtless stand, and clearer views will be obtained of all.

Among genera recently monographed that of *Panicum* by

[No. 1, Vol. 15, of Torreya, comprising pp. 1–20, was issued 25 January 1915.]

Hitchcock and Chase has contributed a goodly number, much in excess of what were named in the older Manuals. As given in that work thirty-three species and one variety, *P. Huachucae* Ashe var. *silvicola* Hitch. & Chase, have been detected in the region around the head of Lake Michigan. This is a crescent-shaped area, forty-five to fifty miles wide in its widest part, the horns becoming thinner and approaching the lake on the east side at Grand Beach, Michigan, and on the west side at Zion City, Illinois, near the Wisconsin boundary. I shall not enumerate the majority of the species, since a reference to that work will give the required information, but give only a few of the more interesting from a distributional point of view. Some have been added since that work appeared and do not find a place on their maps of distribution. All but two of the above number likewise appear in the basin of the Glacial Lake Chicago, or the area once covered by the expansion of the present Lake Michigan when its waters drained southward into the Mississippi. One of these is *P. linearifolium* Scribn., found at Wheaton, Ill. The other, *P. Leibergii* (Vasey) Scribn., is treated as an exception, since I do not know of its growing in the area at present. In June, 1880, I found it in the sandy ground beside the Rock Island Railroad at Englewood, now within the limits of Chicago. The station was destroyed long since, and its presence there may have been due to introduction, since its present place of growth in our region is in a dry field bordering the railroad just east of Joliet. I was not able to identify it with any form given in the Manuals at that time, and it remained long in the herbarium without a trivial name. On the appearance of Britton & Brown's Illustrated Flora, in 1898, I found in the appendix to the third volume a description and figure which answered the purpose, and the name was applied. This was not my earliest collection of this grass. An examination of my herbarium showed specimens of *P. Leibergii*, but under another name, taken in meadows about five miles south of Preston, Minn., in June, 1869, and in June, 1870, in copses at Waldron, Kankakee County, Ill.

Those added or not given for this region in the work of Hitchcock and Chase are *P. Ashei* Pearson, *P. microcarpon* Muhl. and

P. Auburne Ashe, the two former at Grand Beach in the extreme southwest corner of Michigan, and the last at Dune Park, Ind. *Panicum microcarpon*, found in 1913, grew in deeply shaded rather wet woods by State Line Creek, and appears to be unrecorded for the flora of Michigan. The time being early September the stems were much branched, weak and prostrate. *P. Auburne*, found also in 1913, is set off from others with which it was associated by its gray look, due to its silky hairs and velvety pubescence. It grew in the sands of oak and pine woods which characterize the dunes. This species, as well as *P. Albemarlense* Ashe, and *P. verrucosum* Muhl., both likewise of the dune region, are of especial interest as representatives of the Atlantic coast flora far removed from their general range.

Panicum clandestinum L. is somewhat peculiar in its range in the region as far as I can learn. It occurs in Indiana just south of Michigan City, and again north of that place by State Line Creek, a stream draining the ground that skirts the outer side of the sand hills by Lake Michigan, and breaking through them enters it at Grand Beach. In the bottomlands of this creek it forms dense patches with stems 4 to 5 feet high. It follows down the creek and is common along its banks at Grand Beach.

Sporobolus brevifolius (Nutt.) Scribn. I first obtained this in 1906 from dry hills of Joliet gravel a little west of Joliet. It is a representative of a flora whose range is north and west of this region. It grows in dense tufts like a bunch grass. In 1912 I came across it again a few miles west of this station by the banks of the DuPage River. It was in a shallow soil covering the limestone rocks that border the river. The layer of earth was so thin that the roots and stolons passed through it and adhered to the rock. This adhesion was so strong that efforts to pull up the stems commonly resulted in breaking the culms instead of detaching them from the rock, so that a knife was used to cut away the sod.

Poa debilis Torr. Although I found this as long ago as 1890, in the sandy woods at Casello, now within the limits of Indiana Harbor, Ind., it does not seem to have been reported for this region. I had not seen it since within our bounds till the summer of 1913 in the dry oak woods at Glencoe, Ill., only a few rods from the shore of Lake Michigan, the station at Casello being but little farther from the shore. In 1906 I came upon some on the wooded bank of Fish Creek, near Dillman, Wis., a short distance north of Milwaukee. This station also was close by the lake. The collections were all made in the month of June. No mention is made of this species for Illinois in Patterson's Catalogue of the plants of the state published in 1876. For Indiana it is given in Stanley Coulter's Catalogue (1901) for Tippecanoe county, about 100 miles south of Lake Michigan, and for Steuben county at the northeast corner of the state.

Agropyron Richardsonii Schrad. In 1881 specimens of an *Agropyron* were obtained in open sandy woods by Lake George, near Whitin, Ind. They were referred at the time to *A. violaceum* Lange, and listed under that name in Higley & Raddin's Flora of Cook County, Illinois and part of Lake County, Indiana, Having found the true *A. violaceum* at Ha! Ha! Bay, Quebec. in 1888, it became evident that the Indiana plant was something different. But what to call it was not at once apparent. In 1902 while collecting plants at Dune Park in company with Mrs. Agnes Chase we came upon an *Agropyron* with rather prominent awns growing in somewhat open woods of sand hills. On comparison with the descriptions in Britton's Manual and in Scribner's American Grasses, the Dune Park grass was decided to be *A. Richardsonii*. This also covered the case of the Whiting plant. From all indications in both of these stations the evidence was that they were not introduced, but indigenous plants. The station near Whiting was long since destroyed, like many another of our interesting or rare plants, by the encroachments of industrial works.

Agropyron Smithii Rydb. Patches of this were found in 1910 in a deep cut of the Rock Island railroad in the morain hills west of Mokena, Ill. It was evidently of comparatively recent introduction since up to 1902, while making botanical investigations, I had frequently been in the locality, and occasionally for about four years afterwards, and had not seen it. The dense patches were made very conspicuous by their glaucous green color.

Carex seorsa E. C. Howe. On May 30, 1903, a Carex was discovered in a swamp at Dune Park, which I was unable to identify with any given in our handbooks. Having a copy of M. L. Fernald's Northeastern *Carices* of the Section *Hyparrhenae*, published in the Proceedings of the American Academy of Arts and Sciences, Vol. 38, No. 17, it was traced to this species. Having received by the Gray Herbarium, soon after this time, a set of the Plantae Exsiccatae Grayanae, sheet No. 50 of which is an example of this species collected at Canton, Mass., a direct comparison was made. It is doubtless rare in this region as I have seen it in this locality only.

Carex scirpoides Schkuhr. var. *capillacea* (Bailey) Fernald, a closely related species, grows in the same swamp. This was submitted for identification to C. F. Wheeler who named it *C. interior capillacea* Bailey. The latter has much narrower more or less involute leaves, almost setaceous sometimes toward the ends, and the perigynia broadest at the base. Both grow in mats but the weak stems of the latter soon fall over and lie almost flat on the ground. The swamp where these species were collected is mainly one of *Betula lutea* and *Pinus Strobus*, with abundant shrubs of *Rhus vernix* and *Vaccinium corymbosum* around whose bases are dense beds of *Sphagnum*. Of the two *Carex seorsa* appears to be earlier in fruiting, as its perigynia on May 30, 1903, are in about the same stage of advancement as those of the variety of *C. scirpoides* collected July 4, 1906. Some but not all of those of *C. seorsa* are as far advanced in a collection made May 2, 1908.

Œnothera speciosa Nutt. This was obtained in the same railway cut as *Agropyron Smithii*, July 4, 1910. It grew upon the sides of the cut from close beside the roadbed up to the margin of the pasture above, since it readily spreads in the gravelly bank. Though of low growth its large white flowers make it very showy as well as ornamental. Mr. James H. Ferris, of Joliet, well known for his interest in ferns, had taken some plants from the locality and had a fine bed of them growing in his garden. He first called my attention to the plant at this place, which must have come in later than 1902–1904.

Gaura coccinea Pursh. A bed of this was found in June, 1910, beside the track of the Michigan Central Railroad at Crisman, Porter County, Ind. Being near the station and much exposed it soon after disappeared or was destroyed. But it showed its ability to migrate eastward from its native region in the distant west, and will doubtless become established in places where not molested. It was in full flower June 13, when discovered, the rather dense bed well covered with rose colored and scarlet flowers.

Gaura parviflora Dougl. Found in dry open oak woodlands bordering Long Run Creek, town of Lockport, Ill. While visiting this locality in August, 1912, to get specimens of *Fontinalis Umbachii* Card., which grows abundantly in this part of the creek, Mr. W. N. Clute, who was in company with me, brought from the neighboring woods some plants of a *Gaura* that differed from *G. biennis* L., the common one here, calling attention to this difference, We concluded it was *G. parviflora*. In visiting the spot I found *G. biennis* associated with *G. parviflora*, both showing their characteristic features. The station being farther east than the range usually assigned to the species, apparently unrecorded heretofore for the region, the question at once arose whether it was introduced. But this seemed hardly compatible with the location, since it was fully a mile from the nearest railroad and a quarter of a mile from any public highway. All indications pointed to the fact that it was as much at home and indigenous as its companion, *G. biennis*. Some of the plants were very stout, the stems at the base about an inch in diameter and correspondingly tall. The range commonly assigned is west of the Mississippi.

CHICAGO, ILL.

NOTES FROM THE TROPICAL STRAND: IPOMÒEA PES-CAPRAE AND CANAVALIA LINEATA

By Frank C. Gates

In connection with an investigation of the revegetation of Taal Volcano,* in the Philippine Islands a very striking case of the similarity of appearance under the same conditions was encountered. *Ipomoea pes-caprae* is a characteristic, trailing strand plant in the tropics and is quite well represented on Taal Island. Its flowers are entirely like those of other members of the Convolvulaceae, so considerable surprise was at first manifested at finding leguminous flowers rising from seeming beds of

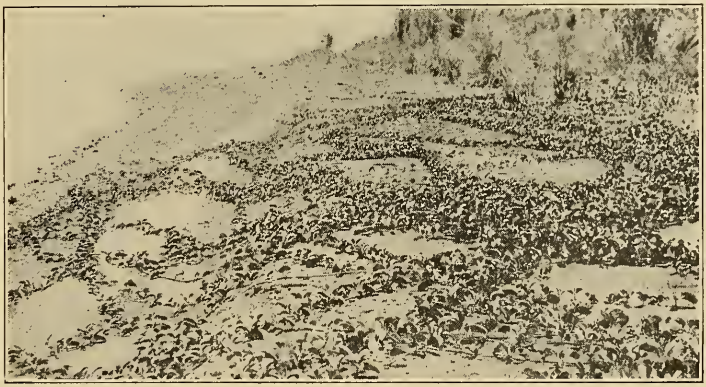

Fig. 1. *Ipomoea pes-caprae* on the strand, Taal Volcano, P.I. (April 18, 1914 10 A.M.)

Ipomoea. Except for the flowers no distinction was apparent even from so short a distance as three meters. Closer examination however revealed a trifoliolate-leaved legume, *Canavalia lineata*, whose leaflets quite closely approached the position if not the form of the leaves of *Ipomoea*.

In one of its forms, *Canavalia lineata* is quite characteristic of the strand, alternating with *Ipomoea pes-caprae*, as well as growing together with it in the same patch. That the *Ipomoea* was better adapted for severe strand conditions was apparent in that it developed hardily under severer conditions than the *Canavalia*

* *In edition*, in the Philippine Journal of Science. 1914,

could withstand. Its clam-shell-like leaves exhibited marked *xerophytic* movements (upward movements due to a partial loss of turgor on the side towards intense sunlight), although of much less intensity than in the *Canavalia*. In the early morning the leaves of *Ipomoea* were flat but soon after the sun began to grow stronger, the halves of the leaves folded upwards, assuming an

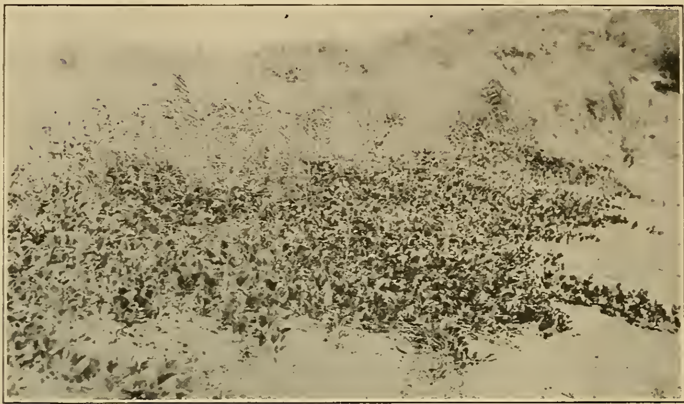

Fig. 2. *Canavalia lineata* on the strand, Taal Volcano, P.I. (April 19, 1914, 9:30 A.M.)

angle of from 30 to 45° from the vertical. Stomates were present in larger numbers on the upper surfaces of the leaves and whenever tested during the daytime were open. The leaves might at times be less turgid, but at no time appeared really wilted. With the coming of dawn the leaflets of *Canavalia* spread out flat and the stomates opened wide. As the sun became hotter, the two lateral leaflets folded together upwards in a nearly vertical position, while the terminal leaflet turned up and folded on its midrib, partially enclosing the lateral leaflets. The leaflets were often quite limp throughout the day and the stomates became closed very tight soon after limpness was apparent. Often this period of closure lasted from about 9 in the morning until 3 or 4 in the afternoon.

In slight shade, a condition which *Canavalia* can endure very much better than *Ipomoea*, all of these reactions were less pronounced as the conditions were less intense.

College of Agriculture, University of the Philippines,
Los Baños, P. I.

REVIEWS

Grigg's Botanical Survey of the "Sugar Grove Region," Ohio *

This paper is a good description of an area which is seldom mentioned in phytogeographical literature, though of exceptional interest and located in one of our most thickly settled states. An 11-page introduction treats of the geology, topography, soils and climate, and there are 37 pages on the vegetation ("ecology"), 6 on economic aspects, and 36 on the flora. The illustrations are excellent half-tones of scenery, vegetation, or single species of plants, most of them apparently never published before; but they are not dated, so that the reader can only guess at what season they were taken from the appearance of the foliage or flowers.

The area has no very definite boundaries, but is located in Fairfield and Hocking counties, a little southeast of the center of Ohio, in the unglaciated Carboniferous plateau region that extends from Pennsylvania to Alabama. (Some of the illustrations could be matched pretty closely in the coal region of Alabama.) The topography is very broken, though hardly mountainous. (Many readers will doubtless be surprised, as the reviewer was, to learn that there is such rugged topography in Ohio, for much of the surface of that state is very flat.) The soils are mostly derived from sandstone, and therefore deficient in basic materials. The nature of the soil and topography has retarded agricultural development, and thus allowed this area to remain one of the best "botanizing grounds" in the state.

The average growing season is 155 days, the average annual snowfall 25 inches, and the rainfall (from 35 to 40 inches a year) is pretty evenly distributed through the seasons, but with a slight excess in the summer months. In this last particular this locality resembles many other places with somewhat sandy soils,† and differs from most places in the Ohio valley.

* A botanical survey of the Sugar Grove region. By Robert F. Griggs. Ohio Biol. Surv. Bull. 3, or Ohio State Univ. Bull. vol. XVIII (18), no. 25, or Contr. Bot. Lab. O. S. U. no. 84. 98 pp., frontispiece, 29 numbered text-figures, and full-page map. "April" 1914 [or rather August, according to a letter from the author]. (The pages are numbered from about 247 to 340, but an examination of Bulletins 1 and 2 of the same series leaves one in some doubt as to the title of the volume to which the pagination belongs.)

† See Geol. Surv. Ala. Monog. 8: 24 (footnote). 1913.

The descriptions of vegetation cannot be adequately summarized in a brief review, but must be seen to be appreciated. For each of the habitats, about fifteen in number, the environmental factors are described in a general way, and the commoner plants listed (usually about one third of the vascular species and sometimes a few mosses and lichens), usually in approximate order of abundance or conspicousness, but often disconnectedly, and with a somewhat arbitrary distinction between dominant and secondary species. At the beginning of most of the habitat lists the names of one or two species regarded as dominant are printed in small capitals; the rest being in italics. (The method of treatment is not very well explained in the paper itself, but some of the facts given in this paragraph have been obtained subsequently by correspondence with the author.)

Some valuable original suggestions are made about the critical environmental factors for certain species, but some of these do not seem to hold throughout the ranges of the species. For example, on pages 270 and 283 it is stated that *Betula lenta* requires a constant supply of water near the surface. But in Massachusetts, New York and Michigan it grows in ordinary "mesophytic" upland woods, and at its southern limits in the mountains of Georgia and Alabama it is chiefly confined to exposed cliffs at high elevations (often with *Kalmia latifolia*). On page 283 *Kalmia latifolia* is said to be "preëminently a sun-loving plant"; but it grows in dense shade always in Florida, often in North Carolina, and sometimes in Massachusetts. (For both of these species protection from fire is probably a more important factor than soil moisture or insolation.)

Very interesting is the suggestion on pages 283–286 and 290–292 that evergreen herbs are confined to places where they are not crowded by other plants or liable to be smothered by falling leaves. It has seemed to the reviewer, however, that such herbs are especially characteristic of soils poor in potassium and pretty well protected from fire* (this is especially manifest in the case of epiphytes, all of which seem to be evergreen†); but at the same

* See Bull. Torrey Club 38: 517. 1911; 41: 214–217. 1914.

† See Ann. N. Y. Acad. Sci. 17: 38. 1906.

time the volume of annual leaf-fall is likely to be least in the poorest soils, *ceteris paribus*,* so that the dead-leaf hypothesis is not disproved. (And epiphytes are naturally just as exempt from smothering by leaves as they are from fire and overfeeding.)

The flora is pretty rich: 972 species of vascular plants being listed. This includes quite a number which have not been seen there by botanists now living, but the mosses and lichens mentioned in the ecological part are not enumerated in the taxonomic part. Most of the species in the catalogue are not referred to any habitat, which seems an unfortunate omission in a work which is so largely ecological. On the other hand, a few of the vascular plants mentioned in the descriptions of vegetation (just how many it is difficult to determine without an index) are not mentioned in the catalogue; but such omissions may be wholly the fault of the printers.

Nearly all the species in the catalogues are given "common" names, fictitious ones being used where no bona-fide ones have been discovered. Most but not quite all of the specific names are decapitalized. Over 15 per cent. of the technical names, and a few other words, are misspelled, many of them more than once or with more than one letter wrong.

From the summary at the end of the catalogue it appears that 22.7 per cent. of the angiosperms are monocotyledons: a figure agreeing pretty well with those for other unglaciated parts of the Paleozoic region of eastern North America.†

One of the objects of a review is to point out the good and bad features for the benefit of those who may undertake similar work afterwards (and there ought to be many more papers of this sort for other parts of the world). Among the good features of the work under consideration are the satisfactory descriptions of physical features, especially climate, the excellent illustrations, the careful classification of habitats, the amount of space devoted to environmental factors, the arrangement of species in order of abundance in the habitat lists, and the accurate identifications of species (a matter with which the Ohio botanists seem to be more

* See Bull. Torrey Club 40: 399. 1913.

† See Torreya 5: 207–210. 1905.

particular than some others are). Most of the shortcomings are not peculiar to this paper by any means, but are merely manifestations of widespread modern tendencies, due largely to excessive specialization in education and a growing indifference to matters not directly in one's line; and for some of them the author can hardly be held responsible at all. Others are points which will probably be given more attention in the future than they have in the past. The principal ones are:

Using too many different serial numbers on cover or title-page, one of them Roman (a sort of notation which has outlived its usefulness).

Dating the publication falsely, and thus working an injustice to any one who may have published something similar between the alleged date and the real date.

Omitting dates from illustrations (where they are just as useful as on herbarium labels, etc.).

Carelessness in spelling and proof-reading.

Using the terms "region" and "ecology" too loosely.

Too few comparisons with other parts of the world and citations of previous literature.

Insufficient explanation of the methods of treatment.

Too little correlation of vegetation with soil.

Lack of quantitative figures for vegetation.

Assuming that species treated as native in floras of the northeastern United States must be indigenous in every part thereof, even where the habitat indicates otherwise.

Too great discrepancy between ecological and taxonomic parts, in number of species included.

Using fictitious common names, which appear to serve no useful purpose, and take up space which might be better occupied with information about habitats or other significant facts.

Decapitalizing specific names, and thus obliterating certain interesting etymological distinctions without benefiting the reader appreciably.

ROLAND M. HARPER

Hitchcock's Text-book of Grasses*

This is one of the Rural Text-book Series, edited by Professor L. H. Bailey. The work is divided into two parts, the first treating of the economic side of the subject, the second of systematic agrostology. The first part includes ten chapters, the first chapter an introduction. Then follow chapters on: economic

* A Text-book of Grasses. With especial reference to the economic species of the United States. By A. S. Hitchcock, systematic agrostologist, U. S. Dept. of Agriculture. Pp. 1–276. Illustrated. The Macmillan Co., N. Y. 1914. Price $1.50.

classification of grasses; forage plants; cultivated pastures; meadow plants; hay and green feed; lawns; grasses used for miscellaneous purposes; weeds; grass crop areas. The second part comprises fifteen chapters, the first two treating of the morphology of the vegetative and floral organs. There are also interesting chapters on ecology and taxonomy or classification. The next ten chapters take up the grass tribes, a chapter to each, while the concluding chapter is on nomenclature. A large amount of information in reference to hay and pasture grasses is brought together in a condensed form, making it readily available. The chapter on lawns gives the essentials in the preparation of the soil for a good lawn, and the best grasses to be used in different regions. It should prove very helpful.

Grass organs are clearly described, a great help to those uninformed on technical terms often found in works on grasses. The chapter on ecology is full of interesting information on seed dispersal, plant societies, habitats, and geographic distribution. The second part also includes keys to the tribes and genera concerned in the work. The whole is illustrated with sixty-three figures, adding much to its value.

In the field it is intended to cover it meets a decided want, and should be fully appreciated by those interested.

George V. Nash

Murrill's Northern Polypores*

This is the first of a series of four manuals on the polypores of North America. The present volume covers the species occurring in eastern Canada and the northern United States south to the southern boundaries of Virginia, Kentucky, Missouri and Kansas and west to the western boundaries of Kansas, Nebraska and the Dakotas.

The volume contains complete keys and descriptions of all the species known in this region, with index to the genera with species and also an alphabetical index to the species. The general style of the book is that of North American Flora, but in order to make the work more condensed all synonyms have been eliminated.

* Murrill, Wm. A. Northern Polypores. Pp. i–iv + 64. Privately published. December, 1914. Price $1.00, postpaid.

The chief object of the work is to serve as a field manual. This and the succeeding volumes will fill a long felt need of some comprehensive work on the more conspicuous fungi of North America.

F. J. Seaver

Murrill's American Boletes *

This manual of the Boletaceae contains complete keys to the genera and species and full descriptions of all of the species known in America. The boletes, which are pore-fungi, differ from the polypores chiefly in their fleshy consistency and terrestrial habits. The group contains many of our best edible fungi. On account of their fleshy consistency the plants are altered greatly in drying and it is necessary to keep extensive field notes as an aid in making determinations. A blank form is inserted in the book to serve as a guide to collectors in making field notes.

The general style and purpose of the book is the same as that of "Northern Polypores," which was published at the same time and by the same author.

F. J. Seaver

Moore, B. The Presence of Inorganic Iron Compounds in the Chloroplasts of the Green Cells of Plants, considered in Relationship to Natural Photo-synthesis and the Origin of Life, Proc. Roy. Soc. B. 87: 556–570, 1914, reports obtaining striking, clean cut reactions (by means of Macallum's haematoxylin method) indicating the localization of iron in the stroma of chloroplasts.

Somewhat earlier Moore and Webster (Proc. Roy. Soc. B. 87: 163–176) announced that they obtained a synthesis of formaldehyde from carbon dioxide and water in the presence of ferric hydroxide and light. Moore concludes that iron salts in the stroma of chloroplasts are primary factors in the initial stages of synthesizing carbon dioxide and water, and also in the production of chlorophyll; the latter in association with the iron-bearing portions of the colorless stroma forming the complete photo-

* Murrill, Wm. A. American Boletes. Pp. i–v + 1–40. Privately published. December, 1914. Price $1.00, postpaid.

synthetic apparatus. As to the part played by chlorophyll, the various familiar possibilities remain; if concerned in the synthesis as such of carbohydrates, it presumably affects the later stages of the process rather than the initial ones.

In support of these conceptions, attention is called, among others, to the following well-established facts: (1) In the majority of plants, at any rate, chlorophyll itself is a product of photosynthesis formed with the aid of light by a "photosynthetic substance" present in the plastid. (2) Although iron is not present in chlorophyll, chlorosis follows an insufficient supply of iron, and can be readily cured by the application of iron salts. (3) Numerous attempts notwithstanding, it has not been possible thus far to bring about to any considerable extent a synthesis of carbon dioxide and water with the aid of chlorophyll separated from plastids (chlorophyll solutions, films, etc.).

Even if we view with reserve the report that salts of iron in the presence of light bring about *in vitro* a synthesis of carbon dioxide and water into formaldehyde, the conceptions here developed by Moore go far towards illuminating the interesting relation between iron and chlorophyll.

W. M.

PROCEEDINGS OF THE CLUB

October 13, 1914

The meeting for October 13, 1914, was held at the American Museum of Natural History at 8:15 P.M. In the absence of other officers the Secretary presided.

This being announced as an "Experience" meeting, informal reports on various subjects were in order.

Mr. Clifford Farr reported having found what purports to be a hybrid *Artemisia* in Ohio during the summer.

Dr. Jean Broadhurst spoke of self pruning of several sorts of trees and exhibited specimens of elm branches to illustrate this phenomenon.

Prof. T. E. Hazen gave a short account of his collecting trip on Mount Washington, N. H.

Dr. G. Clyde Fisher exhibited specimens of *Amelanchier* from the New England States and Dr. B. O. Dodge spoke of collecting some fifty species of rusts and several species of Discomycetes at Algoma, Wis.

Adjournment followed.

B. O. Dodge,
Secretary

OCTOBER 28, 1914

The second regular meeting of the Club for October was held October 28, 1914, in the morphology laboratory of the New York Botanical Garden at 3:30 P.M. with President Harper presiding. Twenty persons were present.

The minutes of the meeting of May 27 were read and approved.

Mrs. Britton, chairman of the program committee, reported that programs for the meetings of the year were being arranged and that complete programs would be presented in the near future.

James G. Scott, 123 W. Price St., Germantown, Pa. and William H. Long, Bureau of Plant Industry, Washington, D.C., were elected to membership.

The first paper on the announced scientific program on "The Genus *Oxymitra* (*Tesellina*) in the United States" was presented by Dr. Marshall A. Howe. All of the genera of Ricciaceous Hepaticae with the exception of *Oxymitra* have long been recognized as having representatives in the United States, and the finding of a species of *Oxymitra* by Dr. M. S. Young at Austin, Texas, now completes the generic representation of this family in North America. The genus as hitherto known has been generally held to consist of a single species, long considered to be confined to the Mediterranean region of Europe and Africa, though more recently reported also from Paraguay and Brazil. The Texan plant exhibits characters which seem to justify its specific segregation from the plant of the Old World. A description of the proposed new species, and a discussion of the history and synonymy of the genus are published in the numbers of The Bryologist for September and November, 1914.

Miss Margaret Slosson presented a paper on "An Interesting *Notholaena* from Cuba." This fern was collected by Prof. J. F.

Kemp near Woodfred, Oriente, Cuba, and is related to *Notholaena trichomanoides* but differs in the structure of the trichomes. This new species will be described and named for Prof. Kemp unless a report of its recent discovery by some one else proves to be correct.

Dr. W. A. Murrill exhibited a number of specimens of *Cryptoporus volvatus* (Peck) Hubbard from different parts of the country and spoke briefly on the morphology of this unique species, which he proposed to place in a distinct tribe, the Volvatae, characterized by the presence of a volva. The apertures in the volva are claimed by some to be natural openings and by others to be due to punctures by small weevils. The sporophore is annual and matures very early, so that the volva would probably decay and liberate the spores in sufficient time even if no apertures were present.

Dr. F. J. Seaver then spoke briefly on "Certain Species of Discomycetes." The recent discovery of two new species of the genus *Ascobolus* by Dr. Seaver in the vicinity of New York City would seem to emphasize the need of a more extended investigation of the local fungus flora. The spores of one of the plants, to be described later, vary from globose to blunt-elliptical, indicating a close relationship to a *Boudiera*.

Dr. A. B. Stout, who has recently returned from Europe, spoke of the successful cultivation of liverworts at the Hamburg Gardens.

Two recent publications on Marine Algae of the Danish West Indies by Dr. Boörgesen were briefly reviewed by Dr. Marshall A. Howe.

Dr. P. A. Murphy, of Dublin University, who has been for some time past engaged in a cytological study of *Phytophthora* gave a highly interesting account of the oospore formation in this genus. A full report of his discoveries will appear in the Annals of Botany.

The order of business was then reopened under the head of nomination. Dr. Michael Levine presented the following names: Miss E. Grace Stewart, 457 West 123d St.; M. A. Raines, 764 East 161st St.; and R. C. Faulwetter, Columbia University, New York City.

Adjournment followed.

B. O. Dodge,
Secretary

NEWS ITEMS

Dr. and Mrs. N. L. Britton and Messrs. J. F. Cowell and Stewardson Brown sailed on January 30 for Porto Rico, where they will meet Professor N. Wille and carry on botanical exploration of that island.

Dr. J. Arthur Harris and Mr. John V. Lawrence sailed January 13 for a few weeks, work on the osmotic pressure of the cell saps of Jamaican rain forest plants, which are to be studied in comparison with the flora of the vicinity of Tucson, Arizona.

Two prizes of $100 each are offered for photographs of large, wild, native trees in the United States, by two members of the American Genetic Association, who are interested in forestry and wish to secure data along somewhat novel lines. These prizes are to be awarded as follows: One hundred dollars for photographs of the largest nut-bearing tree. This includes chestnuts, oaks, walnuts, butternuts, pecans, etc. One hundred dollars for photographs of the largest shade or forest tree, not nut-bearing. This includes such trees as the elm, beech [sic], poplar, tulip-poplar ("yellow poplar" or "tulip tree"), etc. Photographs of conifers will not be considered. All photographs must be submitted to the *Journal of Heredity* before July 1, 1915, and will become the property of the Association. Information may be had at the office of the *Journal of Heredity*, Washington, D. C.

On January 30 the "Flora of the Vicinity of New York: A contribution to Plant Geography," by Norman Taylor, was issued as volume five of the memoirs of the New York Botanical Garden. The Introduction states that "All of the native and introduced species contained in the manuals have been included, besides many more, mentioned in notes." The book, which contains 683 pages, may be purchased at the New York Botanical Garden and the price is two dollars.

At a meeting held at St. Louis on December 28, 1914, the Federation of American Societies for Experimental Biology adopted the following resolutions:

WHEREAS, Various of the European nations with which many of our members are related by birth, descent, or intellectual friendship are now at war

Resolved, That we extend to the scientific men within these nations the hope of an early and enduring peace, which will leave the nations with no permanent cause of rancor towards each [sic] other, and which will insure to each the glories of scientific and humanitarian achievement in accordance with its own conception of these ideals.

The Brooklyn Botanic Garden has recently received a shipment of rare cycadaceous plants from the east coast of Australia. The plants left Rockhampton, New South Wales, on July 29, 1914, and arrived in New York the middle of February. They were twice unloaded en route, once at Sydney and again at Port Said to release the ships for transporting troops to the war. In spite of the long delay they appear to be in fairly healthy condition and most of them are expected to live. The plants are mature specimens of *Macrozamia Moorei*, which is all but extinct, *Cycas meadia*, *Macrozamia spiralis*, and *Bowenia serrulata*. As living members of an extremely ancient group of plants these specimens are very interesting additions to the garden's collections.

We regret to record the death of Dr. Charles E. Bessey, for more than thirty years the professor of botany at the University of Nebraska. He died at Lincoln on the evening of February 25. "Dr. Bessey was born at Milton, Wayne County, Ohio, May 21, 1845, the son of Adnah and Margaret Ellenberger Bessey. He was graduated from the Michigan Agricultural College in 1869, and from 1871 to 1873 and again from 1875 to 1876 he studied with Dr. Asa Gray at Harvard. In 1898 Iowa College conferred on him the honorary degree of LL.D. From 1870 to 1884 he was professor of botany at Iowa Agricultural College and in 1882 acting president. In 1884 he went to the University of Nebraska as professor of botany. Dr. Bessey was botanical editor of the *American Naturalist* from 1880 to 1897, and had been botanical editor of *Science* since 1897. He was a member of the Nebraska Rural Life Commission from 1911 to 1913, president of the American Association for the Advancement of Science from 1910 to 1911, of the Botanical Society of America from 1895 to 1896, of the Society for the Promotion of Agricultural Science, from 1889 to 1891, of the department of natural science of the National Education Association, from 1895 to 1896, and of the American Microscopical Society in 1902. Dr. Bessey was also a member of the Botanical Seminar of the University of Nebraska, the Academy of Science of St. Louis, the Washington Academy of Sciences, the Wild-Flower Preservation Society, the American Forestry Association, the American Breeders' Association, Phi Beta Kappa, and of Sigma Xi." (*Evening Post.*) On August 1, 1912, Dr. Bessey was in New York and was the guest of honor at a dinner given by Dr. Britton to about a dozen botanists who were in town at the time. Those who were present and heard Dr. Bessey reply to the toast "The Nestor of American Botany," will remember his plea for sound scholarship and a greater vision in our work, and particularly his earnest advice to "stick at it." Dr. Bessey has probably turned out more successful professional botanists than any other teacher in America, and his text-books are known wherever botany is taught. He was a member of the Torrey Club for many years. An account of Dr. Bessey's life will appear in an early number of Torreya.

Dr. Alfred Dachnowski, in charge of plant physiology at Ohio State University, has been granted a year's leave of absence; he is continuing his investigations at the Carnegie Desert Botanical Laboratory, Tucson, Arizona, under a grant from the American Association for the Advancement of Science.

The International Botanical Congress, which was to have been held in London during the coming season, and the International Phytogeographic Excursion, which was to have toured the Alps, have both been postponed on account of the war.

Professor LeRoy Abrams, of Stanford University, is preparing a descriptive manual of the Pacific coast trees and shrubs. F. V. Coville, C. R. Ball and S. B. Parish are contributing the text for *Ribes*, *Salix*, and the cacti.

The Torrey Botanical Club

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

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

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25 copies	$ .75	$1.05	$1.30	$1.80	$2.20	$2.50
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100 copies	1.15	1.55	1.95	2.55	2.90	3.20
200 copies	1.70	2.35	2.90	3.75	4.35	4.70

Covers: 25 for 75 cents, additional covers 1 cent each.

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Myxomycetes: Miss M. E. Latham
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Insect galls: Mel T. Cook

OTHER PUBLICATIONS

OF THE

TORREY BOTANICAL CLUB

(1) BULLETIN

A monthly journal devoted to general botany, established 1870. Vol. 40 published in 1913, contained 712 pages of text and 26 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 24–40 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. 28–40 three dollars each.

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

(2) MEMOIRS

The Memoirs, established 1889, are published at irregulas intervals. Volumes 1–13 are now completed; Nos. 1 and 2 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

DR. BERNARD O. DODGE
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New York City

Vol. 15 March, 1915 No. 3

TORREYA

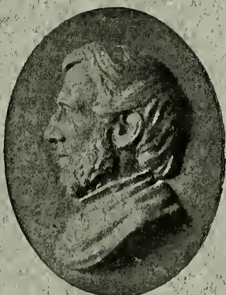
A Monthly Journal of Botanical Notes and News

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR



JOHN TORREY, 1796–1873

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THE TORREY BOTANICAL CLUB

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

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

Norman Taylor
Brooklyn Botanic Garden
Brooklyn, N. Y

TORREYA

March, 1915.

Vol. 15 No. 3

A SPECIES OF COPAIFERA FROM THE TEXAS EOCENE

By Edward W. Berry

The determination of the fossil remains of leaflets or even of the pods of a large proportion of the Leguminosae is attended with great difficulty because of their convergent character in so many of the numerous genera. It is therefore all the more important to call attention to unequivocal fossil forms such as the pod of a new species of the genus *Copaifera* described in the present note. This form also happens to be the oldest known representative of this genus as well as the first fossil record from North America, and to that extent suggestive of the place of origin of the genus and something of its geological history.

The genus *Copaifera* belongs to the tribe Cynometreae of the family Caesalpiniaceae and comprises about sixteen existing species of the equatorial region of Africa and America, ranging in the latter region from the West Indies to the valley of the Amazon. Four of the species are African and the balance are American. They are large trees with hard durable wood and yield the gum or balsam known as Copaiba. The latter term was proposed as the generic name for these trees by Miller and it is often substituted for the Linnaean name *Copaifera*, as for example by Taubert in Engler and Prantl's Naturlichen Pflanzenfamilien.

The present species may be characterized as follows:

Copaifera yeguana sp. nov.

Pods of relatively small size, short and broadly elliptical in outline, greatly compressed and smooth surfaced, pedunculate, somewhat obliquely mucronate tipped, two valved, tardily if at

[No. 2, Vol. 15, of Torreya, comprising pp. 21–40, was issued 11 March 1915]

all dehiscent, very coriaceous, 2 cm. in length by 1.3 cm. in maximum width; containing a single, large, elliptical, compressed seed, 1.1 cm. long and 8 mm. in maximum width.

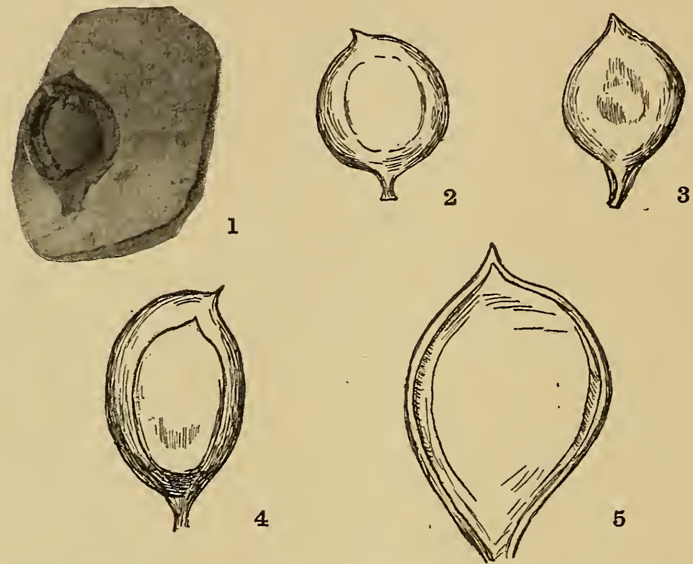

FIG. 1. Fossil and Recent pods of *Copaifera*. 1. *Copaifera yeguana* sp. nov. Middle Eocene of Texas; 2. *Copaifera Langsdorffii* Desf. Brazil; 3. *Copaifera radobojana* Unger, Miocene of Croatia; 4. *Copaifera Kymeana* Unger, Upper Oligocene of Kumi; 5. *Copaifera armissauensis* Saporta, Upper Oligocene of France.

The materials upon which this description is based were collected by C. L. Baker from the hard brown clays of the Yegua formation on Cedar Creek two miles south of the T. S. & E. R. R. bridge and southwest of Lufkin in Angelina County, Texas. The collection was small and the most perfect specimen is that figured. I am indebted to Mr. E. T. Dumble, of the Southern Pacific Company, for the opportunity of studying this and other collections.

The Yegua formation, which consists of several hundred feet of littoral and palustrine deposits of lignitic clays and sands, was differentiated by Dumble* in 1892. It forms the upper division of the Claiborne Group in that state, and is of middle Eocene age, that is to say, about the same age as the Green River beds

* Dumble, E. T., Rept. Geol. Surv. Texas, 1892: 148–154.

of the Rocky Mountain province or the Lutetian stage of the Paris basin.

The genus *Copaifera* has been recognized in the fossil state for over half a century, Unger in 1862 having described in the second part of his Sylloge, a pod of this genus from the Aquitanian of Greece (Kumi)* and a second pod and leaflets from the Miocene of Croatia.† Additional species were subsequently described by Unger,‡ Saporta§ and Engelhardt,|| some based on leaflets and others on pods. Ettingshausen¶ in 1886 described some leaflets from the early Tertiary of Australia as a new species of *Copaifera*, but his material was limited and entirely uncharacteristic, and there is no evidence that the genus was ever present in either Australia or Asia.

The probable origin and geological history of the genus may now be briefly sketched. The Texas form, which is a member of a tropical flora that spread northward from the American tropics along the shores of the middle Eocene Mississippi embayment, is the oldest known form. At about the same time or slightly later the genus is known from Engelhardt's studies (*op. cit.*) to have extended southward into Chili far beyond its modern range. From these facts I would conclude that it had its origin in the equatorial region of America. From America it spread to western Africa, possibly across what is now the south Atlantic. As I have pointed out in another place** there are a considerable number of genera with existing species in the tropics of West Africa and America, old genera that are present in the lower Eocene of the Mississippi embayment. They unite in indicating an equatorial or subequatorial avenue of communication in the early Tertiary, possibly to be correlated with the worldwide emergence of the continents predicated by DeLapparent as occurring during the Oligocene.††

* Unger, F., Sylloge plantarum fossilium, 2: 32. *pl. 11. f. 10.* 1862.

† Unger, F., Ibidem, *f. 4–9, 11.*

‡ Unger, F., Foss. Fl. v. Parschlug, 154. *pl. 3. f. 13.* 1869.

§ Saporta, G. de, Études, 2: 375. *pl. 13. f. 14.* 1866.

|| Engelhardt, H., Abh. Senck. Naturf. Gesell., 16, pt. 4: 681. *pl. 5. f. 8; pl. 7. f. 4.* 1891.

¶ Berry, E. W., Proc. Am. Phil. Soc. 53: 129–250. 1914.

** Ettingshausen, C. von, Tertiarfl. Aust. 2: 56. *pl. 15. f. 23, 23a.* 1886.

†† Traité. 1547. 1906.

All lines of evidence indicate extensive interchanges of terrestrial animal and plant life between Africa and southern Europe during the Oligocene and the oldest known European species of *Copaifera*, in conformity with the above brief outline of migration, are found in the Aquitanian of Kumi on the Island of Euboea and in beds of the same age in southeastern France.

The genus persisted in southern Europe through the greater part of the Miocene and then by reason of climatic and physiographic changes became extinct on that continent.

To facilitate a graphic comparison I have introduced along with the figure of *Copaifera yeguana*, illustrations of the pods of an existing and three other fossil species which were based on the remains of pods.

Johns Hopkins University,
Baltimore, Md.

AN ABNORMAL SPECIMEN OF CITRULLUS VULGARIS

By Glen P. Van Eseltine

A peculiar example of teratology is furnished by a watermelon recently received by the U. S. National Museum from Manteo, North Carolina. Normally the flower of *Citrullus* has a single, tricarpellary pistil; in this specimen the fruit seems to have arisen from a bipistillate flower with hexacarpellary pistils. The segments of the two pistils in developing into fruit have grown together from the receptacle up to the point where the fruit diminishes to form the apex. The development of each pistil has been distinct from that of the other, one fruit being several inches longer than its companion. Each presents, however, an abnormal appearance in the carpels, none of which is symmetrical, all being crowded and having the septa more or less distorted. It is unusual for such deformed fruits to mature, but this specimen weighed about forty-four pounds, measured seventeen inches in length of the longer portion, and was of equal width across the widest part. The texture of the pulp was very crisp and the flavor particularly good.

FIG. 1. An abnormal specimen of *Citrullus vulgaris*. Slightly over 1/6 natural size.

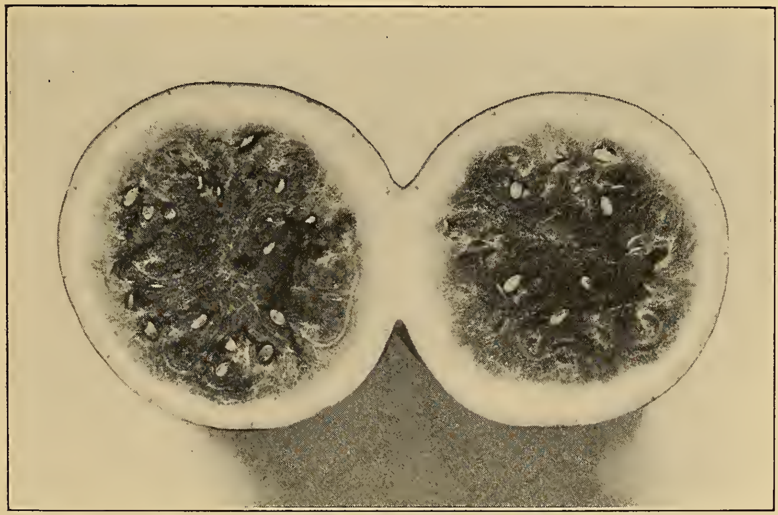

FIG. 2. Cross-section of same.

REVIEWS

The Marine Algae of the Danish West Indies*

Students of the marine algae in general and more especially those interested in the study of the American marine algae will find much of value in Börgesen's copiously illustrated account of "The Marine Algae of the Danish West Indies," of which Parts 1 and 2, dealing with the Chlorophyceae and Phaeophyceae, have already appeared. This critical report is based chiefly upon material collected by the author on three visits to these islands, made in 1892, 1895–96, and 1905–06, though he has had access also to earlier collections made by West, Örsted, and others. Börgesen had good success in dredging at various points, though here, as in most other parts of the West Indies, the nature of the sea-bottom, owing chiefly to the local abundance of corals, is often unfavorable to dredging operations.

Of the Chlorophyceae, Börgesen recognizes 86 species as occurring in the Danish West Indies. These 86 species are considered to represent 34 genera, of which the largest are *Caulerpa* with 11 species, *Chaetomorpha*, *Cladophora*, and *Udotea*, with 6 each, *Enteromorpha* and *Halimeda*, with 5 each, and *Avrainvillea*, *Codium*, *Penicillus*, and *Valonia*, with 4 each. In comparing the rich chlorophyceous flora of the tropics with the poorer representation of this group in northern waters, Börgesen remarks that whereas on the shores of Danish West Indies he found several kinds of green algae growing in abundance at a depth of about 20 fathoms, in the Faeroes (Lat. about 62° N.) he found only a few red algae at such depths, most of the Chlorophyceae not descending below the uppermost part of the sublittoral region. As novelties of the specific rank, Börgesen in Part 1 describes and figures *Pringsheimia*(?) *Udoteae*, *Cladophora uncinata*, *C. corallicola*, and *Avrainvillea Geppii*. Belonging in this category also, though first described and figured by him in various preliminary papers, are *Enteromorpha chaetomorphoides*, *Dictyosphaeria van Bosseae*, *Struvea elegans*, *Avrainvillea asari-*

* Börgesen, F. The Marine Algae of the Danish West Indies. Part 1. Chlorophyceae. 1–158. *f. 1–126 + chart.* 1913; Part 2. Phaeophyceae. 159–222. *f. 127–170.* 1914. Issued separately, with Part 2 repaged, from Dansk Bot. Arkiv 1^4: 1–158 and 2^2: 3–66.

folia, and *Caulerpa Vickersii.* Described earlier also and here maintained are the genera *Cladophoropsis* and *Ernodesmis*, with *Conferva membranacea* Ag. and *Valonia verticillata* Kütz. as types, respectively. Several species, originally described from other parts of the world are attributed to the West Indies for the first time by Börgesen, among them *Boodlea siamensis* and *Acetabularia Calyculus*, the latter having been first known from the Australian region.

Börgesen makes a rather free use of varietal and form names, as is seen especially in his treatment of the *Halimeda tridens* group (for which he prefers the name *Halimeda incrassata*). *Halimeda Monile* and *H. simulans* are considered to be varieties of *H. incrassata.* The present reviewer has seen and handled thousands of plants of this group on the shores of Bermuda, Florida, the Bahamas, Cuba, Porto Rico, Jamaica, and the Isthmus of Panama, and as elsewhere explained* feels convinced that (excluding *H. favulosa*) they represent three absolutely distinct species. They often grow very closely associated, under apparently identical conditions, yet maintain their distinctive characters perfectly. In ninety-nine cases out of a hundred, they may be distinguished at first sight, and in occasionally occurring individuals the position of which may seem at first sight doubtful, a comparison of the size of the peripheral utricles is, we believe, always sufficient for the determination. Börgesen claims to have found cases in which large and small utricles may occur on different parts of a single plant, which may very naturally happen, but if he would use in such cases the *general average* of sizes in making his comparisons we believe his difficulties would vanish. In similar fashion the reviewer has often seen *Caulerpa racemosa* and *Caulerpa clavifera* growing in close proximity, under apparently identical conditions, and is inclined to accept the view of Svedelius that the supposed intergrading of these two forms is apparent rather than real and that their true relationships are best expressed by referring them to the specific category as was done by the earlier writers. Unfortunately, in this genus, there seems to be nothing but external form that one may lay hold of in attempting to limit species.

* Bull. Torrey Club **34**: 501–504. 1907.

As minor peculiarities of nomenclature, not sanctioned by any of the current codes, one notes, in *Halimeda*, the change of the Ellis and Solander substantive specific name *Monile* to the adjective form *monilis* and the attributing under *Halimeda discoidea* of a var. *typica* to Howe, which superfluous varietal name was never published or suggested by the person named. If "var. *typica*" were to be used at all in this case it should be made to cover the original plant now preserved in the Muséum d'Histoire Naturelle of Paris and attributed (erroneously?) to Kamtschatka rather than the larger and otherwise somewhat different plant of Florida, to a photograph of which Börgesen refers. In *Caulerpa*, one notes, several times repeated, the name *C. Vickersii* Börg., which, being manifestly dedicated to the late Miss Vickers, seems to violate Recommendation XII of the Vienna-Brussels Rules by appearing in the masculine rather than the feminine form.

The numerous illustrations include half-tones from photographs, habit sketches, and drawings of microscopic details of morphologic or diagnostic importance, and are both excellent and artistic.

The use of a sketch of the graceful *Batophora Oerstedi*, originally described from the Danish West Indies, on title-page and cover, is most fitting and happy.

In Part 2 of "The Marine Algae of the Danish West Indies," which is concerned with the Phaeophyceae, Börgesen enumerates 40 species, distributed in 17 genera. The largest genera are *Dictyota* with eight species, *Ectocarpus* with seven, *Sargassum* with four, and *Dictyopteris* and *Padina* with three each. As novelties are described and figured *Ectocarpus coniferus*, *E. rhodochortonoides*, *Padina Sanctae-Crucis*, and the genus and species *Rosenvingea Sanctae-Crucis*. The new genus, which is dedicated to the author's compatriot, the well-known phycologist, Dr. L. Kolderup Rosenvinge, is placed in the Encoeliaceae, near *Scytosiphon* and *Chnoospora*. Three extra-limital species also, hitherto variously referred to *Asperococcus*, *Encoelium*, and *Hydroclathrus*, are placed in the new genus. The type of the genus, *Rosenvingea Sanctae-Crucis*, presumably came from the

Danish West Indian island of St. Croix, though the locality and habitat seem inadvertently to have escaped direct mention. The common "gulf-weed" of the "Sargasso Sea," *Sargassum natans* (L.) (more commonly known as *S. bacciferum*) has been discussed in detail by Börgesen in an earlier paper,* but is omitted in this enumeration, presumably because it is a floating pelagic form of uncertain affinities and cannot be said to occur attached on the shores of the Danish West Indies.

A peculiarity in nomenclature of a sort that will disappear as soon as the idea of pinning generic and specific names down to definite "types" meets with universal adoption is seen in Börgesen's use of the specific name *variegata* in both *Zonaria* and *Padina*, the name in each case being derived from Lamouroux's *Dictyota variegata*. This practice, which did not originate with Börgesen, seems to rest upon the assumption that the original *Dictyota variegata* of Lamouroux was a mixture of two species, representing two genera of the same family, and that, in spite of the confusion entailed, this specific name was available and valid in each of these two related genera,—a practice that is possibly permissible under the "Vienna Rules" but is distinctly forbidden by the "American Code." In this particular case, the present reviewer has enjoyed the privilege of seeing the specimens of *Dictyota variegata* Lamour. in Lamouroux's herbarium at Caen

* The species of *Sargassum* found along the coasts of the Danish West Indies with remarks upon the floating forms of the Sargasso Sea. Mindeskrift for Japetus Steenstrup. Copenhagen, 1914.

Börgesen seems uncertain as to whom the combination *Sargassum natans* (L.) is to be credited, objecting to following Kuntze in attributing it to Robert Brown (1855). Unless something earlier can be found, it seems to the reviewer that the name is to be written *Sargassum natans* (L.) Meyen (Wiegmann, Archiv für Naturgeschichte 4^2: 185. 1838). If one were to be very scrupulous in the matter, a "*pro parte*" might be added to the citation, for Meyen evidently considered that *Fucus natans* L. [*S. bacciferum* (Turn.) Ag.] and *Fucus natans* Turn. (*S. vulgare* Ag.) were not to be distinguished specifically. Miquel (Over het Sargasso of Zeekroos. Tijds. Nat. Ges. en Phys. 4: 25–41. 1837) had taken the same ground as to specific limitations, but had coined the new name *Sargassum Columbi* for the combined "species," to which unnecessary specific name Meyen rightly objects. That the pelagic *Sargassum natans* (*S. bacciferum*) may have been derived from the attached *S. vulgare* or the attached *S. Filipendula*, somewhat as the loose-lying var. *scorpioides* of *Ascophyllum nodosum* has been derived from the attached form of that species is one of the interesting suggestions made by Börgesen in his preliminary paper already referred to.

and finds that they agree with the figures published by Lamouroux in showing only a *Zonaria* (the *Gymnosorus variegatus* of J. Agardh), so that the name "*Padina variegata* (Lamx.) Hauck," employed by Börgesen, would seem to be vulnerable on the ground of historical fact as well as on the ground of nomenclatural theory.

Börgeson in his general discussion of the Phaeophyceae refers to "the well-known fact that the northern brown-algal vegetation reaches a luxuriance which greatly surpasses that in the tropics." In the Faeroes he found 73 species of brown algae; in the Danish West Indies, as already remarked, the recorded number is 40.

The text of "The Marine Algae of the Danish West Indies," as may be inferred, is in English, which will render this helpful work more widely useful and more readily available to American students than might otherwise have been the case. Preliminary papers dealing with the Rhodophyceae of the Danish West Indies have already been published by Börgesen and the appearance of Part 3 of the larger work, taking up the red algae of these islands in systematic sequence, will be awaited with interest.

Marshall A. Howe

Calkins's Biology*

As stated in the preface, the work before us is based upon the course outlined in Sedgwick and Wilson's General Biology, and is prepared primarily for the purpose of meeting the need, felt at Columbia University, for a work along similar lines, but covering about thirty class exercises and as many laboratory periods. The course is based upon a study of types, chosen with a view to their serving "as points of departure for various lines of development in subsequent course work." The plan of the book is quite different, however, from that of Sedgwick and Wilson's text. Organisms of one cell, organisms of tissues, and organisms of organs are taken up in the order named, and "emphasis is laid at the outset on cellular activities, especially on the importance of enzymes in metabolism and development, while animal differentiation for the performance of primary functions of protoplasm is the main theme of the entire course."

* Biology. By Gary N. Calkins, Ph.D., Professor of Protozoölogy in Columbia University. New York. Henry Holt and Company, 1914.

This last sentence fully prepares one for the preponderance of zoölogical emphasis which characterizes the book. Out of a total of nine chapters, five have to do exclusively with animal forms, and only two exclusively with plant forms. The other two (Chapters I and IX) deal with general biological matters, but out of the 25 pages of Chapter I only one and one quarter pages refer to plants, and out of 35 pages of Chapter IX, only seven refer to plants, and that only in illustration of Mendelism. Of a total of 133 pages of text, only 34 treat of plant life. The reason assigned (p. 109) for taking up the study of a fern is to facilitate tracing the food of animals, and (p. *VI*) the sources of animal energy. To the reviewer these reasons do not seem cogent. Could not the desired end be attained by a concise statement of not more than one or two paragraphs.

To a botanist the situation suggests the following queries: Why should a zoölogist interject into a text-book on zoölogy a chapter on the fern? Why has no botanist ever felt moved to intercalate into a text-book of botany a chapter on the earthworm? We leave the answers to these questions to the "biologists," whose ways have always been past finding out to the botanists.

The preceding statements are intended, nor primarily as a criticism of the book under review, but as a protest, which apparently needs to be continually raised, against the persistent tendency in some quarters to identify "biology" with the study of only one of the great sub-kingdoms of living things. The reviewer believes in introductory courses in general biology, provided the biology is really general; but he believes it is unfair to botany, wholly misleading to the beginning student *of biology*, and certainly no source of strength to zoölogy (though we appreciate the compliment of the opposite implication) to interrupt an otherwise logical course in zoology by sidestepping for a few days to consider the life history of the fern.

The following points will catch the eye of botanical readers:

On page 36, after noting the secretion of ferments by the salivary glands, stomach, and pancreas of animals, and that "these ferments of the digestive tract act independently of the cells which secrete them and may act apart from such cells," the author continues: "Yeast cells on the other hand do not perceptibly secrete their alcoholic ferments in like manner but give rise to them in such minute quantities that they cannot be identified." Reynolds Green's paper of 1898, on "The alcohol-producing enzyme of yeast," described in detail experiments which led him to the conclusion that, contrary to his own statement of 1897, active yeast cells do secrete an enzyme, which is capable of causing fermentation in sugar solutions under conditions which prevent the activity of living yeast. This enzyme was called by Buchner *Zymase*, not "xymase," as in the text under review.

The specific name of the bracken fern is *aquilina*, not *acquilina* (pp. vii and 109). The "leaf of a fern is the entire aerial part" (p. 114) only in some species, not in others as, *e. g.*, *Drynaria*, *Polystichum varium* and the tree ferns generally, not to attempt a complete list. On the same page, and in one paragraph, the foliage organs of *Pteris* are referred to, in one sentence as leaves, in another sentence as stems. On page 117 occurs the persistent error that starch is manufactured by photosynthesis. The branching of the fern rhizome is considered (p. 119) to occur only "now and then," and to be "only an exceptional method of reproduction." On page 121 we are told that *at the time of spore formation* "the margins of the *mature* leaves . . . turn under," etc. On page 124 the foot of the young embryo is said to be derived from *two* of the cells of the quadrant. The origin of the root is not given.

To state (p. 107) that the nervous response of the higher plants "is limited to protoplasmic irritability," is to ignore all such common motor reactions as those of *Mimosa*, *Dionaea*, *Drosera*, and others, and the numerous and universal movements of tropistic response. On p. 29, we note "Brewer's" yeast. Throughout, *proteid* and *protein* seem to be used interchangeably. Yeast (p. 33) is stated to be, "as regards nutrition at least," intermediate between plants and animals. Spore formation in bacteria is stated to be "not a method of reproduction."

One of the commonest errors in English in scientific writing in general is the predication of all the members of a class of that which is intended to be predicated of only a part of the class. Thus, on page 101 of the present work we read, "all living things cannot use the solar energy directly." Obviously(?), if this were true, there would be no living things to pass judgment upon other living things! But after all, that might be an advantage.

A review of the zoölogical part of the book would not be germain to a botanical journal, but we have no doubt that this portion is characterized by the same scholarly treatment that has always marked the author's zoölogical contributions.

It is often mystifying to one that other people's views do not closely agree with his own, and it is specially difficult for the reviewer to understand why, to those institutions that have departments of both botany and zoölogy, and that plan to offer courses in "general biology," it does not seem perfectly obvious, in the interest of highest efficiency, that the course should be planned by the coöperation of the two departments, the study of plant forms to be conducted in and by the department of botany, and the study of animal forms only, by the department of zoölogy. But, as the Quaker said to his wife, "Most people are peculiar except thee and me, and thee is a little peculiar."

C. Stuart Gager

Shreve's A Montane Rain-forest*

Many writers have called attention to the commanding influence of the great trade winds on the distribution of the West Indian flora but the present book seems to be the first to critically analyze one of the most characteristic regions in the West Indies, the Blue Mountains of Jamaica, where a wonderful rain-forest has developed on the windward side of the mountains.

After giving a general account of the physical features of the region and a discussion of its climate, together with a list of the chief species found in the rain-forest, the author begins his major problem which has been the physiological reactions of individual plants to the environmental conditions. Among this intro-

* Shreve, F. A montane rain-forest: A contribution to the physiological plant geography of Jamaica. Publication No. 199 of Carnegie Institution of Washington. pp. 1–110. pls. 1–29 + 18 figures. Price $1.50. Issued 12 September, 1914.

ductory matter is the statement (p. 8) that the "dominant vegetation of the Blue Mountains is, in accordance with the climate, the evergreen broad-leaved forest, which is here of a type strongly temperate in its floristic make-up and in its vegetative characteristics." Many will be surprised at such a characterization, and not a few slow to accept. The list of species scarcely bears out the statement that the floristic make-up is of a type "strongly temperate."

A very interesting section of the book is devoted to the relation of physical conditions to habitat distinctions in the rain-forest where the great difference between the forest floor condition and that even a few feet in the air, is emphasized. To this is due the well known layers of vegetation, particularly epiphytic, in tropical forests. After a brief section on seasonal behavior of rain-forest vegetation, and another on the rate of growth in rain-forest plants, the author takes up the question of transpiration behavior of rain-forest plants, which occupies nearly half the book.

The author has sought to determine in this section of the book (*a*) daily march of the rate of water loss, (*b*) effect of high humidities and of darkness on the rate, (*c*) comparative amounts of stomatal and cuticular transpiration in the slightly cuticularized and thin-walled leaves of rain-forest plants, (*d*) the behavior of stomata as affecting the rate of transpiration, (*e*) comparative transpiration rate and transpiration behavior of different types . . . simultaneously measured, and (*b*) the daily march of the relative transpiration rate.

An elaborate series of experiments were conducted to determine these various points, and the book is a storehouse of figures and graphs without number on such subjects. An interesting by-product of this investigation is that the author was not able to confirm the results of Lloyd, some years since, in which the position was taken that the greatest transpiration is not synchronous with the greatest opening of stomata. Shreve's graphs show, on the whole, that when transpiration and evaporation are highest the stomata aperture is largest. One very useful result of the work is "the securing of simultaneous readings of transpiration and evaporation which makes possible also the comparison of transpiration amounts and behaviors in plants of widely separated localities, with a basis of accuracy which removes this subject from the limbo of controversy into which botanical literature has sometimes seen it descend."

The care and thought evidenced throughout the book cannot blind us to a subject which it must force uppermost in the minds of all "ecologists," or "phytogeographers," or whatever we shall presently decide to call them. We have already *morphological* and *physiological* ecology, *physiographic* ecology, *floristic* and *ecological* plant geography, and now Dr. Shreve emphasizes the *physiological* plant geography of Jamaica. The obvious overlapping of terms, if not of concepts, must be a source of confusion to those who wonder what it is all about anyway, and have the right to be set straight by those most competent to do it. While this is neither an objection to Shreve's use of the term, for it was used, of course, by Schimper, nor a confession of obscurity in current ecological writing, it is a plea for that clearness of expression which shall makes our terminology capable of but one interpretation, even by those who do not care to tread all the mazes of modern ecology.

NORMAN TAYLOR

Trevena's Adventures among Wild Flowers*

For the spirit of ultra-professionalism in botany, it would be difficult to find a more delightful antidote than Mr. John Trevena's "Adventures among Wild Flowers."* Nowhere but in rural England could there have been written a book of this peculiar flavor of enjoyment of the country. The book seems to radiate the mellowed atmosphere of some cloistered rectory, far from the arena of modern botany and all the hurly-burly of everyday affairs.

For the professional anatomist among botanists the author has deep indignation. "He would snatch off the blossom, tear it into fragments, exposing its vitals, recite a mass of technical details concerning adaptation and fertilization, like some divine preaching upon predestination; discuss ovaries, pistils, inter-

* Longmans, Green & Co., New York, and Edward Arnold, London. 1914. Price $2.00.

nodes, and racemes; lecture upon transpiration, respiration, photosynthesis and osmotic pressure; and would then drop the poor mangled thing and tread it in the dust." That such a person should write a textbook sounds dreadfully familiar to us, but, "It resembled a treatise upon engineering: it treated the flowers as if they were articles of commerce made in Birmingham."

The book is full of flower lore and the love of flowers that is an almost lost art among some professional botanists. Many notes on the cultivation of rare and beautiful plants will be helpful to the wild gardener, and the chapter on the "Higher Sportsmanship" will be balm for those interested in the preservation of wild plants. Not only in England but all through the Alps the author leads the reader to that quieter enjoyment of flowers and their haunts of which he knows so well, and about which he writes so beautifully. Unfortunately most American readers will lose much of the charm of the many allusions, they are so peculiarly local and insular, and this is to be regretted, as some of them are of a delightfully whimsical turn.

The book is to be most earnestly commended to all nature lovers and to those botanists who have the wit to understand. —Ed.

PROCEEDINGS OF THE CLUB

November 10, 1914

The meeting for November 10, 1914, was held at the American Museum of Natural History at 8:15 P.M. President Harper presided. One hundred persons were present.

The program for the evening consisted of an illustrated lecture on "The Life History of a Tree," by Dr. C. Stuart Gager.

Adjournment followed.

B. O. Dodge,
Secretary.

November 25, 1914

The meeting of November 25, 1914, was held in the morphological laboratory of the New York Botanical Garden at 3:30

P.M. with President Harper presiding. Twenty-five persons were present.

The minutes of the meetings of October 13, October 28 and November 10 were read and approved.

The following persons were nominated for membership: Miss Edna Baer, 510 W. 170 St., New York City, Miss Helene Boas, Grantwood, N. J., Miss Mary Stewart, Barnard College, Mr. Clifford Farr, Columbia University, Mr. Ralph Stewart, Columbia University, and Mr. Cecil Yampolsky, Columbia University.

Dr. Howe brought up for consideration the question of the advisability of accepting for publication as Part III of Vol. 14 of the Memoirs a paper by Mr. F. L. Pickett. By a vote of the Club the matter was referred to the Budget Committee with instructions to report at the annual meeting in January. The following were then elected to membership: Misses Grace Stewart, Edna Baer, Helene Boas, Mary Stewart and Messrs. M. A. Raines, R. C. Faulwetter, Clifford Farr, Ralph Stewart, and Cecil Yampolsky.

The first number on the announced scientific program consisted of a paper "Phylogenetische Betrachtungen über Algen" by Prof. Dr. N. Wille.

Dr. Wille began by criticizing the present-day methods in determining phylogenies and followed this with an outline of a natural classification of the Thallophytes especially the algae.

Under the title, "Note on a Fresh-water *Cladophora* from Porto Rico," Dr. M. A. Howe showed and discussed briefly a peculiar specimen collected in a river near Juana Diaz by Mrs. N. L. Britton and Miss Delia Marble in March, 1913. The filaments, which often reach a length of 5–8 cm. without showing any branches and have a diameter of 200–300 μ, were evidently attached by well-developed basal holdfasts. The plant was at first taken for a *Chaetomorpha*, but Prof. N. Wille, to whom it was submitted, found on some of the filaments very short branches, represented for the most part by a simple evagination just below a septum, but in one case reaching a length of three cells. The walls of the main filament are very thick and encrusted, while those of the short branches are much thinner.

The plant is accordingly believed to represent the resting condition of some *Cladophora* which at some other season or under other conditions might be found to branch more freely and perhaps present a very different appearance. So far as may be judged from the material at hand the plant is allied to the almost branchless *Cladophora insignis* Kutz. and *C. setiformis* Kutz.

Prof. T. E. Hazen then gave informally some "Notes on *Uronema*." The results of his studies on a species of this genus will be published in one of the Club's periodicals.

Meeting adjourned.

B. O. Dodge,
Secretary.

December 8, 1914

The meeting of December 8, 1914, was held at the American Museum of Natural History at 8:15 P.M. President Harper presided. Twenty-five persons were present.

The lecture of the evening was given by Dr. John H. Barnhart on "Carnivorous Plants." The speaker classified carnivorous plants under two main types. In the first type the food-animals are captured in a cage-like trap, which may have originated in some structure such as the enlarged leaf-bases of *Tillandsia*. This type was illustrated by the buds of *Bartsia*, the scales of *Lathraea*, the "bladders" of *Utricularia* and *Genlisea*, and the highly specialized "pitchers" of *Cephalotus*, *Heliamphora*, *Sarracenia*, *Chrysamphora*, and *Nepenthes*. The other type may be compared to a snare in its adaptation to the capture of animal food; it originated, possibly, in a merely viscid-glandular surface such as occurs in some species of *Silene*, *Saxifraga*, *Roridula*, and many other plants; is more strikingly developed in *Pinguicula*, *Byblis*, *Drosophyllum*, and *Drosera;* and culminates in the marvellous spring-traps of *Aldrovanda* and *Dionaea*.

The lecture was illustrated with lantern slides, and was followed by a discusssion.

Meeting adjourned.

B. O. Dodge,
Secretary.

DECEMBER 21, 1914

A special meeting of the Club was held in the lecture room of the New York Botanical Garden, December 21, 1914, at which forty persons were present. Vice-President Barnhart presided.

An illustrated lecture on "Some New Ideas Regarding Lichens," under the title "Lichens" was given by Dr. Bruce Fink.

Dr. Fink gave a brief historical survey from the time lichens were regarded as mosses, algae, or fungi to the present time when research seems to have established the belief that the lichen is a fungus parasitic on an alga. In proof of this position, the relation of the lichen to its algal host was considered briefly. Following this, work on the taxonomy of the Collemaceae, based upon the supposition that these plants are fungi, was presented by lantern-slides. The cortex, the medulla, the reproductive areas, and the structure of various parts of the apothecium were discussed with a view to showing their various values as taxonomic characters. Such interesting features,—transitional forms showing how a cortex may have arisen, the varying degree of development of cortices, the methods and degrees of branching of paraphyses, and the presence of internal spermatia were considered. Finally the old and the new types of lichen diagnoses were presented and compared.

Adjournment followed.

B. O. DODGE,
Secretary.

NEWS ITEMS

It is difficult to get information about botanists who are serving in their respective armies during the war, but from Germany some news has come through. According to the *Evening Post* the Berlin *Tageblatt* has an interesting article on the botanists in the field. One of the most eminent of those who early took up arms, Dr. Brandt, has fallen in battle, on the Russian frontier. He hurried to the front from the Spanish Sierra Nevada, where he had been collecting plants. His dissertation on "Der morphologische Bau der Weinstockgewächse" at once attracted the attention of the learned world. Dr. Brandt was barely thirty years of age. He had been decorated with the iron cross for his bravery.

From the same source we quote the following: "The botanists in military uniform do not neglect their scientific interests even in the trenches. Every chance to get into the open is devoted to the collecting and pressing of plants, and the "war herbarium" is an adjunct of many a military camp. Dr. Schottky, the son of the Berlin mathematician, Professor Schottky, writes from the battlefield of Arras that he found in a well rare ferns and moss. Among other prominent botanists in the field are Count von Schwerin, head of the Dendrological Society of Berlin, who is attached to the General Staff; Dr. Baupel, of the Berlin Botanical Museum, who as a lieutenant is drilling recruits; Prof. Erwin Baur, who was to have lectured in Batavia on his special subject, "The Progress of the Theory of Heredity as Applied to the Cultivation of Tropical Plants," and who had been designated to go to the University of Wisconsin as exchange professor; and the Curator of the Botanical Museum, Professor Mildbraed, whose whereabouts are unknown. Many equally famous German botanists are in the East, some of them as prisoners of war in Japan."

Professor Volney Rattan, author in 1879 of "A Popular California Flora," which subsequently ran through many editions, died in Berkeley, California, March 5, 1915. He had given his life to the teaching of botany in the California normal and high schools. His discussion of the peculiar germination of *Echinocystis californica* attracted the attention of Charles Darwin, who makes note of it in "The Power of Movement in Plants."

According to the *Sun* the orchid collection of the late Joseph Chamberlin is to be sold at auction during April in London. For many years it was one of the finest private collections of orchids in the world.

Dr. J. C. Bose, of Presidency College, Calcutta, who has been lecturing in the United States on physiological botany, sailed from San Francisco on March 20.

It is reported in *Science* that Dr. William Trelease of the University of Illinois has been granted leave of absence from the university until May first, for a botanical expedition to Guatemala.

The report on the geography and vegetation of northern Florida by Dr. R. M. Harper, comprising over 300 pages, and issued by the Florida State Geological Survey late in 1914, may be had free by applying to the Survey at Tallahassee, Florida, and enclosing postage.

It is reported in *Science* that Henry Chandler Cowles, Charles Joseph Chamberlin, and Otis William Caldwell have all been promoted to be professors of botany at the University of Chicago.

Dr. and Mrs. N. L. Britton, Dr. and Mrs. N. Wille, and Messrs. Stewardson Brown and J. F. Cowell have all returned from Porto Rico where they were carrying on botanical exploration of that island.

Announcements have been issued for the field meetings of the club from April 3 to May 31. Some of these meetings are to be held on Sunday instead of Saturday as heretofore. Copies of this announcement may be had from Mr. Percy Wilson, chairman of the field committee, New York Botanical Garden, Bronx Park, N. Y. City.

Dr. John K. Small, New York Botanical Garden, recently returned from southern Florida. He spent about four weeks exploring and collecting in the little-known parts of tropical Florida. Most of the time was devoted to unexplored hammocks of the Everglade Keys. Interesting results were obtained and a number of West Indian species were added to the flora of the United States.

A Monograph of the *Usneaceae* of North America and Canada, by R. A. Howe, Jr. (Mémoir of the Thoreau Museum of Natural History), appeared early in April, 1915. It completes the treatment of the genus *Usnea*.

Professor H. H. Whetzel, of Cornell University, spent the early part of April in New York, visiting the botanic gardens and many florists, studying plant diseases. He has delivered several lectures before different organizations in the city.

The daily papers report that Mr. G. W. Brackenridge has given his $100,000 yacht "Navidad" to the University of Texas to be fitted up for scientific survey work, particularly animal and plant surveys.

Nearly one thousand packets of seed offered in exchange by the Brooklyn Botanic Garden have been sent at the request of the different botanical gardens to Europe. Most of these gardens are in the countries now at war. The Brooklyn Botanic Garden has also distributed eighty thousand penny packets of flower and vegetable seeds to the school children of Brooklyn.

The Torrey Botanical Club

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

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OTHER PUBLICATIONS

OF THE

TORREY BOTANICAL CLUB

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(1) BULLETIN

A monthly journal devoted to general botany, established 1870. Vol. 40 published in 1913, contained 712 pages of text and 26 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 24–40 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. 28–40 three dollars each.

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

(2) MEMOIRS

The MEMOIRS, established 1889, are published at irregulas intervals. Volumes 1–13 are now completed; Nos. 1 and 2 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

DR. BERNARD O. DODGE
Columbia University
New York City

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EDITED FOR

THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR

JOHN TORREY, 1796–1873

CONTENTS

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TORREYA

April, 1915.

Vol. 15 No. 4

BRYOLOGICAL NOTES

I. Aschisma kansanum New Species, with Remarks upon the Genus

By A. LeRoy Andrews

The genus *Aschisma* was created by Lindberg in 1878* for a single species of southern Europe and northern Africa which had hitherto passed as a *Phascum*. In the field of distribution of this species (*Aschisma carniolicum* (Weber & Mohr) Lindberg), North America has for some time been erroneously included on the basis of a single collection made by Hall in Kansas. Study of Hall's specimen as represented in the herbarium of the New York Botanical Garden has shown me that it represents an entirely different and apparently as yet unrecognized species. The American plant which grows gregariously with abundant persistent protonema stands somewhat higher (up to 2 mm.), the dry plants having leaves somewhat subsecund and rather concealing the capsule from view. The leaves are longer than in the European plant (up to 1.5 mm.), of different shape, from a long narrow clasping base of very thin-walled hyaline cells widening to well up near the apex, giving a rather spatulate or obovate effect to the leaf as a whole. The leaf shows a remarkably broad costa, up to 70 μ at the base and even 25 μ in its excurrent mucro, and in section at least 4 entirely included guide-cells with stereid bands both dorsally and ventrally. The cells of the leaf-blade, apart from the long narrow very thin-walled ones of the basal part, are rather thick-walled, the lumen appearing roundish or of somewhat irregular shape, the cell-diameter

* Utkast naturl. grupper. 28.

[No. 3, Vol. 15 of Torreya, comprising pp. 41–62, was issued 15 April 1915.]

being about 7–10 μ. These cells are very strongly papillose on both surfaces, a single large central projection being long-pointed or more commonly irregularly shaped or slightly pronged terminally. This arrangement of papillae leaves the cell-walls very clearly defined. A border region is considerably differentiated beginning at or near the apex and running downward with a width of about 2 cells until it finally widens to join the differentiated basal cells. The cells of this border lack the papillae and are about twice as long as wide. This border differentiation is very striking both in leaf-section and surface-view. The inflorescence is autoicous, the antheridia on an inconspicuous lateral branch. The capsule is small and well included in the leaves, nearly spherical (.4 mm. in diameter) with an inconspicuous apiculus, without operculum; its color is a shining yellowish brown, it is connected by a very short seta (.08 mm.) to the vaginule, which is cylindrical or elongated barrel-shaped (.23 mm. high and half as thick) without swollen base. The epidermis of the capsule constitutes a thin brittle plate, striking in a palisade-like arrangement of the exothecial cells except at base and apex. These are very elongate vertically with the two long sides parallel, the ends angular or straight, making the cells elongated rectangular to hexagonal (up to $15 \times 50\ \mu$). The thin lines of cell-division are the natural lines of fracture and the capsule seems very brittle along them so that the spores are quickly lost. The latter are light yellow in color, very slightly roughened and about 15–20 μ in diameter.

In the European species, several specimens of which I owe to the kindness of Mrs. Britton and Dr. Roth, the plant does not appear so raised from the substratum, lacks the conspicuous superficial protonema* and averages in fact rather shorter, with shorter leaves, and capsule much larger in proportion and more conspicuously exposed.† The color of the capsule is a more reddish brown, its apiculus is still less pronounced, its outer membrane not so brittle, nor its exothecial cells quite so long

* Limpricht says (Rabenhorst, Kryptogamen Flora, IV, 1, 195. 1886) that the protonema of *A. carniolicum* is subterranean.

† Fleischer (Malpighia, VII, 317. 1893) gives maximum dimensions of the plant and leaves of *A. carniolicum* equalling or excelling those of *A. kansanum.*

and narrow nor so regular in arrangement; the seta is thicker, the vaginule shorter in proportion to its thickness and brown-reticulate, more narrowed at top, the spores are darker and more strongly papillose.* The leaves are more crisped when dry, ovate-lanceolate in outline, the hyaline cells of the base are decidedly thicker walled, while those above are thinner walled than in the American plant, more regularly quadrate to roundish hexagonal, not differentiated at border, the papillae are quite different, not projecting so far, generally several (up to 4) per cell on either surface, rather regular and rounded in shape, by their disposal toward the cell-walls leaving the cells apparently less sharply set off than in the American species. The costa is very decidedly weaker, only about 40 μ at base and not so strongly excurrent. In section the costa has normally but two fully included guide-cells with a band of thick-walled stereid cells dorsally but not ventrally, where there is generally a single layer of fairly large thin-walled cells, sometimes a tendency to a second layer.†

A. kansanum is not the first species to have been added to Lindberg's originally monotypic genus. Limpricht ‡ included with the original species as var. *speciosum* a form to which an herbarium name *Phascum speciosum* Moris had been attached and the same was later proposed, though not very seriously, as of specific rank by Fleischer § and apparently accepted as such by Limpricht. || In 1901 ¶ Brotherus included a second African species, *A. aethiopicum* (*Ephemerum aethiopicum* Welwitsch & Duby, 1871) as having been already assigned to this genus by Lindberg in manuscript. Roth gives later** a description and figure, from which it appears clearly that the plant is specifically distinct from *A. carniolicum*. At the same time Roth also included a description and figure of a South American species,

* Fleischer (l. c.) again mentions variation.

† Fleischer (l. c.) gives conditions of costa-section more nearly approaching those of *A. kansanum*.

‡ Op. cit. 196. 1886.

§ Op. cit. 317. 1893.

|| Op. cit., III, 637. 1901.

¶ Engler & Prantl, Die natürlichen Pflanzenfamilien, I, 3, 383.

** Die aussereuropäischen Laubmoose, I, 173; pl. XX, fig. 7. 1911.

A. occultum (*Phascum occultum* Carl Müller).* Dr. Roth very kindly sent me a bit of this species from Ule's *Bryotheca brasiliensis*, which though a somewhat similar plant is obviously specifically quite distinct from both *A. carniolicum* and *A. kansanum*. Thériot added another species from New Caledonia, *A. neocaledonicum*.† A description and figure were later furnished by Roth.‡ A specimen in Thériot's *exsiccati* (*Musci et hepaticae Novae-Caledoniae*, no. 126) shows a plant with no particular affinities with the other species placed under *Aschisma*, but clearly referable to *Astomum*.

I have included our North American species in *Aschisma* not from inner conviction, but from disinclination to remove it irresponsibly from the place where it has for some time reposed. As a matter of fact I cannot regard it as naturally congeneric with the European species, constituting the type of this genus; it is however not referable to any other genus of cleistocarpous mosses. As to the European *Aschisma* I am not fully satisfied that its natural affinities are with *Astomum* as Lindberg and Brotherus place it.§ Lindberg was at any rate obviously right in separating it from *Phascum* and the latter genus as left still seems to me a very heterogeneous one. Loeske || has already separated *Pottiella* from the European aggregate, but the exotic species have not been adequately dealt with. The new North American species should probably form the type of a new genus, but so long as the complex of moss-forms left by Brotherus in *Pottiaceae* is phylogenetically so little understood as at present I have not cared to add to the confusion.

It is somewhat remarkable that the plant has not been rediscovered since Hall found it, but our cleistocarpous mosses have hardly been given the attention they deserve. Hall's locality "prairies of western Kansas" is also a trifle vague, but the addition of "silicious soil" may help in further search. What is meant is a soil containing quartz in larger or smaller grains,

* Op. cit., I, 172; pl. XVIII, fig. 1.

† Bull. de l'Acad. de Geogr. Bot., 1911, p. 4. (I have not seen this publication.)

‡ Hedwigia, LIII, 93; pl. II, fig. 5. 1913.

§ Loeske has also (Zur Morphologie und Systematik der Laubmoose, 74 1910) given it a different place in the vicinity of *Phascum*.

|| Verh. bot. Ver. Prov. Brandenburg 47: 322: 1906.

pebbles, etc., the same type of soil by the way chosen by the European and South American species assigned to *Aschisma*. Hall appears to have noted it in more than one place. His original material is now represented in this country by a specimen at the New York Botanical Garden which had been sent to Austin by Lesquereux, and by specimens in the Sullivant and James herbaria at Harvard University. Professor Farlow has kindly furnished me the following from a letter from Lesquereux found with the Sullivant specimen, dated Jan. 1, 1872, the words being quoted by Lesquereux from a letter from Hall: " I am interested in this little moss from the flint pebbles in the Kansas prairies. It grows also a thick leathery confervoid stratum* and is remarkable for affecting only flint pebbles or small flint rocks at their base, forming a thallus or coat frequently all around the stones below."

ITHACA, N. Y.

DESCRIPTION OF A NEW FOSSIL FERN FROM THE JUDITH RIVER FORMATION OF MONTANA†

BY F. H. KNOWLTON

Fossil ferns in a fruiting condition are of such comparatively rare occurrence that the finding of a new one is still worthy fo record, and this is the warrant for the present brief notice. The material which has furnished the basis for the following diagnosis was obtained the past season (1914) by Mr. E. Russell Lloyd, of the U. S. Geological Survey, in the so-called Judith coal field of Montana. These specimens are so fragmentary that they would hardly be worthy of more than passing notice if it was not for the fact that the fruit is preserved in such a high degree of perfection. The form may be known as:

FIG. I. *Dryopteris Lloydii*, sterile pinnule, × 3

* The protonema.

† Published with the permission of the Director of the U. S. Geological Survey.

Dryopteris Lloydii n. sp.

Diagnosis.—Outline of whole frond unknown; pinnae rather thick and firm in texture, narrowly linear, acute, cut nearly to the rachis into numerous alternate, deltoid, obtuse pinnules; fertile pinnae slightly smaller that the sterile pinnae; nervation consisting of a rather strong slightly flexuose midvein and some three or four pairs of slender, once-forked veins; fertile pinnae small; sori relatively very large, 3 or 4 to each pinnule and nearly covering it; indusium centrally peltate; sporangia evidently of large size, producing pits in the leaf substance, the pits disposed more or less clearly in three circles, the outer circle with about 15, the middle circle with 7 or 8 and the inner a cluster of about 5.

Types.—U. S. National Museum, Nos. 34,970, 34,971, 34,972.

Locality.—Near mouth of Judith River, Fergus County, Montana (NW ¼ Sec. 17, T 23 N, R 16 E.).

Horizon.—Judith River formation (Montana group, Cretaceous). Probably between 30 and 50 feet above the base of the formation.

This interesting little species is represented by several detached pinnae only, and hence it is impossible to determine the shape of the whole frond, though it was presumably at least bipinnatified. There is evidence of slight dimorphism, the fertile pinnae being a little smaller than the sterile ones, and with the pinnules more rounded or obtuse at apex. The nervation, which is obscure on account of the thick substance of the frond, consists of a relatively strong midvein and three or four pairs of once-forking veins at a low angle of emergence.

The fertile pinnae are 3 or 4 cm. in length and about 5 or 6 mm. in width. They are cut nearly to the rachis into numerous deltoid almost moniliform pinnules which are only about 3 mm. long and 2 mm. broad at the base. The fruit dots are usually 4 though sometimes only 3 in number, and are relatively of such large size that they almost completely cover the pinnule; the diameter of the sori is about 1 mm.; while the indusium is rarely preserved there is fortunately one which is practically complete showing that it was centrally peltate. When the material is freshly opened each sorus is filled with a carbonaceous mass nearly .5 mm. thick which probably represents the mass of sporangia, though they cannot now be made out. When this carbonaceous mass is removed there is revealed a series of little pits in the substance of the pinnule that represent the impress of the sporangia. These pits are disposed in circles.

The specimens which furnish the basis for this species have been shown to Mr. Wm. R. Maxon, of the U. S. National Museum, and he pronounces them as without doubt dryopteroid. This

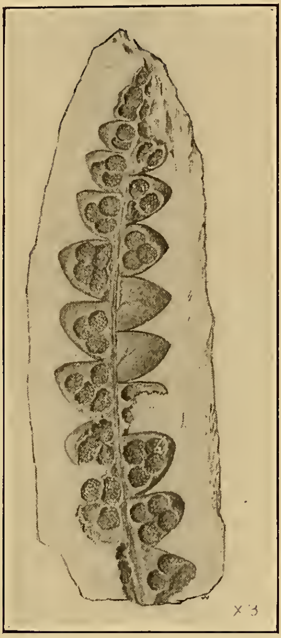

FIG. 2. *Dryopteris Lloydii*, fertile pinnule, × 3.

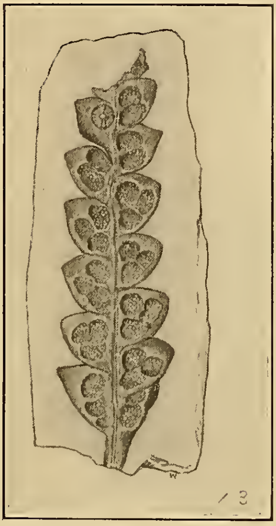

FIG. 3. *Dryopteris Lloydii*, fertile pinnule, × 3.

species has a more or less remote resemblance to several living species, but so little is known of its whole form that it would be perhaps misleading to signal any one for direct comparison.

Among fossil forms the species here described is undoubtedly very closely related to *Aspidium fecundum* Heer* (or *Dryopteris fecunda* as it should now be called) from the Atane beds of Greenland. The latter species, however, is considerably larger, with the pinnae cut to the rachis into oblong, rounded pinnules. The

* Heer, Oswald, Den ersten Theil der fossilen Flora Grönlands: Flora fossilis arctica, Vol. 6, Pt. 2, 1882, p. 32, pl. xxix, figs. 5–9.

sori are from 4 to 6 in number and do not so nearly cover the whole area of the pinnule as in *Dryopteris Lloydii*. The pits left

Fig. 4. *Dryopteris Lloydii*, sori, × 18.

Fig. 5. *Dryopteris Lloydii*, indusium, × 18.

by the sporangia are similar in character in the two species, though not quite so numerous in the Greenland form.

SHORTER NOTES

The Helianthoid genus Tonalanthus.—Among the plants gathered by Dr. Purpus in 1913 in the state of Chiapas, Mexico, was a very interesting new Helianthoid genus, described by Mr. T. S. Brandegee* as *Tonalanthus*. The single species, *T. aurantiacus* Brandegee, was collected on the Sierra de Tonala. The rather brief Latin description, while adequate for recognition, does not readily enable one to fully appreciate the characters of the plant, so I offer some figures and notes, based on fragments of the type lot, very kindly communicated by Mr. Brandegee.

Involucral bracts, at least the outer ones, about 15 mm. long and 4.5 broad, parallel sided except apically; coriaceous, the basal half whitish, the apical reddish-brown; about a dozen parallel veins; dorsal surface of apical part furfuraceous, and margin very briefly, inconspicuously ciliate (fig. *G*).

Receptacle, "long, like *Lepachys*" (Brandegee litt.).

Disc bracts elongate, hyaline, divided apically into about three slender, sharp-pointed lobes, one much longer than the others (fig. *C*).

Achenes narrow, flattened, the surface, except the margins, strongly furfuraceous. Achenes about 4 mm. long, the pappus scales distinctly, but not greatly, longer (fig. *A*).

* Univ. Calif. Publ., Botany, VI, 75, Aug. 3, 1914.

Pappus of disc-achenes consisting of twelve or fewer linear paleae, each narrowly margined on each side with a hyaline striate fringe, which is very minutely denticulate on the edge, and toward the apex of the palea becomes largely modified into a very minute ciliation. The first impression one gets on examining this structure is that the palea is densely ciliate throughout, but for the greater part the elements are united nearly to the apex (fig. *B*).

Disc-corollas with a long slender basal tube, the extreme base of which is swollen (fig. *F*).

Ray-corollas with a long slender basal tube; pistil present, the style branches straight and rather long (fig. *D*); on the wall of

FIG. 1. Helianthoid genus *Tonalanthus*. For description of figures see text.

the corolla, behind the style branches, are two linear or narrowly strap-shaped processes (fig. *E*), the function of which is not evident. They do not extend down the tube, but are attached to the base of the ray.

This has to be referred to the Heliantheæ rather than the Helenieæ on account of the chaffy bracts of the receptacle, and aside from this character it does not closely resemble any genus of Helenieæ. The affinity appears to be with the Galinsoginæ, an apparently ancient group containing a number of American and two Hawaiian genera. The pappus of *Tridax procumbens* L. seems to show a further development of exactly the same feature as are found in *Tonalanthus*, while the disc-corollas have some of the characters of *Marshallia*.

T. D. A. COCKERELL.

THE SCIENTIFIC TYPE OF MIND

A writer in a recent number of *The Unpopular Review* scored scientists severely, claiming that they were less logical in their thinking processes, and less clear and direct in expression than men of equivalent training in literature, languages, etc.

Is this true? I do not know. I only know that many of the ninety-odd papers I heard presented during the Philadelphia mid-winter meeting of the American Association for the Advancement of Science and its affiliated societies were not papers that I would choose to present in refutation of such charges. And yet we were all men and women trained in science, most of us holding graduate degrees, or else titles granted for research or indicative of executive and administrative ability!

What was wrong? Several things: (1) The titles did not sufficiently indicate the content or trend of the contributions. This is illustrated by such titles as "The Genus *Iris*," "The Purification of a City Water Supply," or "Experimental Work in Child Psychology." The authors failed to realize that such topics do not sufficiently indicate the line of discussion—a great disadvantage when several conflicting sections are simultaneously offering programs of interest to each of us. Within the usual fifteen-minute limit, not all phases of a topic can be included, and each auditor has a right to know beforehand whether "The Genus *Iris*," for instance, means a morphological characterization of the genus, a discussion of the iris hybrids now under cultivation, or perhaps an attack on the validity of the name Iris, and a substitution of another name approved by the Vienna rules.

(2) Authors failed to distinguish between subject matter as such, and mere technique. Papers that promised to be real or important additions to our knowledge were too often almost entirely details concerning methods or mechanical procedures. Such matter should be frankly labeled "A New Method of —," "Differential Diagnosis in —," or "The Comparative Efficiency of —," etc. To do otherwise, implies an extreme lack of consideration for the audience, or a most unenviable "fuzzy mindedness" in the writer. The discussion which follows the paper gives op-

portunity for any really important details of technique; and charts (or, preferably, typewritten sheets for distribution) offer more economical and more serviceable methods of indicating such details.

(3) Those on the program often ignored the real uses of charts and diagrams: (*a*) as visual aids, (*b*) as time savers. Long lists of names, substances, etc., given orally, dull the attention of even the most interested. But charts should be allowed to speak for themselves. No speaker has any right to hold the audience while he *reads* every column or describes every curve. He should pay his auditors the compliment of recognizing that they can read, and should not persist in droning over a chart minutes after they have exhausted its possibilities. Years ago in this same Philadelphia town, a friend watched two children at play in a back yard. In her usual slow way, the older, a little girl of seven, began to tell about a kitten. Her playmate, a boy of six, fidgeted nervously, anticipated every word as she drawled out, "*Willie*, once-I-had-a-lit-tle-kit-ty,-and-once-it—" Here Willie jumped up nervously, almost shouting, "Did it bite? Did it scratch? Did it run away?" How I would have welcomed a Willie during some of the papers!

(4) Contributors too often insisted upon laying before us their day-book instead of the ledger; indeed, the balance sheet itself would often be preferable. Would it not be better to *write* our papers as we *read* the articles of others? Usually we turn first to the summary and conclusion, glance back to make sure we did not mistake Alfred J. Smith for Alfred M., who really doesn't know at all anything about the haploid chromosomes (or conical horns, or the entropy of vaporization), and then search in the appropriate parts of the paper itself to see if the striking differences noted are supported by a sufficient number of instances or experiments, or if this result is based on Smith's former method, which, you pointed out last year, was faulty in not recognizing such and such relationships; or else you measure his conclusions by that recent brilliant discovery of Brown's which promises to remodel all our theories and most of our methods in such research. Even a murder trial—or a case of petty larceny—is conducted in

much the same way. Yet most of us evidently consider it unscientific to deliver a paper so that the audience can see whither the evidence is tending. Instead, the author often leads his hearers blindfolded through the various trial by-paths, and when they are thoroughly dazed and irritated by the numerous turns and blind alleys, they are at last brought into the open and told where they are—or where they ought to be! Would any one *choose* to travel from New York to San Francisco with the names blotted from every station, and a dizzying detour at every railroad center? Somehow we prefer to buy a straight ticket for San Francisco and then to follow our route on our railroad maps station by station.

And yet we write our papers as if we felt with Barrie's mother that they must be a "manzy of different things all sauced up to be unlike" the sensible, straightforward way of proving a point; as if this natural simple method of exposition would cause our fellow members to "run about flinging up their hands and crying, 'Woe is me.'" L. H. E.

REVIEWS

Taylor's Flora of the vicinity of New York*

During the quarter of a century that has elapsed since the publication by the Torrey Botanical Club of the "Preliminary catalogue of Anthophyta and Pteridophyta reported as growing spontaneously within one hundred miles of New York City,"† knowledge concerning plant distribution within this area has been greatly extended and, especially during the last few years, much of this data has been recorded in several more or less comprehensive local catalogues. The consummation of the scheme originally projected by the committee on local flora of the Torrey Botanical Club is seen in Taylor's "Flora of the vicinity of New York." The area included by the present work is the same as that covered by the preliminary catalogue. It comprises all of the states of Connecticut and New Jersey and the parts of New York and Pennsylvania within a radius of slightly more than one hundred miles from New York City. The general plan of the

* Mem. N. Y. Bot. Garden 5. vi+683 pages. 9 maps. 30 Jan. 1915.

† Pp. xviii+90. Map. New York. 1888.

book is as follows: Introduction (pp. 1–37); list of local floras of the Torrey Club range (38–45); catalogue of plants (47–651); index (652–683). From the summary it is learned that the total number of species admitted into the work, excluding waifs, is 2,651, and that of these 2,038 are native. A list (p. 32) is given of twenty-two species which appear to be endemic within the area.

The introduction is largely taken up with a discussion of phytogeographical problems. The factors which affect the distribution of the local flora are treated under two heads: edaphic and climatic. From a geological standpoint the region presents great diversity, while its floristic diversity is suggested by the fact that 281 species (list, p. 14) reach their northern and 180 species (list, p. 18) their southern limits of range here. For the purpose of the phytogeographer the area is divided into two parts: glaciated and unglaciated. The terminal moraine which separates the two extends through Long and Staten Islands, upper New Jersey, and Pennsylvania. The glaciated region is said to be typified by the large percentage of hardwood trees, the relative numerical scarcity of conifers, and the large number (595) of introduced species. A list (p. 5) is given of 165 native species which occur exclusively north of the moraine. The unglaciated region includes the coastal plain (Tertiary) in southern Long Island and New Jersey and the Piedmont Plateau (Cretaceous) in northern New Jersey and Pennsylvania. Many bog plants found elsewhere seem, so far as New Jersey is concerned, to be absent from this latter district (list, p. 4).

In discussing the coastal plain the author reasserts his conviction* that the origin and present distribution of the pine-barrens is to be explained on a geological basis. In his opinion this tract is coëxtensive with the Beacon Hill formation, an area which, according to geological evidence, has been "uninterruptedly out of water since upper Miocene times," whereas the adjoining parts of the coastal plain have been subjected to repeated submergence and emergence. The pine-barrens are therefore said to represent an area which has been isolated by

* See Torreya 12: 229–242. 1912.

geological processes and maintains a relict flora, "the antiquity of which greatly antedates any of the rest of the vegetation hereabouts, so far as permanency of position and phytogeographic isolation are concerned." Perhaps the most convincing botanical evidence introduced in support of this contention is the fact that of the 565 plants which comprise the total number of indigenous species known from the pine-barrens, 386 are true pine-barren plants; in other words, so far as New Jersey is concerned, they attain their optimum development within this area. Two species seem to be endemic to the pine-barrens, two are "practically unknown" outside of this area, and it might have been added that, according to Stone,* fifty-five have not been found elsewhere in New Jersey. The author also finds evidence favoring his isolation theory in the extra-territorial distribution of certain pine-barren plants. The occurrence in the mountains of eastern Tennessee of several typical pine-barren species is thought to have an important bearing on the question, while the northward distribution of *Schizaea pusilla* and *Aster nemoralis* is also regarded as significant.†

"If this theory is correct, then the pine-barrens can no more be considered as a new or pioneer vegetation, but rather an old or climax condition, ancestrally infinitely more ancient than anything in the surrounding area." At first thought, this statement seems quite at variance with current ecological conceptions, but such is not really the case. The New Jersey pine-barrens lie within a region whose climate is capable of supporting a highly mesophytic forest, and this type of forest represents the climax or ultimate type of vegetation throughout the area. In comparison with it the vegetation of the pine-barrens, from an ecological standpoint, must be classed as a primitive or pioneer type. But while the successional trend of vegetation throughout the east is unmistakably toward a mesophytic condition, and while the climate undoubtedly favors the development of a mesophytic forest, it must be recognized further that the actual attainment of such a climax postulates the existence of favorable edaphic conditions. Local conditions, however, such as soil

* New Jersey State Mus. Report 1910: 75.

† In this connection see Fernald, Rhodora 17: 67–69. 1915.

texture or composition and available water, may be such that a series of successional changes may be halted for an indefinite period at a point far short of the regional climax. Thus the reviewer has pointed out, in his discussion of the plant societies of Connecticut,* that along the crests of the trap ridges edaphic conditions may be such that the ultimate forest is dominated by oaks and hickories; similarly many pitch-pine forests in the Connecticut sand-plains may very likely represent the most mesophytic type of vegetation attainable under the existing soil conditions. It seems important therefore that a careful distinction be made between an edaphic climax which may be determined by local conditions, and a regional climax, which is favored by climate but can be attained only under favorable edaphic conditions. While, therefore, in a sense the vegetation of the pine-barrens is to be regarded as a primitive or pioneer type, it probably represents a remarkable example of a widespread edaphic climax, widespread because the peculiar soil conditions with which it is so intimately associated are likewise widespread.

Several pages of the introduction are devoted to a consideration of "the probable effects of the glacier on the coastal plain excluding the pine-barrens" and to the northward distribution of coastal plain plants into Staten Island and Long Island. In the latter connection it is assumed that an "avenue of migration" must have existed in post-glacial times between these areas and New Jersey, yet the necessity of assuming the existence of some such former connection between eastern Long Island and the adjacent mainland to account for the segregation in southern New England of a very considerable group of coastal plain species "seems doubtful."†

Under the head of climatic factors an attempt is made to correlate the distribution of the flora within the area treated with the length of the growing season. It is pointed out that the number of days intervening between the last killing frost of spring and the first one of autumn varies from 117–123 days in the Catskills and the mountains of Pennsylvania to 220 days at Cape May, a difference of more than three months. On an

* Torreya 14: 177. 1914.

† In this connection, see the reviewer's observations in Torreya 13: 94–99. 1913.

appended map is drawn a line, north of which every weather station record is said to show an average growing season of 153 days or less and south of which the average is 164 days or more. It should be remarked, however, that in Connecticut there are at least three stations south of this line which record averages of less than 153 days, notably the station at Voluntown where the records of twelve years seem to show an average growing season of less than 130 days. "This arbitrarily drawn line, seems to separate, roughly speaking, the northern plants from those more generally distributed."

In the mind of the reviewer it seems extremely doubtful whether, within the comparatively small area under surveillance, it is possible to correlate the distribution of plants in general with widespread climatic phenomena. It is of course not disputed that climatic factors are of primary importance in determining the geographic distribution of plants in the large. And it may indeed be possible, even within the area in question, to correlate with climate certain of the broader aspects of the vegetation, as for example variations in the nature of the climax forest on uplands.* But as affecting the distribution of plants in general, it seems impracticable, except where pronounced climatic dissimilarities, such as may be produced by considerable elevations or proximity to seacoast, are observable, to attempt to use variations in climate as a criterion. For even within a tract of but a few square miles, due to differences in slope, exposure, etc., there may exist a miniature diversity of "climates" quite as appreciable as the more wide-spread dissimilarities upon which emphasis has been laid. Moreover, where individual species of diverse habitats are concerned, physiographic factors and soil conditions are of prime importance. Within a very limited area like the one just assumed, there may thus be encountered cliffs and sand-plains, bogs and swamps, ravines and flood-plains—in other words, edaphic conditions which would tend to exert an influence on plant distribution far more profound than comparatively slight climatic differences.

Coming now to the catalogue proper, it is a pleasure to find

* See Bot. Gaz. **56**: 143–152. 1913.

included keys to genera and species, adapted from Britton and Brown's "Illustrated Flora." In matters of nomenclature and taxonomy also the author in the main has followed this work, but the taxonomic treatment of a number of families or genera has been contributed by various specialists. In treating the respective species there is given (1) the habitat, (2) the geographical range (after Britton and Brown), and (3) the "distributional trend" for the states of Connecticut and New Jersey and those parts of New York and Pennsylvania included within the range of the work. As a rule this data is followed by a statement regarding the presence or absence of the species on the different geological formations (Tertiary, Cretaceous, and "Older Formations") and its distribution with respect to the length of the growing season and elevation above sea-level. Introduced species are included in the body of the catalogue, and species reported as waifs are indicated in small type.

For Connecticut the statements regarding the distribution of various species are not always in accord with the observations of local botanists. A few of the discrepancies noted in comparing the present work with the Connecticut catalogue* are as follows. Some species are much more restricted than the author indicates, *e. g.*, *Dryopteris Goldieana*, *Picea rubens*, *Polycodium stamineum*, *Viburnum prunifolium*, and *Lobelia siphilitica;* while *Carex setacea* and *Cerastium viscosum* are not recorded at all in the Connecticut catalogue. Other species are much commoner than is indicated, *e. g.*, *Picea mariana*, *Juncus brevicaudatus*, *Blephariglottis grandiflora*, and *Sanicula trifoliata*. The distributional trends in Connecticut of *Asplenium montanum*, *Rhododendron maximum*, and *Lobelia Dortmanna* are southeastward, not northwestward; *Lonicera coerulea,* given as "increasing northwestward," is recorded only from the east; while five of the seven recorded stations for *Solidago Elliottii*, cited as "Common along the coast, decreasing and perhaps wanting inland," are in the interior. A few Connecticut records apparently have been overlooked entirely, viz., *Carex laxiflora leptonervia*, *Juncus brachycephalus*, *Trillium grandiflorum*, *Castalia tuberosa*, *Aquilegia*

* Catalogue of the flowering plants and ferns of Connecticut. Bull. State Geol. & Nat. Hist. Survey Connecticut, Bull. 14: 1–569. 1910.

canadensis flaviflora, *Oenothera grandiflora*, *Raimannia laciniata*, *Kneiffia pratensis*, *Bidens aristosa*, and *Artemisia caudata*.

Notwithstanding occasional discrepancies of the sort just noted which seem to have crept into the text, this work must be regarded as a noteworthy contribution to the phytogeographical literature of eastern North America, and one which will find a wide range of usefulness. The manner of presenting the subject matter is in some respects unique, while the attempt which has been made to correlate plant distribution with external factors and to outline the distributional trends of various species will encourage further investigation along these lines.

George E. Nichols

Kraemer's Applied and Economic Botany*

A book so ambitious in scope, attempting to appeal to such a large constituency, raises one or two questions the answers to which depend on the viewpoint more than they do on the facts of the case. Is it possible to make sufficiently intensive the treatment of any one of the subjects, which must at the same time be so presented that it will make a general appeal to all the readers to whom the book is addressed. Conversely, are the different classes of readers so diverse that any attempt to cater to all of them must end in such a general treatment, that the specific requirements of some group of specialists, chemists for instance, can not be met? The difference of motive here is obvious, and the compromise that Professor Kraemer has made of a difficult situation is, on the whole, a very satisfactory one.

The book has been divided into eight chapters, the headings to which are significant of the importance that Professor Kraemer has seen fit to give to each subject. The chapter-headings are as follows. I. Principal Groups of Plants (pp. 1–133), II. Cell-contents and Forms of Cells (pp. 134–297), III. Out and Inner Morphology of the Higher Plants (pp. 298–429), IV. Botanical

* Kraemer, H. Applied and Economic Botany: Especially adapted for the use of students in Technical Schools, Agricultural, Pharmaceutical and Medical Colleges, and also as a book of reference for chemists, food analysts and students engaged in the morphological and physiological study of plants. Ph. 1–806. fig. 1–424. (including 2 colored plates). Published by the author. For sale by M. G. Smith, 145 North Tenth Street, Philadelphia. 1914. Price $5.00.

Nomenclature (pp. 430–462), V. Classification of Angiosperms Yielding Economic Products (pp. 463–727), VI. Cultivation of Medicinal Plants (pp. 728–748), VII. Microscopic Technique and Reagents (pp. 749–776).

In a book, the title to which is applied and economic botany, the fifth chapter is the most cogent. About this chapter one or two very obvious reflections must spring up in the mind of everyone. In the first place it comprises only a little over one quarter of the whole book, and in the second place the heading of it is "Classification of Angiosperms Yielding Economic Products." Let us take only one class of readers to whom the preface suggests it may be useful, as a "reference book for manufacturers." Picture the attitude of mind of a busy manufacturer of fiber products wanting to find something more about his materials, when the "Classification of Angiosperms yielding Economic Products" is brought to his attention. The "Classification of Angiosperms" is very likely to be pushed off on the office boy.

This, of course, raises the very serious question whether or not a book on applied and economic botany should concern itself with classification of Angiosperms at all. The manufacturer we are sure considers it a nuisance, and perhaps that is the attitude of nearly everyone who might be expected to use the book. For classification implies taxonomy which has almost nothing to do with drugs, foods, fibers, and so forth. Our hypothetical manufacturer will find, of course, a description of the best-known fiber plants in their proper place in the classification, but he must know at least their genera to find them. Why should he be made to dig through endless families, etc., for his information? The same is true of all the other chief vegetable economic products.

This should not be construed as harsh criticism of a scholarly book; it is merely to raise the question with which this review started. Perhaps it is impossible to cater to so wide a field, and perhaps this book is not just the way to do it.

The work for which Professor Kraemer is best known is pharmacognosy, and of course this side of the book is very complete.

As a member of the committee of revision of the Pharmacopoeia of the United States, he certainly speaks with great authority. Large sections of the book are taken up with histological studies and from this standpoint, it must have a wide reading.

The enormous amount of information in the book and a splendidly prepared index will undoubtedly make its range of usefulness very great. That it will successfully cater to quite all the readers to whom it is addressed, some will doubt.

N. T.

Bessey's Essentials of College Botany*

Bessey's Essentials of Botany has been "entirely rewritten" by Professor Charles E. Bessey and his son, Professor Ernst A. Bessey, and now appears as Essentials of College Botany.

The range of subject matter is a wide one. The first five chapters deal mainly with histology and physiology; chapter five contains an interesting list of chemical substances—their formulas and something of their distribution in plants. The remaining seventeen chapters deal with the main plant divisions and their representatives.

The laboratory work is arranged to allow for choice as to the parts selected for use. It would seem as if the amount were not too great for one year's work by college students. In some cases, at least, a more critical type of work might be demanded of college students (*e. g.*, the *unsealed* apparatus in the CO_2 experiment on page 102). The present reviewer does not agree with the authors in preferring diagrams rather than detailed drawings, photographs, etc.; the type of labels or legends used do not sufficiently compensate for the character of the illustrations used; pages 72, 107, 230, and 256 furnish examples of illustrations that would mean little even to a college student.

Jean Broadhurst

Teachers College

PROCEEDINGS OF THE CLUB

January 12, 1915

The annual meeting of the Club was held January 12, 1915, in the American Museum of Natural History at 8:15 P.M. President Harper presided. Ten persons were present.

* Holt & Co., N. Y. 1914.

The minutes of November 25, December 8, and December 21, 1914, were read and approved.

Dr. M. Levine proposed the names of Mr. Theodore Muller, N. Y. City, and Mr. Jesse Pasternak, Commerical High School, Brooklyn, and the secretary proposed Mr. W. E. Jenkins, librarian of the University of Indiana, Bloomington, Ind., for membership.

Dr. J. H. Barnhart reported on the work of the finance committee and Dr. M. A. Howe reported that the budget committee had considered the special question of accepting for publication as Part III of Vol. 14, of the Memoirs, a paper submitted by Dr. F. L. Pickett. It was the sense of the Committee that it was desirable to complete Vol. 14 and that this paper should be accepted for publication under the conditions which were being arranged with Dr. Pickett.

Reports of the chairman of the sub-committess on local flora were then called for by the president. Dr. T. E. Hazen reported on the work being done on the freshwater algae and referred especially to a form of *Stigeoclonium* which had been found at West Farms. This was followed by a report from Dr. M. A. Howe on the marine algae, who spoke of a recent article published in TORREYA on the local marine algae. Professor R. A. Harper presented a list of the species of *Cortinarius* found in this district and exhibited numerous photographs of species representing most of the forms mentioned.

Dr. M. Levine spoke of the lively interest being aroused in the collection and identification of the species of the Polyporaceae and Dr. B. O. Dodge remarked on the collection of certain species of Discomycetes.

The following resignations were accepted:- Miss Elizabeth Schettler, H. R. Bishop, Luther Livingston, and Dr. Z. L. Leonard.

Reports of the officers for the year were next in order:

President Harper spoke of various ways in which further interest might be aroused in the Club through the work on the local Cryptogamic flora and Vice-President Barnhart followed with a report on the duties performed by the vice-president.

The secretary's report stated that there had been an increase of 243 persons in the attendance at the meetings held during the year and that 18 new members had been elected and 9 resignations accepted. The report of the treasurer was read and referred to the auditing committee.

Dr. M. A. Howe, reporting for the editors, presented an informal report.

The election of officers resulted as follows: *President*, R. A. Harper; *Vice-Presidents*, J. H. Barnhart, H. M. Richards; *Secretary-Treasurer*, B. O. Dodge; *Editor*, A. W. Evans; *Associate Editors*, Jean Broadhurst, J. A. Harris, M. A. Howe, H. M. Richards, A. B. Stout, N. Taylor, W. Marquette; *Delegate to the Council of the Academy of Sciences*, J. H. Barnhart.

Adjournment followed. B. O. Dodge, *Sec.*

January 27, 1915

The meeting of January 27, 1915, was held in the morphological laboratory of the New York Botanical Garden at 3:30 P.M., President Harper presiding. Twenty-three persons were present.

The minutes of the annual meeting of January 12 were read and approved.

Mr. William Clay Barbour, 149 Newark Avenue, Bloomfield, N. J., was nominated for membership.

Mrs. E. G. Britton, chairman of the special committee on mosses reported that additional specimens of mosses from this region were being arranged in the display cases at the New York Botanical Garden.

The application of Mr. Norman Taylor for a grant of $200 from the Esther Herrman Fund of the N. Y. Academy of Sciences to aid him in continuing a phytogeographical and ecological survey of the flora of Long Island was endorsed by unanimous vote of the Club. Mr. Taylor brought before the Club the question of accepting a paper for publication in Torreya by Dr. H. A. Gleason describing his trip around the world. The question was referred to the board of editors for consideration.

Messrs. Jesse Pasternak, Theodore Muller, W. E. Jenkins and William Clay Barbour were then elected to membership. The resignation of Mrs. M. M. Le Brun was accepted.

Dr. F. D. Fromme presented the first paper on the announced scientific program on "Methods of Predicting Probable Life Histories of Rust Species."

The following abstract was prepared by the speaker:

"The possession of more than one spore form in the life-cycles of most rust species together with the heteroecious habit of a large number of them makes the working out of their life histories a difficult problem. This is especially true of the heteroecious rusts, as cultures are in all cases necessary to the establishment of the specific identity of an aecial and telial stage on different hosts. While the technique necessary to secure infection is in itself simple the knowledge of the proper trial host to use is hard to obtain. Field studies on the association of hosts have been the most fruitful source of information but such studies, owing to the geographical location of many unconnected forms, often require a greater outlay of time and money than is available. The study of the morphological peculiarities of different spore forms has been of great assistance as an indication of probable relationships. Certain structural parallelisms often exist between the spore forms found on the two alternate hosts of a heteroecious species; others are found between species of *Uromyces* and *Puccinia;* and between the teliospores of long-cyle and short-cycle forms."

Following a discussion of this paper, Dr. J. C. Arthur spoke on "The Species Question among the Rusts."

Prof. Arthur furnished the following abstract: "The history of the application of names to the rusts was traced from the establishment of the genus *Puccinia* for a cedar rust by the pre-Linnaean botanist Micheli to the present time. The short-cycled forms, like *Puccinia Xanthii*, having only one spore-form, have never presented special difficulties. When DeBary in 1865 compelled attention to heteroecism in the long-cycle forms confusion and uncertainty began in the application of names, both as to genera and species. It has been, and is still largely customary to refer aecial forms having the telia unknown to form-genera, rather than to the true genus, even in cases where there is no question of relationship. The first systematist to break away from the old method was Kern in his monograph of *Gymnosporangium* in 1911. With Klebahn's culture work the confusion of so-called physiological or biological species was made prominent, in which the specialization of the rust goes with the dissimilarity of the hosts. This was illustrated by the *Aster-Solidago-Erigeron-Carex* complex, going under many names but doubtless a single specialized species. The geographical specialization of a species was illustrated by *Puccinia subnitens* with aecia on *Sarcobatus*, *Chenopodium* and various crucifers. A morphological specialization explains the application of the names *Uromyces Spartinae* and *U. acuminatus* to the same species of rust. The rule to be adopted in defining species seems to require dependable morphological characters and a uniform life-cycle.

However, Tranzschel has pointed out a troublesome, and yet unexplained parallelism, in which the telia of a short-cycled species resemble morphologically those of a long-cycled species, the host of the short-cycled form being identical with the aecial host of the long-cycled form. It is yet uncertain whether such parallel species should be considered independent species, possibly belonging to two genera, or two forms under one species. Other equally disturbing problems in the limitation of both species and genera were mentioned and their relation to the species question in general indicated.

Dr. Britton and Professor Harper led the discussion which followed.

Meeting adjourned. B. O. DODGE, *Secretary*

NEWS ITEMS

At a recent meeting of the board of managers of the New York Botanical Garden, Dr. N. L. Britton, the director, reported the transfer by the City of New York of additional land in Bronx Park, to the New York Botanical Garden. The newly acquired area contains a large tract of forest, the old Lorillard mansion, and consists of about 150 acres, making the whole area of the Garden nearly 400 acres.

Professor Duncan S. Johnson, of Johns Hopkins University, has been given leave of absence for the spring term. He will spend April and May at the Desert Laboratory of the Carnegie Institution of Washington, at Tucson, Arizona, and the summer at Coastal Laboratory at Carmel, California. He will continue at these laboratories the studies of the fruit development of the Cactaceae initiated at Tucson three years ago.

Dr. B. H. Alfred Groth, plant physiologist, has resigned his position as plant physiologist and plant breeder in the New Jersey Agricultural Experiment Station to become head of the new Agricultural College and Agricultural Experiment Station in Panama. He and his family sailed April 15, 1915.

E. D. Merrill, botanist, Bureau of Science, Manila, P. I. has returned to the United States, on leave. Mr. Merrill will be in Washington, D. C., for several months.

After serving as acting director of the biological station of the University of Michigan for two years, Dr. H. A. Gleason has been appointed director. Courses in botany will be given as follows: Field and Forest Botany, Professor F. T. MacFarland of the University of Kentucky; Systematic Botany and Advanced Systematic Botany, Dr. F. C. Gates, of the University of the Philippines; Ecology and Plant Anatomy, H. A. Gleason.

The University of Michigan has recently secured twenty acres of fertile ground for a botanical garden, and about twenty thousand dollars will be expended in improvements during the current year. This will include appropriate glass ranges and boiler plant and a laboratory building. One glass house is intended for research alone, and will be divided into a series of small rooms for individual use, each provided with independent thermostatic control. Active work at planting the grounds will not begin until 1916. Dr. H. A. Gleason, assistant professor of botany, has been appointed director of the garden.

Dr. F. C. Gates, instructor in botany in the University of the Philippines, has been given leave of absence, and will arrive in the United States in June. He will spend the summer at the biological station of the University of Michigan.

Dr. George H. Shull of the Carnegie Station for Experimental Evolution, has been appointed professor of botany and genetics at Princeton University. He will continue his investigations in genetics, and will teach a course in development and heredity, open to seniors and graduate students. Experimental gardens, greenhouses, and laboratories are in course of preparation for his work.

We are glad to correct an error that appeared in the March number by quoting the following, sent in by Dr. Shull: "I note in the last number of TORREYA that you mention Dr. Erwin Baur among the botanists who are on the battlefield. This is a mistake, as Dr. Baur has been retained in the marine office in Berlin. He had already started on his trip around the world when the war broke out, and for this reason he was not on hand when the marine surgeons were apportioned to the various ships. I have just received a letter from Dr. Baur in which he says that his experimental work is continuing satisfactorily. He has been able to arrange a few days' furlough for the sowing of his pedigreed seeds. He expects to have about 20,000 pedigreed Antirrhinums this year. Several of his assistants and students are already at work in his garden at Friedrichshagen."

Mr. F. Schuyler Mathews announces the publication of his Fieldbook of American Trees and Shrubs (Putnams), on which he has been at work for three years. The book describes many woody plants of the United States and distribution maps are given for each species.

Invitations have been issued for a private view of the grounds of the Brooklyn Botanic Garden, including the new Japanese Garden, on June 5. The garden will be opened to the public the next day. Work has recently started on the last section of paths for the garden, on the newly acquired tract ceded by the City of New York which is now being fenced. The total area of the garden is now about 50 acres.

We regret to record the death of Mr. J. F. Cowell, for many years the director of the Buffalo Botanic Garden. He had made several trips to the West Indies in cooperation with the New York Botanical Garden.

Any members of the club or others interested in the local flora will confer a favor if they will send to Mr. Norman Taylor, Brooklyn Botanic Garden, Brooklyn, N. Y., any specimens or notes that will add to or correct statements as to distribution of our native plants, as given in "Flora of the Vicinity of New York."

We learn from *Science* that Dr. R. F. Griggs, of Ohio State University, has been selected by the National Geographic Society to lead an expedition to study the vegetation of the Katmai district in Alaska. The purpose of the expedition is to study the means by which vegetation gains a foothold on the volcanic ash with which that country was covered by the eruption of Katmai in 1912.

Lectures are announced at the New York Botanical Garden on Saturday afternoons at four o'clock as follows: June 5, "A Rose Garden for Every Home," by Mr. Robert Pyle; June 12, "Dwarf Fruit Tress for Suburban Homes," by Prof. F. A. Waugh; June 19, "Philippine Fiber Plants and Their Uses," by Mr. Theodore Muller; June 26, "The Upper Delaware Valley and Its Flora," by Mr. G. V. Nash; July 3, "Some Interesting Plants of the Rocky Mountains," by Dr. P. A. Rydberg; July 10, "The Poisonous Plants of the Eastern United States," by Dr. William Mansfield; July 17, "Botanic and Scenic Features of the Dells of the Wisconsin River," by Dr. A. B. Stout; July 24, "Botanizing on the Austro-Italian Border," by Dr. W. A. Murrill; July 31, "The Library of the New York Botanical Garden," by Dr. J. H. Barnhart.

The field committee of the club announces field meetings as follows:

June 5. (Saturday.) Leonia, N. J. Fresh-water Algae. Meet at Fort Lee Ferry, West 130th St., leaving at 1:40 P.M. Cost 30 cents. Guide: Dr. T. E. Hazen.

June 13. (Sunday.) Cold Spring Harbor, Long Island, N. Y. Fungi. Train leaves N. Y. (Long Island R. R.), Seventh Ave. and 33d St., 9 A.M. Change cars at Jamaica for Wading

River Branch. Excursion ticket $1.70. Bring lunch. Guide: Dr. B. O. Dodge.

June 19. (Saturday.) West Englewood, N. J. Ferns. Leave N. Y. (West Shore R. R.) ft. Cortlandt St., 8:55 A.M.; West 42d St., 9:15 A.M. Train leaves Weehawken (W. S. Sta.), 9:29 A.M. Cost 50 cents. Bring lunch. Guide: Dr. R. C. Benedict.

June 27. (Sunday.) Spring Valley, N. Y. Wild Flowers. Direct train leaves Jersey City, Erie Station (N. J. and N. Y. R. R.), 8:44 A.M. Another train leaves Jersey City, Erie Station (Northern R. R. of N. J.), 8:44 A.M., Englewood, N. J., 9:20 A.M.; change cars at Sparkill. Return ticket from Jersey City about $1.30. Bring lunch. Guide: Miss E. M. Kittredge.

July 3–9. The 1915 Symposium will be held in conjunction with the Philadelphia Botanical Club at Fleetwood, Berks Co., Pa. Leave New York via Central R. R. of N. J. (West 23d St., 10:20 A.M. or 12:50 P.M.; Liberty St., 10:30 A.M. or 1:10 P.M.). Trains leave Jersey City (C. R. R. of N. J.), 10:42 A.M. or 1:21 P.M. Cost of single ticket to Fleetwood, $2.92. Change cars at Allentown. Fleetwood may also be reached by trolley from Allentown. Hotel Fleetwood. Rates $2.00 or $2.25 per day. Guide: Mr. Stewardson Brown. Members wishing to attend will kindly make arrangements with Mr. W. H. Leibelsperger, Hotel Fleetwood, Fleetwood, Berks Co., Pa.

July 10. (Saturday.) Agricultural Experiment Station, New Brunswick, N. J. Leave New York (Pennsylvania R. R.) Seventh Ave. and 33d St., 9:30 A.M. Purchase return ticket to New Brunswick. Cost $1.55. Bring lunch. Guide: Dr. Mel T. Cook.

July 18. (Sunday.) Closter, N. J. Lichens. Meet at Northern R. R. Station, Englewood, N. J. 10:10 A.M. sharp. Cost about 20 cents. (Same train leaves Jersey City, Erie Station, 10:00 A.M. Cost 85 cents). Bring lunch. Guide: Mr. W. C. Barbour.

July 24. (Saturday.) Great Kills, Staten Island, N. Y. Boats leave South Ferry, N. Y. (Municipal Ferry), 10 A.M. and 11 A.M. Purchase return ticket to Great Kills. Cost 40 cents. Trains leave St. George at 10:25 A.M. and 11:25 A.M. A shore dinner will be served at Sauer's Hotel to members and their friends at 1:30 P.M. sharp. Cost $1.00 per plate. Liquid refreshments extra. Invitations have been extended to members of other botanical societies. Each person expecting to attend will kindly notify the Chairman at least two weeks in advance.

July 31. (Saturday.) Alpine, N. J. Woody Fungi. Meet at ferry dock, Yonkers, 10 A.M. Cost 25 cents. Bring lunch. Guide: Mr. C. H. Farr.

Friends of members are welcome at all field meetings of the Club.

Train-time is given according to current schedules, but time-tables are subject to changes.

Professor J. H. Priestly, head of the department of botany at Leeds University is serving with the British Army in France. It is reported, also, that almost 60 of the employees at the Royal Botanic Gardens, Kew, are now in the army.

The Torrey Botanical Club

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

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OTHER PUBLICATIONS

OF THE

TORREY BOTANICAL CLUB

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(1) BULLETIN

A monthly journal devoted to general botany, established 1870. Vol. 40 published in 1913, contained 712 pages of text and 26 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 24–40 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. 28–40 three dollars each.

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

(2) MEMOIRS

The MEMOIRS, established 1889, are published at irregulas intervals. Volumes 1–13 are now completed; Nos. 1 and 2 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

DR. BERNARD O. DODGE

Columbia University

New York City

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EDITED FOR

THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR

JOHN TORREY, 1796–1873

CONTENTS

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

NORMAN TAYLOR
Brooklyn Botanic Garden
Brooklyn, N. Y

TORREYA

May, 1915.

Vol. 15 No. 5

BOTANICAL SKETCHES FROM THE ASIATIC TROPICS

By Henry Allan Gleason

I. Japan

Every botanist who has studied or worked in his favorite science in the temperate zone has wished for a sight of the more luxuriant vegetation of the tropics, with its multiplicity of species, its wealth of vegetative forms, and its varied adaptations to the environment. Sometimes he has the opportunity to gratify his wish, and he is seldom disappointed with the reality. He finds the species just as numerous and as bewildering as he anticipated, and their morphology and ecology just as interesting, yet it is not exactly what he had expected. In the most accessible and convenient parts of the tropics, and these, measured by botanical standards, are the tropics of Asia, he finds that the dense and impenetrable jungle is almost as thoroughly a thing of the past as are virgin forests in eastern America. He soon discovers, also, that the unusual morphological and ecological types are about as widely scattered in space as their analogs in temperate zones, and that most of them can be observed with far greater ease in an American greenhouse. Furthermore, it becomes evident on his first trip into the tropical forest or grassland, or along the seashore, that he must revise to a very considerable extent his early ideas of the vegetation. Every botanist of the temperate zone knows, of course, that palms are seldom a conspicuous part of the tropical forest, that legumes are very abundant, and similar facts of a general nature, but it seems impossible to form from literature a clear mental idea of the actual nature of the tropical vegetation. Whether

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the literature is not sufficiently graphic, or whether the vegetation baffles satisfactory description, is not clear; but the fact remains that the botanist must discard most of his preconceived notions, and form new ideas based on his own observation.

These remarks are not intended to disparage the interesting features of tropical vegetation. They are intended to emphasize that distances are vast and travel slow in the tropics, making observation of the vegetation correspondingly difficult, and that ideas of the tropics gleaned from print are always incomplete and frequently erroneous. Neither is it expected that these sketches will add to our knowledge of tropical botany. They represent merely the impressions gained by a botanical observer in a hasty trip through a small portion of the Asiatic tropics.

It still seems to be a general truth that a plant or an animal loses part of its interest to one who does not know its name. In the exceedingly rich flora of the tropics, the traveller from temperate America recognizes few plants even as to the genus, and turns much of his attention, merely for his own satisfaction, to the cultivated species. So in these sketches, a good proportion of the description must be devoted to the economic botany of the regions visited. In the tropics more native species are in cultivation, and there is a much closer relation between the population and the vegetation, than in temperate climates. The botanist who takes little interest in the economic side of his science while at home soon finds himself sampling the different varieties of native fruits, and visiting the markets and plantations as often as the forests.

On the trip here described, the writer left San Francisco early in September, 1913, and reached the Philippines via Hawaii and Japan. After two months in these islands, he travelled along the coast of Borneo to Singapore and thence to Java. Two months more were spent here, six weeks in Ceylon, and the return voyage was made through the Suez Canal and across the Atlantic, ending in New York in May, 1914.

We landed in Yokohama on September 27, and spent a part of that day and the next at the Botanical Garden in Tokio. One reaches the garden by rickshaw after a ride of nearly an hour from the chief railway station, through the narrow, crooked, crowded, Japanese streets. On week days tickets of admission to the garden are on sale at a little grocery shop across the street, price four sen (2 cents). On Sundays the regular ticket office is open, and the price is raised to five sen.

There is a broad gravel walk leading from the entrance up a gentle hill to the Botanical Institute, which has its name printed above the door in English. The path is bordered with small lawns and a variety of coniferous and deciduous trees, mostly of familiar temperate zone genera. The effect is broken near the Institute building by a group of cycads, *C. revoluta*, while immediately by the building is a group of tall palms, *Trachycarpus Fortunei*, with *Yucca filamentosa* behind. Farther along stands a group of grass-trees, *Cordyline indivisa*. These and other tropical or subtropical plants scattered through the garden indicate that Tokio is in a semitropical climate, notwithstanding its fairly high latitude. The cultivation of tea and rice shows the same thing, while the frequent solitary banana plants at the edge of the villages remind one of a still warmer climate.

The Institute building is a rather extensive one-story tile-roof structure, not at all Japanese in its architecture. When we entered, students were working in various rooms, some with fresh plants, others with microscopes. On the wall a program was posted in English, giving a schedule of all the classes, including physiology, ecology, and systematic botany. In America their laboratory facilities would be called poor, but the quantity and quality of the research which they produce show that it is at least adequate.

Outside the building, one enters their so-called European garden, with straight gravel paths, trees bordering the walks in rows, and herbaceous plants in geometrical beds. It does look somewhat like some American parks, but if, while in it, one could imagine himself back in America, the illusion would be at once broken by the group of tall grass-trees in the background. The principal walk is lined with the Japanese cherry trees, *Prunus yeddoensis*. These trees are larger than the American cultivated species, but have the typical cherry-like spreading branches and open crowns. Their bark is also rather cherry-like, but gray rather than brown.

Farther up the garden this formal arrangement is abandoned, and the trees are scattered in groves or groups, very seldom in straight lines. There are some open lawns, but generally beneath the trees the vegetation is composed of wild or semi-wild herbaceous species, or is trampled out by the dozens of children who play in the garden.

Many of the trees are labeled, but enough are left unlabeled to make it tantalizing for the botanist. Probably at least one tree of every species is labeled, but with dozens of new things seen here for the first time, the names are forgotten before another labeled tree of the same species is reached. Once in a while we found a tree of a familiar species, such as *Liriodendron Tulipifera* or *Taxodium distichum;* frequently we recognized the genus, as *Quercus*, *Acer*, or *Aesculus*, but in most cases we did not know the genus at all, or were surprised to read some familiar generic name on the label.

There are maples of all sorts, including one much like our American box-elder. The most abundant, however, is *Acer palmatum*, with a deeply lobed leaf not over five cm. long. We found this species planted commonly throughout southern Japan. Of the oaks, there are some with leaves very much like our red oak, but more with undivided leaves like our shingle oak or chestnut oaks. A large tree of *Aesculus turbinata* looks almost exactly like the European horse chestnut; *Magnolia hypoleuca* reminds one very much of the American *M. tripetala;* and *Rhus semialata* shows no superficial distinction from our *R. copallina*. In other cases the resemblance to American species is not so strong, and we were especially surprised by a large tree of *Cercis sinensis* with crooked, deliquescent trunk and smooth gray bark. Still the general aspect of the tree flora is decidedly North American; and only here and there a tree obtrudes which would look out of place in the northeastern states, such as the palms, cycads, and grass-trees mentioned before, or other small trees with glossy rhododendron-like leaves.

Species of Araliaceae are common, especially *Fatsia japonica*, with large, orbicular, eleven-divided leaves. These are planted in masses at the edge of groves or against walls. There are some genera represented by good-sized trees, which in America are small and chiefly southern, such as *Illicium* and *Styrax*, and others not native in America at all, such as ginkgo and camphor. The latter reaches a diameter of more than a meter, and has a close but flaky gray mossy bark, a wide-spreading crown, and elliptical acute leaves five cm. long. The huge historic ginkgo tree, which furnished the material for the discovery of motile male gametes, is one and a half meters in diameter, and at the time of our visit was bearing a good crop of the plumlike fruit. There is an immense variety of other gymnosperms, mostly unlabeled, and many deciduous trees entirely unknown to us.

As weeds in or around the garden, there are several species occurring also in America, as *Erigeron canadensis*, *Plantago major*, *Trifolium repens*, and a smartweed, either *Polygonum acre* or something very much like it. Under the forest cover a day-flower, *Commelina*, is very common, with a small grass, like an *Echinochloa* on a small scale, a little mint resembling a *Satureja*, and a liliaceous plant like a Solomon's Seal, but blooming at the apex first, with white and red flowers five cm. across. Most striking of all the herbaceous plants are *Phryma leptostachya* and *Polygonum filiforme* Thunb. The former is of course just like its American form. The smartweed has the general habit of its American analog, *P. virginianum*, with broad clustered leaves and a slender raceme. Its fruit is also of the same structure and explosive at maturity, but is red instead of green. The two species grow side by side in great profusion, just as they do in moist woods in the eastern United States.

The numerous identical or parallel species, the familiar generic names, and the vegetational similarity all combine to make real the close relationship of the floras of Japan and of eastern America, and to show in a striking way something of the present distribution of the arcto-tertiary flora. It was especially obvious that most of the native trees had smooth bark. Since the mild climate of modern Japan is something like that of the Miocene period, it is entirely possible that the arcto-tertiary vegetation of that time was typically smooth-barked.

In a valley at the farther end of the garden, shut off by the hills from the rest, is the Japanese garden. There is scarcely a foot of level ground in it. There are small ponds with lilies, lotus, and goldfish; crooked pines with their branches spreading horizontally over the water and supported there by props; cedar trees trimmed into fantastic shapes or trained to cover the rocks; rustic bridges, and paths running in every direction over the hillsides. Japanese children in picturesque garments play solemnly on the paths, or feed the goldfish with cakes which they have bought from an equally picturesque old woman. The place is absolutely un-American in every respect, and there is not a single bed of blooming plants within it.

The following day, September 29, we left Yokohama for Kobe by rail, a distance of nearly four hundred miles through charming scenery. At close range, nearest the railroad, are the cultivated fields, leading up quite naturally to the villages behind at the foot of the hills, while the mountains form a natural background to the whole scene.

The mountains rise steeply and abruptly from the edge of the valleys, with rough irregular slopes and a very broken sky-line. They are green from bottom to top, not with the uniform tone of an American forest, but with various shades caused by the light-green bamboo, the emerald green rice, the dark pines, and other plants. Then one reaches a valley and has an instant's glimpse up its course for a mile or so, the hills coming down steeply on each side, and its bottom covered with a narrow curving strip of rice, rising in terrace above terrace up the valley. Usually there is a stream in the valley, with its banks enclosed in masonry and with a huge undershot wheel, half hidden by a bamboo thicket, barely turning in the slow current.

The railway crosses many rivers on immense bridges, three of them over half a mile long. During September the amount of water in them is small, and sometimes almost hidden by fishing boats, but their immense beds, covered with boulder bars, show at once both the great rainfall of southern Japan and the effect of deforestation on the mountains behind. The river beds are always diked in, and so thoroughly that a flood apparently never breaks over. Even the railroad crosses the flood-plain, if such it can be called, without any embankment, climbs a grade to the bridge, and drops off again at the other end. But these dikes are not made of alluvial mud, like those along the Mississippi River, but of stone, and several centuries of experience have evidently taught just how high it is necessary to make them.

The view of Japanese agriculture from the train window is most interesting. After the twelve-hour ride, three impressions stand out at once above all others: the limited amount of agricultural land available, the closeness of its cultivation, and its wonderful fertility.

The railway naturally follows the easiest route, thereby crossing the most extensive areas of flat land and avoiding the mountains as much as possible. Still, hills too high or too steep for cultivation are in view from the track every mile of the way, and in most places they rise to genuine mountains, cutting off completely the view to the north. The arable land borders the rivers, occupies the narrow coastal plain, when there is any, and extends up the narrow intermontane valleys. In places the cultivated strip appears to be ten miles wide, but it averages much narrower, and there seems to be an interminable area of mountains behind it.

Of this arable land, a wonderfully large proportion is in cultivation. The railroad, of course, cuts a strip through it, but there is no marginal right of way, as in America. The villages and lanes take up space, but nothing is wasted on dooryards in the former, or on width in the latter. The lanes are seldom more than six feet wide, usually less, and the fields come right to the beaten track, without any fence or hedge. In the villages, there is a fence around most houses, or between them, and usually a row of trees along the lanes. Sometimes there is a hedge, but it is composed of a mixture of species, and apparently has its own economic value. There are many small groves, seldom more than a city lot in size, surrounding the Shinto shrines or sometimes around the small cemeteries. There are numerous small ponds, but these are usually planted to lotus, and, whether planted or not, are used for carp cultivation. The sides of the streams are walled up, and the streams themselves are used for fish, power, and irrigation; the sides of the hills and railroad embankments furnish hay, and the groves afford building material and fuel. Ordinary woods, in the American sense of the word, are unknown, at least near the railway track, and a wild flora is never seen from the train, except along the flood-plains of rivers subject to frequent overflow. In short, all the arable land is used. Farther back from the railway, at the edge of the hills, the narrow valleys have been flattened out and terraced; the sides of the hills have been terraced whenever possible, and in many places so steeply that masonry retaining walls are necessary. The groves of pine and bamboo are usually on the hillsides, probably occupying areas too rocky for agriculture, but the terraces sometimes extend a thousand feet above the valley.

Since rice must be flooded at certain times, the fields must be perfectly level. The valley land is not perfectly level, and is consequently divided off into small fields separated by low earth walls. One seldom sees a single field more than an acre in extent, and they will not average a hundred feet on a side. Their sides are straight or rather regularly curved, so that the whole area appears laid out in geometrical fashion. In corners and narrow valleys, or on steeper slopes, the fields become progressively smaller, and we saw one in the shape of a triangle six feet on a side, containing about eighteen square feet. But it was carefully planted to rice and had its regular earth ridge surrounding it.

Even the earth ridges are cultivated. Standing above the wet rice fields, they will support a different sort of crop, and are usually planted to beans, whose dark-green foliage stands out very clearly against the light-green background of rice. In some cases they are planted with sorghum, or with plants of beans and sorghum alternately, or still more rarely with buckwheat.

If there are any weeds, they are invisible from the train. On the whole trip from Tokio to Kobe not one weedy plant was seen rising above the rice fields. Probably there is none, because the soil is too precious to waste on anything of no value.

The fertility of the soil is scarcely open to description. At the time of our visit, the rice was short, two to three feet high, but wonderfully dense; the buckwheat fields were absolutely white with blossom; the trees of persimmon, chestnut, and russet pears were bending with fruit; the soy beans, pulled up whole and offered that way in the markets, were crowded with pods. And the land must needs be fertile to support the dense population, which appears to be almost one continuous village.

(To be continued)

ROSA NUTKANA

By J. K. Henry

This paper aims to present some of the variations of *R. nutkana* as it grows near the coast of southern British Columbia. No account is taken of those forms with simply serrate, mostly eglandular leaflets, which occur at Shawnigan, Vancouver Island, and Spence's Bridge, and which are possibly referable to *R. meleina* Greene, a species reduced to synonymy by Dr A. Nelson. All the forms here examined have doubly serrate leaflets glandular beneath, and more or less glandular calyx and peduncles.

In the neighborhood of Vancouver and Elgin (near Blaine, Wn.) this rose has stout stems 1–3 m. high, at base either naked or densely clothed with rather weak somewhat retrorse prickles. The ordinary prickles vary from narrowly lanceolate to broadly triangular, are usually in pairs or more or less scattered, but often as shown in Figs. 2 and 11 more or less grouped. Such grouping, however, does not appear to be concomitant with other variations, and often occurs in a less marked way. So, too, the broadly triangular prickles may occur with very different fruit-forms,—with subglobose in Fig. 10 and strongly flattened in Fig. 9. Recurved prickles are not at all rare, sometimes occurring with the straight, sometimes (Fig. 8) giving character to a clump.

This species flowers on the flats at Elgin about the end of the first week in June; on dry slopes near Vancouver with a favorable exposure, about fifteen days earlier. The flowers vary in size from 4.5–8.5 cm. broad (the one in Fig. 14 is 8 cm. broad) and are either solitary or in clusters of two or three. Sometimes there is alternation from year to year in the inflorescence. Fig. 13 shows very marked clustering of fruit, while the following year the flowers were solitary.

The calyx-appendages are either short or long. In the plant of Fig. 13 from Jones Island the appendages are foliaceous, 4–6 mm. wide, and, like the leaflets, serrate and glandular beneath. The shape of the leaflets and their very coarse serration give this specimen a peculiar character. An interesting variation is shown in Fig. 14 where two of the sepals are lobed. Such forms are not rare at Elgin, and occur chiefly in the earliest flowers.

What attracts even the casual observer of the Elgin plants is the variation in the shape of the fruit. Typically, I suppose, the fruit is subglobose or slightly obcompressed. Such is the prevailing form at the coast; but obovoid, ovoid, deltoid, oblong, elongated and strongly flattened forms are very common. Curiously enough at Elgin these various forms often occur pure or almost so; and thus give character to large clumps (Fig. 3). This is in no way due to environment, as several very marked forms alternate in one habitat. Neither is it due, as I at first thought, to the great number of carpels matured in one and the small number matured in another. Whether they represent new forms in process of development or old forms hopelessly confused I cannot say.

On the dike of the Serpentine River near Elgin several of these forms grow together. First were a few low bushes with hispid fruits (var. *hispida* Fernald). Next came a hedge of globose forms; and then, without a gap or change in the character of the clumps, plants practically all the fruits of which were obovoid, longer than wide and with an acute base (Fig. 3). More globose forms were succeeded by strongly flattened forms, the body of which was almost twice as broad as long (Figs. 7, 8, 9); while at the far end of the hedge were some not very healthy-looking plants with elongated necked fruits not reddening well on account of some fungus, though the nutlets were well formed (Fig. 5). Out on the diked flats were globose fruits with or without a short neck. Fig. 10 shows indistinctly the globose, necked fruits. In the shade of the woods I found a large clump with very large oblong fruits (the body of the largest almost 2 cm. long) which matured very few carpels, probably because of

FIG. 1. *Rosa Nutkana*. For explanation of figures see text.

imperfect pollination. The large-fruited form (Fig. 4) growing on an open sunny bank also has few mature carpels (8, 15, 15, 8, in 4 examined). It should probably be classed as pyriform (mentioned in the next paragraph) though, as is clearly seen in the figure, two of the fruits are subglobose. Lastly, on the flats I found a clump the fruits of which were ovoid-deltoid with a cordate base, and the base of the receptacle correspondingly raised within. (Fig. 6). In 1912 the fruit of this had a tendency to shed the sepals, a peculiarity it did not show in 1913. Deltoid or ovoid forms are quite common mingled with the globose (Figs. 11, 12) but this was the only plant found producing fruit with a cordate base.

For convenience I may refer to the elongated forms with acute base as *pyriform* (Figs. 3, 4, 5) and to the flattened as *napiform* (Figs. 7, 8, 9, 14).

Later I found the pyriform, napiform, and globose forms on low ground along the northwestern edge of a wood, and marked them in order to observe their spring development. I confidently expected different dates of flowering, but the spring of 1913 showed no differences. The exposure, perhaps, was not particularly favorable. A correspondent on Vancouver Island, however, thought that the pyriform plants flowered earliest. At Elgin they showed a slight tendency to ripen early.

In the autumn of 1912 I marked some plants growing near Vancouver with prevailingly pyriform fruit. When these were coming into leaf next spring they were easily distinguished from the ordinary globose forms among which they were growing, by the darker green but somewhat glaucous unfolding leaves. I was unable to follow up the development of these plants, but shortly after at Elgin, no such peculiarities were to be seen in the plants when in full leaf.

The number of fully matured nutlets in well-formed large fruits from Elgin plants was as follows: Globose 53, 39, 48; napiform 67, 70, 61; pyriform 6, 22, 25. (Some globose fruits from Vancouver plants gave 28, 28, 12, 43, 16, 25; average 25; while some rather elongated fruits growing with them but not on the same bushes, gave 15, 12, 6, 15.) Six globose short-necked fruits gave the following: from the top of the branch 44, 35, 27; from the bottom of the same branch 37, 13, 5. This last suggests failure in pollination, though there was nothing in the outward appearance of the fruits to suggest so few nutlets as 13 and 5. The proportion of undeveloped carpels to developed was greater in the pyriform than in the napiform and globose, but the total original number appeared to be fewer. Of this last point I am not sure, as I neglected to examine flowering specimens. It is worth noting that the same thing happens in the elongated fruits of *R. gymnocarpa*, which commonly mature only 1 or 2 carpels as compared with 4–8 in the globose fruits.

The napiform and globose fruits thus mature the greatest number of carpels. But that this does not determine the final form is clear in the case of napiform fruits at least, from the fact that their peculiar flat shape is quite easily recognized in bud or flower.

There is no concomitant relation between fruit-form and prickle-form. Thus napiform fruits are accompanied by lanceolate (Fig. 7) broadly triangular (Fig. 9) and recurved (Fig. 8) prickles; and pyriform fruits by either lanceolate or triangular prickles. The flowers of napiform plants vary from 4.5–8 cm. in width, and the stipules are either broad (Fig. 14) or medium to narrow (Fig. 8). There is some variation in the glands of sepals and peduncles, but if this has any significance I did not detect it.

Lastly these fruit-forms are not always so pure as in the Elgin plants. Fig. 1 shows a common phenomenon,—the best-developed fruits are mostly pyriform, the others subglobose. (The large fruit at the right in this figure that appears to have a round base, really has an acute base.) Necked and neckless forms may occur on the same plant, as may napiform and globose; while globose forms readily vary into ovoid or deltoid. While, then, my observations result negatively, it is quite possible that a wider survey may show greater significance in these forms than I have been able to detect. The most important and apparently the most widely distributed is the pyriform, which shows a tendency to mature fewer nutlets than the globose or napiform.

Vancouver, B. C.

SHORTER NOTES

Trichospira verticillata (L.) Blake, n. comb.—*Bidens verticillata* L.! Sp. Pl. 2: 833. 1753. *Trichospira menthoides* HBK. Nov. Gen. 4: 28 t. 312. 1820. *T. biaristata* Less. Linnaea 4: 343. 1829. *Rolandra septans* Willd. ex Less. l. c. as syn. *Trichospira Pulegium* Mart. ex DC. Prod. 5: 91. 1836. *T. Prieurei* DC. l. c. (1836).—This common composite of the American tropics, from Vera Cruz to Brazil and Peru (*Ruiz & Pavon*, hb. Brit. Mus.), has long been known as *Trichospira menthoides* HBK. It is identical with Linnaeus's *Bidens verticillata*, based on the *Bidens* no. 4 of the Hortus Cliffortianus (399 (1737)), which was founded on specimens collected in Vera Cruz by Houston and now in the British Museum, and the name of this monotype must consequently be changed to the one given above. The achenial characters relied on by Lessing and de Candolle in their separations seem, as long ago noted by Bentham in the Genera Plantarum, to be of no consequence; the intermediate awns at the apex of the achene, formed by the excurrent ribs of the achene face, varying from none, to short deltoid teeth, or quite distinct short-aristulae on the same plant.

S. F. Blake

London, England

REVIEWS

Bailey and Gilbert's Plant-Breeding*

Volumes with this title written solely by the senior author have, during the past twenty years, passed through four editions with several reprintings. The last edition appeared in 1906 with the text in the form of six lectures. In the new edition this style of presentation is only slightly modified, making the book a popular treatise for the general reader and an elementary text for the student of plant-breeding.

One of the new chapters treats very excellently of the measurement of variation. The former treatments of mutations and of heredity have been expanded and treated in special chapters. As in the previous volumes, there is a glossary of terms, a bibliography, and, in addition, lists of books and periodicals treating

* By L. H. Bailey, new revised edition by Arthur W. Gilbert. The Rural Science Series. Published by the MacMillan Company, 1915. Price $2.00 net.

of plant-breeding subjects, and also a series of twenty-seven laboratory exercises for class instruction in plant-breeding.

During the nine years that have elapsed since the appearance of the fourth edition, there has been much investigation, especially with reference to the experimental phases of hybridization. To summarize adequately, critically and impartially these results is not a simple task, yet it is one which justifies the revision in question, and it is in this respect that the new volume is most defective.

For example, it is stated and in general maintained that characters such as the "presence or absence of pubescence on the leaves, the height of the plant, whether dwarf or tall, the color of the flower or fruit" are unit characters of which plants and animals are composed (p. 9). This we may note was the view held several years ago. Recent investigations and critical studies of the older investigations show that characters which behave as consistent units in hybridization are indeed rare.

The authors are fully aware (as intimated especially on pages viii, 128, 179, 185, and in Chap. III) that the older conceptions of the unity of characters, of dominance, of segregation into parental characters only, and of the purity of the germ cells formed by a hybrid have all been modified by numerous subsidiary hypotheses which attempt to account for increased variability, unexpected ratios and the appearance of intermediate characters. In fact, characters are now considered to be so complex in heredity that even the most enthusiastic Mendelians have discarded the term "unit-character" and substituted the rather intangible term "unit-factor."

It is clearly pointed out in the fourth edition (p. 166) and reiterated in the new edition (p. 168), in harmony with Bateson's views some ten years ago, that the most important and crucial point of Mendelian doctrine pertains to the assumed purity of the germ cells produced by hybrids with respect to pairs of contrasting characters. At the present time the evidence not only indicates that few if any characters are in any sense continuous units in heredity, but that also there may be all degrees of impurity in segregation, a condition fully admitted by Bateson in a recent publication. The significance of these facts could and should be clearly presented in any popular treatise.

In the review of Mendel's work there is no mention of his report of investigations with beans, in which he found that the apparent unity of characters observed in *Pisum* did not prevail and in which he suggested what is essentially the multiple factor hypothesis of today.

Probably no phase of plant-breeding is of greater popular and scientific interest than that of mutation. Among investigators there is much diversity of opinion regarding this, and there is much conflicting evidence which would hardly be suspected by the treatment in the volume under consideration. In the first place, doctrines of mutation were based on the simple conception of unit-characters and have not been brought into close harmony with the revisions of that conception. Furthermore, de Vries does not consider that the loss of hereditary factors or characters is usually associated with a mutation. The hereditary units he conceives as either stable or labile. When labile they may change from active to inactive or latent, or to a semi-latent condition. It is not the presence or absence, the gain (with the exception of the few progressive mutations) or the loss of well-defined units as most Mendelians take for granted, but the varying degrees of activity of ever-present "pangens" that bring about mutations. This view of de Vries is not even considered by the writers (see page 193).

The treatment of graft-hybrids is decidedly inadequate if not misleading. The facts recently developed in connection with studies of graft-chimeras and graft-hybrids are undoubtedly of greater significance in their bearing on the fundamental principles of heredity than are those of any other line of investigation developed during the last decade. The excellent studies of the cell relations in *Cytisus Adami* in the *Crataegus-Mespilus* chimeras and in *Solanum tubingense*, *S. proteus*, *S. Koelreuterianum*, *S. Gaertnerianum* which are already treated in standard texts like Jost's Pflanzenphysiologie and the Strasburger text-book show that all these are periclinal chimeras. A few words regarding the cell relations in these plants would make clear their nature and illustrate most excellently the visible effects of interaction between cells, which is a point of particular interest especially in relation to the expression of such characters as leaf-shape. The evidence that *S. Darwinianum* is a true fusion hybrid is not given. All this data is certainly well known by the authors, as is indicated by the discussion on page 148, but the treatment is hardly clear to one not already fully acquainted with the literature of the subject.

The bibliography includes no reference later than 1912, and in the list of books on plant-breeding there are some noticeable omissions of which we may mention Cramer's *Kritische Ubersicht der bekannten Falle von Knospenvariation* published in 1907 and the recent volume by de Vries entitled *Gruppenweise Artbildung.*

The reviewer is in full sympathy with the purposes of the volume, with the excellent selection of the subject matter, and the interesting presentation which gives to volumes of this kind a well-deserved popularity.

The defects of the volume are those that are common to American text-books and popular treatments of scientific subjects. It seems to be the rule that the presentation must be simple and definite with little if any critical analysis of facts and theories, a treatment which gives an unwarranted air of finality and authority not in harmony with the subject itself and not stimulative to an attitude of inquiry on the part of the average reader.

A. B. S.

Illick's Pennsylvania Trees*

This is an excellently conceived book of 231 pages, of which the first 52 pages, Part I, "is intended for the layman and the beginner of forestry" and "comprises abstracts from the author's lectures on elementary forestry at the Pennsylvania State Forest Academy." This part is neatly and comprehensively illustrated by numerous photographs and drawings, and constitutes a simple and compact treatment as to general considerations of the economic value, natural and artificial development, and eco-

* Pennsylvania Trees, by J. S. Illick, professor of dendrology and forest management, Pennsylvania State Forest Academy. Bull. No. 11, Penn. Dept. Forestry, Harrisburg, Pa., 1914.

logical relations of the forests of the state, as well as a very serviceable treatise on the morphology of a tree with particular reference to the use of the systematic part of the book.

Part II, pages 53–223, is a "Manual of Pennsylvania Trees" and comprises a discussion on the identification of trees and a description of families, genera, and species, with accompanying keys. For each of the 126 species treated there is a full-page plate containing excellent line drawings of a shoot with flowers, another with fruit, another in the winter condition, with a larger figure of individual buds, and often other detail figures. The page of text accompanying this plate treats of the species briefly under the following heads: Form, Bark, Twigs, Buds, Leaves, Leaf-scars, Flowers, Fruit, Wood, Distinguishing Characteristics, Range, Distribution in Pennsylvania, Habitat, and Importance of the Species. To the present reviewer this part of the book deserves great praise. The typography is good, the proof-reading has been carefully done, the nomenclature is that of Gray's Manual (seventh edition). It is perhaps to be regretted that the author uses a comma between the specific name and its author.

Under the heading "Distribution in Pennsylvania," however, there is a lack of accuracy which to the 120 members of the Botanical Society of Western Pennsylvania, and to the many other amateur botanists and teachers in western Pennsylvania, will cause considerable confusion. In the Pennsylvania Herbarium of the Carnegie Museum there are now, thanks to the activities of the Botanical Society and of the Museum and its friends, about 50,000 specimens, representing more or less completely all of the counties of the western and many of those of the central part of the state. There is a fair proportional number of tree specimens among these and, inasmuch as Professor Illick notes, in his preface, that "Special efforts are being put forth to ascertain the distribution more accurately," it may be of interest to note, as authenticated by specimens in the Carnegie Museum, the following occurrences of trees in western Pennsylvania outside of the range given for them in *Pennsylvania Trees:*

Quercus Muhlenbergii Engelm. Noted in *Pennsylvania Trees* as "found locally in the southeastern and southern parts." Has been found in Beaver and Lawrence counties in the western part of the State.

Quercus prinoides Willd. Noted as "locally in the eastern, southern and central parts of the state." Occurs in fine condition just north of Valencia, Allegheny County, where the plants fruit abundantly.

Quercus imbricaria Michx. Noted as occurring "locally west of the Alleghenies as far north as Indiana County" and we have found it in southern Butler County and in Clearfield County in the valley of the north branch of the Susquehanna River, west of Clearfield.

Quercus ilicifolia Wang. Noted as sparse in the north-central and northern parts, occurs abundantly on the uplands between Clearfield and Pottersdale.

Quercus macrocarpa Michx. Noted as "Rare or local in the eastern, southern, and western parts of the state. Not reported from other parts." Of this there is a specimen with characteristic acorn, an old twig with battered leaves, and a flowering twig. "Centre Co., June 9, 1868. Tree between Centre Furnace and Thompson's Mill. J. T. R[othrock]."

The statement that the White Oak is "Abundant throughout the eastern, central, and southern parts, and rather common, at least locally, in the northern and western parts," will perhaps not quite suit the botanists of the southwestern sixth of the state where the white oak forms the main part of the forests of the uplands and hill tops over large areas.

Morus rubra L. Noted as "Local and sparse in the eastern and southern parts, occasional in the central part and rare in the mountainous parts." Has been collected in Allegheny, Westmoreland, and Blair counties.

Magnolia acuminata L. Noted as "Recorded as far east as Lancaster county and as far west as Forest and Allegheny counties." Occurs abundantly in Erie, Crawford, Mercer, Washington, and Green counties along the western boundary of the state.

Aesculus glabra Willd. To the list of counties noted should be added Washington. (Hanlin. *O. E. Jennings*, 1908.)

Tilia heterophylla Vent. Noted as "Not known to occur in the western part." Is represented by a specimen from Charleroi, Washington County, *O. E. Jennings*, June 9, 1904. Leaves white beneath with a fine stellate pubescence.

Oxydendrum arboreum (L.) DC. Noted as "found only sparingly in the southeastern part of the state." Dr. J. A. Shafer and O. P. Medsger collected this tree in Westmoreland County, "Mt. Pleasant Twp., field near Brush Creek. July 19, 1900."

Fraxinus nigra Marsh. Noted as "Common in the eastern, southern central and western parts." But the present reviewer has botanized rather extensively in southwestern Pennsylvania and it can be stated positively that this species is *rare* in that part of the state. It occurs in great abundance in Crawford County, is common in Erie, occurs in Beaver and Armstrong counties, and is represented by specimens collected a number of years ago in Allegheny County, otherwise we know of no records for western Pennsylvania.

O. E. Jennings

Carnegie Museum,
February 8, 1915

PROCEEDINGS OF THE CLUB

February 9, 1915

The meeting of February 9 was held at the American Museum of Natural History at 8:15 P.M., President Harper presiding. Fifty persons were present.

There being no business the President announced the lecture of the evening, "A Phytogeographic Trip in the Himalayas," by Mr. Ralph R. Stewart. An abstract prepared by the speaker follows:

"The ground covered by my trips extends from Rawalpindi in the Punjab to Kashmir, thence to Leh and Himis in Western Tibet (Ladak) and south to Simla, via Rupshu, Lahoul and Kulu. The distance is about 900 miles. As the range of altitude is three miles there are great variations in the flora from tropical to arctic, all on the same meridian. The Himalayas act as a tremendous barrier and their southern slopes have abundant rains so that in most places, especially above 8,000 feet, the vegetation is luxuriant and rich Alpine meadows extend to the snow line which is about 15,000 feet.

"On the Tibetan side of the 'great range' the transition is rapid to a desert flora. Pencil cedar, *Tamarix*, *Myricaria*, *Elaeagnus*, *Hippophae* and willow seem to be the only common indigenous trees, but on irrigated bits of land the apricot, mulberry, apple, balsam poplar, Lombardy poplar and several willows grow readily up to 12,000 ft. Wheat, buckwheat, barley and peas are the best crops. The barley and buckwheat ripen readily at 14,000 ft. where the snow line is 19,000 feet. Vascular plants have been found right up to this tremendous height. The struggle for existence is not between plant and plant, but between plants and nature as great patches have no vegetation whatever. Where irrigation is possible, however, the yield is excellent and wild herbs and shrubs spring up luxuriantly along irrigation ditches where they get some seepage. The Compositae, Gramineae, Leguminosae, Labiatae, Caryophyllaceae and Ranunculaceae are especially common families. Monocotyledons, mosses, ferns and saprophytes are rare."

Following the lecture, President Harper called attention to an interesting form of *Elfvingia megaloma* placed on exhibition by Dr. Fisher. This fungus was an exceedingly large specimen upon which several secondary sporophores had developed subsequent to the falling of the tree upon which it had originally developed.

Adjournment followed.

B. O. Dodge,
Secretary

February 24, 1915

The meeting of February 24, 1915, was held in the morphological laboratory of the New York Botanical Garden at 3:30 P.M., President Harper presiding. Twenty-five persons were present.

The minutes of the meetings held January 27 and February 9 were read and approved.

The following persons were nominated for membership: Dr. A. H. Chivers, Dartmouth College, Hanover, N. H.; Mr. Kenneth R. Boynton, N. Y. Botanical Garden, N. Y. City; Miss Margaret Slosson, N. Y. Botanical Garden, N. Y. City; Dr. M. A. Graham, 127 Kensington Avenue, Jersey City Heights, N. J.; and Miss Olga Hinsberg, 1285 Hoe Avenue, The Bronx, N. Y. City.

The death of Mrs. Alla Doughty, occurring February 12, was announced.

The resignation of Dr. E. D. Clark was read and accepted with regrets. The resignation of Mr. F. V. Rand was also accepted.

The following new members were then elected: Dr. A. H. Chivers, Mr. Kenneth Boynton and Miss Margaret Slosson.

The first number on the announced scientific program was a paper on "*Agalinis* and Allies in North America," by Dr. F. W. Pennell. An abstract prepared by the speaker follows:

"A brief summary of the speaker's investigations in this group of scrophulariaceous plants was presented. Of this group, until recently mostly included in *Gerardia* L., he would recognize as occurring in North America nine genera and seventy-nine species. Two of these genera, both monotypic, and nineteen species are now being proposed as new. The attempt is being made to work out as thoroughly as possible the interrelationship of the various species, then from this the comparative phylogeny of the several genera. Of the fifty-three species occurring in the United States nearly all have been studied and described in their native environments, a point, the value of which in taxonomic work, the speaker believes cannot be over-emphasized. Specimens illustrating most of the latter species were shown, also maps showing the known range of each. As besides his own collections, the speaker has reviewed nearly all extant herbarium-material of this group, these maps portray distribution with unusual completeness. Also brief mention was made of the type of root-parasitism in the several genera. The results of this investigation, carried out under a research appointment from the University of Pennsylvania, are to appear in a forthcoming monograph on "*Agalinis* and Allies in North America."

Dr. A. B. Stout then gave a paper on "A Dwarf Mutant of

Hibiscus oculiroseus" that has appeared in his cultivation of this species. The new form was described in comparison with the usual robust type, and the history of its origin was given. It is the plan to present a full account of the plant in a future number of the *Bulletin* of the Club.

Adjournment followed.

B. O. Dodge,
Secretary

NEWS ITEMS

Announcements have been issued for the twentieth anniversary of the appropriation by the City of New York of 250 acres of land in Bronx Park for the use of the New York Botanical Garden. The event will be commemorated at the Garden during the week commencing September 6, 1915. Botanists from all parts of North America have been invited to attend. The part played by the Torrey Club in the early days of the initiation of the movement for the establishment of the New York Botanical Garden is well known to most of our members. On Friday, September 10, the botanists attending the anniversary are to be taken to a locality in the pine-barrens of New Jersey, under the guidance of the Club.

It is reported in *Science* that Mr. G. Massee has retired from his position as head of the cryptogamic department in the herbarium at the Royal Botanic Gardens, Kew.

Professor H. A. Cummins, professor of botany and agriculture at University College, Cork, has been given a commission in the British Army.

The *Plant World* announces two prizes which are to be awarded for the best papers embodying original work in any phase of the water relations of plants. The amount of the first prize is $50, and of the second prize $10. The offering of these purses is made possible by the generosity of Professor B. E. Livingston and by contributions from Dr. D. T. MacDougal, Professor J. J. Thornber, Dr. J. B. Overton, Dr. H. C. Cowles and Mrs. Edith B. Shreve. Competing papers should be written so as to give no internal evidence of authorship, and should be sent to the editor of the *Plant World*, Dr. Forrest Shreve, Tucson, Ariz., by December 1. The *Plant World* reserves the right to publish any papers submitted in the contest.

Dr. Howard Spencer Reed, now professor of plant pathology and bacteriology in the Virginia Polytechnic Institute, has been appointed professor of plant physiology in the Citrus Experiment Station and Graduate School of Tropical Agriculture, recently established by the University of California at Riverside, California. Dr. F. D. Fromme, formerly of Purdue University has taken Dr. Reed's place at the Virginia Polytechnic Institute.

Dr. H. M. Fitzpatrick, assistant professor of plant pathology at Cornell University, is spending three months at the Brooklyn Botanic Garden.

Professor R. J. Pool has been appointed acting head of the department of botany at the University of Nebraska, to fill the place made vacant by the death of Dr. C. E. Bessey.

Dr. Alfred Dachnowski has accepted a position with the Bureau of Plant Industry, where he will continue his work on peat soils and their agricultural utilization.

Dr. M. A. Howe of the New York Botanical Garden has gone to Porto Rico to continue studies on the marine Algae of that island.

At a meeting of the Board of Estimate and Apportionment of the City of New York, held June 18, the sum of one hundred thousand dollars was appropriated for the completion of the building and greenhouses of the Brooklyn Botanic Garden. The appropriation was conditional on a similar sum being raised by private subscription. This amount was contributed by Mr. Alfred T. White, chairman of the Botanic Garden Committee, and two other friends of the garden who wish to remain anonymous.

The Torrey Botanical Club

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

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OTHER PUBLICATIONS

OF THE

TORREY BOTANICAL CLUB

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(1) BULLETIN

A monthly journal devoted to general botany, established 1870. Vol. 40 published in 1913, contained 712 pages of text and 26 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 24–40 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. 28–40 three dollars each.

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

(2) MEMOIRS

The MEMOIRS, established 1889, are published at irregulas intervals. Volumes 1–13 are now completed ; Nos. 1 and 2 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

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BY

NORMAN TAYLOR

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BOTANICAL SKETCHES FROM THE ASIATIC TROPICS

By Henry Allan Gleason

(*Continued from May Torreya*)

II. The Philippines

We arrived in Manila on October 6, 1913, and went out by rail the next day to Los Banos, the site of the College of Agriculture, as the guests of Dr. Frank C. Gates, of the department of botany of that institution.

The ride from Manila out to Los Banos is interesting botanically, because it gives one a general impression of tropical vegetation and scenery without bewildering one with details. Always in the background, on one side or both, are mountains, covered completely with forest, or with alternating areas of forest and grassland. When the railway comes closer to the mountain side, as it does near Los Banos, one can get a general idea of the external appearance of the tropical forest. Two features are at once obvious in which it differs from the forests of the temperate zone. One of these is the prevailing color of the bark, grays and light browns instead of the dark colors of the temperate zones. The other is the irregular height of the trees, occasional specimens projecting their crowns far above the general level of the forest.

In some places on the way out, also, the railway passes through large fields of grassland, of the same type as those seen at a distance on the mountain side. These are entirely uncultivated and uninhabited, and are unused except for pasturage for small droves of cattle. They are monopolized by the notorious cogon grasses,

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Saccharum spontaneum and *Imperata cylindrica*, and the only shrubs or trees commonly seen are scattered plants of the legumes *Bauhinia malabarica* and *Acacia Farnesiana*.

Most of the lowlands through which the railway passes are fairly well settled, with villages every two or three miles. Each village is nearly hidden under a thicket of trees of economic value, especially bamboo, mango, various species of palms, and bananas. Between the villages are extensive rice fields, with numerous scattered clumps of tall bamboos. Their tall stems are very graceful, and form spreading tops with an abundance of

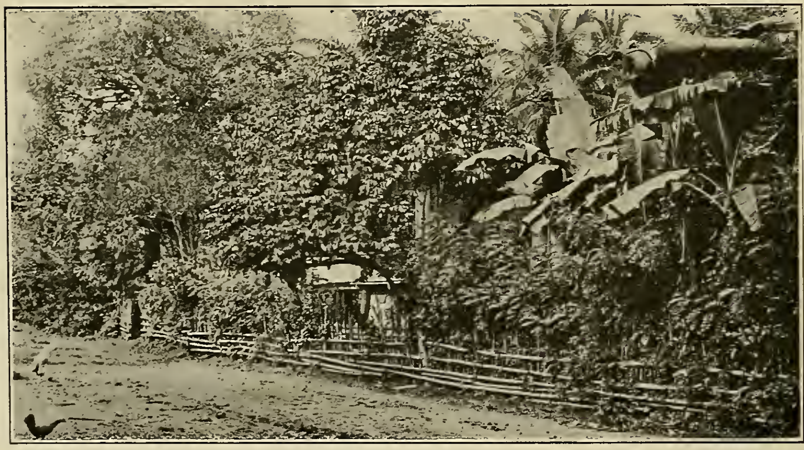

FIG. 1. Typical Philippine roadside, with several economic plants. In the center is the lansonia, *Lansium domesticum*.

feathery foliage. At a distance across a rice field, the whole gives an effect very like that of an alluvial meadow in America, with scattered thickets of tall willows beyond.

The two common species of bamboo here are *Bambusa Blumeana* and *Bambusa vulgaris*, both of them introduced into the islands in prehistoric times. They are planted everywhere, and are used for a great variety of purposes. The Filipino's house is made out of bamboo completely, except the thatched roof, and the number of minor utensils which can be and are constructed of bamboo is surprising. Of course the structure of bamboo gives it unusual advantages in this line. The long hollow stems are at once strong, light, and straight, making them useful for all sorts of construction where a flat surface is not essential, and their hollow centers make them useful also for various sorts of containers. The bamboos grow in dense clumps, and rise to a height of fifty feet or more. These clumps increase in extent and in density from year to year, as new stems push up around and among the old ones. When stems are cut, a stump two or three feet high is left, and stumps and stems combine to make eventually a thicket which is almost impenetrable. Everywhere over the lowlands these bamboos are planted, and a couple of clumps will provide all the building material needed by an average Filipino family.

The College of Agriculture lies about two miles out from Los Banos, with an excellent road connecting them and passing on its way through the little village of San Antonio. Walking along this road, one can see an almost complete exhibition of the economic botany of the Philippines. The little square or oblong houses of the natives, with bamboo frames and floor, woven sides, and thatched roofs, are set on stilts five or six feet above the ground. Each is surrounded by a little yard, enclosed by a bamboo fence, and thickly planted. Vegetables, in the ordinary sense of the word, are seldom seen here. Most of the plants are trees and are cultivated for their fruits. Coconut palms are everywhere, and their fruits are offered for sale in every little native shop. Sugar palm, *Arenga saccharifera*, and betel palm, *Areca Catechu*, are much less frequent, although certainly common enough. Second in abundance to the coconut palm is the banana, of which many different varieties are cultivated. So far as we could see in our limited experience, the plants themselves look very much alike, but there are striking differences in the size, shape, and flavor of the fruits. They sell for various prices, ranging from a cent a dozen to five cents apiece, and some kinds are good only when cooked. There is a very striking contrast between the entire young leaves of bananas and the ragged old ones. The segments of the latter are generally only an inch or two wide, and seldom more than four inches. On very hot days the leaves fold lengthwise until the sides are almost appressed. Water is conducted down the channeled petioles into the sheathing base, where mosquitoes breed. The margin of the leaf-sheath is almost transparent, and probably only one cell in thickness. The external surface of the leaf-sheath is exceedingly smooth. Because of this, the sheaths are used to make runways in trapping grasshoppers, since the insects can not climb over them.

Next in abundance, probably, comes the papaya, *Carica papaya*. The plant is a most ungainly affair, with a slender but tapering unbranched trunk rough with leaf scars and almost always

FIG. 2. Typical rain-forest on Mt. Makiling, Philippine Islands.

crooked, and a cluster of huge palmately-lobed leaves at the top. In this climate they grow very rapidly, and a tree two years old may be fifteen feet high and eight inches in diameter at the base. A cluster of flowers appears at the base of nearly every leaf, and the fruits ripen in rapid succession the whole year round. A first-class tree should ripen a fruit every two days, weighing one and a half to two pounds each. In general, the natives use no care in selecting their seeds and give the plants no attention, so they seldom have first-class trees. They may be seen in cultivation in the College of Agriculture, however, producing at this enormous rate. It is said that papaya fruits which are longer than wide have seeds which tend to produce all pistillate plants, or only a small proportion of staminate ones. Seeds from thick fruits are more apt to produce an even distribution of staminate and pistillate trees.

While these three species, coconut, banana, and papaya, are the commonest fruits in cultivation, many other species are also commonly seen. Mangos, *Mangifera indica*, are very frequent. The tree is large, with a spreading crown, and resembles in habit some of our American oaks. The trees are frequently scared with a bolo, under the superstition that such treatment makes them bear more fruit. Chicos, *Achras Sapota*, grow on the same species of tree that produces chicle gum in Mexico, and was of course introduced into the Philippines from that country. The fruits are brown, the size of a lemon, rough on the outside, brown and juicy within, and taste like an overripe pear flavored with maple. The natives are perfectly willing to sell or eat the fruit, but they are superstitious about the tree, and are said to refuse to plant it. Other trees are the arnatto, *Bixa orellana*, whose crimson fruits are used to color rice; pomelo, *Citrus decumana*, with yellow fruits like a large grape-fruit, used by the Americans chiefly in salads; cacao; coffee; custard apple, *Anona reticulata*, and two or three other species of the same genus, and various others.

All these species are planted in a heterogeneous mixture around the houses, without any semblance of order whatever. The result is that, seen from a distance, the houses appear to be set within a forest. Behind the houses rise the thickets of tall bamboo, and back of the villages lie the small fields of rice or maize or sugar cane, with small patches of several kinds of vegetables. Probably the commonest of these is the gabi, or taro, *Colocasia esculentum*.

After the stranger has established himself in the Philippines, the first impression which comes to him, as it has to every other botanist in the tropics, is the overwhelming vigor of the tropical plant life. All around the college campus, one can see the steady attempt of the jungle to creep in. Some of the worst weeds are trees, and grow with almost unbelievable speed. Around the front veranda of Dr. Gates's house were a number of trees of ipul-ipul, *Leucaena glauca*, in common use here for firewood. These trees were less than a year old, and had been cut down to the ground in June, four months before our arrival. During that interval they had grown fifteen feet high, and were full of flowers, green fruit, and ripe pods. A young tree of teak, *Tectona grandis*, planted in 1912, had during the rainy season of that year grown eight feet, producing fourteen internodes of from three to ten inches in length. In the following dry season it had produced fourteen more internodes, half an inch to an inch and a half long, amounting in all to one foot. During the rainy season of 1913 it had already produced nineteen internodes, the lowest a foot long and the uppermost not yet fully elongated, but the total length was already ten feet.

It is quite probable that there is no place in the world where the tropical forest can be observed under more favorable circumstances than on the slopes of Mt. Makiling. This extinct volcano rises immediately behind the campus of the College of Agriculture, and reaches a height of somewhat more than 3,700 feet. An excellent trail has been constructed from the campus, leading past the residences of the faculty, across the Malawin river, and thence into the deep forest. After crossing the river, the trail has several branches, so that one can use different routes to and from the summit, and can easily visit various situations on the flanks of the mountain. The value or the necessity of carefully made trails will hardly be appreciated by one who has never been in a real tropical forest. With the trails, one can easily walk to the summit in three or four hours; without them it would probably require two full days. Along the trails, the botanists and foresters have placed labels on many of the trees, giving the native and scientific names and also the name of the family. The mountain side is accordingly converted into a natural botanical garden, where the botanist can observe at his ease the vegetation in its original condition. One can easily find the labeled plants in such gardens as those at Buitenzorg and Peradeniya, or by sufficient exertion he can fight his way through the virgin forest elsewhere. Here, however, one finds the comforts of the garden and the luxuriance of the forest together, and it affords a unique opportunity to the botanist. The nearest approach to it is found in the mountain garden at Tjibodas, in Java, but there the elevation is so much higher that a great deal of the tropical luxuriance of the lowlands is lacking.

The marvelous richness and luxuriance of such a forest must be seen to be appreciated, and baffles adequate description. One scarcely enters the forest before he is impressed by the relatively great importance of the arborescent flora. The visitor finds himself giving all his attention to the trees, and neglecting

FIG. 3. Base of a large balete, or strangling fig, showing the anastomosing trunk-roots.

almost completely the herbaceous plants along the side of his path. The number of species which compose the forest is very large. More than four hundred have been reported from Mt. Makiling. Also they are widely scattered, so that a single small area contains a very large number. In a small arboretum of about seven acres, over two hundred species were found growing naturally. As a result, a group of trees of the same species is seldom found; the nearest neighboring individuals may be and usually are separated by a considerable distance, and the number of species is so large and so confusing that the visiting botanist learns to recognize only a very few of them. These are mostly species that are also planted on the campus below. Some others he learns as to the genus, such as *Dillenia* and *Ficus*, while the vast majority of individuals away from the trails and unlabeled are completely unknown.

In the lower two-thirds of the mountain slope, the forest is composed of tall trees, usually with a second or even a third story of lower trees beneath them. A good proportion of the individuals belongs to the Dipterocarpaceae, so that the whole forest type is called the dipterocarp forest. The trees have tall straight trunks two to five feet in diameter, with their branches appearing at a great height. The smooth light-colored bark is generally characteristic. The leaves are at so great a height, and the forest cover is so tangled with lianas that it is difficult to form any idea of the general leaf character. Now and then one finds on the ground flowers or fruits which indicate the near presence of some familiar genus. At the time of our visits. the fruits of *Dillenia* were especially common. They are green in color, spherical in shape, and about the size of a lemon. The outside is composed of the enlarged green sepals, enclosing within a twisted mass of juicy carpels. Stripped of their sepals, the carpel mass is edible, and tastes somewhat like exceedingly sour and juicy apples. In the absence of drinking water, they are useful for quenching thirst. In other places one finds the fruits of nutmeg, with an oblong seed surrounded by the network of mace, or even acorns from some of the tropical species of *Quercus*.

Palm trees are not common. Here and there one meets with a slender fan palm twenty to thirty feet high, but they are so rare that they never constitute an important part of the forest, and from most points along the trail no palms are in sight at all. This does not include the rattans, species of the genus *Calamus*. These climbing palms are common everywhere through the forest, stretching to immense distances but never getting very high above the ground. Their trunks, including the bristly leaf-sheaths, may be six inches in diameter, and at the base are reclining on the ground. Farther out they ascend obliquely into some tree, and thence may be traced looping away from one tree to the other across the forest. *Calamus* is one of the many genera that make a trail necessary through the forest. Its stems and petioles are thorny, and being green in color they are not easily seen against the green background. Worse than these, it has a thorny prolongation of the leaf rachis, called a whip, which is one of the most murderous things met with in the forest. This elongated rachis begins by growing upward, and if it meets with an obstruction, such as the limb of a tree, the reflexed thorns upon it catch and support the plant. But if an obstruction is not met with, the whip soon hangs down from its own weight. These pendent whips are common all through the forest, so slender and so green that they are scarcely noticed, but so strong, and armed with such sharp thorns, that they never let go of anything which they may catch. Luckily, the hat brim catches most of them. Off comes the hat, and the owner must turn around and pick it off the whip where it hangs suspended. But if the whip catches the clothing, or still worse, the person, a piece of cloth or of skin will come out before the whip lets loose. So the path of the botanist away from the cleared trail is indeed beset with thorns.

Other forms of lianas are everywhere, and constitute one of the most striking features of the forest. There are twiners, root climbers, and tendril climbers. There are little species, appressed to the trunks of trees, and big fellows a foot in trunk diameter, and so tall that their foliage is lost in the general forest cover. They climb on the trees, they climb on each other, they stretch across the path and from tree to tree in great festoons and loops. They disappear into the upper branches, or they hide the tree trunks behind dense masses of green foliage. They exist in dozens of species, in every shape and size and habit of growth imaginable. Also, for the most part they are unidentified and almost unidentifiable, because it is practically impossible to find the leaves or flowers of the larger ones.

Of the smaller lianas, species of *Pothos* are common. Their slender stems lie closely appressed to the trunks of large smooth-barked trees, and seem to show a special preference for the surface of buttress roots. Their leaves are similarly appressed to the bark, and spread at right angles to the stem. Some of the smaller species have leaves less than an inch long, and the larger ones are four to six inches long. Species of *Piper* are also low climbers with a somewhat similar habit, but with more spreading leaves.

Next in size are the aroids, with many different species. They are root climbers, but the large leaves are produced in great numbers and may completely hide the trunk of the supporting tree. A climbing bamboo, *Schizostachyum*, is also very common. It produces a dense but loose tangle of stems, which may double the apparent diameter of the supporting tree, and the small leaves are produced freely over the whole mass. A larger bamboo, *Dinochloa*, has rather solitary stems. These smaller lianas, *Pothos*, *Piper*, *Schizostachyum*, and the aroids, represent the shade-loving species. While it is frequently considered that the liana habit may have developed in response to a demand for greater light within the forest, it is obvious that it has developed to a variable degree, because to these smaller species the amount of light available is certainly not very different from that received by plants of normal stature on the ground. Just how much that is, is not definitely known, but in photographing them the necessary exposure is one hundred to three hundred times as great as would be required in the open. Whether these shade-loving forms have developed from shade-loving ancestors, or from larger sun-loving lianas, is a question of considerable interest to the ecologist.

The larger lianas all differ from these in having long leafless stems, with the foliage developed only at a great height, where it can compete for light with the leaves of the trees which support them. Of course they must begin their development on the ground, and there may be a very long and severe struggle for existence before they finally attain the requisite height. Just how large these plants may be is again a question, because in several trips on the slopes of Mt. Makiling the writer was never able, even with the aid of a field glass, to recognize with certainty the foliage of any particular liana from that of the trees around it. It is probable that their development is favored by the death and fall of a large tree, affording a temporary clearing in the forest. This view is favored by their great abundance under certain trees, and their smaller numbers over the adjacent ground. Most of them are twiners, but the death of the first plants upon which they twined leaves the lower part of the stem unsupported, sometimes for probably a hundred feet up into the air. Even allowing for the possible death and disappearance of former supports, it is still difficult to imagine how they are able to loop from one tree to another as they do, without any present support for a distance as great as fifty feet. It is very probable that the liana is itself connected with the death of the supporting plant, because instances are common where small supporting trees are badly constricted by the tight coils about them. It is also common to find two or even three twiners coiled about each other, and ascending in a tight spiral many feet into the foliage above. Of all the numerous species and genera on the mountain, only one genus was ever recognized with certainty. That was *Bauhinia*, known by the 8-shaped section of the stem.

Equaling the lianas in general interest are the baletes, or strangling figs, of which fourteen species are known on the mountain. In general, however, it is not only impossible for the botanist to recognize the species, but even to distinguish one species from another. On the mature trees the foliage is so high that it can not be seen, and the flowers and fruit are also necessary for the identification of the species. A few species are cauliflorous, and may be seen in bloom at close range. One such species had the lower part of its trunk almost completely hidden beneath a tangle of inflorescences, each a yard long and bearing some hundreds of small obovoid figs.

But whether the species can be recognized or not, it is possible to observe with a good deal of accuracy the stages in the growth and development of a balete. The seeds germinate on the surface of some horizontal branch, or in a crevice in the bark of a tree, sometimes at a considerable height. Here the young plant begins its life as an epiphyte. Such plants may be seen commonly in the forest, with a thick cluster of stems extending out and up obliquely from the side of a tree. Just how high their development may begin can not be said accurately—probably there is no limit. Soon after the establishment of the young plant, a series of roots begins to grow downward along the bark of the host tree. When these reach the ground and take root, the fig is converted from an epiphyte into a holophyte, and henceforth contributes to its own physical support. It is obvious that the growth of a large epiphyte is rather hazardous, because of the difficulty of obtaining an adequate supply of water and inorganic materials, and this condition may set the upper limit of height at which the balete may develop. In other words, if the balete seedling is too high, it may starve to death before its roots establish connection with the ground. In the younger baletes under observation, where the point of attachment could be readily observed, it was seldom more than twenty feet above the ground, but in one case the height was at least forty feet at a conservative estimate. In this particular balete, there was just one straight root descending without branches to three feet from the ground, and then branching and entering the ground in two places. Most baletes send down several roots, which branch and anastomose freely on the way. Possibly the unusual habit of this one enabled it in some way to reach the ground from so great a height.

Most baletes observed had germinated on the side of a comparatively small tree, seldom exceeding two feet in diameter at the point of attachment. Even on a tree of only six inches diameter, the mechanical strain of supporting a young balete can not be very great. The branches of the balete, also, are under those of the host, and can not interfere with the light. The first danger to the host comes from the roots which grow down the sides of the stem. These branch repeatedly, surround the stem within a short distance from their base, and anastomose freely to form a complete network around the tree. This mesh of roots is so thick and strong, that it is very doubtful whether the host can grow in thickness after it is once established. At any rate, by the time the mesh work has become a solid mass around the tree within, the host dies, and the balete now enters on a completely independent existence. On the younger ones, the mesh work of roots is still obvious, or is indicated by the irregularity of surface. On the older ones it is smoothed out completely by successive years of growth, and the mature balete becomes a tall, straight, smooth-barked tree, six to eight feet in diameter, with its branches and foliage lost to view in the forest canopy above, and with no trace whatever of its earlier epiphytic history. Of course they are hollow, and on one cut balete the decaying mass of the host tree was very evident.

Baletes exist in the Makiling forest by the thousands. Without walking from the trail, one can see them in every stage of

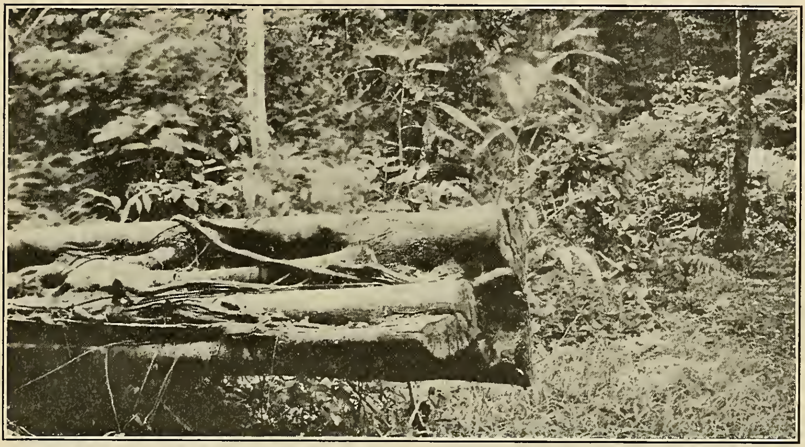

FIG. 4. A felled balete showing four principal roots and a central cavity filled by the decayed remains of the host tree.

existence, from the small epiphytes on the host tree to the giant mature tree. No two of them look exactly alike in their intermediate stages, because their descending roots differ in size, in number, and in the amount of anastomosing, and the botanist will not tire of examining all of them that he sees.

The mature baletes, and many other species of the tropical forest, show in a very interesting way the development of huge buttress roots of the plank buttress type. These may be fourteen feet long, eight feet high at the base, flat, vertical, and straight, and even at the base scarcely exceeding a foot in thickness. They stand out from the main trunk, at all angles and in all lengths, without any symmetry or regularity. Their bark is generally of the same color and surface as that of the main trunk. It is quite evident that the various species may differ in the number, size, straightness, and thickness of the buttresses, but their general character is the same.

The herbaceous vegetation must not be neglected completely. There are tall plants of the Marantaceae, with canna-like leaves, growing close beside the trail. Under them are many other species of unknown genera or families, but everywhere there is a multitude of the shade-loving Elatostemmas. These small

Fig. 5. A tangle of lianes. Philippine Islands.

relatives of our temperate zone nettles are easily the most characteristic members of the herbaceous flora of these densely shaded forests. Their plagiotropic stems arch out from the base, and the leaves are so inserted as to lie in a horizontal plane, thereby receiving the maximum proportion of the diffuse light. The leaves are inequilateral at the base, resembling those of a begonia. There are also numerous ferns, especially along the rocky banks of the small streams which course down the mountain-side.

One tall semi-shrubby plant of the Marantaceae (? *Donax arundastrum*) is quite noticeable because of its habit of growth.

In general habit it suggests the cultivated umbrella plant, *Cyperus alternifolius.* A tall erect stem reaches a height which may be as much as eight feet, and consists apparently of but one internode. At the summit it bears a whorl of branches, which stand horizontally or at some oblique angle. These consist also of one internode each, and may bear tertiary branches at their summits in turn.

The trail winds on up the side of the mountain, past giant baletes and under giant lianas, now turning around a shoulder of the mountain, now descending slightly to cross one of the numerous small streams, and then ascending steeply on the other side. In every direction the dense forest intercepts the view. One never gets a glimpse of the valley which he has left, or of the peak which is his goal. He must merely continue along the trail, knowing that in due time it will lead him to the summit. Little lizards scurry silently off the path into the vegetation at the side, gallinaceous birds scratch in the leaves and hurry away when alarmed, a pair of unseen songbirds whistle to each other in the treetops overhead. The animal life is smothered and lost in the overwhelming luxuriance of the vegetation, and the few sounds heard in evidence of its presence impress one by their mystery and secrecy. The only exception comes from the hoarse-voiced hornbills, whose raucous cries are heard frequently, although the big birds themselves keep well hidden.

Approximately a third of the way up the mountain the forest decreases in height, and consists now of two stories of trees where there had been three before. The general character of the vegetation, however, is virtually unchanged. The general size of the lianas is decreased. The screw-pine, *Pandanus*, becomes relatively common. Great masses of the climbing pandan, *Freycinetia*, join with the aroids in covering the trunks of the trees. Occasionally among the trees one gets a glimpse of a giant erect aroid, of a species as yet unnamed, with a trunk ten feet tall or more, and with spreading leaves whose length, including the petiole, may reach twelve feet. A leaf of that size on a palm is not very impressive, because the leaves there are compound, but when it exists as a single unlobed blade it is immense, and carries the impression of a size even greater than the actual figures would indicate.

The trail becomes steeper, and about two thirds of the way up there is a more pronounced change, where the trail enters the mossy forest of the summit. Here the forest becomes one story in height. The species of trees change considerably also, and the whole aspect of the forest is entirely different. The trees are low, widely branched, with numerous crooked spreading branches, and with small or leathery leaves. Their stems and branches are completely hidden within dense enveloping masses of lichens and mosses. These masses frequently increase the apparent diameter of the branch fourfold. On the branches, among the mosses, are great numbers of epiphytes, including many species of orchids. The latter are mostly narrow-leaved, and with rather inconspicuous flowers. The ground vegetation, because of the greater amount of light available, is a dense mass of low shrubbery, in which various species of *Eurya* and *Medinilla* are especially conspicuous. The trail twists its way through these stiff-branched shrubs and under the moss-laden trees up the last steep slopes, and emerges at the shelter house on the summit.

Makiling enjoys the reputation of being the most carefully studied mountain, from an ecological standpoint, in the world. For some years past Dr. Brown has worked over its vegetation, and has maintained batteries of self-recording instruments at numerous stations, from the hot steamy base to the wind-swept summit. His results, when published, should present the most accurate and detailed account of tropical vegetation extant.

This description may give some idea of the facilities which the mountain offers to the student of tropical vegetation. To the traveller with little time to spare, it makes easily accessible two great types of tropical forest, and exhibits all of the principal vegetation forms of the tropical forest, except those which are purely littoral in nature. To the student who wishes to make more careful or extended studies, it offers large and inexhaustible supplies of material, even including such unusual forms as the myrmecophilous *Hydnophytum* and the saprophytic *Rafflesia*, with the additional advantage of a botanical laboratory, American homes, and American botanists at its base.

(*To be continued.*)

RELATIONSHIP BETWEEN ROESTELIA TRANSFORMANS AND R. BOTRYAPITES

By B. O. Dodge

Roestelia transformans is one of the few rusts of this type that have remained unconnected with a *Gymnosporangium* form. Several European works on the fungi contain statements to the effect that *Gymnosporangium Ellisii* is connected with *R. transformans* but no one has reported making such a connection. Fromme has recently shown that *G. Ellisii* and *Aecidium Myricatum* are phases of the same rust.

Farlow, in his work on the "Gymnosporangia of the United States," describes a foliicolous form of *G. biseptatum* as having "all or nearly all two-celled spores." Kern has made a new species of this leaf form under the name *G. fraternum*.

A number of infection experiments with *G. biseptatum* and "*G. fraternum*" have been carried out at Columbia University and a more detailed report of the results obtained will soon be published. It has been found that the leaf form will infect both *Aronia* and *Amelanchier*. The roestelia developing on *Aronia* are very characteristic of *R. transformans*. The basal hypertrophies from which secondary horn-like galls arise, and the long, strongly hygroscopic peridial cells, coarsely warted on their inner face, have been generally regarded as unmistakable characters of this species.

The hypertrophies produced by the infection on the *Amelanchier* are quite unlike those on the *Aronia*. The galls from which the roestelia arise do not ordinarily coalesce and are at first merely flattened, wart-like growths which later elongate somewhat. The roestelia are very different from *R. transformans*, resembling, in fact, *R. Botryapites* as commonly described and distributed in exsiccati.

As *R. transformans* has never been reported on *Amelanchier* certain infections of this host which I obtained in 1914 were open to the question of accidental field contamination of teleutospore material by spores from *G. biseptatum.* Converse inoculations from the roestelia obtained on *Aronia* back to small potted plants of *Chamaecyparis* were made during the summer of 1914 and a considerable number of sori of "*G. fraternum*" appeared on the leaves in February and March. Whether these sori came from the artificial infections or from a perennial mycelium in the cedars, can be determined only by further work.

A large number of infections on both *Aronia* and *Amelanchier* have been obtained with this material this spring. The results agree with those of last year. The change of aecidial host has been followed not only by a different reaction of the host plant to the fungus as shown by the hypertrophies or galls, but also by the transformation of the fungus itself to such an extent that what has been regarded as a characteristically different aecidium is developed.

Columbia University,
Department of Botany

REVIEWS

The Scinaia Assemblage*

A phycological paper of unusual systematic and biologic interest is that on "The *Scinaia* Assemblage" recently published by Professor Setchell. *Scinaia*, a genus of red algae of the small family Chaetangiaceae, was first recognized and named nearly a hundred years ago and for a long time was considered to have but a single species, *Scinaia furcellata*, which was described originally from England, but had since been held to occur in the Mediterranean, on our Atlantic coast from southern Massachusetts to Florida, and on the coasts of California, Chile, South Africa, New Zealand, Hawaii, Japan, etc. Later, in part from plants that had been passing as *S. furcellata* and in part from plants so different in habit as to have escaped confusion with it, other species had been described until the genus was currently

* Setchell, William Albert. The *Scinaia* Assemblage. Univ. California Publ. Bot. **6**: 79–152. *pl. 10–16.* 7 O 1914.

credited with six species. And in 1876 the generic name *Gloiophloea* had been proposed by J. Agardh for an Australian plant that had been previously referred to *Scinaia furcellata.* It was this group of seven supposed species, currently placed in two genera, that Setchell undertook to set in order, and in this undertaking he has evidently met with distinguished success. In this assemblage, in the world as a whole, Setchell now finds grounds for recognizing twenty species, distributed in three genera—*Scinaia* with eleven species, *Gloiophloea* with seven, and *Pseudoscinaia*, a new genus, with two species. In what, until recently, had been passing as *Scinaia furcellata* on the eastern and western coasts of North America, he now recognizes eight species, of which he places five in *Scinaia*, two in *Gloiophloea*, and one in *Pseudoscinaia.* It should, perhaps, be remarked that the thallus in all the plants of the group is very gelatinous and dried specimens do not revive satisfactorily on being soaked out, even when swelling reagents are applied. To this last fact and to the study of dried specimens alone are doubtless to be attributed some of the confusions that have obtained in the past.

Differences in the structure of the cystocarp, in the character of the cortex, and in the external form of the thallus, are, in the main, what the author of the paper has relied upon for diagnostic peculiarities. Just how distinct all of the proposed genera and species really are, of course remains for the future to determine, but so far as the material now available is concerned, they do not seem to intergrade, even though they are sometimes superficially similar. The case of the *Scinaia* assemblage appears to be much like that of many other tangles all along the line from the algae and fungi to the seed-plants that have been unraveled in the last few years—cases in which a supposed extremely variable and widely distributed species has been found on critical study to consist of two or more separable non-intergrading things, sometimes with distinct and limited geographic ranges or sometimes with nearly identical overlapping or widely extended ranges. When only two things have been confused it is usually not very difficult to separate them, but when three or more related things have been lumped together under one specific name it is nearly always a most difficult matter to recognize and group properly the real distinctive characters. Professor Setchell certainly deserves congratulation for getting hold of the tangled threads in what seems to be the right way in this *Scinaia* matter.

MARSHALL A. HOWE

David Douglas's Journal

A volume of unusual interest to the Pacific Northwest has just been published by the Royal Horticultural Society of London, entitled "Journal kept by David Douglas During His Travels in North America 1823–1827, Together With a Particular Description of Thirty-three Species of American Oaks and Eighteen Species of *Pinus*, With Appendices containing a List of the Plant Introduced by Douglas and an Account of his Death in 1834."

Douglas was the botanist for whom the most improtant timber tree in the Pacific Northwest, viz., the Douglas or red fir, is named.

The portion of the present volume of most interest to students of the Northwest is that part of the verbatim Journal kept by Douglas during his first trip to western America, from the time he reached the mouth of the Columbia River, April 7, 1825, until he sailed from Hudson Bay September 15, 1827. This journal covers 218 printed pages. During this period Douglas made botanical explorations from his headquarters at Fort Vancouver as far south as the Rogue River Mountains in Oregon; northward to Gray Harbor and the head of Puget Sound; in the interior all along the Columbia River to Kettle Falls; the region between Spokane and the present site of Lewiston, Idaho; the Craig Mountains; the Blue Mountains about the source of the Walla Walla River; and finally across the continent by way of the upper Columbia River and down the Athabaska and Saskatchewan Rivers to Lake Winnipeg and thence to Hudson Bay.

The only account of these explorations previously published is a condensed narrative by Douglas published after his death by Sir William J. Hooker. This condensed narrative is republished in the present volume. The original is in Douglas's own hand-writing and was apparently written by him after his return to London in 1827. In contrast with the detailed notes in the Journal now published, the brief narrative contains some inaccuracies which have led to doubt being expressed concerning Douglas's reliability. For example, in the abridged account he speaks of the peak which he christened Mount Brown, as "the highest peak yet known on the continent of America," and of the neighboring Mount Hooker as of nearly the same height. As Douglas was already familiar with the high peaks of the Cascade Mountains, his statements were long accepted by geographers, but modern measurements give Mount Brown the rather modest elevation of 9,050 feet.

Douglas was for a time greatly lionized after his return to London, and it was doubtless this influence which inspired the exaggerated statements in his brief account of his travels, and it is refreshing to find no trace of this spirit of boastfulness or exaggeration in the detailed narrative now published.

From the standpoint of the historian the journal is interesting and illuminating from the side lights which it throws on the men who were the most active agents of the Hudson Bay Company in the Northwest and on the methods used in their commercial operations; to the botanist the detailed narrative will help clear up many of the mooted points concerning the exact locality where Douglas found each of his new plants. Several of these plants, strange to say, have never since been found.

The publication of Douglas's Journal unabridged is in part due to the efforts of the reviewer who four years ago consulted the original manuscripts in London and finding them very different from the abridged accounts already published, urged upon the Royal Horticultural Society the desirability of printing them complete. Not only has the Society done this, but they have also included a number of other papers by Douglas never before published.

C. V. Piper

NEWS ITEMS

At Rutgers College, Messrs. Henry Clay Lint, and C. R. Fellers have been appointed Research Fellows in Botany; and Messrs. R. E. Curtis, S. A. Waksman, W. S. Porte, Orville Schultz, W. H. Martin, W. S. Krout, H. E. Carney, A. C. Foster, and F. P. Schlatter, have been appointed Research Assistants in Botany.

Dr. John W. Shive (Johns Hopkins University) has been appointed Plant Physiologist in the New Jersey Agricultural Experiment Station.

John P. Helyar, Instructor in Plant Pathology, Rutgers College, has been promoted to assistant professor.

Mr. George W. Martin, Assistant in Botany in Rutgers College for the past two years, will take a leave of absence for graduate study in the University of Chicago.

Dr. Daniel DaCruz, of Portugal, who has been studying at the Catholic University of America, visited the Brooklyn Botanic Garden during the last week of June en route to Chicago, the Yellowstone and San Francisco. Dr. DaCruz is interested chiefly in the cytological side of heredity.

At the recent symposium of the Torrey Club, held with the Philadelphia Botanical Club at Fleetwood, Pa., stations of interest were found for the persimmon, the papaw and *Pinus virginiana*. Near Lenhartsville, on the southerly slope of the Blue Mountains, all these trees were found. So far as eastern Pennsylvania is concerned these stations are near farthest north of the species. From eight to ten persons attended the symposium, and a local naturalist, Mr. W. H. Leibelsperger, acted as guide on most of the excursions.

The Torrey Botanical Club

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Of former volumes, only 24–40 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. 28–40 three dollars each.

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

Correspondence relating to the above publications should be addressed to

DR. BERNARD O. DODGE
Columbia University
New York City

Vol. 15 July, 1915 No. 7

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A Monthly Journal of Botanical Notes and News

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR

JOHN TORREY, 1796–1873

CONTENTS

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Norman Taylor
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Brooklyn, N. Y

TORREYA

July, 1915.

Vol. 15 No. 7

BOTANICAL SKETCHES FROM THE ASIATIC TROPICS

By Henry Allan Gleason

II. The Philippines.

(Continued from June Torreya)

The problem of dealing with the cogon grasses in the Philippines is a serious one. The two chief species, *Imperata cylindrica* and *Saccharum spontaneum*, grow in dense masses, with perennial rhizomes, and are very difficult to eradicate when once established. Their seeds are distributed by the wind, and soon take possession of the abandoned native clearings. After the grasses have completely occupied such a field, it is used only for pasturage, or else abandoned completely. Fires burn off the cogon every dry season, destroying the young trees that may have germinated and even encroaching somewhat upon the forest. As a result of agricultural neglect and continued burning, the cogon has occupied an immense area in the Philippines, changing it from agricultural land to waste. Under native control, the cogon will never be reclaimed until the population ultimately becomes so dense that reclamation is an economic necessity. In the meantime, its area is gradually extending and yearly reducing the area available for agriculture.

Seen from a boat coming into Manila harbor from the north, the high mountains along the west coast of Luzon, north of Manila, appear to be half or more covered with cogon, with the forest occupying only the more precipitous slopes or the deeper ravines. North of Manila in the lowlands near Dagupan, the railway crosses an immense tract of cogon prob-

[No. 6, Vol. 15 of Torreya, comprising pp. 117–138, was issued 16 July 1915]

ably ten miles wide and fully as long, absolutely uninhabited at present, but capable of producing immense crops of rice or sugar cane. In all probability it was so planted some time in the past, because cogon could scarcely have occupied so large a territory without previous cultivation and the aid of cogon fires. The mountains behind the city of Cebu are almost entirely deforested and covered with continuous fields of cogon, although they did in the past and could in the future support a luxuriant forest growth.

There are also some scattered shrubs in most of the cogon fields occupying the lower grounds near settlements. These

FIG. 6. The cogon grass association, with scattered small trees of *Bauhinia malabarica*, showing the sharp contact with the forest.

are chiefly of two species, *Bauhinia malabarica* and *Acacia Farnesiana.* Even they are killed by too frequent burnings. If the fires are kept off for a very few years, however, they will form such dense thickets that the cogon is killed off by excessive shading, and the forest is reëstablished as a consequence.

The interrelation of fire, cogon, and forest is beautifully shown on the slopes of the little hill Bulungbulo, adjacent to the College of Agriculture at Los Banos, and on several other low hills in the vicinity. The cogon grows in a dense jungle about six feet high, with a very small number of secondary species. It occupies the eastern slopes of the hills almost completely, extends just to the ridge at the very top, and there meets the forest with a very sharp tension line. The margin of the forest is so abrupt that it looks like a solid vertical wall or hedge, and it follows the sharp ridge of the hill so closely that a single step into the forest may be a step of a foot or two downward as well. In one or two places here, where small depressions extend across the crest and into ravines on the east, or cogon side, *Bauhinia malabarica* has established itself. The trees are low, widely branched, with rounded spreading crowns,

FIG. 7. Road through a coconut orchard, Philippine Islands.

and look very much like the American black-jack oak, *Quercus marilandica*. Under them is very little underbrush, so that one walks through the forest about as easily as through a dense forest of second-growth in America. In fact, the Bauhinia forest here bears the same relation to the cogon association that the black-jack and black oak forest bear to the prairies in Illinois. In each case the rapid advance of the forest is prevented by fires, while these trees, because of their fire-resisting qualities, are the pioneer species in the advance. It is also probable, although we did not observe it, that this pioneer forest, like its analog in Illinois, is in turn succeeded by another forest of more mesophytic type.

No visitor to the Philippines should neglect the picturesque gorge near Pagsanjan, and the botanist will be especially interested in the trip because of the opportunity it gives to observe the coconut industry, which centers about that little city. Our own trip was made on one of the little steamers on Laguna de Bay as far as Paete, at the east end of the lake, and thence by a dugout canoe to Pagsanjan. This last part of the journey lies across about four miles of open water in the lake, through the marshes that obstruct the mouth of the Pagsanjan river, and then about four miles up the river itself. The northeast monsoon helped us across the open water in fairly quick time, but the wind died shortly after we entered the delta, so that the remainder of our trip was exceedingly slow. The boatmen tried to help matters by whistling for the wind, in a series of low plaintive notes, and once in a while they did get enough breeze to push on up the slow sluggish stream. If the progress was slow, it gave us all the better chance to observe the interesting aquatic vegetation of the marshes.

The chief species of floating vegetation is the well-known *Pistia stratiotes*, with yellow-green rosettes up to eight inches in diameter. In sheltered coves of Laguna de Bay it grows in dense masses, and isolated plants or groups of plants, washed out by waves or swept out by wind, are seen scattered all over the lake. Of course they live as well in the open water as in the sheltered bays. Once in the open water, the general tendency of the current is to carry them all slowly toward the Pasig river, which drains the lake into Manila Bay, passing enroute through the city of Manila. Standing on one of the bridges in that city, one sees a continuous procession of *Pistia* plants, usually cohering in masses two or three feet across, floating slowly down. The plants die when they reach salt water.

Pistia is also common on the made land near some of the villages along shore, and on the mud of rapidly forming deltas. This land form appears to be permanently rooted, and is somewhat smaller and much yellower than the floating form.

Among the numerous mouths of the Pagsanjan river, where the water is quiet and free from wave action, there is a very obvious zonation. The zone next to the open water is characterized by *Jussiaea repens* and *Ipomoea aquatica*, both of them forming dense floating mats, and usually growing together. The width of these mats is apparently determined chiefly by the current, rather than by the depth, although we had no opportunity to observe the relation of the seedlings to the depth of water. *Jussiaea* is noteworthy for its development of aerenchyma on special pneumatophores along the stem at each node. These are adventitious roots, the nature of which is determined wholly or in part by the position of the leaf from whose base they arise. If the leaf is at the side or under surface of the stem, the roots are usually normal and positively geotropic; if on the upper side of the prostrate stem, all or most of them become pneumatophores and are negatively geotropic. Their size at maturity averages about an inch long by a quarter of an inch through, and there are three to seven at each node.

Behind the floating mat comes a reed thicket, in which *Phragmites karka* is most conspicuous and may be ten feet tall. As the soil accumulates and becomes firmer and drier, shrubs of *Pithecolobium dulce* and thickets of bamboo appear. These are in turn followed on still drier ground by coconut, banana, and other cultivated species, and the river banks are populous with fishing villages.

Pagsanjan is the cleanest, most picturesque, and most attractive village that we saw in the Philippines. Its streets are shaded with immense coconut palms, and the surrounding country for some miles around is covered with coconut orchards. In the city, almost every stage in the preparation of coconuts may be observed, but it is all carried on by native methods without the use of modern machinery.

The coconut orchards are usually planted in regular rows, and the trees may be eighty feet tall. Most of them show some crook or defect in the stem, the result of some typhoon in the past, and a few of them are actually prostrate at the base. The terminal portion which grew since the typhoon is, of course, erect. None of the orchards is carefully tended or kept free from weeds, as would be done under American or European control, and in some of them the jungle of weeds is higher than one's head. On the sides of the trunk a small epiphytic orchid is abundant. Many of the trunks have been hacked with a bolo, probably under the superstition that their productivity is increased by such treatment, and such scars are usually overgrown with lichens. Some of them produce nuts which are completely filled with endosperm, without the usual hollow center filled with milk. These trees, when known, are usually marked with some distinctive sign. To facilitate picking the ripe fruit, pairs of bamboo poles are frequently lashed from the

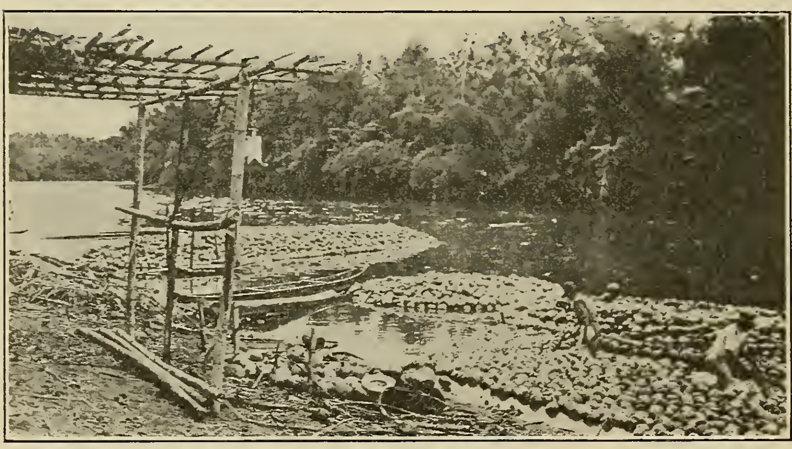

FIG. 8. Unloading coconut rafts on the Pagsanjan River, Philippine Islands.

top of one tree to the top of the next, about three feet apart, and the pickers travel across on them without having to return to the ground.

Immense quantities of coconuts are exported by steamer down the river and across the lake to Manila. Most of these are brought into Pagsanjan by raft. Long slender bamboos are tied or spliced into a huge circular or oval frame, floating on the river. To it is tied a circle of coconuts, still in the husk, and the interior of the frame is then filled up and piled high with others. Such a raft may be up to fifty feet long by half as wide, and will contain some thousands of nuts.

In the city a copra mill may be easily located by the rank pungent odor. They are all crudely built shacks, situated by preference on a hillside. Inside the mill, the operator sits on a tool shaped something like a child's hobby horse, but armed with a sharp spike for the head. After the nut is removed from the husk, it is split open and the kernel removed upon this spike with astonishing deftness. The husk is used for coconut fiber, and the shell for fuel. Under the mill is a stone-walled pit, and the floor above it is covered with strips of bamboo. On this the kernels are spread, the fire of shells built in the pit below, and the smoke and heat dry the kernels into copra. A great deal of this is exported directly, but in some mills there are also primitive oil presses. These consist of a large split log and a trough beneath. Copra is placed between these logs, pressure is applied by huge hand screws, and the oil drips out into the trough.

Along the city street, one sees everywhere piles of coconuts, of husks, of shells for fuel, of seedlings waiting to be transplanted. Coconut trunks are used for building, and the poorer houses have their sides and roof of coconut thatch. Even the prevailing street game of the children, something like hop-scotch, is played with a coconut shell.

The trip from Pagsanjan to the gorge is made by the native bancas up the river. For a considerable distance its exceedingly rapid current is confined within vertical walls several hundred feet high, and at the upper end of the gorge are some very picturesque falls. The sides of this gorge are clothed with a dense mat of climbers, epiphytes, and rock plants. Fig trees attach themselves as epiphytes on the cliff, and send their roots down to the water's edge. Other epiphytes attach themselves to the figs. Palms and tree ferns establish themselves in the tangle. Aroids grow in vertical strips under the smaller falls, where they are constantly drenched by the spray. Thickets of a willow-like *Eugenia* grow on the gravel bars near the river. All combine to present a most varied and interesting display of tropical vegetation, whose quiet colors and motionless foliage are in sharp contrast to the turbulent waters of the stream.

It is only about twenty miles across country in a direct line from Los Banos to the famous Taal volcano, whose eruption in January, 1911, caused the loss of fifteen hundred lives and the destruction of an immense amount of property. The volcano is situated on a small island in the center of a lake. Since the original vegetation was almost entirely destroyed by the eruption,* the island offers an interesting opportunity to observe the reëstablishment of vegetation, under conditions somewhat similar to those on Krakatoa.

It will be remembered that Krakatoa, whose vegetation has attracted so much attention during the last thirty years, is

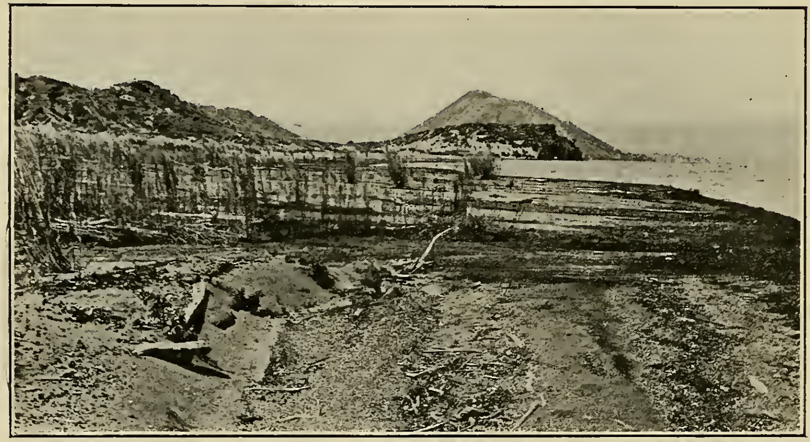

FIG. 9. Shore of Lake Bombon on Taal Island, Philippine Islands, with *Phragmites Karka* and *Ipomoea pes-caprae.*

located off the west coast of Java, surrounded on all sides by salt water, and separated from the mainland by a considerable distance. Naturally the immigration of vegetation must go on more slowly under such circumstances. From Taal to the mainland, the width of open water is in no place more than four miles, so that wind-borne seeds can be readily carried.

Desiring to observe the condition of vegetation there after nearly three years development, we started on October 24 from

* For a graphic description of the eruption, with illustrations of the volcano in action, see the article by Worcester, in the National Geographic Magazine for April, 1912.

Los Banos to Tanauan by rail. The party consisted of four Americans and about twenty Filipino students of the College of Agriculture. From Tanauan the Americans started by carromata toward the shore of the lake. The roads were exceedingly rough, and in places almost impassable, so that the carromatas had to be abandoned when about halfway to Bombon Lake, and the rest of the trip was made by horseback. Even then, the students who walked reached the lake well ahead of us.

It was too late to get boats to Volcano Island after our arrival, and there are no accommodations whatever for strangers in the little village of Banadero, on the shore of the lake. The students took refuge in the houses of the natives, while the four Americans climbed to the flat roof of the Seismological Observatory, and spent the night rolled in their blankets under the stars.

The shore of Bombon Lake is bordered by mountains or high hills on every side, except at the northeast in the direction of Tanauan. Here there is a gradual slope to a table land estimated at five hundred feet above the lake. At the north of the lake is a high plateau with steep southern escarpment facing the lake. The crest is mostly covered with forest and cogon, and the sparse cultivation is confined to the foothills. At the south, on the east side of the lake, stands Mt. Macolod, with its western face almost vertical for about a thousand feet. There are some other precipitous islands and headlands in the same vicinity, covered with scattered groves and much cogon, and seemingly connected with the general table land to the east. Volcano Island, examined through the field glasses from a distance of five miles, showed a very sparse vegetation and great areas of bare yellow-brown volcanic ash. Its surface is rolling, with several isolated peaks, but culminates in the volcanic peak proper, around which the rim of the broad crater reaches heights of a thousand feet.

The shore of the lake is composed principally of black volcanic sand, and the principal vegetation is a mixed association of the creeping morning glory, *Ipomoea pes-caprae*, and the legume *Canavalia lineata*. These plants cover the sand with their long prostrate stems, and their erect leaves are on petioles nearly a foot long. The flowers of both are partially hidden beneath the foliage. *Ipomoea pes-caprae* has simple leaves, while those of *Canavalia* are compound. The leaflets of the latter, however, resemble whole leaves of the former so closely in shape, size, and venation, that we walked through the mats for some minutes before we observed that there was a second species at all. It made a most striking illustration of the frequent tendency of unallied species of the same association to present the same vegetative form.

Back of the beach proper, the flat meadows are thickly sprinkled with small rocks of remarkably uniform size, all probably deposited there during some eruption of the volcano. Most of them are heavy black lava, some with a mixture of a red iron compound, but there are some of pumice as well. Thickets of *Acacia Farnesiana* were coming up freely over these meadows. Along the paths and at the base of the low hills were mixed thickets of numerous species.

A small stream which entered the lake here is bordered by numerous plants of a tall aroid, apparently an *Alocasia*. Its broad triangular leaves are a yard long, and clustered at the summit of an erect caudex three or four feet high and ten inches in diameter. The plants nearest the stream were being undermined by the meandering of the current, and plants still alive may occasionally be washed down stream and into Bombon Lake. One such plant was seen on the lake shore, still alive and apparently in good condition, and there is no reason why the species should not sometimes reach the shore of the volcanic island and colonize there.

There was considerable delay in arranging for our transportation by water across to the volcano. Part of that may be attributed to the general habit of procrastination of the Filipino, part to the difficulty of making our wants known, and part to superstition. No one would venture on such a trip until after the Americans had started. With us and our cargadores, or carriers, on the way, the students followed very quickly. The native boat, or banca, is a dug-out, with single or double outriggers of bamboo. It is very narrow, not exceeding twenty inches, and of about the same depth. The boatmen use paddles or oars, in the latter case using their toes for an oar-lock, or run up a sail when the wind is favorable. They apparently have no knowledge of tacking across or against the wind. Outriggers make the boat ride with extreme steadiness, and prevent capsizing absolutely. In fact, the bamboo outrigger, with its hollow internodes, might be regarded as the forerunner of the watertight compartment of the modern ocean liner. Such a rigging certainly makes the banca safe, and must be very valuable in stormy weather, but in a moderate wind it is uncomfortable. The banca refuses completely to rise with the waves,

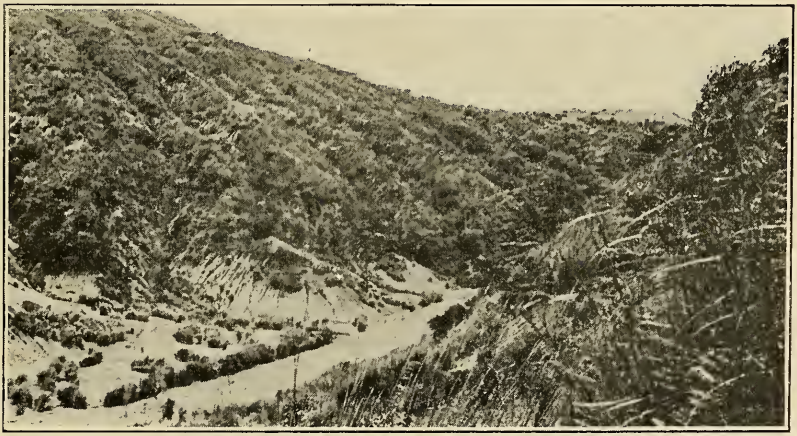

FIG. 10. A newly-formed ravine on Taal volcano, Philippine Islands, showing the dense growth of cogon grass.

but ploughs straight through them. Every little wave comes over the bow or gunwales and drenches the occupants. On our return trip, against a stiff breeze, one boatmen was constantly employed bailing, and the passengers were completely soaked.

As we approached the volcano, the north shore of the island was seen to be bordered by numerous islets of various sizes, from mere rocks to others of several acres. The distance of these from the volcano certainly sheltered their vegetation somewhat during the recent eruption. Also the deposit of ash was less, and the distance to the mainland is much shorter. All of these conditions contribute to a more luxuriant type of vegetation They are covered chiefly with cogon, with small thickets of shrubbery in a few places. Of especial interest were several clumps of bamboo, not only near the shore, but also back some distance inland, and a single clump of banana. Both of these species are intimately associated with man and are seldom or never seen away from cultivation. Since the government now forbids settlements on the island, we considered these two species as relics antedating the eruption.

Our boats passed between several of these outlying islets, and finally landed on a broad flat beach of volcanic ash. This was entirely of deltal origin, and was composed of material washed down from the hills behind. At either side of the delta, the hills came to the water's edge, and were densely covered by cogon grass. We had scarcely landed before some of the boys set fire to it, and the flames ran up the hill with a great crackling. Firing the cogon seems to be a common practice, and of course effectually prevents the establishment of the forest.

Most of the delta was without vegetation. In the moist spots were green algae, and loose patches of the tall reed, *Phragmites karka*. There were a few mats of *Ipomoea pes-caprae*, a few shrubs of *Acacia Farnesiana*, a few tufts of cogon grass, a single plant of the yellow-flowered composite *Wedelia biflora*, and plenty of small driftwood. The latter was found far enough up the delta to prove its insular origin, although *Ipomoea*, *Wedelia*, and *Acacia* have probably reached the island by water. Near the upper end of the delta was a single small plant of an *Amorphophallus*, its stem about sixteen inches high, and much too small comparatively for its large underground parts. We believed that it had persisted through the eruption, and had later washed down to the delta and established itself there.

This delta was the deposit from an immense ravine which entered it from the south and which had its inception high up on the outer wall of the volcano proper. We turned inland along the side or crest of its west wall twoard the crater. During the first part of the way, the vegetation was a dense growth of healthy cogon, forming close jungles much higher than one's head. *Saccharum* and *Imperata* were both present, and with them occasionally another unidentified species which closely resembled in vegetative habit the American *Andropogon furcatus*. One outlying promontory of the island was occupied chiefly by this, with an effect much like that of the bunch-grass association of the prairie states. Mixed with the dense cogon were scattered shrubs of various species. Commonest among them by all odds was *Acacia Farnesiana*, sometimes well loaded with pods. Among the other less common species were a *Cissus*, *Tabernaemontana* sp., *Cordia myxa*, *Desmodium tenellum*, an *Indigofera*, and a gourd with warty, orange, melon-like fruits five inches in diameter. The size and age of all these was such that they seemed to be recent introductions since the eruption.

As we gradually ascended the sides of the mountain and penetrated farther inland, the vegetation became more and more sparse. This decrease seemed to be correlated with the proximity of the crater, rather than with the altitude. The cogon began to disappear first from the crests of the ridges, then from the bottoms, until half way to the crater it occupied only the smaller ravines, which it colonized in long strips. The last ascent of the crater was considerably steeper, and here the cogon disappeared entirely, exposing hundreds of acres of perfectly bare yellow-brown ash.

With the torrential tropical rains, and with a loose soil of ash entirely unprotected by vegetation, the rapidity of erosion is very great. It has resulted in the working out within three years of a most elaborate system. Every feature of erosive activity and result taught by physiography may be observed within a very little distance, from stream piracy to meandering, and viewed from the summit of the mountain the surface of the island looks like a physiographic model.

Because of the great relief, the erosion is at first chiefly in depth, and results in a narrow canyon with vertical walls and flat bottom. One may find such a canyon a foot wide and a foot deep, and by stepping into it and following it to the lake, observe its whole history. It becomes rapidly deeper, while preserving its vertical sides, and an obstruction or hard stratum in the ash may be followed by a vertical drop of several feet. At such places it is narrowed in proportion, and we passed through canyons where it was necessary to walk sidewise, while the canyon walls were twenty feet high on either side. As the canyon approaches base level, its curving sides and the location of gravel deposits in the bottom, show that it has begun to meander. At this stage, the canyon which we explored was two hundred feet wide at the bottom, and the vertical sides were at least a hundred feet high. Exit from such a canyon is impossible, and the explorer must follow it to one end or the other.

The rim of the crater is exceedingly narrow. The inner wall is quite precipitous, of rough rocks in contorted strata, while the outer is also very steep. The two meet at such a sharp angle that one must watch every step. The crater is about a mile and a half across, and the crater lake at the bottom over half a mile in diameter. With some difficulty we made our way to the bottom, finding the whole interior of the crater absolutely without vegetation, and with an odor strongly suggestive of a chemical laboratory. The temperature of the water in the lake was about blood heat, or a little warmer, while that of the air was certainly not much less.

Dr. Gates has prepared a careful description of the vegetation of the island, which gives a much fuller account than possible here. In general it may be said, that practically all of the vegetation has colonized on the island after the eruption, that the chemical nature of the ash and the proximity of the mainland has permitted a more rapid development than on Krakatoa, where the fixation of atmospheric nitrogen seemed to be a prerequisite, and that wind has been the chief agent in the immigration. With the proximity of Taal to botanical centers at Los Banos and Manila and its comparative accessibility, it should be observed at frequent intervals, and should offer interesting conclusions concerning the post-volcanic development of vegetation.

The natives have a superstition that the eruption was caused by an old man who lived in the crater lake, and who was very averse to noise. Since the villagers on the island made too much noise to suit him, he destroyed them by way of punishment. The boatmen with us kept very quiet while on the island, and never left the landing place. The students were also rather subdued, and only one of them had the courage to climb into the volcano, my cargadore Elvina. When we returned and met the other students at the landing place, Elvina reported that the old man had risen up from the lake, and had talked

FIG. 11. The last outposts of cogon on the upper slopes of Taal volcano, Philippine Islancs.

with the Americanos, a story which seemed to add considerably to the respect of the boatmen for us.

We returned to Banadero in the evening, spent another night on the observatory roof, walked to Tanuan in the morning, and returned to Los Banos by rail.

(To be continued.)

SHORTER NOTES

A LETTER FROM GREENLAND.—"Just a message from this land of Thule, as the Danes call the unglaciated tract about Wolstenholme Sound, where I am studying the plants, rocks, and birds this summer, the guest of the Danish explorer Knud

Rasmussen who has a station here,—though he is an absent host, having gone to Denmark to arrange for bringing back to his home museum the great meteorite which I examined for him at Melville Bay last winter.

It is snowing here to-day, and sledging is still expedient though hardly safe. Nevertheless, summer has come to the Northland. The big gold and black bumblebee is a-buzz over the catkins of our diminutive willow trees; the royal purple *Saxifraga oppositifolia* is a-blossom among the snow-drifts, wherever a gravel bank is exposed and the golden poppy is coming into blossom along with *Draba hirta* and *alpina*, *Oxyria digyna*, *Cochlearia officinalis*, *Ranunculus nivalis?*, *Pedicularis arctica*, *Potentilla pulchella*, *Mertillus* sp., *Dryas integrifolia* and a number of others. The snow-bunting sings his blithe lark-like song all day long and the ptarmigan is nesting on the hills. All day long the sun circles the sky. It is summer in Thule!

W. Elmer Ekblaw*

Etah, N. Greenland,
June 30, 1914

Wild Flower Preservation Society of America

The Chicago Chapter of the Wild Flower Preservation Society of America has leased a natural tract of land near the city as a permanent reserve for the native plants of the southern Lake Michigan region. In this tract the chapter will safeguard the species naturally growing there; bring in all those species that have been previously lost to the area; and allow all persons to visit and enjoy the wild flowers so long as they refrain from picking them.

The tract is amply extensive. It includes naturally forested land; a deep wooded gulch through which runs a winding stream; high timbered banks and knolls, and a large, characteristic, shifting sand dune. On May 15th, this year, 93 species were found in flower on the tract though the date was too early for the full vernal blooming period.

* Extract from a letter received by Mrs. E. G. Britton which was mailed in Copenhagen, 28 May, 1915. On 19 June a relief ship sailed from Boston to carry supplies to the party of which Mr. Ekblaw is one.—Ed.

The Chicago Chapter has a membership of over 300 adults and a large contingent of junior members. It issues a neat and attractive pin button upon which is depicted, in colors, a leaf and flower of the lotus (*Nelumbium luteum*). The button bears the legend "Help us save the wild-flowers, W. F. P. S." It was designed by Frederick Richardson, the delightful illustrator of children's story books. These buttons are sold to children of the city schools for two cents each, who, on purchasing, become junior members pledged to support the cause.

Charles F. Millspaugh,
President, W. F. P. S. A.

Field Museum of Natural History,
Chicago, Illinois.

REVIEWS

Murrill's Polypores

Three small and compact volumes have recently appeared on the Polyporaceae of North America. These volumes are supplementary to the volume on Northern Polypores which was reviewed in a recent number of Torreya. Each volume, in addition to complete keys, contains descriptions of all of the species known to occur in the region covered in each respective case. The treatment of the Polypores known in different sections of the country in separate volumes is a convenient arrangement since it will enable the worker to locate the species in his own section of the country without being compelled to "wade" through the literature of the species which do not occur in his particular region and, from this point of view, the scheme is a great time-saving device. The three volumes which have recently appeared are as follows:

Southern Polypores*

This volume includes the species known to occur in the United States from North Carolina to Florida and west to Texas.

* Murrill, W. A. Southern Polypores. Pp. i–iv + 66. Privately published. January, 1915. Price in cloth, $1.00 postpaid.

Western Polypores*

Including the species known to occur on the Pacific Coast from California to Alaska.

Tropical Polypores†

Including species known to occur in Mexico, Central America, southern Florida, the West Indies, and the islands between North America and South America.

PROCEEDINGS OF THE CLUB

March 9, 1915

The meeting of March 9, 1915, was held at the American Museum of Natural History. President Harper presided. Twenty-four persons were present.

Professor W. L. Bray gave the lecture of the evening: "Some aspects of the New York State vegetation."

The speaker presented, with explanatory comments, part of a series of slides made from his own and other photographs showing various aspects of the vegetation of the state as determined by or identified with local edaphic conditions.

The point of view or method of treatment, which is to be more fully elaborated in a forthcoming bulletin, will be indicated by the following partial summary furnished by the speaker:

To get a properly magnified conception of the significance of the developmental history of vegetation one should begin by considering the terrain as it lay after the retreat of the last glacial invasion—a terrain naked of vegetation covering and characterized by features incident to glacial action which would profoundly influence the course of a subsequent conquest by vegetation; for example, the general covering of glacial deposits with such special features as moraines, drumlins, etc.; sand deposits upon the Adirondack relief; filled drainage channels such as the Conewango valley and the blocking of the outlet of

* Murrill, W. A. Western Polypores. Pp. i–iv + 36. Privately published. February, 1915. Price in cloth, $1.00 postpaid.

† Murrill, W. A. Tropical Polypores. Pp. i–iv + 113. Privately published. March, 1915. Price in cloth, $1.50 postpaid.

Cayuga Lake (the Montezuma Marsh region); sand plains as at the mouth of the Mohawk and the Saranac, lake filled basins, etc. Contrast this naked terrain with the conditions found by the earliest explorers and colonists. Certainly the greater portion of it was occupied by a type of vegetation which for certain reasons (not to be specified in this summary) is called by some botanists climax vegetation. The sand plains were occupied by approximately pure stands of white pine. A vast amount of filling had taken place in glacial lakes and filled streamways as shown by peat and muck deposits. The effects of plant invasion may well be compared with the effects of glacial invasion so far as concerns the building up of a covering upon the terrain.

Developmental aspects of the vegetation may be studied at the present time. These studies throw light upon the course of events broadly indicated in the foregoing paragraph.

1. What may be called the hydrarch succession of vegetation (the filling of glacial lakes, of filled or blocked drainage channels and of tide marsh flats) has not been completed or carried to a climax stage. Successive stages recognized and more or less thoroughly studied by different botanists in this and other states described as to general distribution and conditions in New York State. Two courses of development stand out especially: (1) the normal sequence from submerged aquatics through marsh meadow to swamp forest coincident with more or less complete aeration (oxygenation) of the substratum and consequent freedom from (presumably) toxic substances. (2) The bog sequence coincident with imperfect drainage and oxygenation and the (presumed) consequent accumulation of toxic substances or at any rate of conditions resulting in great dwarfing even of the specially resistent bog species (e.g., black spruce, *Chamaedaphne*, etc.), and attended apparently at times with an almost complete check of vegetation development (e.g., Bean Pond near Cranberry Lake).

2. What may be called the xerarch succession of vegetation (upon naked rock, large boulders, sand deltas, etc.) which although they may have reached the climax stage in some cases,

have by human interference been brought back to or near the starting point. In this connecction, some studies have been made upon the stony summit of Dibble Mountain in the Catskills and upon certain burned areas in the Adirondacks. The sand barren vegetation of the Plattsburgh, Schenectady, Carthage and Oneida Lake districts is considered in this connection. The so-called "plains" on the Oswegatchie south of Wanakena are to be regarded as a heath-like aspect of sand barren vegetation. The suggestion is ventured that the abandoned or deteriorated hill farms of Broome, Delaware and other counties of southern New York with their covering of *Polytrichum* fern or *Comptonia* are in effect heath-like aspects of vegetation brought about first by the removal of the climax forest and its humus ground cover and secondly by the method of farming and the resulting puddled or acid soils. That is to say they are a feature of xerarch succession which might be supposed to culminate again ultimately in the climax forest type which within fifty or a hundred years occupied those hill lands.

Adjournment followed.

B. O. Dodge,
Secretary

March 31, 1915

The meeting of March 31, 1915, was held in the morphological laboratory of the New York Botanical Garden at 3:30 P.M., with President Harper in the chair. Twenty-five persons were present.

The minutes of the meeting of February 24 were read and approved.

Dr. M. A. Graham, 127 Kensington Avenue, Jersey Heights, N. J.; Miss Olga Hinsberg, 1285 Hoe Avenue, New York City, and Mr. E. C. Wurzlow, Houma, Louisiana, were elected to membership.

The Chairman of the Budget Committee presented a report summarizing the budget proposed for the current year, which was adopted.

A paper on "The Slime Moulds" was presented by Dr. Edgar W. Olive, of the Brooklyn Botanic Garden. The group was regarded as comprising two classes, the Acrasieae and the Myxomycetes, the Plasmodiophorales being excluded.

The seven genera of the Acrasieae were described in some detail, and the work of Van Tieghem, Brefeld and others was reviewed. Following the glimpse at the historical side of our knowledge of the group, the main features of the two more or less distinct stages, the vegetative and the fructifying, were briefly summarized, The formation and structure of pseudoplasmodium, as well as the peculiar method of formation of the cellulose stalk, were especially emphasized.

In the treatment of the Myxomycetes, representative herbarium specimens were shown, illustrating various types of fructifications. The early treatment of the Myxomycetes by Sachs, the contentions of Prowazek, Jahn, Kränzlin, and others, as to nuclear fusions were briefly reviewed, as well as the work of Strasburger, Harper and Dodge, and Bisby on the formation of capillitial threads.

Dr. Marshall A. Howe exhibited cystocarpic and a tetrasporic specimens of *Dumontia filiformis* (Huds.) G ev. from South Harpswell, Maine, at which locality this red alga has been collected by Miss Grace Dunn, of Johns Hopkins University, in the late spring and early summer of 1913 and 1914. This genus and species occurs on the northern shores of Europe and in Alaska, but no published record of its existence on the Atlantic coast of North America seems to have been made. However, a letter from Mr. F. S. Collins states that sterile specimens were collected near Kittery, Maine, by Professor Roland Thaxter in the spring of 1914.

Dr. Howe exhibited also living specimens of *Corsinia marchantioides* Raddi from the vicinity of Austin, Texas, where it was collected recently by Dr. F. McAllister, of the University of Texas. This monotypic genus is of special morphologic interest as one of the simplest representatives of the family Marchantiaceae. It has been best known from the Mediterranean region of Europe, though its existence in Louisiana was reported by Rev. A. B. Langlois in 1887. But there had been no American specimens of it in the larger American collections of Hepaticae.

Adjournment followed.

Marshall A. Howe,
Secretary pro tem.

NEWS ITEMS

Volume 14, number 3 of the *Memoirs* of the club, consisting of a paper by Dr. A. H. Chivers, of Dartmouth, on a monograph of the genera *Chaetomium* and *Asotricha* has been recently issued.

Dr. H. J. Banker announces a change of address from De Pauw University, Greencastle, Ind., to Eugenics Record Office, Cold Spring Harbor, Long Island, N. Y.

" Dr. E. W. Sinnott, of the Bussey Institution, has been appointed professor of botany and genetics at the Connecticut Agricultural College to succeed Professor A. F. Blakeslee."

The Torrey Botanical Club

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THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR

JOHN TORREY, 1796–1873

CONTENTS

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NORMAN TAYLOR
Brooklyn Botanic Garden
Brooklyn, N. Y

TORREYA

August, 1915.

Vol. 15 No. 8

BOTANICAL SKETCHES FROM THE ASIATIC TROPICS

By Henry Allan Gleason

(Continued from July Torreya)

III. JAVA

The steamers of the Dutch lines ply directly between Europe and Java, but the ordinary way by which the tourist reaches that island is from Singapore. The short trip is itself interesting, because at almost all times the vessel is in sight of some mountainous island, and through the field glasses one may get glimpses of the tropical vegetation along shore. On the second morning, the great mass of the Gedeh volcano suddenly appears in the sky to the southward, and a few hours later the steamer is in the harbor of Tanjong Priok.

This place is the seaport of Batavia, the largest city of the island, located some six miles inland, and connected with its port by rail. The old city of Batavia is now completely merged with the new city of Weltevreden, recently built by the Dutch. The newer part has broad streets, immense public squares, and several government buildings. It gives one the impression of having been patterned, in some degree, after the city of Washington, without having attained either the beauty or the dignity of our own city.

The through trains, which traverse the entire length of the island, start at Batavia, pass through Weltevreden, and then run inland to and beyond Buitenzorg. The ride of forty miles to the latter city is extremely interesting, and one almost re-

[No. 7, Vol. 15, of Torreya, comprising pp. 139–160, issued 12 August, 1915.]

grets that it is ended so soon. Always on one side or the other of the train, and sometimes on both sides, huge forested mountains are in view. The gently-rolling valley land along which the train passes is intensively cultivated and very densely populated. The villages are shaded by slender betel palms, heavy sugar palms, tall coconuts, and huge spreading trees of durian, rambutan, and mangosteen, so that only the marginal houses are visible. So dense is the population that the train is hardly out of one village before it enters another, and their groves of fruit trees and palms blend at a little distance so that the whole country appears one vast forest. But for forty miles not a bit

FIG. 12. *Parkia intermedia* as seen from the railway between Batavia and Buitenzorg, Java.

of real forest is passed, and one can easily understand the fact that the whole island is under cultivation up to an altitude of five thousand feet. To see the tropical forest in Java, one must visit the forest reserves, or must climb high up into the mountains, where the cooler climate makes ordinary tropical agriculture impossible.

Between the villages there are extensive rice fields, or *sawahs*, rising one above the other in countless terraces, with a stream of muddy water flowing away from them beneath. At the edge of the fields one sees rows of kapok trees (*Ceiba pentandra*), with their horizontally spreading branches, and the immense elm-like trees of *Parkia intermedia*.

Buitenzorg, the site of the famous botanical garden, is a city of some thirty thousand people, of whom nearly three thousand are Europeans. The great garden is widely advertised as an attraction to tourists, and consequently the city contains two or three good hotels. One of these, the Bellevue, is located at a corner of the garden, and has been the temporary home of scores of botanists. From the rear of the Bellevue one gets a charming view of tropical scenery. At the foot of a hill run the dark brown waters of the Tji Sadane. Across it a forest of palms and fruit trees conceals the streets of the old city, and in the background rise the forested slopes of the huge volcano Salak.

The newer part of the city is laid off with wide and regular streets, and built up with houses and shops of a curious blend of Dutch and Javanese architecture. The native part of the city bears the old Javanese name of Bogor, which is seen in its Latinized form in the title of various botanical works. It is a maze of crooked, cobble-stoned streets, seldom more than ten feet wide, and frequently only three or four, thickly lined with the small native houses, and the whole is so hidden beneath a wilderness of trees that it looks like a part of the original forest itself. These smaller lanes are of course travelled only by pedestrians, but the wider macadamized streets are crowded with every sort of transportation, from the coolie with his shoulder pole to the modern automobile.

The streets offer, also, a good exhibition of the botanical products of the region. They are lined with vendors, squatting on their heels behind a small pile of fruits or vegetables, and thronged with coolies bringing in fresh supplies. The commonest fruit is the rambutan (*Nephelium lappaceum*), which is eaten as freely and as ubiquitously as the peanut in this country. It has a leathery crimson rind, armed with numerous soft thorn-like projections, surrounding an interior which is plum-like in both appearance and taste. The closely related pulasan (*Nephelium mutabile*) is also commonly seen, in which the thorns are replaced by obtuse rounded wart-like projections. Other common fruits are the dark rusty-brown sawa Manila (*Achras Sapota*), the nanas or pineapple, the dark-purple, spherical mangosteen (*Garcinia mangostana*), the dull-green, heavy, thorny durian (*Durio zibethinus*), the yellow-green duka (*Lansium domesticum*), the mango (*Mangifera indica*) in many varieties, and a score of less important species. The tourist, especially if he is of a botanical turn of mind, samples all of these, and invariably selects the mangosteen as the choicest one of the lot. The fruit is the size of a small orange, and has an interior similarly divided into five to seven segments. The rind is thick, red within, with a yellow milky juice, and unpleasant to taste. Some of the segments bear a single large seed, but in most of them the seeds are abortive. The taste seems to unite something of the flavors of pineapple, strawberry, and peach.

The natives themselves appear to relish the durian next to the rambutan. In fact, the chief reason for the popularity of the latter is probably its cheapness, since one can purchase a bunch of twenty for less than a penny of American money, while a single durian costs two cents. The durian fruit is the size of a large grape-fruit, somewhat ellipsoidal in shape, and densely covered with extremely stout and sharp conical thorns. Considering that a single fruit weighs two pounds or more, and grows on a tall tree, one can understand that there might be serious consequences if a fruit should fall from a tree on some unlucky passer-by. Near the railway station a huge durian tree, loaded with fruit, overhung the street, and we never passed under it without a little apprehension.

Inside the heavy outer rind, a durian contains five compartments, each with a single seed embedded in a white pulpy aril. Five natives generally club together to purchase and eat a durian, and such groups are frequently seen squatting at the roadside. They seem to relish it for its food value rather than its flavor, which has been both praised and maligned by travellers. Its notorious and unsavory odor is not very apparent in a single specimen, but a pile of a hundred or so, in front of a *toko* for sale, may be apprehended by the nostrils from a considerable distance. The flavor of the custard-like pulp may be compared to ice-cream flavored with onions. The thorny rind, by the way, seems to be the only object upon which the barefoot natives can not walk with impunity.

Besides the fruits, the botanist is always interested in the numerous kinds of vegetables or other plant products offered for sale, sometimes along the streets, but in greater variety in the large public market. There are huge corms of taro (*Colocasia antiquorum*), bread-fruit (*Artocarpus incisa*) and jack-fruit (*A. integrifolia*) of all shapes and sizes, djahe, the large rhizome of the zingiberaceous *Alpinia galanga*, kunjir, the small rhizome of *Curcuma longa*, hondje, a huge zingiberaceous fruit, bamboo sprouts, yams, sweet potatoes, pods of the legume *Parkia intermedia*, manihot roots, strings of betel nuts, neat bunches of sirih leaves (*Piper Betle*), and naturally a wide variety of plantains and bananas.

Neither is the use of these various tropical plants confined to the natives. The vegetable stews served at *rijsttafel* at the hotel always contained some fresh surprise, which was identified, if at all, only with considerable difficulty. We found bread-fruit seeds, palm pith and palm cabbage, ginger roots, various sorts of unknown leaves, and even the fruits of Gnetum.

One can not appreciate the luxuriant vegetation of the botanical garden without some knowledge of the climate. Probably in no other place is there a climate of greater uniformity. From the coldest month to the warmest month, the mean temperature varies only a couple of degrees. At night, the minimum temperature is about 70°; in the middle of the day, the maximum rises to about 90°. The rainfall, amounting to about 180 inches in the year, shows a slight distinction of wet and dry seasons, but so slight is it that it makes no appreciable difference in the vegetable life.

Day after day goes by in Buitenzorg with exactly the same weather. The mornings begin clear and cool, but the steamy air rapidly grows warmer, until by noon it is uncomfortably hot. All morning, also, the clouds have been gathering around the summit of the Salak, or the even larger Gedeh, and descending in increasing numbers into the valley. About two o'clock the storm breaks, and for a couple of hours the rain falls in torrents. Europeans and Americans pass the time by taking their daily siesta, and traffic on the streets ceases almost completely. By six o'clock the rain is over, the sun sets in a blaze of glory, and there follows an evening of delicious balminess which can not be surpassed. At this time the Tji Liwoeng, the river which flows through the garden, is a torrent of brown water, but by next morning it has shrunk to an insignificant stream, and one can cross it almost anywhere on the boulders in its channel.

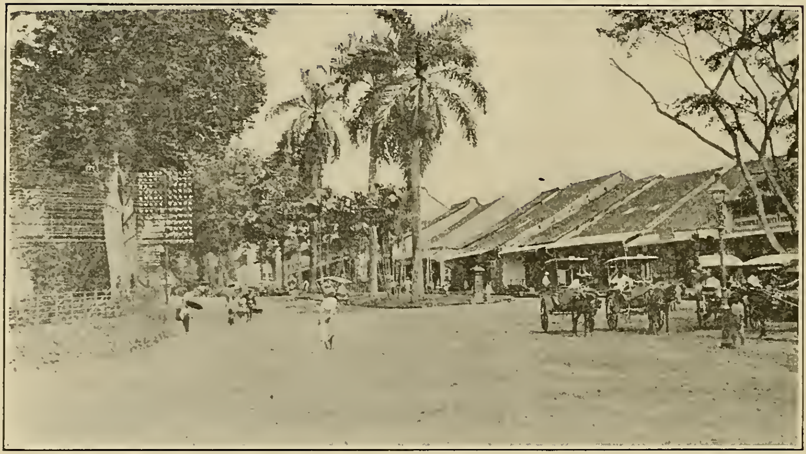

FIG. 13. The Groote Weg in Buitenzorg. The corner of the botanical garden appears at the left.

The efficiency of the Javan stream systems in carrying off the huge daily rainfall is indeed remarkable.

The great botanical garden is of course the center of interest in Buitenzorg. It lies along the Groote Weg, or main street through the city, and occupies almost 160 acres of ground. It is fairly compact in shape, but is divided naturally into three distinct parts, each of different age. The largest part, nearest the main street, represents the old garden, and is in the highest state of cultivation. It is bounded on its farther, or eastern side by a part of the Tji Liwoeng. Over the stream lies the Island, more recently added to the garden, and still showing signs of newness. Beyond the second channel of the river, and therefore on the mainland again, lies a sort of experimental garden, called by the Dutch the Proeftuin. These three portions are all connected by bridges across the river, but the main entrances to the garden are all from the Groote Weg, and therefore into the main portion of it. North of this, and scarcely separated from it, is the palace of the governor-general, with a deer park behind it.

The visitor's first view of the garden is from the Groote Weg, as he drives from the railway station out to the hotel. On one side of the street is an iron fence, and over the fence ostensibly a forest. If it were not for the frequent walks through the tangle of vegetation, or the glimpses of labels at the base of trees, he might easily suppose it was a forest. Because, it must be known, a botanical garden in these tropical lowlands is entirely different from one in America. There is almost no attempt to secure the long vistas, the open grass plots, or other conventions of landscape architecture. Nor should there be, because such effects would be as completely out of harmony with tropical vegetation as they are in harmony with the plant life of the temperate zone. The charm of the garden lies in its marvelous wealth and density of vegetation, and that must be heightened if possible, by plantings in dense masses, by paths disappearing into apparent jungles, by short vistas closed by opaque masses of foliage, and by tree trunks and branches concealed under epiphytes and lianas. So the tourist is pleased by the garden, not for any similarity which it bears to American parks and gardens, but by its remarkable dissimilarity.

For practically a century the garden has been growing in size and in importance. Its growth was suddenly accelerated some forty years ago, when Melchior Treub assumed the directorship, and its present high development is due chiefly to his energy and zeal. Under the present direction of Dr. Konigsberger, to whom the writer is indebted for many courtesies, the scientific policies of Treub are being continued, and even better facilities offered to visiting botanists.

It was Treub who first opened the garden to botanists from other lands, and who built the first laboratory for visitors.

During the thirty-odd years that foreigners have been welcomed, some scores of them have worked there. In fact, most of the leading botanists of Germany and Austria have studied there, as well as many from other European countries. Most of the contributions to our knowledge of tropical morphology, physiology, and ecology have been developed there, and one can even now see still growing some of the actual plants with which Goebel, Haberlandt, or Schimper worked. It is a matter of great regret that more Americans have not used the wonderful opportunities offered at the garden, for we were the ninth and tenth Americans to register our names in the visitors' book at the laboratory.

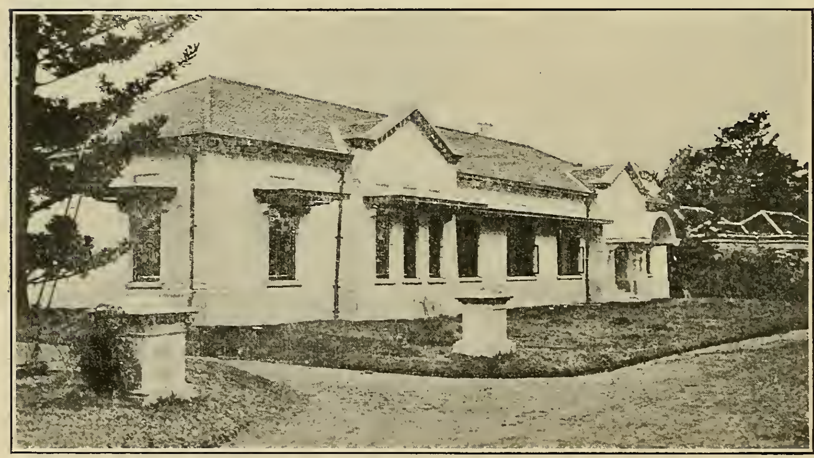

FIG. 14. The new Melchior Treub Laboratory for foreigners at the botanical garden, Buitenzorg, Java.

The buildings of the garden are all at the corner of the Groote Weg, and consequently easily accessible. There are several of them, all one story in height, with tile roofs and white stucco walls. All are small in size, since it is more comfortable to build many small buildings than few larger ones. Some of them are used for experimental work connected with the garden proper or with the Department of Agriculture; some for administration, museums, or work-shops; one is the residence of the director; but only two will be of much interest to the visitor. These are the laboratories for foreigners.

The old laboratory is a very plain rectangular building of one large room. One end of the room is a veranda, with a dark-room opening from it. On one side of the room are windows. The other side and end are wall, covered with shelves and cupboards, but with a door leading to another broad veranda, from which opens the office of the director of the laboratories, Dr. von Faber. Plain laboratory tables face the windows on one side. Larger tables stand in the middle of the room, but to get running water one must go to the veranda. A small bookcase contains a working collection of books, mostly systematic. Microscopes, ordinary apparatus and glassware, and reagents are provided freely. Heavier apparatus is stored in outbuildings near by. Native carpenters or mechanics are always ready to help with the construction of special apparatus. A native servant is in the laboratory, but must be addressed in the Malay language. Plant material is supplied in the greatest profusion upon application to the director. In fact, there seems to be almost no limit to the kind or quantity of plants that the botanist may ask for and receive.

The new Treub laboratory was nearing completion during our stay at the garden, and has since been opened. It is a handsome and commodious building, of the usual one-story tile-roof style, but with high ceilings and plenty of windows. The ends of the rectangular building are occupied by offices, a chemical laboratory, dark-rooms, library, and store-rooms, while the large center is the laboratory proper. It is incompletely divided by partial walls, extending from the sides into the room, into six compartments, three on each side. Each compartment has its own window, and the style of construction assures sufficient isolation to each worker, while not interfering with the free circulation of air.

One misses glass-houses from the garden buildings, but they are of course unnecessary. Their place is taken, in a way, by shade houses, covered with wooden lattice only, and used especially for orchids, ferns, begonias, and other shade-loving species. Of course most of the sixteen thousand species in cultivation grow in the garden with no artificial protection.

It is the plan of the garden to have each species represented by at least two individuals, planted at such a distance from each other that both would not likely be injured at once. Even then several species are lost from the garden each year, but their loss is compensated by the annual arrival of some hundreds of new species, so that the garden shows a steady growth.

It would seem that most of the species are represented by these two individuals only, because very few species attract attention by their abundance. Certain palms, especially the betel, the coconut, and the royal palm, are rather freely planted

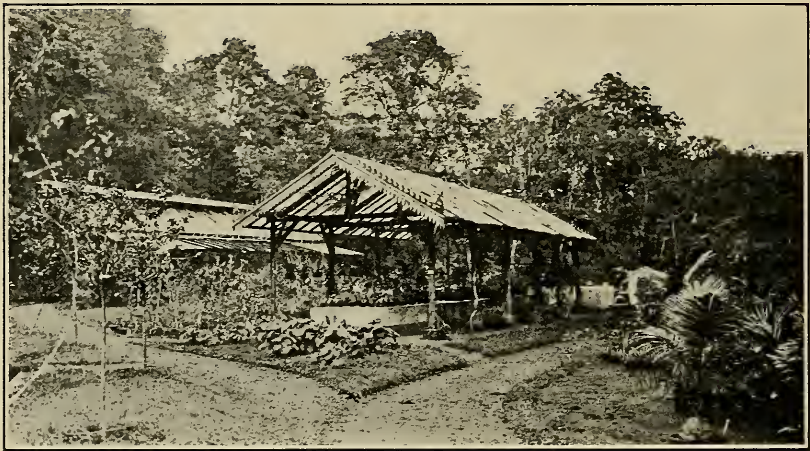

FIG. 15. A shade house in the botanical garden, Buitenzorg, Java.

along the avenues; the canary trees, *Canarium* spp., are planted along both sides of the famous canary avenues; the huge legume *Parkia intermedia*, is rather common; *Ficus indica* and *F. religiosa* are frequent; the giant bignoniad, *Spathodea campanulata*, is planted in many places, and keeps the ground beneath littered with its huge red flowers. But aside from these, which form merely trifling exceptions among the great multitude of plants, the whole garden presents the general effect of endless variety of species.

The main entrance to the garden is through a gateway from the Groote Weg, almost hidden behind the drooping leaves and immense flower clusters of *Amherstia nobilis*. It leads directly to the famous Canary Avenue, one of the chief show places of the garden. The avenue is perfectly straight, about one third of a mile long, well macadamized, and shaded by two rows of immense canary trees, whose elm-like crowns arch over and meet above the road in a continuous canopy of foliage nearly a hundred feet above the driveway. The canary trees themselves are noble in appearance, but the tropical beauty of the avenue is not due to them alone. At the base of every tree leafy lianas have been planted, Fagraeas, Freycinetias, Gnetums, but chiefly

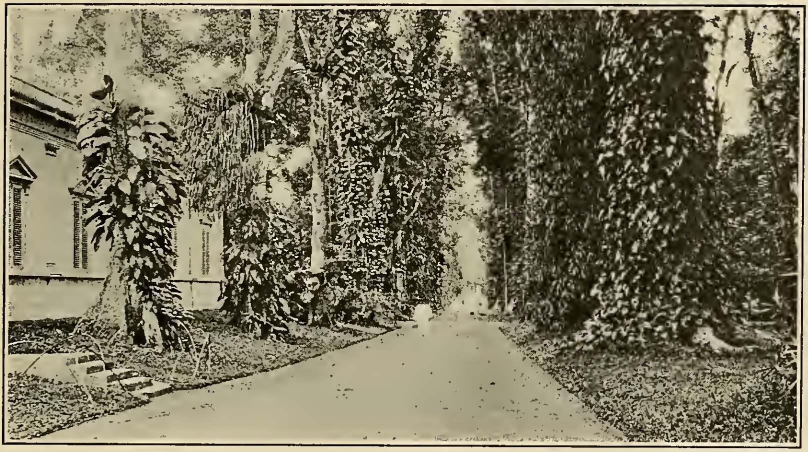

FIG. 16. Canary Avenue from near the main entrance, Buitenzorg. The second tree from the left supports the huge orchid *Grammatophyllum speciosum*.

huge aroids, which completely cover and hide the tree trunks as high as the lower branches. Besides these, hundreds of bird's nest fern (*Asplenium nidus*), and various other epiphytic ferns and orchids have colonized on the branches and trunks, until the avenue has become almost a tropical garden in itself.

Unfortunately the canary trees are rather short-lived, and preparations have already been made to replace this avenue. Another one has been planted running the length of the island and the lianas have already started to climb the trees. By the time the original Canary Avenue has begun to deteriorate, the new one is expected to be at its prime.

From the inner end of Canary Avenue, in front of the palace of the governor-general, a formal avenue of royal palms leads to another gate. From these avenues as a base, other walks and drives extend through the whole garden, always past plants of great botanical interest, but never past any single scene with as much attraction for the ordinary tourist as the famous Canary Avenue.

The botanist can easily spend a whole day along this avenue alone, examining the lianas and epiphytes. Among the aroids, several species of our common greenhouse genus *Philodendron* are planted, as well as various other genera seldom seen in cultivation in America. Few of them have developed the long pendent aërial roots, so frequently seen in the Philippine forest, although they are all root-climbers. In many cases roots have reached the ground from somewhere along the stem, so that the stem itself is no longer essential. The stem of one big *Philodendron*, four inches in diameter, was completely dead and severed from the ground, while for two or three feet the wood was eaten away by termites until only the bark remained. Still a few of these roots reaching the ground were sufficient to keep the plant in a flourishing condition.

From a physiological standpoint at least, there are two kinds of these aërial roots. One serves for holdfasts only, and such roots are diageotropic, or nearly so. If there is any deviation from the horizontal position around the tree-trunk, it is usually upward, making them slightly negatively geotropic. The whole root, even to the extreme tip, is closely appressed to the bark, indicating a strong thigmotropism, although their uniform direct-tion, not influenced by irregularities in the bark, indicates that the thigmotropic response is subordinate to their diageotropism.

The second kind of root is always positively geotropic and sends out absorbent roots if it finally reaches the ground. These roots are also strongly thigmotropic, and two of them may sometimes parallel each other around all sorts of crooks and turns for three or four feet. In this case the thigmotropism seems to outweigh the geotropism, for a root may make abrupt turns to the horizontal, following some ridge of bark, or a holdfast root, to its end, and then again turn downward.

Some species of aroids produce one kind of root, some another, and a few produce both. One species of *Philodendron* produces a geotropic root from each alternate leaf, and, since the leaves are two-ranked, all the roots appear on the same side of the stem, and grow down the tree-trunk in a flat bundle because of their strong thigmotropism. Several of the aroids begin producing geotropic roots at an early stage, which soon aid materially in water-conduction. The upper part of the stem, supplied not

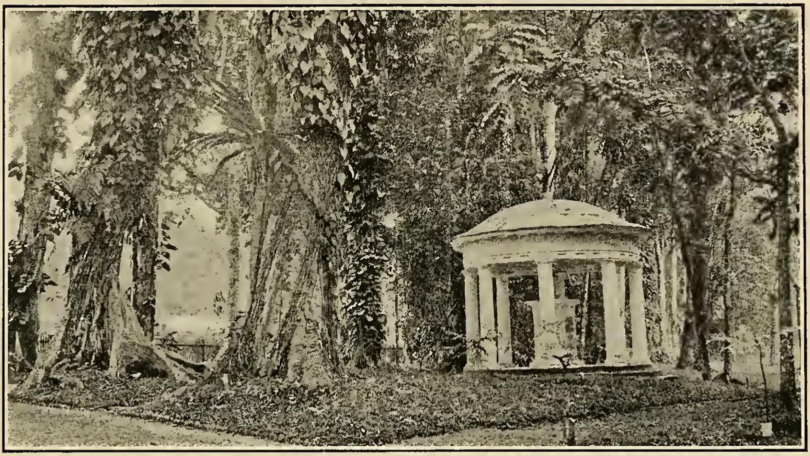

Fig. 17. Lady Raffles' tomb on Canary Avenue, botanical garden, Buitenzorg, Java.*

only from below in the normal fashion, but also from the aerial roots, is larger in diameter, and presents the phenomenon of a stem enlarging upward. None of the Buitenzorg aroids, however, show this peculiarity as well as the Philippine *Rhaphidiophoras*.

At the north end of Canary Avenue is a huge tangle of *Gnetum latifolium*. The trunk is six inches in diameter at base, and

* Lady Raffles was the wife of Sir Thomas Stamford Raffles, an English colonial governor and administrator in Java and Sumatra (1781-1826). *Rafflesia*, one of the most remarkable parasitic plants in the world, was described by Robert Brown in 1821, from plants discovered in 1818 in Sumatra. The flowers are often three feet across.—Ed.

ascends to about sixty feet in many loops and tangles. The leaves remind one greatly of those of *Celastrus scandens*. At other places in the garden are similar immense tangles of Gnetums, which produce a very dense shade. The systematic collection of Gnetums, located on the island, is composed of smaller plants, but includes several different species. Many of them exhibit the racemes of ellipsoidal fruits in various stages of maturity.

At the south end of Canary Avenue, near the main entrance, are several legumes of ecological interest. Plants of *Humboldtia laurifolia* reach a height of about 25 feet, with crooked irregular spreading branches, which at first sight appear diseased. Numerous ants are seen running on the trunk and collected on the branches. They are particularly numerous under the coriaceous appressed stipules, on the younger internodes where there are scale insects, and in and around the racemes, where they appear to be feeding, but upon what could not be ascertained. Their nests are inside the internodes, which are hollow and in the younger twigs somewhat clavate in shape. Here they cut a hole about two mm. in diameter just opposite the leaf. When the internodes become old, hard, and woody, the nests are deserted. The orifice then becomes surrounded with callus, and the whole wound becomes half an inch or more across, producing the general diseased appearance of the tree. It is obviously out of the question to try to draw any new conclusions here concerning the relation of plant and ant, but it may be remarked that when a pencil point or small stick was presented to these ants, they ran away or dropped off the twig completely.

Another legume, *Brownea grandiceps*, has a similar general appearance. Here the large spherical flower buds are covered with ants, although there is nothing apparent for them to feed upon. These ants are fierce, and vigorously attacked the point of a pencil when presented to them.

Various other myrmecophilous plants are frequently seen in the garden. *Acacia sphaerocephala*, with its hollow thorns and food-bodies terminating the leaflets, grows just as described years ago by Belt. Several species of the moraceous shrub *Conocephalus* have lanceolate appressed stipules, up to two inches long, behind which ants make their nests. *Conocephalus* bears its leaves in terminal clusters, and since seldom more than five leaves are in each cluster, the ants must keep moving their nests at short intervals. Species of *Hydnophytum* and *Myrmecodia* are frequently seen, with large swollen tuberous bases, perforated with numerous holes and inhabited by ants. Since these plants are epiphytes, one can easily understand that these swollen bases are organs for water storage rather than definite myrmecophilous adaptations.

(*To be continued*)

A SIMPLE METHOD OF MAKING CARBON LEAF IMPRESSIONS

By E. D. Merrill

With the present development of photography it is usually a very simple matter to photograph any botanical specimen when a graphic representation of a borrowed type, or one examined in some distant herbarium, is desired for future reference. It sometimes happens, however, that it is not always practicable to make photographs, or to have them made, in which case recourse may be had to the simple, rapid, and effective method of making leaf impressions indicated below.

It is quite unnecessary to argue the value of graphic illustrations of plants or parts of plants, for the utility of botanical illustration is everywhere acknowledged. In a surprisingly high percentage of cases the graphic outline of a characteristic leaf of a type or typical specimen is of the very greatest value in supplementing the published description of a species, and in assisting the systematist in future identifications. In some families of plants, notably in the monocotyledons, leaf outlines will prove to be of little value in making ordinary determinations, and the same applies to certain families and genera of dicotyledonous plants. Generally, however, all broad leaved plants are adapted to the method of outlining described below, and carbon rubbings or impressions of such leaves are of the very greatest value in complementing published descriptions, whether such descriptions be brief and imperfect, or whether they be very detailed.

The subject of making leaf impressions or prints is not new, nor does the method described here originate with me, yet I have never seen this particular method described in print. Its utility is so great, and the possibility of its application to other purposes, illustration, for instance, is so evident, that the publication of a short description of the method seems to be warranted. Perhaps the very simplicity of the method explains why it has not previously attracted attention among systematic botanists.

Fig. 1. *Ulmus campestris* L.

The method described by Berry* can be utilized only when leaves can be sacrificed, as his method involves the removal of a leaf from the specimen and the smearing of both surfaces with ink. Manifestly this method should never be used in making prints of the leaves of type specimens, or of other valuable botanical material.

* A method of making leaf prints. Torreya 2: 62–64, 1911.

In December, 1907, I was working at Kew rather laboriously and imperfectly penciling outlines of the leaves of certain types of Philippine plants preserved in the Kew Herbarium, and adding details of venation as well as I was able to do so with the time at my command and with my very slightly developed artistic ability. While thus engaged Mr. N. E. Brown called my attention to a method used by him in making carbon rubbing outlines of aroid leaves. This method he had developed in order to preserve for the Kew Herbarium graphic representations of certain species not represented in the collection by actual specimens. In essentials the method described below does not differ from that used by Mr. Brown, except that where he prepared his own paper by smoking it over a flame, I merely substituted for his home-made carbon paper ordinary typewriter carbon paper that can be secured in all parts of the world.

The leaf selected for outlining is not to be removed from the specimen, but over it, as it lies attached to the stem, and perhaps glued to the herbarium sheet, is placed a sheet of ordinary black carbon paper, medium hard finish, with the carbon surface upward. Over this is placed a piece of rather thin but firm, slightly rough finish, unglazed white paper of good quality. The white paper and the underlying carbon paper should then be held firmly in position over the selected leaf with the one hand, and rubbed with a steady firm pressure with the tips of the first two fingers of the other hand. Great care should be taken that the paper does not slip. The carbon paper will make an exact impression of the leaf, its shape, and even the minute details of its venation, on the lower surface of the white paper. As the rubbing progresses the result can be inspected from time to time, merely by raising the side or end of the white paper, until an impression sufficiently distinct has been secured. These carbon rubbings can be made very quickly, a few seconds sufficing for ordinary leaves, they are very permanent, and they can be made without danger of injuring ordinary botanical specimens. In very thin leaves, such as those of dried specimens of *Begonia*, dried aroid leaves, etc., while the venation is often very distinct to the eye, the veins and reticulations are not sufficiently raised to make strong carbon rubbings. In such cases the lines can readily be strengthened by using a pencil. For purposes of illustration leaves may be outlined by this carbon paper method, the lines inked, and the drawing afterward cleaned up with a soft eraser, with the absolute certainty that the drawing will represent the true outline of the leaf and the details of its venation down to the ultimate reticulation.

FIG. 2. *Platanus orientalis* L.

In herbarium practice I have found these carbon rubbings or impressions to be of the very greatest utility. To illustrate their value I will merely cite a few representative cases. In January, 1908, I made a carbon impression of a single typical leaf of *Bauhinia warburgii* Perk., the type of which is preserved in the Berlin herbarium. This species did not appear in our Philippine collections until the year 1912 or 1913, yet when it did appear I was enabled at once to identify the specimen, merely by direct comparison with my carbon rubbing of a single leaf from the type, and a very brief examination of the printed description.

In the case of *Cynometra warburgii* Harms, a carbon rubbing of two or three leaves of the type enabled me at once to determine the identity of the species when it finally appeared in our Philippine collections, although the second collection of the species was sterile, that is, without flowers and without fruits. While at Berlin the Director of the Museum Královstoví Českého at Prague kindly loaned me a number of types of Philippine plants collected by Haenke, among them four types of *Piper* described by Opiz. Of these types I made carbon impressions of the leaves. These carbon rubbings were later submitted to M. C. DeCandolle with the Philippine specimens of *Piper*, whereupon he was able definitely to place all of them, although in his monograph of the Piperaceae* all were placed under the heading "Species non satis notae." Two species described by Opiz, of which I did not see the types, *Piper haenkeanum* and *Piper rufinerve*, and hence secured no leaf impressions, still remain unrecognizable because of their imperfect original descriptions.†

Carbon rubbings or impressions of leaves not infrequently present details of the venation better than do some photographs, and have the distinct advantage of always showing the leaf the exact size of the original. It is believed that in many cases carbon leaf prints would be a valuable adjunct to actual photographs of types.

The leaf prints can be mounted on herbarium sheets, protected against undue rubbing or smudging by a protective flap of some thin smooth paper, such as onion skin paper, and are thus immediately available for purposes of direct comparison. The original description, and other data, can be copied on the sheet with the leaf impression. From a simple examination of a carbon rubbing of a typical leaf of a type, together with a study of the original description and the examination of additional material from the same general region from which the type came, species that have long been obscure, unknown, or entirely overlooked, can usually be recognized. This applies even in such

* Prodromus 16^1: 235^{65}–471. 1869.

† DeCandolle, C. A Revision of Philippine Piperaceae. Philip. Journ. Sci. 5: Bot. 405–463. 1910.

critical genera as *Eugenia*, *Ficus*, *Quercus*, *Piper*, *Begonia*, etc. With some graphic representation of the type, even if only of a single leaf, a far more accurate conception of the species can be secured than by a most critical study of the description alone.

Certain considerations are essential to success in making carbon leaf impressions. In the first place the paper selected should be of good quality, thin but firm, slightly rough in finish.

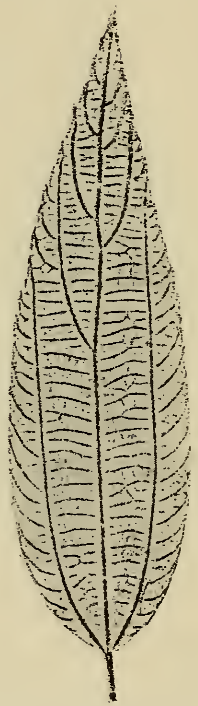

FIG. 3. *Leucosyke capitella* Wedd.

and not glazed. The carbon paper should be of medium hardness; if too hard it is difficult to make clear impressions, and if too soft the finished impression is apt to rub or smudge too easily. A clearer impression will usually result if the finger used in rubbing be first wrapped with a single thickness of a linen or cotton handkerchief, or with a small piece of cotton cloth, the slightly rough surface of the cloth on rubbing over the paper giving a sharper impression than will the naked finger. Likewise sharper outlines as to venation and reticulations will usually be secured if the lower surface of the leaf be selected in preference to the upper. In selecting leaves for outlining care must be taken not to injure the specimen, especially if it is a type. Wrinkled or very brittle leaves should never be selected, and care should be taken to avoid those that are so mounted that they might be broken if rubbed too hard.

About eight years' use of these carbon rubbings or impressions has thoroughly convinced me of their practical utility in herbarium work. Several European botanists to whom I explained the simple method of making the carbon rubbings were at once impressed with the utility and advantages of the method and have adopted it in their regular herbarium work. The advantages of the method are so great, the technique so simple, and the preperation of the impressions or rubbings so rapid, it is believed that rapidity, accuracy, and ease in certain lines of routine herbarium work will be greatly enhanced by the general utilization of this simple method. The illustrations accompanying this paper are reproductions of carbon rubbings or impressions, not at all retouched, prepared by the method described above.

WASHINGTON, D. C.,
July 15, 1915.

REVIEWS

Cowles and Coulter's Spring Flora*

The purpose of this flora, as stated by the authors, is "to provide, especially for young people in high schools, a ready means for the identification of the more common and widespread spring flowering plants." Descriptions are given of 380 plants which flower before July in the North Central and Eastern States and there is a single comprehensive key to the various species treated, based on such characteristics as are readily observable in spring. The work is illustrated by nearly 150 drawings.

As an introductory guide for the identification of the spring flowering plants in the area covered it is difficult to see how this little book can be improved upon. One notes with some surprise,

* Cowles, H. C., and Coulter, J. G. A Spring Flora for High Schools. Pp. 1–144. American Book Co. 1915.

to be sure, the omission of the Orchidaceae, of certain species like *Castalia odorata* and *Castanea dentata*, and of all species of *Rubus* except *R. canadensis*. But, on the whole, speaking from the standpoint of the eastern botanist, the judgment of the authors in the selection of the species to be included is to be highly commended. Some idea as to the usefulness of the book to the eastern student may be deduced from the fact that out of a list of about 150 common spring flowering plants which the reviewer has been accustomed to give his elementary field classes, there are scarcely a dozen which are not to be found in this flora. A few of the species, however, such as *Podophyllum peltatum* and *Claytonia virginica*, which are cited as "common," are certainly not common in southern New England, and of course many species are described which are not found there at all. In this connection the question might be raised whether it might not be worth while, even in a work of this sort, to outline briefly the ranges of species which are more or less restricted in their distribution, as, for example, *Asimina triloba* and *Dodecatheon Meadia.*

It may perhaps be objected by some that in the analytical key too little emphasis has been laid on family relationships. These, however, are clearly brought out in the descriptive part of the text, and to the mind of the reviewer their omission from the key is more than offset by the increased simplicity and lucidness thereby made possible. For, after all, not only to the beginner but to the more advanced student as well, a key primarily is but a means to a definite end, namely, the identification of the specimen in hand, and upon the ease with which such a determination can be made depends very largely its value.

George E. Nichols.

Yale University

PROCEEDINGS OF THE CLUB

April 13, 1915

The meeting of April 13, 1915, was held at the American Museum of Natural History at 8:15 P.M., President Harper presiding. Sixteen persons were present.

The evening's program was a lecture on "Miscellanies of a South African Trip," by Dr. Emmeline Moore.

The lecture was illustrated by numerous lantern-slides and prepared specimens of plants of southern Africa.

Adjournment followed.

B. O. Dodge,
Secretary.

APRIL 28, 1915

The regular meeting of the Club was held in the morphological laboratory of the New York Botanical Garden, April 28, 1915, at 3:30 P.M. President Harper presided. There were fifteen persons present.

The minutes of March 9 and March 13 were approved. Miss Henrietta Lisk, New York City, Dr. Raymond J. Poole, Department of Botany, University of Nebraska, Lincoln, Nebraska, and Mr. H. F. A. Meyer, Syracuse University, Syracuse, N. Y., were nominated for membership.

President Harper presented a request from the librarian at Woods Hole, Mass., for the BULLETIN beginning with vol. 27, to complete their set. The motion made by Dr. Barnhart that the Club grant the request was carried. These volumes to be sent as an exchange for duplicate copies of papers and journals which the library at Woods Hole may have for disposal.

Miss Henrietta Lisk, Dr. R. J. Poole and Mr. H. F. A. Meyer were then elected.

The scientific program consisted of a paper by Dr. O. E. White on "Mendelism."

Adjournment followed.

B. O. Dodge,
Secretary.

MAY 11, 1915

The meeting of May 11, 1915, was held at the American Museum of Natural History at 8:15 P.M. President Harper presided. There were forty-five persons present.

Dr. M. A. Howe gave an illustrated lecture on "The Sea Gardens of Tropical America."

Adjournment followed.

B. O. Dodge,
Secretary.

NEWS ITEMS

Professor F. K. Ravn, professor of plant pathology at the Danish Royal College of Agriculture, who has been travelling and lecturing in the United States as the guest of Government, visited the Brooklyn Botanic Garden on August 13.

Dr. A. F. de Waldheim, director of the Imperial Botanic Garden at Petrograd, has just completed his fiftieth year of scientific and administrative activities. A ceremony in the hall of the herbarium at the garden, with presentation of addresses marked the occasion. Until 1897, when he became director of the garden, Dr. de Waldheim was professor of botany at the University of Warsaw.

Mr. Walter Pitz has been awarded the bronze thesis medal of the Science Club of the University of Wisconsin for his paper on "The effect of elemental sulphur and of calcium sulphate on certain of the higher and lower forms of plant life."

In the *Journal* of the New York Botanical Garden for July a statement of the permanent funds and endowment of the garden shows that the fund is now somewhat more than five hundred thousand dollars, not counting two bequests aggregating $25,000, which are subject to life interests. Besides the general endowment fund, there are eleven other funds devoted to special purposes. The Board of Managers appeal for a total endowment fund of over a million and a half dollars.

Among Cambridge University scientists serving in the British army the following botanists are recorded in *Nature:* R. P. Gregory, E. Hindle, and H. H. Thomas.

From the *Sun* (August 14) we learn that Dr. Otto Appel, the European plant pathologist, who came to the United States more than a year ago at the invitation of this government to aid investigations into diseases which are destroying the potato crops throughout the country, will sail to-day on the steamship Kristianiafjord of the Norwegian Line. He has been working with governmental experts on various plant blights since July, 1914.

The program of the twentieth anniversary celebration of the New York Botanical Garden is, in part, as follows:

MONDAY, SEPTEMBER 6TH.

Registration and inspection of the building in the morning, and in the afternoon, addresses of welcome by the President of the Board of Managers, Dr. W. Gilman Thompson, by the Chairman of the Scientific Directors, Dr. H. H. Rusby, by the Hon. Thomas W. Whittle, Commissioner of Parks for the Bronx, and a History of the New York Botanical Garden by the Director, Dr. N. L. Britton. After an inspection of part of the grounds, dinner will be served at the Rocking Stone Restaurant in the New York Zoological Park, which will also be inspected.

TUESDAY, SEPTEMBER 7TH.

Session for the reading of scientific papers, in the morning under the Chairmanship of Prof. R. A. Harper, in the afternoon under that of Dr. C. Stuart Gager.

WEDNESDAY, SEPTEMBER 8TH.

Salt Water Day on Staten Island, in cooperation with the Staten Island Association of Arts and Sciences.

Lunch at Saurer's Restaurant, followed by study of sand dunes and salt marshes at Crooke's Point.

THURSDAY, SEPTEMBER 9TH.

Session for the reading of scientific papers, in the morning under the chairmanship of Dr. D. T. MacDougal, in the afternoon under that of Dr. W. A. Murrill; followed by an inspection of another part of the grounds after tea at the Mansion. In the evening there will be a smoker at the Faculty Club, Columbia University.

FRIDAY, SEPTEMBER 10TH.

Visit to the pine-barrens at Tom's River, New Jersey, under the guidance of the Field Committee of the Club.

Saturday, September 11th.

Visit to the Brooklyn Botanic Garden in the morning and to a white cedar swamp at Merrick, L. I., in the afternoon.

Visitors will be the guests of the New York Botanical Garden at luncheon on Monday, Tuesday and Thursday, and of the Brooklyn Botanic Garden on Saturday.

The Torrey Botanical Club

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

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A Monthly Journal of Botanical Notes and News

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR

JOHN TORREY, 1796–1873

CONTENTS

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NORMAN TAYLOR
Brooklyn Botanic Garden
Brooklyn, N. Y

TORREYA

September, 1915.

Vol. 15 No. 9

BOTANICAL SKETCHES FROM THE ASIATIC TROPICS

By Henry Allan Gleason

(Continued from August Torreya)

III. JAVA

The numerous walks and drives which branch off from Canary Avenue ramify in so many directions through the botanical garden that it is impossible to get a good impression of the place from a single walk through it. The casual tourist is guided along the main avenues only, and emerges with a confused jumble of impressions, but the botanist will explore all the by-paths, and devote a day or more to each section. Every part of the garden affords opportunity for interesting observations, and some of them are presented below. The order is that in which one might naturally study the garden, beginning at the main entrance, passing east to the Island, crossing again to the Proeftuin, and returning through the farther northern end of the garden to Canary Avenue and the Groote Weg.

Leguminous trees of many species are planted freely throughout the garden, but the chief collection of them is near the main entrance. It includes remarkably few species, for a tropical garden, and the liana forms are all relegated to the Island, with the exception of the famous specimens of *Entada scandens*.

This huge climber has a basal diameter of about a foot. It ascends diagonally through the air about forty feet to a *Parkia* tree, 'and branches in it at a height of about sixty feet. One branch loops down, and, rebranching at a height of ten feet, swings into two trees, distant respectively about sixty and eighty

[No. 8, Vol. 15, of Torreya, comprising pp. 161–186, was issued 30 August, 1915.]

feet. The second main branch goes nearly horizontally into a *Pterocarpus* tree forty feet away, rests in a crotch there at a height of fifty feet, and then loops down and across some eighty feet to another tree, in which loops may be traced for at least eighty feet more. This branch is therefore approximately 260 feet long. Growing thus in the open, where its branches and swinging loops may be easily traced, this climber gives one a vivid impression of the huge dimensions reached by tropical lianas. There is a still larger specimen of the same species growing in the Economic Garden at Buitenzorg, which will be described in that connection.

FIG. 18. One of the main avenues through the botanical garden at Buitenzorg.

There are always several species of leguminous trees which exhibit the drooping young leaves, so characteristic of tropical vegetation. In *Amherstia nobilis* the leaves are produced in bunches of three. The internodes do not elongate till after leaf expansion is complete, so that the young clusters are quite compact. The young leaflets hang vertically along the rachis, and are each folded lengthwise along the midrib, the upper side in, and the margins cohering lightly. In the early stages, the color is a delicate semi-transparent reddish brown. The terminal leaflet expands most rapidly, and is followed in turn by the lateral ones. As expansion continues, the red color is lost uniformly, the basal leaflets reach their normal proportions, the internodes elongate, and the petioles stiffen out, beginning at the base, until the leaves have reached their normal position.

In *Brownea hybrida* the red color is not lost uniformly, but in patches, so that the leaf becomes mottled green and red. The proportion of green increases as the leaf approaches maturity, but the leaflets remain appressed to the rachis until they are entirely green, and the whole leaf has reached its full size.

In several legumes the young leaves are almost colorless, and gradually assume the green color as they expand. In *Cynometra cauliflora* they are pink, and as delicately colored and almost as conspicuous as a cluster of flowers.

These bunches of drooping young leaves do not terminate every growing branch, but occur scattered here and there. On one spreading tree of thirty feet in height there were, for example, just six bunches. This indicates that, in Buitenzorg at least, the new leaves appear at no one particular season, but throughout the whole year. This is of course to be expected in a climate so uniform as that of western Java, but is in marked contrast to the obvious periodicity of vegetation in a region with sharply differentiated wet and dry seasons. *Amherstia nobilis*, for illustration, has large clusters of remarkably showy flowers, but in Buitenzorg, where a few clusters are always present, they attract no special attention. In Ceylon, however, where there is a definite blooming period, the tree becomes a most striking object when in full flower.

Beyond the legumes, one enters a collection of monocotyledonous plants, including the agaves, yuccas, dracaenas, and pandans. The representation of *Agave* and *Yucca* is poor, as might be expected in this humid climate, and offers nothing of note, although a few species of the former are generally in bloom. There are many species of *Dracaena*, affording one a better idea of the character of the genus than can be secured in an American greenhouse. Most species, of course, have sparingly branched stems, and their narrow foliage gives them a distinctly monocotyl appearance. One species, on the contrary, has a freely branched stem and ovate-lanceolate leaves, giving it the general aspect of our cultivated mock-orange or *Philadelphus*.

There are many species of *Pandanus* in cultivation, showing all sorts of variation in habit. The trunks may be straight or crooked, erect or branching; the prop-roots few or many, thick or slender, straight or crooked, smooth or covered with lichens; the leaves long or short, green or glaucous, spreading or erect, straight or flexuous. One species, with very numerous branching prop-roots and divergent freely branched stems, receives and deserves the name *Pandanus labyrinthicus*. The prop-roots of one unnamed species are enormous, standing out perfectly

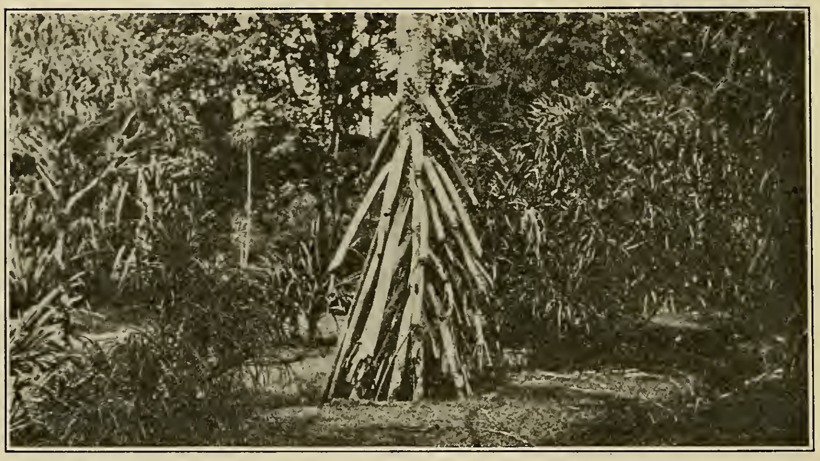

FIG. 19. *Pandanus* sp. with unusually large prop-roots.

straight at an angle of 45° from the stem, and reaching a diameter of six inches. Even these huge roots terminate in a regular root-cap, four inches in length and diameter. This particular tree was at least forty feet tall, with only three branches, and with leaves ten feet long. Many species bear fruit, varying from one to six inches in diameter, yellow or red in color, and looking rather like a pineapple. They fall to the ground when still hard, and decay under the trees, unless picked up by the natives.

Across from the pandan collection an opaque hedge of shrubbery bounds the fernery. One enters it under a huge tree of *Xanthophyllum excelsum*, five feet in diameter, and probably seventy-five feet high, with very dense foliage. It comes as a decided surprise to the visitor to learn that this giant tree belongs to the family Polygalaceae, a group represented in America by herbaceous plants of rather less than average height.

Within the fernery, the smaller species are planted in regular rows, and almost every tree supports one or two epiphytic forms. The most attractive display of epiphytes, however, comes from the hundreds of plants of *Asplenium nidus* which have established themselves everywhere in the taller trees, not only over the fern collection, but throughout the garden, until they must actually be treated as weeds and cleaned off the trees which they infest.

Tree ferns are noteworthy by their absence, and the botanist is disappointed to see so few and such poor specimens. Their place is taken in a way by hundreds of magnificent specimens of *Angiopteris evecta*, whose short stocky trunks are a foot or two high and almost as thick, and whose huge ascending fronds may be twelve feet long. In many places the walks are completely overarched by them.

There are numerous ferns represented by familiar generic names, but the botanist is most interested in seeing some of the rarer forms. There are two species of *Psilotum*, related to our *Lycopodium;* an epiphytic species of the latter genus; hanging fronds three feet long of *Ophioglossum pendulum;* delicate plants of the rare *Helminthostachys zeylanica*. There are several species of the stag-horn ferns, *Platycerium*, showing a large variation in the shape and position of the fronds. Of these the largest is perhaps *Platycerium coronarium*, with drooping fronds six feet long.

In connection with the fern collection, one must not omit mention of the little epiphyte *Drymoglossum heterophyllum*, whose specific name indicates the obvious difference between the foliage leaves and the sporophylls. The species occurs wild everywhere through the garden and city, on trees or walls, in deep shade or full sun, and seems to be perfectly adapted to either condition. Although one soon becomes accustomed to seeing it in all sorts of habitats, it still looks decidedly out of place when scores of plants of it are found growing among the long spines of the cactus *Piereskia*.

Among the ferns is planted the small collection of bromeliads. Most of these are set out in beds along the walks, and only a few epiphytic species are shown, while all the species seem to have been chosen for their ornamental value rather than for their scientific interest. One is disappointed by the relatively small number of species, but it must be remembered that these plants are exclusively American, and must be more difficult to secure for a garden so far removed from the source of supply.

Just beyond the fern collection is the orchid section, and this is invariably one of the most attractive spots in the garden for the visitor. There are said to be over a thousand species in cultivation, and almost all of these are epiphytes. For a support the shrub *Plumiera acutifolia* is regularly used. Its rather stiff trunk is suggestive of our stag-horn sumach, and seems to be ideal for orchid cultivation. The shrubs are set out in regular rows, with paths between, and each one bears a single plant of some orchid. The few terrestrial orchids are planted in beds at the margin. The whole collection is shaded by some large trees of *Spondias*, whose fruits, the size of an unhulled walnut, are continually dropping.

Always there are a few species of orchids in bloom with large and showy flowers, and it is these which attract the casual visitor. No attempt is made, however, to provide a special display of flowers, and a more showy orchid collection can be found in any metropolitan American greenhouse. Only a small proportion of the species are in bloom at one time, and of them a majority have small or inconspicuous flowers. There is instead a remarkable variety of vegetative form, which is even more interesting to the botanist, since it offers a good illustration of the diversity of structure in this large family. There are leaves of every size, from the huge linear ones four feet long of *Cymbidium Finlaysonianum* to the rigid ones of *Dendrobium rigidum* or the terete ones of *Bulbophyllum alliifolium*, while *Vanilla* *aphylla* is completely leafless. There are thigmotropic roots on the tree trunks, aerial roots with a silvery coating of velamen, for water absorption, and pseudobulbs at the base of the leaves occur in every size and shape.

Among the great multitude of species, two seem to be of special interest. One of these is the giant orchid *Grammatophyllum speciosum*, probably the largest known species of orchid, of which the largest known individual is one of the several planted in the Buitenzorg garden. Like most of the others, it is epiphytic. It grows completely around the trunk of a canary tree, about sixteen inches in diameter, at a height of about

Fig. 20. Portion of the orchid collection, Buitenzorg, Java.

fifteen feet from the ground. The dense mass of fibrous roots is over a yard in diameter, and two to four feet high. The numerous leafy shoots begin their growth in an erect direction, become declined and finally pendent from their own weight, and ultimately almost reach the ground. Their spreading or slightly ascending ends, however, indicate that they are naturally negatively geotropic. The rapidly growing young shoots, up to six feet in length, are leafy throughout. The old leaves soon die, leaving the basal portion of the stem covered with appressed scales, while only the terminal two or three feet is leafy. These mature stems are as much as fifteen feet long, and an inch and a half in diameter, and the spreading or ascending leaves are sixteen inches long. The flower stalks are about six feet long, and bear a raceme three feet long and a foot in diameter, with probably a hundred flowers, each of a golden color with brown spots, and almost three inches wide. The lower flowers of the raceme are always sterile.

The second noteworthy orchid is *Dendrobium crumenatum*. It grows wild all through the garden, as an epiphyte on all sorts of trees, usually preferring the main trunk or the lower branches. It is inconspicuous in every way, and without flowers might pass completely unnoticed. But on January 31, 1914, thousands of individuals of the species burst into bloom at once, although not a single flower was open the preceding day. All over the garden, but especially among the more open plantings of the Island, the showy white flowers were very much in evidence. The next day they had all disappeared. On February 4 and 5, a few scattered individuals blossomed, but no other flowers appeared on the plants at any other time during our two months' stay at the garden. Just why the species should bloom on this particular day, or what environmental factor is the cause of such behavior, which is a regular characteristic of the species, is by no means apparent. It is probably on a par with the reported simultaneous blooming of the bamboo trees in India, or the appearance of the broods of seventeen-year locust in this country.

As a mere curiosity, mention should be made of the stemless and leafless orchid *Taeniophyllum Hasseltii*, whose slender hold-fast roots radiate over the surface of the canary trees, and give the plants the appearance of a long-legged spider.

Leaving the orchids, one passes through a small planting of cycads, and descends a little hill to the collection of aquatics. There are two artificial ponds, with numerous species planted close along the shore, within easy distance for inspection. The species exhibit the usual devices for floating, and most of the genera are familiar. Two or three forms exhibit aerenchyma, some along the stems and some on special erect roots. There are vigorous plants of *Victoria regia* and some interesting specimens of the aquatic fern *Ceratopteris*.

At one end of the ponds is a small artificial mangrove swamp, where two of these salt-marsh species are growing well, and exhibiting the two chief ecological features of the group. *Sonneratia acida* exhibits a great number of pneumatophores, straight, slender, narrowly conical, a foot or so long, and appearing by the hundred around the base of the tree. A *Rhizophora* bears fruit freely, and one can find all stages in the development of the long heavy hypocotyl while the seed is still attached to the parent tree, can hasten the fall of those nearly ripe, and watch them plant themselves by penetrating deeply into the mud below, and can find all stages of seedlings, from those recently fallen to those with several well developed leaves.

Next in order comes the collection of palms, occupying a large area, and containing certainly more than a hundred species. Here again the remarkable diversity of vegetative form is at once apparent. There are the straight smooth trunks of the royal palm, *Oreodoxa regia*, usually swollen near the middle, or the similar smooth trunks of *Oreodoxa acuminata*, swollen at the base. In *Caryota Rumphiana* the scars left by the fallen leaves are slightly rough, and the trunk is colonized by rings of epiphytes, occupying each node. In *Scheela regia* the whole trunk is rough and covered with epiphytes. In *Vorschaffeltia splendida* the lower portion of the trunk has prop-roots, after the manner of a pandan. In *Corynophora gobanga* the persistent leaf bases are arranged in obvious spirals; in the sealing wax palm, *Cyrtostachys lakka*, the sheathing leaf bases are a bright red. Species of *Zalacca* and *Phytelephas* look like herbs rather than trees. *Raphia pedunculata* has an inflorescence twelve feet long, while in other genera the fruits may be in clusters only a few inches long. Many species have massive trunks, sometimes two feet in diameter, while the betel palm, *Areca catechu*, seldom exceeds six inches, and at maturity its height may be over a hundred times its diameter.

There are two or three plants of the Seychelles Islands palm, *Lodoicea seychellarum*, whose immense fruit, known as the double coconut, is seen in all botanical collections. These trees are all pistillate, and one is now bearing fruit, pollen having been sent from the garden at Peradeniya, Ceylon. The fruit was only half grown when seen, but was reported as already six years old.

Beyond the palm collection, the bridge is crossed to the Island. At the south lies the shrub collection, containing a great variety of species, but with little of special interest, unless it be the yellow, leafless, dodder-like *Cassytha*, of the family Lauraceae. Beyond this is the herbaceous garden, laid off in regular rectangular beds, with walks between, and arranged in systematic sequence. The small space devoted to herbaceous plants, and the small number of species represented, impress one at once with the relatively larger number and greater importance of trees in the tropics. It also looks strange to see beds labeled with such familiar names as Cruciferae and Polemoniaceae, with not a single plant in them. Several American species are growing here, including *Portulaca oleracea*, *Verbesina virginica*, *Phytolacca decandra*, and *Physostegia virginiana*, and all of them look rather the worse for the humid tropical climate. A row of *Helianthus annuus*, however, stands full six feet high, and blossoms profusely. A few species of *Opuntia* look decidedly out of place, as do also the agaves and yuccas in another part of the garden.

Most of the Island is devoted to a collection of lianas. There are a great many species of Menispermaceae, Bignoniaceae, Leguminosae, Asclepiadaceae, and various other families, and most of them offer comparatively little of interest. Among the whole collection, however, a number of things are noteworthy.

Several species of the monocotyl *Flagellaria* are grown, which climb by a tendril terminating the leaf. This appears to be insensitive to touch, and becomes permanently coiled and indurated at maturity, even if not in contact with a support. There are a few species of *Nepenthes*.

Among the considerable collection of anonaceous lianas, the genera *Uvaria* and *Artabotrys* are especially well represented. At first sight it is not apparent how they climb. There are no aerial roots, they do not twine, and the whole mass is so loose that it appears ready to tumble down with any wind. Search soon shows that *Uvaria* has coiling twig bases, which may be a half-inch in diameter, and extend out into normal leafy branches. *Artabotrys* has stiff short hooked tips on some twigs. These organs are quite few in number, but their size and strength apparently compensates for their numbers.

Other striking lianas are the great Bauhinias, with zigzag stems of very unsymmetrical structure, Hippocrateas with tendrils a foot long, and the icacinaceous *Phytocrene macrophylla*. The latter is especially conspicuous for its huge clusters of flowers and fruit, borne in globular clusters a foot in diameter on the old wood, and therefore exhibiting the well known tropical phenomenon called cauliflory. Many other species of plants in the garden illustrate the same habit, but the descriptions and photographs of cauliflorous trees in Schimper's Plant Geography are so familiar that further discussion is unnecessary.

At the extreme end of this collection is a large plant of the leguminous climber *Derris scandens*, with a basal diameter of about four inches. It is wound around the trunk of a good-sized tree, and branches freely on its way up. Some of these branches have been completely overgrown by the tree, so that portions of the climber disappear from view beneath the bark, to reappear as much as four feet away. In one or two places, even, the liana has branches whose point of origin is completely covered, so that the smaller stems appear to grow out from the host tree. Neither tree nor liana appear to suffer from the peculiar circumstance.

In this section of the garden, three or more species of the epiphytic genus *Dischidia*, of the family Asclepiadaceae, are common on trees, and show some remarkable adaptations for securing their water supply. Two or possibly more of these species, all without labels, have the same structure but differ merely in size. In the smaller the leaves are about an inch wide; in the larger, three inches. In both the leaves are orbicular or nearly so, lie closely appressed at their edges to the bark of the supporting tree, and are convex on the outer exposed surface, so that a free space is included behind the leaf. Here small quantities of rubbish collect and doubtless hold some water, while the roots which arise freely from the side of the stem penetrate this cavity and absorb water from it. Such a structure is of course essentially analogous to that of the stag-horn fern, *Platycerium*, and is also imitated in a more irregular way by the bird's-nest fern, *Asplenium nidus*, and by various other epiphytes.

Dischidia Rafflesiana is the most remarkable species. Here the leaves are modified into urn-like pitchers, flattened-fusiform in shape, an inch in width and three or four inches long. These are generally grouped in clusters of five or six, and are spreading or pendent on their short petioles. Most of them contain water collected from the daily rains, and into them grow the roots. The habit of collecting water in similar cisterns may also be observed in various bromeliads, but this is the only plant in which water is absorbed from the cisterns by roots of the usual type. All of these species are common in the garden, and are frequently seen growing wild on various sorts of trees. Those with appressed convex leaves appear to be limited to the trunks of trees, while *D. Rafflesiana* may establish itself among the branches. In fact, the first one found was on the branches of a *Pandanus* which had been cut down.

Beyond the Island in the Proeftuin, are seen several species of economic plants of interest. The main avenue is shaded with some rubber trees, *Hevea brasiliensis*, now about ten years old, but already thirty feet high and tapped for rubber. Their fruit, much like that of a castor bean but twice as large, apparently explodes while still on the tree, since fruits with sound seeds are never found on the ground beneath. There is also a plantation of *Erythroxylon coca*, the source of the drug cocaine. These small shrubs look very much like our American *Nemopanthus mucronata*.

Returning now to the mainland, and turning at the bridge toward the farther end of the garden, the visitor enters a collection of forest trees, set out in no regular order. In the lower ground there are several species of figs, some of considerable size and with a great development of buttress roots. These roots extend out in every direction, are generally crooked and freely branched, and lack entirely the size and the peculiar flatness of the figs of Philippine forests. With them are a few very old canary trees, one of which covers with its buttress roots a ground diameter of thirty-five feet. Even some oaks show a slight development of buttresses, extending out horizontally three or four feet from the trunk. These Javan oaks have oblong entire leaves, while the peculiar structure of the acorn cup shows that they belong to an entirely different section of the genus from our American species.

On the higher ground here is the collection of Dipterocarpaceae, without doubt the most important family of timber trees in the whole Malayan region. All genera of the family are represented except two, and many of them may be found in fruit, so that the botanist can become quite familiar with these interesting trees. The calyx lobes, enlarging in fruit, act as wings for wind distribution in many genera, while in others the fruit is heavier, the calyx lobes not enlarged, and the fruit seems to have no special method of dispersal. Those of the latter type may be found under the trees where they have fallen, but the winged species are scattered by the wind and it is sometimes difficult to associate the fruit with the proper species of tree. Some of these weigh as much as an ounce, with wings six inches long, and are probably the heaviest fruits normally distributed by the wind.

This circuit of the garden brings the visitor back to Canary Avenue. Crossing it, he enters the collection of shade plants, growing in narrow beds under a dense canopy of trees and shrubs. Here are aroids, elatostemmas, begonias, peperomias, calatheas, and many other shade-loving species. The most interesting plants, however, are the gingers and marantas. Next to the bananas, these families include the largest species of monocotyledonous herbs. Three or four species exceed ten feet in height, while the huge stems of *Nicolaia speciosa* arch over the paths and reach lengths of at least eighteen feet. Other species are of course much smaller, and some are mature and bearing flowers at a height of two feet.

The ginger flower clusters are most striking, and exhibit a great variation in size. In a few, the clusters are almost sessile at the base of the stems. Thus in *Achasma foetans*, the peduncles are only two inches high, but the flowers are vivid scarlet in color and three inches wide. In other species the peduncles stand six feet tall, with flower clusters six inches across, while the colors are orange, or scarlet, or deep crimson. In every case the flower cluster is a dense head, in which the chief color comes from the conspicuous bracts, while the individual flowers are small and by no means showy. The outer bracts are usually somewhat larger, and spread horizontally, thus simulating the rays of a composite. Within these the flat cluster of flowers blooms centripetally, so that the resemblance to a composite head is quite noticeable. After blooming the bracts wither, and the heads of subspherical fruits become ovoid. Few tropical plants are so conspicuous when in bloom as these gingers, with their

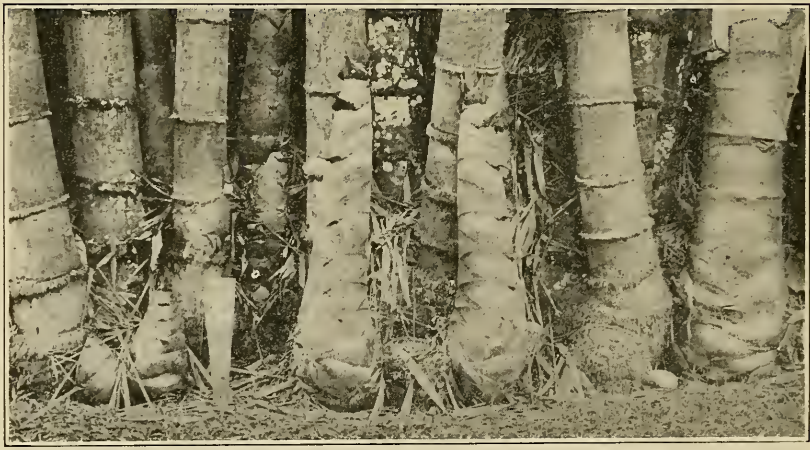

FIG. 21. Old and young stems of *Dendrocalamus giganteus*.

tall, gracefully curved stems and stiff erect peduncles with crimson heads.

Lastly, before leaving the garden, one reaches the collection of bamboos. The largest species here is the famous *Dendrocalamus giganteus*, of which two clumps are planted. These are now fourteen years old and about ten feet in diameter. The individual stems are at least sixty and probably nearer eighty feet high. The diameter of the mature stems averages six to eight inches, but seems to be increasing with each successive generation, for new canes now coming up have a diameter of as much as a foot.

Most of these new canes appear at the margin of the clump, so that its diameter increases from year to year. Others come up just within the margin, but so dense is the clump that it could not be observed whether there are any new central canes or not. At each node there is a large brown leathery sheath, more or less triangular in shape, so that a portion of the stem is exposed, although the sheaths are more or less overlapping. At the apex each sheath bears a dull brown ascending or divaricate leaf rudiment, which soon falls off. As the plant becomes older, a zone of adventitious roots is formed just above the base of each sheath. Shortly after the sheath breaks loose at the base and

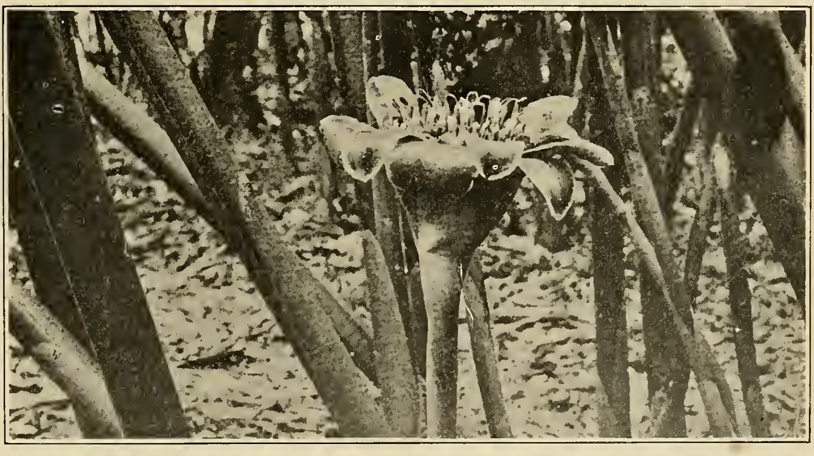

FIG. 22. Inflorescence of *Nicolaia* sp.

ultimately falls off. It gives the impression of being pushed off by this zone of roots, as indeed it may be.

The sprouts of other species look much the same, differing naturally in proportions and size. When offered for sale in the market, the sheaths are neatly removed, exposing a conical tip. At the hotels these sprouts appear cut up in strips and stewed.

The leaves do not begin to unfold until the stem has reached full size. If it chances to be taller than other stems of the same clump, it makes a conspicuous sight with its leafless erect branches. The final appearance of the basal part of the thicket depends on the species. The sheaths may be persistent or deciduous; there may or may not be thorny leafless axillary branches; there may be short accessory leaf-bearing branches. In one extreme, the result is a leafy tangle or jungle of thorns, in which the main stems are almost invisible and quite unapproachable; in the other the perfectly smooth jointed stems bearing leaves only near the top. *Bambusa Blumena*, the common building material of the Philippine Islands, is of the former type, *Dendrocalamus giganteus* of the latter.

(To be continued)

SOME PLANTS FROM THE VICINITY OF THE ARAPAHOE GLACIER.

By T. D. A. Cockerell

Looking west from the town of Boulder, Colorado, up Boulder Canyon, the skyline is formed by the Arapahoe Peaks, with the highest summit some 13,500 feet above sea level. On the face of this mountain is a large white area, the Arapahoe glacier; now greatly reduced from its original size, but still a moving mass of ice. The glacier is at the end of a narrow valley, occupied by quantities of morainal matter, the successive deposits of which, crossing the valley, have given rise to a series of small lakes. The lakes or ponds near to the glacier are of a most beautiful green color, presumably due to the suspension of exceedingly fine particles, ground by the slowly moving ice. On the south side of the valley or gulch, extending eastward from the peaks, is an enormous upland area, in places very rocky, with one especially large rounded elevation known as Baldy Mountain. This region is all above timber line, with elevations of between 11 and 12 thousand feet. It is bounded below by the dense forests of the Hudsonian Zone, consisting mainly of Engelmann spruce. On July 24, 1915, the Arapahoe Peaks were visited by the summer school of the University of Colorado. Accompanying the expedition, I did not attempt to climb to the highest point, which offers nothing of botanical interest, but contented myself with exploring, as well as the time permitted, the elevations extending along the south side of the gulch, including Mt. Baldy. In this I was assisted by Miss Anna Deacon of Iowa, whose keen eyes materially contributed to the success of the search.

Speaking broadly, the flora of these regions is well known; yet every visit seems to yield something worthy of note. I record here only a few of the more interesting plants we found.

1. *Silene acaulis* L. Extremely abundant, covering the ground with its moss-like growth in many places. Three forms, distinct at a glance, were found.

(*a*) Typical, with larger flowers, about 10 mm. diameter; stamens long and anthers well developed, exposed; stigmatic branches at first short, later becoming elongated; (flowers protandrous).

(*a*¹) Flowers pink; the common form.

(*a*²) Flowers white, sometimes with a very faint pinkish flush.

(*b*) Small flowers, about 6–6.5 mm. broad; the three stigmatic branches very long, protruding, fully as long as the petals; stamens short, concealed, with minute infertile anthers.

I supposed, at first, that I had two different species; growing intermixed, but each plant true to a single type. The floras of the region say nothing about dimorphism in the species, but in Knuth's Handbook of Flower Pollination, translated by Ainsworth Davis, Vol. II, the matter is fully explained, with figures after H. Müller.

2. *Papaver coloradense* Fedde. Growing among enormous rocks, quite common in one place. It is not in "The Flora of Boulder, Colorado, and vicinity" (1911), by Dr. F. P. Daniels, but Mr. D. M. Andrews had previously found it on the south slope of Arapahoe Peak. We found two color varieties in approximately equal numbers; (*a*) *typicum;* petals clear bright sulphur yellow; (*b*) *aurantiellum*, nov., petals dilute reddish orange (apricot color), white at base, but the base beneath greenish yellow. Exactly the same color variation is found in the allied European plants. This is certainly the plant named by Fedde, but it may not be truly distinct from *P. radicatum*. It is not "dense brunneo-setulosa," as Fedde describes; the calyx and upper part of peduncles are so, but the leaves are *sparsely* pale-hirsute. The peduncles of the orange variety are about 50 mm. long, leaves about 31 mm. of which about 13 mm. is blade.

3. *Primula angustifolia* Torrey. Exceedingly abundant on the higher slopes. Miss Deacon found a beautiful color-variety, with the corolla a clearer pink (not at all magenta or bluish-pink), a tint best described as bright rose-pink, the eye pale orange. The difference is doubtless due to greater acidity of the sap, not to any difference in the pigment itself. There are various intermediates, and very possibly the shade of color changes during the life of the flower, so it hardly seems advisable to give a varietal name.

4. *Primula parryi* Gray. In the midst of a hailstorm, as we hurried along, we were arrested by a truly magnificant sight, a large clump of bright *Primula* flowers, entirely different from the *P. angustifolia* growing all around. I thought I had a new species of *Primula*, for although I had several times met with *P. parryi*, it was always in the dense forests of the Hudsonian Zone, by streams, and growing at least twice as tall. This plant, with scapes about 80–90 mm. long; leaves about 80 mm. long, and 20–25 broad; calyx very dark red, densely glandular; corolla-lobes 11–13 mm. long, very bright purplish pink; growing out in the open far above timber line, looked very unlike true *P. parryi*. Nevertheless, on actual comparison later with fresh material of *parryi*, no doubt remained that we had found the same species, a growth-form affected by the conditions of the environment. For such a form a name is available, if required; *P. parryi* f. *mucronata* (*P. mucronata* Greene, Pittonia, III, 251). The apical mucro of the leaves is present in our plant, but there are also remote marginal mucrones or denticles, not mentioned by Greene. The outer leaves do not appear to be narrowed, as they are said to be in the Nevada plant. The round-topped flower clusters are characteristic. Greene remarked that *mucronata* grew "far above timber-line, among rocks and near snow."

5. *Eritrichium argenteum* Wight. Very abundant on the higher slopes. Two forms were observed:

(*a*) Typical. Flowers 6.5 mm. broad (Wight measured 4–6 mm. in dry specimens) very bright blue.

(*b*) Flowers 3.5–4 mm. broad, blue sometimes less bright.

The first is the common form.

Last year Mr. E. Bethel found a white-flowered form (*albiorum*, nov.) below the glacier.

The continued observation of variations in plants, in different parts of the world, brings out the fact that these are (unless environmental) almost always due to the shuffling or loss of genes which are themselves of great antiquity. Thus the comparative study of minor differences becomes increasingly important for the understanding of the origin of species, as well as for horticulture. With our greatly increased knowledge of the processes of heredity, we can now go into the field and interpret our observations in ways formerly impossible, so that the study of variation becomes increasingly fruitful.

In Europe the minute study and taxonomic treatment of plant-variation has been carried to extremes unknown in this country. The European literature in large part needs reinterpretation in the light of genetic research, but it affords an invaluable basis for comparisons.

PLEISTOCENE PLANTS FROM INDIAN HEAD, MARYLAND.

By Edward W. Berry

About a year ago I received a small collection of plant remains from Mr. Geo. B. Lloyd who collected them at the bottom of a dug well at Indian Head in Charles County, Maryland. The well is in the Talbot formation and is located near the 20-foot contour on the northern edge of the valley of Mattawoman Creek.

The materials passed through in the digging of the well, as reported by Mr. Lloyd, are as follows:

	Feet
Yellow clay	10
Fine yellow sand	12
Gravel	9
Blue clay with vivianite	10
Bluish sandy clay with leaves	1½

A considerable flora has previously been recorded from the Pleistocene of Maryland, the interest in the present small collection consisting in the clearly indicated changes of level since the leaves were buried. The leaves were buried at near sea level, or if the water was a few feet deep there was evidently only the finest detrital materials being brought down by the valley stream, and this quiescent condition continued during the time represented by the 10 feet of clay overlying the leaf-bearing layer. Subsidence with quickening erosion followed and the surface of the estuary finally rose to at least 40 feet above the plant layer. This was followed by reversal of movement which finally resulted in bringing the surface at least 20 feet above sea level.

The recognizable plants are all recent species most of which are common Pleistocene types. *Fraxinus americana* has not heretofore been recorded in the Pleistocene but it and all of the other forms are still common in the Potomac valley except the Bald Cypress, which is no longer found in the immediate vicinity, although several cypress swamps are still present farther south in Charles County. The Liriodendron is represented by a characteristic juvenile leaf such as is rarely found fossil.

Order *CONIFERALES*

Family PINACEAE

Genus Taxodium L. C. Richard

Taxodium distichum (Linnaeus) L. C. Richard

The remains of the bald cypress are very common in American Pleistocene deposits from New Jersey and Maryland southward, where they are represented by the deciduous twigs, cone scales, seeds, aments, and stumps with the characteristic "knees." A few of the deciduous twigs occur in the present collection.

Order *FAGALES*

Family FAGACEAE

Genus Fagus Linnaeus

Fagus Americana Sweet

The beech is widely distributed in the fluvial Pleistocene deposits of the Southern States, where it is commonly represented by nuts and husks as well as leaves. Leaves are sparingly represented in the present collection. In the existing flora the beech is a common river-bottom type ranging from southern Canada to Florida and Texas.

Quercus Michauxii Nuttall

This oak has already been recorded from the late Pleistocene (Chowan formation) of North Carolina. There are several leaves in the present collection. In the existing flora the cow oak is found in bottoms and similar wet situations from Delaware to Texas.

Quercus palustria Du Roi

A single specimen occurs in the present collection. The species has been already recorded from the Pleistocene of the Port Kennedy Bone Cave in Pennsylvania where a cupule was found, and from the Chowan formation of North Carolina, where both leaves and characteristic cupules were collected. In the existing flora it has a wide range especially in the coastal plain.

Order *URTICALES*

Family ULMACEAE

Genus Ulmus Linnaeus

Ulmus americana Linnaeus

This is a species of low rich woods and stream banks, ranging from Newfoundland and Ontario to Florida. It is common in the Interglacial deposits of the Don Valley in Ontario but has not been previously recorded from the coastal plain. There are two specimens in the present collection.

Order *PLATANALES*

Genus Platanus Linnaeus

Platanus occidentalis Linnaeus

This modern inhabitant of low woods and banks from Canada to Florida and Texas is frequent in the bottom lands of the coastal and midland zones in Maryland. As a fossil it is of frequent occurrence in Pleistocene deposits from those of the Don Valley in Canada to Alabama. Fragments of the leaves are among the commonest forms in the present collection.

Order *RANALES*

Genus LIRIODENDRON Linnaeus

LIRIODENDRON TULIPIFERA Linnaeus

This common mesophile forest type ranges from New England to northern Florida and southern Alabama and Mississippi. Previous fossil records are based on fruits and leaves from Alabama and upon abundant leaves from the Wicomico formation near Weldon, North Carolina.

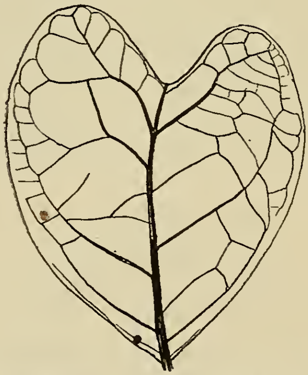

Fig. 1. Juvenile leaf of *Liriodendron tulipifera* L., from the Talbot Pleistocene of Indian Head, Md.

The present record is based upon the characteristic juvenile leaf figured.

Order *GENTIANALES*

Family OLEACEAE

Genus FRAXINUS Linnaeus

FRANINUS AMERIÇANA Linnaeus

The white ash is found in rich rather moist woods from Canada to northern Florida, central Alabama and Mississippi. Both large and small leaflets occur in the present collection. It does not appear to have been recorded heretofore from the Pleistocene.

JOHNS HOPKINS UNIVERSITY.

SHORTER NOTES

Relation of Sunshine to the Habitat of *Rottboellia exaltata* (Poaceae)—In the Philippine Islands *Rottboellia exaltata* is a good example of a plant, which although relatively intolerant, does not long survive full sunshine. Because it grows throughout the year, the consequences of this relation become conspicuous at certain seasons. At the borders of woodlands and in the edges of thickets *Rottboellia* grows luxuriantly all the year round. Within woods and thickets however it is not present. *Rottboellia* is a weed common to corn and rice fields. When the land lies after the harvest, *Rottboellia* frequently becomes entirely dominant. This takes place in the latter part of the rainy season when there is a high percentage of cloudiness. The luxuriant growth reaches an average height of six feet in the open but at the edge of woods it is somewhat higher and more spindling.

As the amount of sunlight increases with the approaching dry season, a great change takes place. Gradually the grass growing in the full sun dries up and falls over, resulting in the reduction of the height of the vegetation from that of *Rottboellia* (6 feet) to that of the plants heretofore growing beneath it, for example, *Mimosa pudica* (1 foot). Meanwhile plants of *Rottboellia* in the partial shade of the edge of thickets continue to develop and flower throughout the dry season. If, however, the partial shade be removed, the *Rottboellia* plants dry up and fall over.

Thus we have in *Rottboellia exaltata* an example of a plant whose habitat in the dry season is restricted to partial shade on account of its inability to withstand full sunshine.

F. C. Gates.

Douglas Lake, Michigan,
August, 1915.

REVIEWS

Dixon's Transpiration and the Ascent of Sap in Plants*

For over seventeen years botanists have been familiar with Prof. Dixon's papers, embodying the results of his scholarly investigations on the subject of transpiration and the ascent of

* Dixon, Henry H. Transpiration and the ascent of sap in plants. pp. i-vi and 1–216. figs. 1–30. Macmillan & Co. London, 1914. $1.40 net.

sap. The present book will be cordially welcomed as it brings together in one place a concise review of the literature and a clear statement of the present status of one of the most difficult subjects in plant physics.

Referring to the earlier writings, which, almost as a foregone conclusion, assigned the ascent of sap to "vital force," as now chiefly of historic interest, the present monograph gives an account "of a physical explanation of the rise of water in trees. This theory rests on a knowledge of a property of liquids, which, although discovered in the middle of the last century, was little recognized and seldom referred to in physical literature. It now appears that a full appreciation of this property is essential for a realization of the manner in which water is raised in plants and of the meaning of the structure of trees as a mechanism for lifting water." This property of liquids is cohesion.

The first chapter, on "The nature of transpiration," supports the thesis that the process of transpiration is not a purely physical one, but involves the important vital activity of secretion. This contention is supported by experimental evidence on the transpiration of living and dead leaves, and on transpiration in saturated spaces. The experiments demonstrate that the elevating force is largely, if not wholly, confined to living leaves, and that it is not evaporation but secretion.

The next and following chapters are devoted successively, to a criticism of the physical theories, a criticism of the vital theories, the cohesion theory of the ascent of sap in stems (the author's theory, the tensile strength of the sap in trees, estimate of the tension required to raise the sap, osmotic pressures of leaf-cells, the thermo-electric method of cryoscopy, methods of extracting sap for cyroscopic observations, osmotic pressures in plants, and the energy available for raising the sap.

To summarize, the author claims to have demonstrated that, "The transpiration stream is raised by secretory actions taking place in the leaf-cells, or by evaporation and capillarity (imbibition) at their surfaces, drawing water from the trachae. The state of saturation surrounding these cells determines which of these agencies is effective."

It is shown that the water in the vascular bundles in the stems of tall trees, when not subjected to pressure upwards from below, must be in a state of tension. "Therefore when root pressure is not acting and when the leaves of trees are transpiring, the cohesion of their sap explains fully the transmission of the tension downwards, and consequently explains the rise of the sap." For example, in a tree 100 meters high there results a tension of 20 atmospheres, but the cohesion of sap has been experimentally shown to be at least 200 atmospheres; therefore it "is in no way taxed by this tension."

The author finally points out that, in such tall trees, the osmotic pressure, necessary to keep the cells in the mesophyll turgid, must equal in magnitude the tensions necessary to raise the sap; and that "the stored energy set free by respiration in leaves is quite sufficient to do the work of secretion against the resistance of the transpiration stream; while, when the vapor pressure of water in the surrounding space is low, and when evaporation is doing the work of raising the sap, the expenditure of energy in this process will reduce the quantity of water evaporated only by an imperceptible amount."

C. Stuart Gager.

NEWS ITEMS

Ernst Ule died on July 15 in Berlin-Lichterfelder after a short illness at the age of 61 years. He was known chiefly for his exploration of the Brazilian flora.

Professor T. D. A. Cockerell is anxious to get living material of *Helianthus*, from eastern and southern United States. Those who could collect such material will confer a favor by writing to Professor Cockerell at Boulder, Colorado.

Dr. H. S. Jackson, professor of botany and plant pathology at the Oregon Agricultural College, has accepted the position of chief in botany at Purdue University Experiment Station, beginning Sept. 1, 1915. He will be succeeded by H. P. Barss, formerly associate professor of botany and plant pathology at the Oregon Agricultural College and Experiment Station, *Genetics* is the name of a new journal to be issued by the Princeton University Press for the publication of research papers on heredity and allied subjects. This journal will be a bi-monthly, aggregating about 600 pages per annual volume, and the subscription price is $6 per volume. Adequate illustration will be aimed at, but will be attainable only with the cooperation of all those interested in genetics. All such are cordially invited to subscribe. On the editorial board are W. E. Castle, E. G. Conklin, B. M. Davis, C. B. Davenport, E. M. East, R. A. Emerson, T. H. Morgan, H. S. Jennings, Raymond Pearl, and G. H. Shull. Manuscripts and all editorial correspondence should be addressed to the managing editor, Dr. Geo. H. Shull, 60 Jefferson Road, Princeton, N, J., and all business correspondence to the Princeton University Press.

We learn from *Secince* that Professor J. C. Arthur, who has been in college and experiment-station work for nearly forty years, and for the last twenty-eight years has held the chair of professor of vegetable physiology and pathology in Purdue University and chief of the botanical department of the Indiana Agricultural Experiment Station, retired on the first of September to become professor emeritus of botany in the same institution under the provisions of the Carnegie Foundation. He will continue the researches on plant rusts which have been in progress for a number of years.

Dr. Chas. H. Otis, for the past two years instructor in botany in the College of Arts and Sciences of Cornell University, has accepted a position in the botanical department and experiment station of the New Hampshire College.

Dr. J. J. T. Quensel, professor of pathological anatomy at the University of Upsala, has died at the age of seventy years.

The Torrey Botanical Club

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New York City

Vol. 15 October, 1915 No. 10

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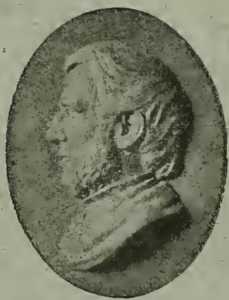
A Monthly Journal of Botanical Notes and News

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR



JOHN TORREY, 1796–1873

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TORREYA

October, 1915.

Vol. 15 No. 10

THE GENUS CETRARIA AS REPRESENTED IN THE UNITED STATES AND CANADA

By R. Heber Howe, Jr.

The species of this genus since 1753 have appeared under the following: *Lichen* L. 1753, *Lichenoides* Hoffm. 1790, *Lobaria* Hoffm. 1795, *Platisma* Hoffm. 1801, *Physcia* Michx. 1803, *Parmelia* Spreng. 1825, *Evernia* Nyl. 1857, *Platysma* Nyl. 1858, *Cornicularia* Trevis & Mudd 1861. Few of these names are, however, generic synonyms.

The genus *Cetraria* was proposed by Acharius in 1803, and has been variously limited by later authors. Though Acharius included under his *Cetraria* various species now removed to other genera, his species cannot be considered "altogether incoherent," and the genus must be credited to him, particularly as his type species has only been removed once (Mudd) from his genus.

Genus: CETRARIA* Ach., Meth. Lich. 293. 1803

(Subgenus: *Stigmatophora* Wain., Arkiv for Bot. 8: 20. 1909 in part.)

(Section: *Eucetraria* Korb., Parerga Lich. 17. 1865.)

(B. *Physcia* Fr., System. Orb. Veg. 239. 1825.)

(*Platyphyllum* Vent., Tableau reg. vegetal, 2: 34. 1799.)

(*Chionocroum* Ehrh., Beitr. naturk. 4: 148. 1789.)

Description: *Thallus* fruticose or subfoliose, laciniate, bifacial, brown or yellow; hyphal structure radial; *cortex* complex (decomposed), medulla arachnoid, axis stupeous; gonidia protococcoid, monostratified, heteromerous.

* *Cetra* or *Caetra* = a short Spanish shield.

[No. 9, Vol. 15 of Torreya, comprising pp. 187–212, was issued 28 September, 1915.]

Apothecia subterminal, adnate, scutelliform, convex or hooded, occasionally lacerate, emarginate (rarely spinulose), disk dark. Asci clavate, containing 6–8 spores; paraphyses gelatinous, simple or branched, septate. Spores ellipsoid or ovoid-ellipsoid, monoblast, hyaline. Spermogones immersed or papilliform. Sterigmata simple. Spermatia cylindrical.

OBSERVATIONS: The genus is represented in our area by six species. Though the hyphal structure is truly radial, the single stratified layer of gonidial cells links this genus with the dorsiventral genera. In the genus *Ramalina* for instance, the gonidial layer even in the most expanded types adheres to the radial structure, and therefore evidently does not take its position alone because of light exposure. In *Cetraria Richardsonii*, the most doubtful member of this genus as here limited, a common decorticate, concave surface rarely gives the plant a continuous, radial structure.

The species here included are, however, all separable from such species as *Platysma saepincolum* (Ehrh.) Nyl., which have a dorsiventral structure throughout, and have been to some degree taxonomically set apart from time to time by many authors. The variety *Cetraria islandica subtubulosa* Fr. (*tubulosa* Schaer.), suggests an interesting evolutionary speculation as to the development of the radial from the dorsiventral types.

KEY TO THE SPECIES

1	Thallus more or less brown	2
	Thallus stramineous to yellow	6
2	Margins of branches spinulose	3
	Margins of branches entire	5
3	Laciniae expanded, soralio-maculate	4
	Laciniae narrow, esoralio-maculate	var. *tenuifolia*
4	Margins denticulate, pale	var. *platyna*
	Margins spinulose, dark	*islandica*
5	Laciniae cartilaginous, branches divaricate	*Richardsonii*
	Laciniae coriaceous, branches thyrsoid-entangled	*hiascens*
6	Laciniae narrow-canaliculate, glabrous	*cucullata*
	Laciniae wide, distinctly lacunose	*nivalis*

CETRARIA ISLANDICA (L.) Ach.

The type species of the genus.

SYNONYMY: *Lichen islandicus* Linn., Spec. Plant. 2: 1145. 1753.

Cetraria islandica Ach., Meth. Lich., 293. 1803.

TYPE: In the Linnean herbarium, Burlington House, London, England.

TYPE LOCALITY: "Europae."

ORIGINAL DESCRIPTION: "foliaceous adscendens laciniatus; marginibus elevatis ciliatis." l. c.

DIAGNOSIS: *Thallus* fruticose, bifacial, brown, *bicolored*, *maculo*-soraliate margins *spinulose*. Apothecial margins *entire*.

DESCRIPTION: typical: *Thallus* fruticose or subfoliose (max. alt. 14 cm.), rigid, pale chestnut to dark brown, pale and often sanguineous below; *cortex* nitidous, sublacunose, maculo-soraliate; *branches* bifacial, laciniate (max. width 8 mm.), canaliculate, subconnivent, margins cilio-spinulose. *Apothecia* common, adnate, mostly subterminal, ample (max. diam. 1 cm.), convex, margins entire or crenulate, disk chestnut. *Spores* 6–11 × 3.5–5 μ.

CONTINGENT PHASES: (*a*) Maculate *throughout* with small decorticate areas. (? *C. islandica* var. *maculata* Wain., Arkiv för Bot. 8: 21. 1909.)*

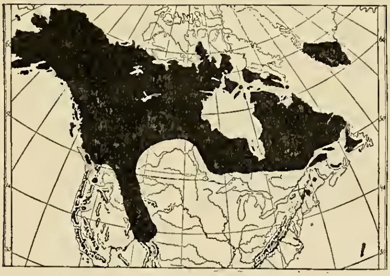

FIG. 1. *Range of Cetraria islandica* (L.) Ach.

(*b*) Laciniae slender above (*C. islandica* var. *gracilis* see Cummings, Lich. Alaska 144. 1900).

(*c*) Spines long (4 mm.), rarely furcate (= *C. islandica*

* Type loc., "prope Pitlekai." Orig. descpt. "Thallus laciniis angustis, marginibus conniventibus, apicibus concavis aut anguste planiusculis, margine spinulosus, maculis decorticatis albidis impressis in latere inferiore instructus. Medulla jodo caerulescens, $CaCl_2O_2$ non reagens. Haec variatio intermedia est inter var. *rigidam* et *crispam*, in ambas transiens." l. c.

var. *leucomeloides* Lindsay, Trans. Linn. Soc. **27**: 321. 1871).*

SUBSTRATA: On the earth.

DISTRIBUTION: Not uncommon in the Boreal zone or in high alpine situations (above 6,000 ft.). It occurs from Labrador to Vermont, westward to Washington (Mt. Rainier) and Alaska.

OBSERVATIONS: This easily recognized species is found represented by typical material only in the most boreal or alpine regions of our area. Owing to the fact that Tuckerman did not recognize the species *tenuifolia* (= var. *crispa* Ach.) almost all our herbaria material is determined as *C. islandica*. This misconception I first pointed out (Bryol. **16**: 34. 1913) when I published a figure of the Linnean type.

EXSICCATI: No. 3. Tuck., Lich. Amer. sept. Exs. 1 & 2. 1848. "Montium Alborum." = atypical.

No. 44. Decades No. Amer. Lich., Cummings, etc. Mt. Moosilauke, N. H. July 30, 1892. = in some numbers typical material, in some atypical, in some *C. tenuifolia*.

No. 6. Lich. Boreali-Amer., Cummings, etc., same as above.

No. 6. Canadian Lich., Macoun.

CETRARIA ISLANDICA var. PLATYNA (Ach.) Fr.

SYNONYMY: *Cetraria platyna* Ach., Synop. Meth. Lich. 229. 1814.

Cetraria islandica var. *platyna* Fr., Lich. Europ. reform. 37. 1831.

Cetraria islandica a. *vulgaris*† *latifolia* Kremplhb., Lich.

* "laciniae as long and flexuous as in *P. leucomela*." Type loc. "Greenland."

† Type loc., "St. Paul's Island, Behring Sea." Orig. Descript., "Thallus growing in tufts, erect or sub-decumbent, pallid-fuscescent brown or even nigricant at the tips but paler basally, rigid but brittle, the lobes variable in width, attaining to a maximum of 16 mm. and a height of 7 cent. the margins dividing into relatively short irregularly outlined lacinulae, both major and minor axils rounded. lobes commonly plane but variously contorted, only the tips canaliculate; the superior surface smooth, irregularly lacunose, the lacunae shallow, or here and there ribbed, scarcely differing below except in remaining pale with scattered white soredia, cortex continuous, sub-shining, the borders of the lobes laciniolate-spinulose. Apothecia not seen." l. c.

Flora Bayerns, Denkschr. k. bay. bot. Gesell. Regens. **4**: 121. 1861.

Cetraria islandica var. *robusta* (Branth.) ? see Macoun, Canadian Lich. 54. 1902.

Cetraria hiascens var. *macrophylla* Merr., Bryol. **13**: 26. 1910.

TYPE: In the Acharian herbarium, Universitetets Botaniska Institution, Helsingfors, Finland.

TYPE LOCALITY: "Helvetia."

FIGURE: Merr., Bryol. **13**: *Pl. 2. f. 1.* 1910.

ORIGINAL DESCRIPTION: "thallo pallido-cinerascente laevigato, laciniis latiusculis planis diffusis irregulariter sublobatis flexuoso-complicatis, marginibus undulatis tenuiter innocueque denticulatis." l. c.

DIAGNOSIS: Similar to the preceding, laciniae *expanded, pale* cinereus to *pale* virescent.

DESCRIPTION: typical: *Thallus* subfoliose (max. alt. 10 cm.), subrigid, pale cinereus to virescent; sanguineous below; *cortex* nitidous, sublacunose, punctate-decorticate; *branches* bifacial, laciniate (max. width 1 cm.), subcanaliculate, margins subspinulose. *Apothecia* as in the species.

CONTINGENT PHASES: Unobserved.

SUBSTRATA: On the earth.

DISTRIBUTION: In the Boreal zone or in high (12,000 ft.) alpine situations.

OBSERVATIONS: This variety represents the most luxuriantly developed condition of the species, and has been seen only from Greenland, Alaska and Colorado. Miss Cummings writes in The Lichens of Alaska that the specimens representing this variety are "a much richer color than the type," but the specimens she refers to I have examined and find they have no characters to cause them to be determined as this variety. I have, however, typical material from St. Lawrence Island, one of the localities named.

CETRARIA ISLANDICA mod. ARBORIALIS Merr.

SYNONYMY: *Cetraria Islandica* = "*aboricola*" Tuck. herb.

Cetraria Islandica modification *arborialis* Merr., Bryol. **9**: 4. 1906.

TYPE: No. 7. herb. J. Macoun.

TYPE LOCALITY: "British Columbia."

ORIGINAL DESCRIPTION: "Thallus cartilagineous, foliaceous, suberect or now appressed; laciniae plane, variously and irregularly divided, the apices commonly obtuse, from narrow to sometimes four mm. in breadth, very smooth and shining or sub-opaque; greenish-olivaceous or olivaceous-fucescent, the margins of the laciniae either spinulose or not, in the latter case sometimes white-sorediate. Apothecia not observed." l. c.

SUBSTRATA: On fallen twigs and bushes (huckleberry).

DISTRIBUTION: Alpine above 6,000 ft., from Mt. Tacoma and Olympic mountains, Washington to the Selkirk mountains and Glacier, British Columbia.

OBSERVATIONS: Th. Fries first recorded (1871) the growth of *C. islandica* on wood, and Tuckerman indicated speci-

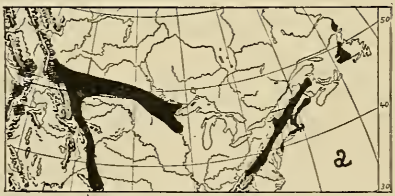

FIG. 2. Range of *Cetraria tenuifolia* (Retz.) R. H. Howe, Jr. (reduce to 2 in. wide). Range of *Cetraria islandica* mod. *arborialis* Merr. shown with hachures.

mens from the western United States in his herbarium which had been collected on wood, with the label "aboricola." It was not, however, until 1906 that Mr. G. K. Merrill gave a "conditional nomination" to such specimens. I have had the opportunity to study seven packets of this corticoline variety through the kindness of Prof. Fink, five of which were collected by himself. Mr. Merrill *in litt.* to Prof. Fink named a packet of this material from Mt. Tacoma "*C. nitidiscola*." This material bears espinulose apothecia which would seem to ally it with *C. islandica* rather than with *C. tenuifolia*, and as its range would also suggest, though the plants have narrow rather than expanded laciniae. It is evidently a modification as Mr. Merrill called it, caused by the corticoline substrata, a more or less accidental result of environment* as the following field note on one of Prof. Fink's labels goes to prove: "Collected specimens on branches two or three feet from the ground and about the trees at Glacier & Loggan and have a number of interesting transitional forms which convince me that this (*Cetraria* "*nidiuscula*" Merrill)" (note change of spelling) is not a good species." *All* these specimens show *spinulose* margins to some degree and *none* of them *sorediate* margins. The one plant from Central Point, Ore., collected by Mrs. Ashworth referred to by Mr. Merrill is *membranaceous* rather than "cartilagineous," is entirely *espinulose*, with *sorediate* margins, and represents typical *Platysma saepincola* (Ehrh.) Nyl., with a *dorsiventral* thallus and numerous *rhizinae*. Mr. Merrill's description is therefore composite and the words "or not, in the later case sometimes white sorediate" should be struck out.

Further material of this interesting modification may prove to argue its acceptance as a variety or even species.

CETRARIA TENUIFOLIA (Retz.) comb. nov.

SYNONYMY: *Lichen islandicus β tenuifolius* Retz., Fl. Scand. prod. 227. 1779.

Cetraria islandica γ crispa Ach., Lich. Univ. 513. 1810.

Cetraria islandica α vulgaris † *angustifolia* Kremplhbr., Lich. Fl. Bayerns, Denkschr. k. bay. bot. Gesell. Regens. **4**: 121. 1861.

TYPE: In the Retzius herbarium, Botaniska Institutionen, Lund, Sweden.

* See such for *Umbilicaria pustulata* var. *papulosa* Tuck., Merr., Bryol. **9**: 3. 1906, and Howe, ibid. **16**: *pl. 3. f. 1.* 1913.

† littoral examples.

TYPE LOCALITY: "Scandinaviae."

ORIGINAL DESCRIPTION: None given, but the Dillenian description and plate analysis is cited.

"Est in Phytophylacio Sherardino ejus exemplar, dictae figurae respondens, foliis vel caulicaulis angusti-

FIG. 3. *Cetraria tenuifolia* growing at Norwood, Mass.

oribus, magis glabris & splendentibus, colore obscuriore spadiceo, marginibus magis, ac in priore, approximantibus, ut convoluta & teretia folia appareant, ciliis introversis & vix apparentibus, extremitatibus magis divisis & corniculis brevibus, crebrioribus & angustioribus terminatis, in quibus nulla, ceu in illa specie, ne per vitrum quidem, cilia apparent; cilia porro per margines foliorum minus crebra sunt, ob quas differentias diversa videtur esse species." l. c.

FIGURE: Dill., Hist. Musc. *pl. 28. f. 112.* 1741.

Howe, Common & Conspicuous Lich. New Eng., 1. *pl. 2.* 1906.

Diagnosis: Similar to the preceding, *unicolored*, laciniae *narrow*, often *connivo*-canaliculate, *never soralio-maculate*, apothecial margins *spinulose*.

Description: typical: *Thallus* fruticose (max. alt. 9 cm.), rigid, chestnut to olivaceous-brown throughout; *cortex* nitidous, *never* soralio-maculate; *branches* bifacial, canaliculate to connivo-canaliculate, margins spinulose. *Apothe-*

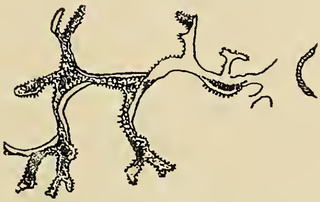

Fig. 4. Laciniae of *Cetraria tenuifolia*.

cia rare, adnate, subterminal, small (max. diam. 5 mm.), convex, disk dark chestnut, spinulose. *Spores* as in preceding species.

Contingent phases: (*a*) much branched above, branches connivent, edges now adhered (= *C. islandica* var. *subtubulosa* Fr., Lich. Europ. reform. 37. 1831, *C. islandica* γ *tubulosa* Schaer. Enum. crit. Lich. Europ. 16. 1850).

(*b*) Dark brown to black (= *C. Islandica* γ *nigricans* Retz., ibid., *C. islandica* f. *nigrescens* Harm., Catal. Lich. Lorr. 171. 1894).

(*c*) Spines long (4 mm.) (= *C. islandica* ? *erinacea* Schaer., Enum. crit. Lich. Europ. 16. 1850.

Substrata: On the earth.

Distribution: Common in the Boreal and Transitional zones. It occurs from Labrador south to North Carolina (alpine) and westward to Colorado, Montana and British Columbia (eastern slopes). Littoral stations on the Atlantic coast are common as far south as New Jersey.

Observations: This species, long recognized only as a variety of the preceding species, deserves specific rank as its apothecia are always spinulose and its thallus never soralio-maculate. It was raised to a species by Nylander in 1888 (Enum. Lich. Fret. Behr. 7. 19. 53. 61) when he also described the variety *inermis* (ibid. 19) from Kony-ambay.

EXSICCATI: No. 66. Lich. Exs., Merrill, Camden, Me., Aug. 22, 1909 = called *C. islandica.**

No. 15. Lich. Nova Angliae, Howe, Norwood, Mass., Dec. 4, 1905 = called *C. islandica.*†

No. 7. Canada Lich., Macoun, Spence's Bridge, B. C., May 24, 1875.

CETRARIA HIASCENS (Fr.) Th. Fr.

SYNONYMY: *Cetraria aculeata β hiascens* Fr., Lich. Europ. 36. 1831.

Cetraria hiascens Th. Fr., Lich. Scand. 98. 1871.

Cetraria islandica var. *Delisei* Bory Schaer., Enum. crit. Lich. Europ. 16. 1850.

Cetraria Delisei Bory Schaer, Fellm., Lich. arct. coll. aest. No. 60. 1863.

Cetraria Delisei Bory Schaer, Nyl., Enum. Lich. Fret. Behr. 19. 1888.

TYPE: Untraced.

TYPE LOCALITY: "alpibus Norvegicis."

ORIGINAL DESCRIPTION: "thallo in frondes ramosissimas dehiscente, apotheciis terminalibus liberis maximis." l. c.

DIAGNOSIS: *Thallus* fruticose, bifacial, slender, *bicolored, thyrsoid-entangled* above, margins *espinulose below.*

DESCRIPTION: typical: *Thallus* fruticose (max. alt. 5 cm.), rigid, cinereo-stramineous to brown above; *cortex* glabrous, sublacunose; *branches* bifacial, subcanaliculate (max. width 3 mm.), dichotomous, thyrsoid-entangled above, apices spinulose, margins below entire. *Apothecia* rare,

* Type loc., not given. Orig. descpt. "Inter reliquas formas praecipue insignis subtubulosa, divisione ceterum vulgaris, erecta, parce ramosa, sutura (thalli dehiscentis vestigio) ciliato-spinosa." l. c.

† Type loc., "alpib. helvet." Orig. descpt. "frondibus angustis, pollicaribus, in caespites densos congestis, densissime elongato-ciliato-spinulosis, canaliculatis, laciniis terminalibus obscure spadiceis, ramosisimis, subcurvatis, crispatis, lacero cristatis." l. c.

adnate, lateral, small, concave, margins often denticulate, disk chestnut. Spores as in last.

CONTINGENT PHASES: (*a*) Sorediate.

(*b*) Branches dilated below (= *C. hiascens* var. *dilatata* Wain., Arkiv. Bot. **8**: 22. 1909).*

SUBSTRATA: On the earth.

DISTRIBUTION: Common in the Boreal zone or alpine above 4,000 ft. It occurs from Labrador and Newfoundland south to New Hampshire and westward to Alaska.

OBSERVATIONS: This species is distinguished from the smaller

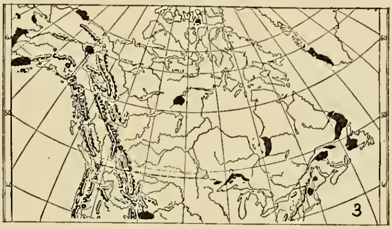

FIG. 5. Range of *Cetraria hiascens* (Fr.) Th. Fr.

forms of *C. islandica* (f. *minor* Harm.) by its espinulose, lateral margins. It is more easily confused with *Coelocaulon aculeatum* (Schreb.) Link though distinctly bifacial, rather than terete, never sulcate and fistulous, and generally glabrous rather than nitidous. In most of our North American herbaria the plant is labelled *C. islandica* var. *Delisei*. Wainio has recognized several varieties in material collected at Pitlekai, Siberia, a point only 150 miles from Cape Prince of Wales, Alaska,† and Nylander described a new variety also from "Behring-insula."‡ I cannot agree with Mr. Merrill that there is a "parallelism" between the explanate forms of *C. islandica* and certain plants which he has designated to belong under

* Type loc., "Pitlekai et Tjapka." Orig. descript. "Thallus laciniis dilatatis, circ. 17–2, 5 millim. latis, applanatis aut partim concavis, apicibus late rotundato-lobatis, rhizinis destitutus, papillis elevatis et spinulis brevibus passim parce marginibus laciniarum affixis, maculis decorticatis albidis cinereisve impressis in latere inferiore instructus." L. c.

† *fastigiata* (Del.), *rhizophora*, *Delisei* (Bory).

‡ *submedia*, *nigricescens*.

C. hiascens representing his variety *macrophylla*, unless we are to move the variety *platyna* of *islandica* into the synonymy of *macrophylla* and recognize it as the same plant. The best character we have to distinguish *hiascens* from the smaller states of *islandica* and *tenuifolia* is the espinulose lateral margins of the laciniae, and even the variability of this character for many years held *hiascens* as a variety of *islandica* itself. It is true that *platyna* has generally subspinulose lateral margins, but the spines are confined to the summits much less rarely than in *hiascens*, and Mr. Merrill himself attributes spinulose margins to his variety. A comparison of Acharius' original description of *platyna* and Mr. Merrill's of *macrophylla* shows a marked similarity. Both contain the diagnostic word "pallid," and Acharius calls the margins possessed of harmless teeth. Even if Mr. Merrill's assumption is correct, the Acharian name has priority for these broad leaved plants. And finally I cannot help believing that a far closer relationship exists between the plants of the *islandica* and *hiascens* stock than is expressed in even a parallelism.

EXSICCATI: No. 187. Decades No. Amer. Lich., Cummings, etc., Newfoundland, Lane au Mort, Sept. 28, 1895. Rev. A. C. Waghorne, called *C. islandica* var. *Delisaei* (Bor.) Schaer.

No. 118. Lich. Boreali-Amer., Cummings, etc., Newfoundland, Blanc Sablon, Sept. 14, 1894., Rev. A. C. Waghorne.

No. 7. Canadian Lich., Macoun., various stations, 1869–1883, called *C. islandica* var. *Delisaei* (Bor.) Schaer.

No. 230. Decades No. Amer. Lich., Cummings, etc., Mt. Lafayette, N. H., Aug. 6, 1896, C. E. Cummings, called *C. aculeata* (Schreb.) Ach.

CETRARIA RICHARDSONII Hook.

SYNONYMY: [*Lichenoides corniculatum rigidum spadiceum*, etc., Dill., Hist. Musc. 545. 1741.]

Cetraria Richardsonii Hook., Rich. App. Frankl. Narr. Jour. Polar Sea 761. 1823.

Evernia Richardsonii (Hook.) Nyl., Mem. Soc. Imp. Sic. Nat., Cherb. 5: 99. 1858.

Platysma Richardsonii (Hook.) Nyl., Synop. Lich. 306. 1858–60.

TYPE: In the Kew Herbarium, Royal Botanic Gardens, Kew, London. Cotype in the Herbarium Boston Society Natural History, Boston, Mass., from Ft. Enterprize, Canada, also in Herbarium of Wellesley College, Wellesley, Mass., Herbarium Harvard University, Cambridge, Mass.

TYPE LOCALITY: "Barren Grounds from Punt Lake to the Arctic Sea."

ORIGINAL DESCRIPTION: "thallo brunneo omino libero: laciniis dichotomis linearibus, apotheciis marginalibus flavescenti-brunneis." L. c.

FIGURE: Rich. App. Frankl. Narr., etc. *Pl. 31.* 1823.

Elenkin & Savicz, List Lich. coll. Yakutsk & Maritime Prov. by M. Tscheroleff, etc. *Pl. 10.* 1903.

DIAGNOSIS: *Thallus* everniiform, subcanaliculate, *brown*, *margins entire.*

DESCRIPTION: typical: *Thallus* fruticose, everniiform (max. alt. 16 cm.), rigid, brown; *cortex* glabrous, ecorticate here and there on the concave face; *branches* bifacial, divaricate, dichotomous above (max. width 9 mm.), margins entire. *Apothecia* rare, adnate, marginal, ample (max. diam. 9 mm.), convex, margins crenulate, disk yellowish-brown. *Spores* 6–6.5 $\times$ 4–6 μ.

CONTINGENT PHASES: Unobserved.

SUBSTRATA: On the earth and on the dung of *Rangifer arcticus.*

DISTRIBUTION: Common in the Boreal zone from Chesterfield Inlet, Hudson Bay to Dawson, Yukon. Dr. Eckfeldt recorded it from Newfoundland but his herbarium is without material from this island. No. 105 of Canadian Lichens distributed by J. Macoun from Mt. Aylmer, B. C. (8,000 ft.) and determined doubtfully as *Cetraria odentella* appears to be abortive or degenerate material of this species.

OBSERVATIONS: This little known arctic lichen is easily recognized. It suggests *Everniopsis Trulla* (Ach.) Nyl., and its prostrate habit is more evernioid than cetrarian. Nylander even placed it in the genus *Evernia* in 1858, and in *Parmelia* in 1860, and its inclusion in this genus must be considered only tentative, as it may find a more logical resting place in the genus *Everniopsis*. It is quite clear that its radial structure is doubtful in view of its almost decorticate concave side and yet if sections for study are taken in corticate areas the plant is allied here rather than with the strictly dorsiventral Evernias.

Fig. 6. Range of *Cetraria Richardsonii* Hook.

It is interesting to note that this plant was first discovered by J. Ammann in Siberia and sent to Dillenius prior to 1741 as was pointed out by Tuckerman in 1860 and confirmed by Crombie in 1880. It was therefore figured and described by Dillenius eighty-two years before Hooker gave it his binomial name. Through the kindness of Dr. S. H. Vines of the Oxford Botanic Gardens I am reproducing on page 227 a photograph of the original Dillenian plant.

Exsiccati: No. 8. Canadian Lich., Macoun. Dome, Yukon, Aug. 15, 1902.

Cetraria cucullata (Bell.) Ach.

Synonymy: *Lichen cucullatus* Bellardi, Osserwazione 54. 1788.
Lichen cucullata Bell., App. Floram Pedemontanam, Act. Acad. Turin **10**: 209. 1790–91.
Lichen cucullatus Smith, Act. Soc. Linn. **5**: 84. 1791.
Cetraria cucullata Ach., Meth. Lich. 293. 1803.

Type: In the Bellardi herbarium, R. Instituto Botanico, Turin, Italy.

Type locality: "montis Cenisii," Italy.

Original description: "foliaceus, erectus, laciniatus albus, scutellis poticis, cucullatis, fuscis." l. c. Smith in epist.

Figure: Smith, Act. Soc. Linn. **5**: *Pl. 4. f. 7.* 1791.
Howe, Bot. Gazette **56**: 498. *f. 1.* 1913, of type.

Fig. 7. The Dillenian type of *Cetraria Richardsonii* preserved at Oxford, England. An alga is mounted to the right on the same sheet.

Diagnosis: *Thallus* fruticose, bifacial, canaliculate, *elacunose*, yellow.

Description: typical: *Thallus* fruticose (max. alt. 11 cm.), rigid, stramineous to yellow, often pale virescent; *cortex* glabrous, rarely sublacunose; *branches* bifacial connivo-canaliculate (max. width 5 mm.), margins undulate or lacerate, often spiculose. *Apothecia* not uncommon, terminal, cucullate, ample (max. diam. 1 cm.), concave, disk chestnut. *Spores* 7–10 × 3–4 μ.

Contingent phases: (*a*) Purplish at the base.

FIG. 8. The Hooker type of *Cetraria Richardsonii* preserved at Kew.

(*b*) Reduced, 4 cm. alt. (f. *minuscula* Elenkin & Savicz, ibid.).

SUBSTRATA: On the earth.

DISTRIBUTION: Common in the Boreal zone or in alpine regions above 5,000 ft. It occurs from Labrador to New York and westward to Colorado, British Columbia and Alaska.

OBSERVATIONS: This species is only to be confused with the following from which it may be distinguished by its taller, more slender, and less laciniate thallus, which is never more than slightly sublacunose. The complete early synonymy of the species is given as the name *cucullata* is occasionally attributed to Smith, who though evidently proposing it was antedated in print by Bellardi.

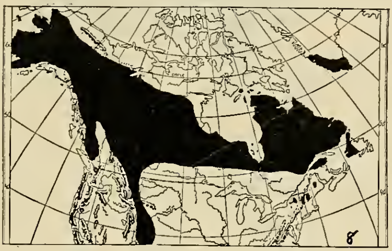

FIG. 9. Range of *Cetraria cucullata* (Bell.) Ach.

EXSICCATI: No. 4. Lich. Amer. sept. Exs., Tuck. I & II. 1848. "Montium Alborum."

No. 101, ibid., V. & VI. 1855. "Montium Alborum," called form *latior*.

No. 45. Decades N. Amer. Lich., Cummings, etc. Mt. Moosilauke, Aug. 10–17, 1898, 4,800 ft.

No. 230. Lich. Boreali-Amer., Cummings, etc., ibid.

No. 8. Canadian Lich., Macoun. Various stations, 1882–1891.

CETRARIA NIVALIS (L.) Ach.

SYNONYMY: *Lichen nivalis* Linn., Spec. Plant. 2: 1145. 1753.

Cetraria nivalis Ach., Meth. Lich. 292. 1803.

TYPE: In the Linnean herbarium, Burlington House, London.

TYPE LOCALITY: "Lapponiae, Upsaliae, Gronlandiae."

ORIGINAL DESCRIPTION: "foliaceus ascendens laciniatus crispus glaber lacunosus albus margine elevato." l. c.

FIGURE: Dill., Hist. Musc. *Pl. 21. f. 56A.* 1741.
Howe, Bot. Gazette, **56**: 499. *f. 2.* 1913, of type.

DIAGNOSIS: *Thallus* subfoliaceous, bifacial, subcanaliculate, *reticulate-lacunose*, stramineous.

DESCRIPTION: typical: *Thallus* fruticose to subfoliose (max. alt. 7.5 cm.), rigid, stramineous to pale virescent, often stained below; *cortex* reticulate-lacunose; *branches* bifacial, subcanaliculate, pinnate-lacerate (max. width 1

FIG. 10. Range of *Cetraria nivalis* (L.) Ach.

cm.), margins lacerate, rarely subspiculose at the apices (spicules often black tipped). *Apothecia* rare, adnate, subterminal, ample (max, diam. 8 mm.), convex, margins crenulate, disk pale chestnut. *Spores* 7–8 × 3–4 μ.

CONTINGENT PHASES: (*a*) Degenerate, pulvinate.

SUBSTRATA: On the earth.

DISTRIBUTION: Common in the Boreal zone or in alpine regions above 4,000 ft. It occurs from Labrador to Vermont and westward to Colorado, British Columbia and Alaska.

OBSERVATIONS: This species is sometimes difficult to distinguish from the preceding, and represents the most foliaceous species of the genus. Its thallus is nevertheless distinctly radial in structure.

EXSICCATI: No. 59. Lich. Amer. sept. Exs., Tuck., II & III. 1854. "Montium Alborum."

No. 14. Lich. Exc., Merr., St. Paul Island, June 19, 1897. J. M. Macoun.

No. 9. Canadian Lich., Macoun. Rocky Mts., etc. 1885–1891.

No. 10. Canadian Lich., Macoun. Banff, 1891.

ABNORMALITY IN LILIUM PHILADELPHICUM

By C. B. Atwell

Lilium philadelphicum L. grows abundantly along the shores, and especially in the moist grassy openings among cedars and balsams immediately back of the old beach, of Bois Blanc Island, in the Straits of Mackinac. Individual plants producing three flowers each are found not infrequently, and plants having two flowers are quite frequently seen. One which appeared to be of the latter variety, collected July 12, 1915, and preserved in formalin, proved to be an extremely interesting example of abnormality. One flower is normal in every respect, while the second has a pedicel thickened and grooved, as if made up of two pedicels grown together. Its flower appears to be double, but closer observation reveals these facts: there are five outer and five inner segments of the perianth, and each member of each of these series is normal as in single flowers; there are two

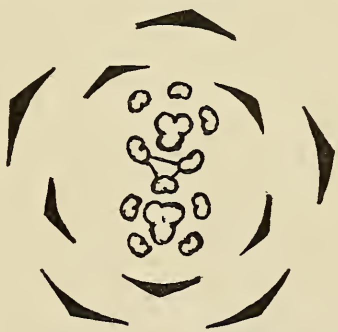

Fig. 1. Abnormality in *Lilium philadelphicum.*

separate and distinct pistils, each with seed-case, style, and stigma, quite as in normal forms; the stamens are ten in number, five in a cycle around each pistil; three of the stamens lie between the pistils, and slightly cohere by their filaments for the distance of five millimeters upward from their bases. Thus, it seems, this freak lily has one of its flowers on the normal "plan of three," and the other on the "plan of five," except for the two pistils with their three-celled ovaries. The cross-plan of the flower serves to make these relations clearer. In this combination of two flowers in one, two stamens and two segments of the perianth appear to have been lost.

Northwestern University,
Evanston, Illinois.

NEWS ITEMS

The prizes announced in Torreya for February offered by the *Journal of Heredity* for photographs of the largest deciduous trees in the United States, have been awarded. In the order of size the largest trees entered in the contest and their girths are as follows: Sycamore, 42½ ft.; Tulip tree, 34½ ft.; Chestnut, 33¼ ft.; American Elm, 33 ft.; Black Walnut, 24 ft.; and White Oak, 21 ft. Besides the amount of information secured through the contest as to big and historical trees, there are many significant trends in forest geography suggested by the results. A preliminary report of the contest appears in the *Journal of Heredity* for September.

Dr. L. O. Kunkel sailed for Stockholm on September 25th for a year's study abroad.

Mr. Guy R. Bisby has gone to Purdue University, Lafayette, Indiana, to fill the position vacated by Dr. F. D. Fromme.

We regret to record the death on September 30 at his country home at Stamford, Conn., of Mr. Lowell M. Palmer, who for many years maintained one of the best private collections of evergreens and rhododendrons in this country. Hundreds of specimens at the New York Botanical Garden and the Brooklyn Botanic Garden were presented to those institutions by Mr. Palmer.

We learn from *Science* that the sum of $25,000 has been put into a trust fund by the late Anna Yarnall for the support of the botanic garden of the University of Pennsylvania, as long as the garden "is under the supervision of the head of the botanical department."

The Torrey Botanical Club

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

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OTHER PUBLICATIONS

OF THE

TORREY BOTANICAL CLUB

(1) BULLETIN

A monthly journal devoted to general botany, established 1870. Vol. 40 published in 1913, contained 712 pages of text and 26 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 24–40 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. 28–40 three dollars each.

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

(2) MEMOIRS

The Memoirs, established 1889, are published at irregulas intervals. Volumes 1–13 are now completed; Nos. 1 and 2 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

DR. BERNARD O. DODGE
Columbia University
New York City

Vol. 15 November, 1915 No. 11

TORREYA

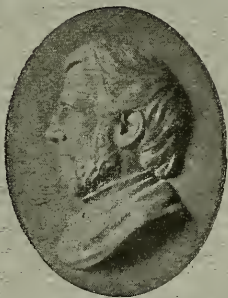
A Monthly Journal of Botanical Notes and News

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR



JOHN TORREY, 1796–1873

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THE TORREY BOTANICAL CLUB

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

Norman Taylor

Brooklyn Botanic Garden

Brooklyn, N. Y

TORREYA

November, 1915.

Vol. 15 No. 11

BOTANICAL SKETCHES FROM THE ASIATIC TROPICS

By Henry Allan Gleason

III. JAVA

(Continued from September Torreya)

Of the several thousand tourists who annually visit Java probably ninety-five per cent make a pilgrimage to Buitenzorg to see the famous botanical gardens. They give it a hasty inspection of one or two hours, probably never deviating from the main travelled paths, and depart, carrying with them the idea that the garden is a curiosity or a tropical park, but having no idea whatever of its botanical importance. And they can be forgiven for this, for some preliminary knowledge of botany is really requisite to the proper appreciation of this immense collection of plants.

By the average tourist, the time in Buitenzorg could be far better spent by a visit, not to the Botanical Garden, but to the Culturtuin, or Economic Garden, located about as far north of the railway station as the Botanical Garden is south of it. Here there is a remarkable collection of the economic plants of the tropics, including all the important species, and scores of cultivated forms and varieties, growing under virtually the same conditions as exist on the plantations.

A botanist from the temperate zone will recognize many of the species at sight, and a glance at the scientific name on the label will give him all necessary information about most of the others. The non-botanical tourist would appreciate the plants more if the labels bore also the vernacular names in English or German.

[No. 10, Vol. 15, of Torreya, comprising pp. 213–232, issued November 4, 1915]

There are also many species the uses of which are local or limited, or which do not commonly enter into commerce. A brief statement of their uses added to the label would in such cases be of value to every visitor. But these remarks must not be construed as criticisms: the garden is not intended for public exhibition, and visitors, while welcome, are exceedingly few in number.

The garden occupies apparently about 120 acres of quite level land, arranged in three sections of about equal size, which are so placed that they form three quarters of a square. The two sections nearest the city are attractively laid out in rectangular beds, closely planted with a great variety of species, and intersected with well-kept gravel walks. The third section, lying farther to the north, is devoted chiefly to experimental plots for rice, tapioca, sugar, and other plants of local importance, and are neither very accessible nor very attractive to the visitor.

FIG. 23. Old trees of *Ficus elastica*. The scars on the trunk are made by tapping for rubber.

The botanist, however, will be interested in the numerous varieties of rice and tapioca, if in nothing else. Both of these species are very common in the fields near Buitenzorg, but apparently only one variety of each is cultivated. Here in the garden there is a great variation in the height and color of the rice, and in the height, size of leaf, and spread of branches in the tapioca. It is quite likely that some of these varieties are more productive than those in general cultivation, but the Sundanese natives are very slow to take up any new improvement.

The approach to the center of the garden, the Landbouwweg, is a beautiful drive, with a noble line of lofty royal palms on the left and plots of coffee on the right. At the end of the drive are situated some of the buildings, including the laboratory for plant pathology, an office building, and the usual shops, storehouses and propagating grounds. At the east of these, at the edge of the garden, are the attractive new laboratory buildings.

In front of the old laboratories a small area is laid out in lawns and decorative plants, but this area is typically tropic in design, and is in no way an imitation of temperate zone landscape architecture. Any visitor here will be interested in inspecting the huge plant of the leguminous climber *Entada scandens*. Mention has already been made in these sketches of the plant of the same species growing in the Botanical Garden, but this one exceeds it in size. It has a basal diameter of about twenty inches, and, although not so old as the famous *Entada* in the Botanical Garden, has some advantages over it to the visitor. Many of its original supports have died or been broken, so that its twisted and tangled stems now lie on the ground in full view. Under living trees they again ascend and are lost to sight in the upper branches, although huge loops depending from heights of from 30 to 80 feet indicate something of the luxuriance of its growth. An entire morning was spent in tracing out in detail the course of the numerous branches, over a thousand feet of which are easily visible. In the tangle of foliage overhead *Entada* leaves and stems are frequently distinguishable, although their origin can not be traced. At 30 yards from the base twisted stems five inches in diameter loop down from the trees. In two places branches stretch from tree to tree across a small stream. At least twenty trees are covered by this huge climber, and the most distant of these is over 50 yards from the base. The larger branches of the vine are themselves covered with the epiphytic ferns *Drymoglossum heterophyllum* and *Asplenium nidus*.

Passing from the building toward the southeastern section of the garden, the visitor will first be attracted by a large tree of Para rubber, *Hevea brasiliensis*, now about two feet in diameter. This tree was planted in 1875, one year before the formal establishment of the garden, and is considered to be the oldest Hevea tree in the Dutch East Indies. It has been frequently tapped for rubber. There is also a plot devoted to Para rubber, with young trees averaging six to ten inches in diameter, which are being tapped regularly. Under them, as is the case in all modern plantations, there is not a trace of vegetation.

In the same section is a plot of nutmeg trees, not yet full grown, but old enough to bear freely the yellow pyriform fruit. Some distance beyond is a plot of clove trees, with glossy fragrant foliage and dense symmetrical conical crowns. Their principal branches exhibit well the feature described by Haberlandt in his Botanische Tropenreise. They deviate abruptly from the main trunk at a rather large angle for one or two feet, and then

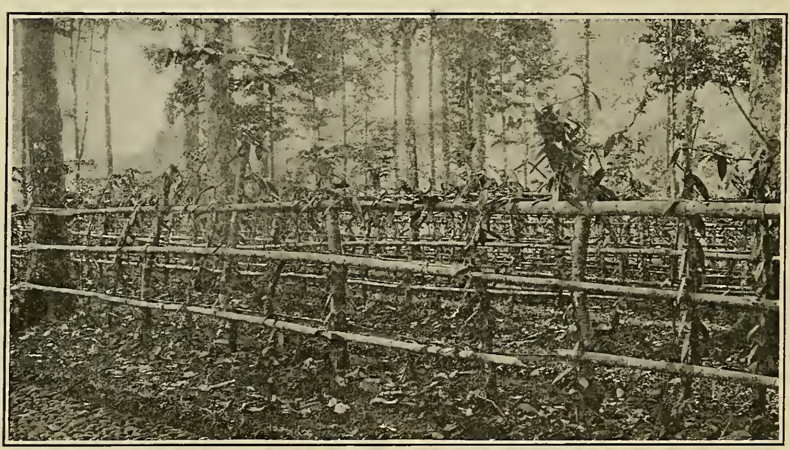

FIG. 24. A trellis of *Vanilla*.

bend upward, forming a very prominent elbow. The same peculiarity is observable in many species of tropical trees, but in none more clearly than in the clove.

Many plots in this section are planted to coffee. The visitor who knows of *Coffea arabica* only will be surprised at the display of other species. The cultivation of *C. arabica* on a large scale has long since ceased in Java because of the ravages of the parasite *Hemileia vastatrix*. It was followed by *Coffea liberica*, and it by *Coffea robusta*, which now produces the bulk of Java coffee. But in the garden are also plants of at least a dozen other species or hybrids. These have been introduced from the Congo region and the Sudan in the hope that among them will be found, or from them may be developed, a variety that will combine the flavor of *Coffea arabica* with an immunity to *Hemileia*.

Most of the plots of coffee are planted with some species of legume between them for a catch-crop, and when older they are shaded by small trees of the same family. Shade is necessary to the coffee plants, and the leguminous trees furnish the protection and enrich the soil at the same time. The selection of the proper shade-tree is a matter of considerable importance and numerous species are on trial in the garden. The plant must grow rapidly, to keep well above the coffee, must not make too dense a shade, must have a spreading crown, and must be resistant to disease and wind. Until recent years the dadap, *Erythrina indica*, was in general use as a shade-tree, but it was lately attacked by a fungus disease and has had to be replaced in many plantations. At present *Leucaena glauca* is chiefly favored. This American species, imported into Java from the Philippines, is now grown even in Africa under the name of "Javaschattenbaum."

There is also a plot of India rubber, *Ficus elastica*, composed of very old trees, covered with epiphytic ferns, and with a wonderful display of prop roots. Its branches are always ascending, never horizontal, and the prop roots always arise near the main trunk, so that the plant assumes nothing of the true banyan habit. As an illustration of prop roots, however, the plants excel anything to be seen in the botanical garden. The trunks and branches are always scarred with hundreds of oblique cuts, made in tapping for rubber. None of these is fresh and the plot as a whole is apparently neglected. In fact, most India rubber plantations in Java are neglected, although they can be seen frequently from the train windows. The species was always subject to disease, and its cultivation at present is not profitable in competition with *Hevea.*

One of the most attractive features of the garden is the extensive grove of the oil palm, *Elaeis guinneensis.* These tall massive palms have rough trunks caused by the persistent leaf-bases, which afford a good foothold for ferns and orchids, so that they are now almost hidden by greenery. The straight avenues of palms, the luxuriance and variety of the epiphytes, the great leaves interlaced far above, and the semi-twilight beneath combine to produce an effect little, if any, inferior to the famous Canary Avenue of the Botanical Garden.

In the southwestern section of the garden a larger variety of economic species may be seen. There are fragrant young plants of *Cinnamomum zeylanicum*, yielding cinnamon, and *C. cassia*, yielding cassia bark. The two species of tea, *Thea chinensis* and *T. assamica*, grow side by side, but both appear to be in poor condition in this hot lowland climate. These tea plants are not picked regularly, and consequently grow taller than they do on plantations. For the same reason they also bloom freely, and the three-lobed capsules may frequently be found upon them. *Vanilla planifolia* is cultivated on two long trellises. There is a good-sized grove of four or five species of gutta-percha. Of these probably the largest is *Palaquium Treubii*, named for the former director of the garden. There are plants of *Strychnos* and *Cinchona*, sources of the well-known drugs.

Still two other species of rubber trees are grown in this section. Of these, *Castilloa elastica*, the ceara rubber, has been planted the longest. The trees are now about 60 feet high and have been tapped for rubber. Near them are seedlings of two other species of the same genus, planted for experimental purposes. *Manihot Glaziovii*, the fourth of the important commercial species, is growing in the same plot, but is represented only by small plants. A small planting of *Ficus Vogeltii* is a relic of attempts to use this species for rubber, when the plantations of *F. elastica* were failing, and before the universal introduction of *Hevea.* The old trees are short and squat, reminding one of old apple trees, but their gray, obliquely ascending branches are perfectly characteristic of the genus *Ficus.*

In this section also may be seen various species of *Andropogon*, yielding ethereal oils, and a number of fiber plants, such as species of *Agave*, *Hibiscus*, and *Sanseviera*. Most interesting to an American in this connection are the plants of abaca, *Musa textilis*. This species is a native of the Philippines, and as the source of Manila hemp is the foundation of a large and ever increasing industry. As yet it has not been found practicable or profitable to cultivate the species elsewhere, so that, for the time being at least, the Americans enjoy a natural monopoly of this important fiber.

The few species so briefly mentioned here indicate merely some of the more important or interesting features of the garden. There are scores of other species, used as forage or food plants, for oil, for drugs, in dyeing, and in many other ways.

As the visitor leaves the garden, he may well pause a few minutes on the Landbouwweg and watch the display of local economic plants. An unceasing stream of natives, each with a shoulder-pole and two loaded baskets, passes by on the way to

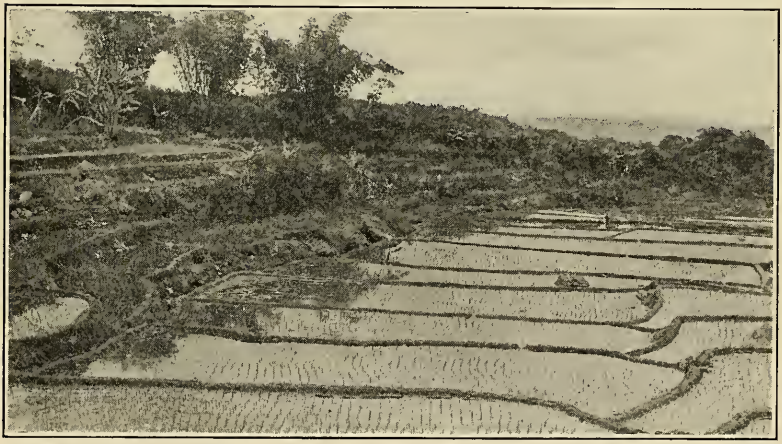

FIG. 25. Rice terraces on the Praenger Plateau, Java.

market. A dozen different plant products may be seen in as many minutes and each of them is of a little more interest to the tourist if he has already seen the live plant growing in the garden.

Of the various agricultural operations of the natives, the only one which deserves mention here is the rice industry. As in all the Asiatic tropics, rice is the staple food of the natives, and a correspondingly large proportion of the land is devoted to it. Between Batavia and Buitenzorg, one would estimate that two thirds of the land is in rice, and in certain other places the proportion is doubtless higher.

In the lowlands between Buitenzorg and the coast, the rice fields are usually extensive, and are separated by fields of tapioca and the groves and gardens around the villages. An observer gets the impression that the best land is always devoted to rice, while the other crops merely occupy what is left. That is doubtless true to a considerable extent, but the possibilities of irrigation must be considered.

The average rice *sawah* is located on a gently sloping hillside and is divided by earth terraces into numerous small level plots, whose size depends on the steepness of the slope. The natives avoid unnecessary labor as far as possible, and the terraces follow the contours quite closely. This leads to a peculiar optical effect, by which the relief of the ground is accentuated when viewed from the bottom, and is apparently flattened when seen from the top of the slope.

On the steeper hillsides, the natives go to great pains to use all the available land, building earth walls sometimes eight feet high, with nearly vertical outer faces, to support a narrow strip of rice above it. If the hillside is rocky, the walls are so located as to take advantage of the larger stones, while the smaller movable rocks are built into the terrace walls. The crest of the walls rises only a few inches above the water level behind it, and is about eighteen inches wide on top. So close to the water, they are always muddy, and are generally covered with various small weeds, especially sensitive plants. Laborers are always busy in the *sawahs*, working with huge hoes, and most of their labor seems to be the maintenance of the terraces.

The water supply is always taken from a river. The rapidly flowing streams descending from the mountains are diverted into irrigation canals, and the water is conducted at a slight fall in a sluggish stream until it is many feet above the natural channel. Then a part of it is turned into the uppermost terraces of the *sawah*. These are filled to the proper level, and overflow into the next one below. If the terrace is small and the stream of water in proportion, it may spill out over the wall, but usually a split bamboo serves as the conduit. In this way the water in each terrace does not become stagnant, but is used in turn for other terraces, until it finally reaches the lowest and empties back into the river channel. Nor does its usefulness cease here, for the same stream may be diverted many times at successively

FIG. 26. The mountain garden at Tjibodas, Java.

lower levels. One can understand why the water of the lowland rivers is so muddy, when it has passed through some hundreds of rice-fields on its way down from the hills.

The magnitude of some of the irrigation systems is surprising. In Buitenzorg a concrete dam diverts the entire current of the Tji Sadane into an irrigation canal, so that the river bed below is merely a mass of boulders with a few small pools of water. The canal, a hundred feet wide, has been excavated in the hills to a depth of at least fifty feet. In the rural districts one is seldom out of sight or sound of some little canal, running either to or from the *sawahs*.

The Preanger plateau, lying to the southeast of Buitenzorg, is famous for its rice cultivation. Our first view of this region was from a mountain pass at an altitude of 4,900 feet. Here the whole expanse of plateau was spread out before us, glittering with the reflection of sunlight from thousands of *sawahs*. For miles ahead the country was terraced, even on the steepest hillsides, into large fields of an acre or little fields as small as a room, but mostly the latter, because the country is very hilly. The terraces here are made, to a considerable extent, of rocks, and around the huge boulders bananas are frequently planted.

There are no shades of green in temperate zones to rival those of the tropics, and there the most brilliant greens of all are in the *sawahs*. Before they are planted, they are red with the red tropical soil, when the plants first appear, they are converted into a series of mirrors, as the sky is reflected back from the water, with just a faint tinge of yellowish-green from the young plants. Then it becomes a bright yellow-green, a bright emerald green, and later an intense deep green. Then the green turns to white as the rice heads out, then to yellow as it ripens, and finally to a pale yellow-brown as the old straw is left after harvest. One can look over a couple of miles of terraced valley and see the whole extent mottled with every one of these shades at once. No two valleys are ever terraced in the same way, and no two *sawahs* look exactly alike, so that they never lose their attractiveness to the traveller.

As the rice grows, so do the plants on the terraces, until at the time of brightest green one can hardly distinguish where the terraces are. Here too, as in all mountainous countries, it is impossible to decide on what is true level, so that many of the level *sawahs* seem to slope uphill. Little irrigation canals go rushing down the hills over the *sawahs*, other little canals flow smoothly and quietly around the hills between them, hollowed logs of coconut carry one stream across another, little streams drop over a low spot in the terrace wall from one *sawah* to the next, and all the water is used over again, in a series of rice fields, clear to the ocean. Paths run along the terraces from one village to another, brown bitterns fly over the *sawahs*, white herons wade in the shallow water, windmills whirl and squeak, scare-crows flap in the breeze, small boys crack whips or pound bamboos together and shout at the birds, women with big flat baskets seine the unplanted *sawahs* for fish, and catch them, too. Always the rice fields are interesting to look at and always something interesting is happening on them.

The Mountain Garden at Tjibodas is reached most conveniently from the excellent hotel in the little village of Sindanglaja. Here at an altitude of 3,500 feet the climate is always cool, and there are many conveniences not to be found in the sleeping quarters in the garden. A well-made path ascends steeply through the rice fields to the garden, about an hour distant and some 1,500 feet higher. Beyond the *sawahs* the path crosses the

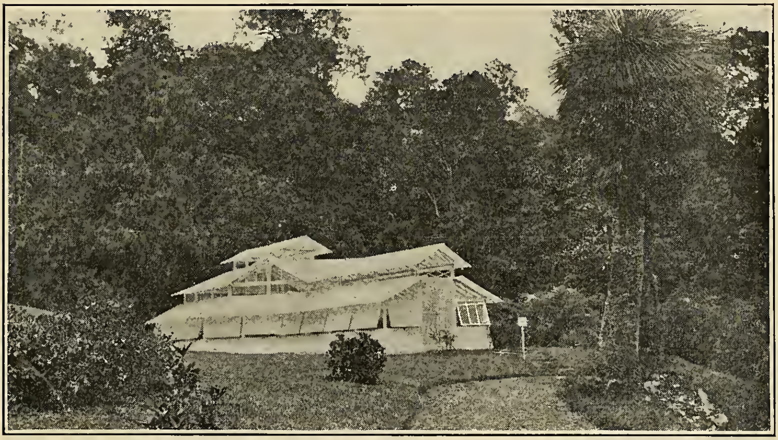

FIG. 27. The glass-house and a large grass-tree at Tjibodas, Java.

smooth lawns of the garden, with some remarkable views of the mountains to the east, and reaches the laboratory building under a row of huge *Araucaria* trees.

The one building is a simple but attractive one-story house of wood, containing a laboratory room and four sleeping rooms, three of which are available to visiting botanists. The laboratory room is small and very plainly furnished, with some tables, a couple of cases for apparatus, and a small collection of books. It does not seem to be well fitted for any sort of experimental work. There is also a small glass-house, necessitated by the relatively cool climate at this altitude.

In front of the laboratory are the plantings, and they are decidedly suggestive of a temperate zone climate, with rectangular flower-beds, lawns, and coniferous trees. The best feature of the plantings is the display of conifers, which seems to find almost optimum conditions in this mild cool rainy climate. The genera *Agathis*, *Cryptomeria*, *Cupressus* and *Dacrydium* are represented by large trees of several species, and there are numerous species of *Araucaria*. The genus *Pinus* is completely lacking: in fact, the only genus of eastern America represented is *Juniperus*, with a couple of species.

Behind the laboratory is the government reserve of original forest, extending almost all the way to the top of the Gedeh. There are good paths through it in every direction, the different sections of the garden are numbered, so that plants are easily located, and many of the trees are labeled. The most interesting trees to us were *Vernonia arborescens*, up to three feet in diameter, and *Altingia excelsa*, up to eight feet. In general, giant trees are not common. Epiphytes and lianas occur profusely, but most of them are comparatively small. The ground cover is dense, with numerous species of ferns, *Medinilla*, and Marantaceae. Buttress roots are not well developed, and strangling figs are few in number and small in size. The numerous paths through the forest make all parts of it more accessible than is the case on Mt. Makiling, but as far as the vegetation is concerned, the Tjibodas forest is far inferior to the one on Makiling. This is probably due to the greater altitude and the consequently cooler climate, since the highest peak of Mt. Makiling is over a thousand feet below the lower edge of the Tjibodas forest.

We left Java for Ceylon in the middle of February, and that island will be considered in the next of these sketches.

(*To be continued*)

A PROPOSED ECOLOGICAL SOCIETY

At the Philadelphia meeting of the American Association for the Advancement of Science about twenty men interested in ecology met informally on the evening of December 30, 1914, to consider the advisability of organizing an American Ecological Society. The immediate occasion for the conference was an expression of feeling on the part of Professor R. H. Wolcott and Professor V. E. Shelford to the effect that there is now no adequate opportunity for plant and animal ecologists to meet together, and also that there is for ecologists an urgent need of summer field meetings in addition to the present winter meeting.

The conference was attended by Messrs. Adams, Bartlett, Blodgett, Bray, Cannon, Cowles, Dachnowski, Griggs, Harshberger, Hill, Jennings, MacDougal, Nichols, Pearse, Shantz, Shelford, Shreve, Taylor, and Wolcott; Professor Harshberger was selected chairman. The opinion was practically unanimous that the time is ripe for the organization of an Ecological Society and it was voted, in connection with the Columbus meeting of the American Association, to call a conference of all ecologists interested in the formation of such a society. A committee was appointed to call such a conference and present a scheme of organization, the committee consisting of Professor J. W. Harshberger (chairman), Professor V. E. Shelford (vice-chairman), Professor H. C. Cowles (secretary-treasurer), Professor R. H. Wolcott, Professor Charles C. Adams, Dr. Forrest Shreve.

Announcement will be made later of the exact time and place of the Columbus conference, but it may be assumed that it will not be earlier than Tuesday, December 28, nor later than Thursday, December 30, 1915. The purpose of this early announcement is to give ample opportunity for full expression of opinion. It is hoped that all working ecologists will write to the undersigned, noting (1) whether the proposed society is favored or disfavored and why, and (2) whether attendance at the Columbus conference is to be expected.

HENRY C. COWLES

UNIVERSITY OF CHICAGO

DROSERA ANNUA SP. NOV.

By E. L. Reed

Annual, with slender tap root. Leaves all basal forming a rosette, varying in color from deep green to red, clothed with red glandular hairs; 5 mm. to 12 mm. long. Leaf blades suborbicular to nearly triangular, gradually tapering into dilated petioles which are copiously supplied with glandular hairs; blades much shorter than the petioles. Scapes, 1 to 3, slender, 1 cm. to 10 cm. high, glandular pubescent, racemes, 1 to 5 flowered; corolla of 3 (rarely 1, 2, or 4) petals, rose-colored; remaining convolute or rarely opening about 2 mm. to 4 mm.; petals 2.5 mm. to 6 mm. long; peduncles short, glandular pubescent; calyx green, glandular. Seeds dark brown, tuberculate. April to June.

Drosera annua is quite common in open oak woods, abandoned fields, pine barrens, and is sometimes found in moist sand around ponds. It grows with no apparent inconvenience in soils that

Fig. 1. *Drosera annua*, sp. nov.

for weeks will have as low a water content as 6 per cent. to 8 per cent.

I have specimens collected near College Station, Houston, and Jacksonville, Texas, and specimens have been sent to the New

York Botanical Garden, Missouri Botanical Garden, the National Herbarium, and the Brooklyn Botanic Garden.

Drosera annua seems to be closely related to *D. brevifolia*, from which it differs in its smaller corolla, rose-colored petals, less pubescence, and drier habitat.

In one of my field trips in April, 1914, I was surprised to find a species of *Drosera* growing in an open oak wood that is invading an abandoned field. It was growing among such flowers as *Sabbatia campestris*, *Phlox Drummondii*, *Alsinopsis Nuttallii*, *Linum multicaule*, *Lechea Drummondii*, and *Opuntia grandiflora*. An attempt to classify it failed and a close study of it this spring convinced me that it is an undescribed species.

A VISIT TO THE PINE BARRENS

By W. A. Murrill

The program of the Twentieth Anniversary of the New York Botanical Garden included a visit to the pine barrens of New Jersey on Friday, September 10, under the guidance of Mr. Percy Wilson, chairman of the field committee of the Torrey Botanical Club. The party of about fifty botanists left New York on the Atlantic City express at 9:50 A.M. and arrived at Tom's River at 12:20, where lunch was served.

The day was clear and warm, with a pleasant breeze. Coats and other impediments were left at the hotel and the party was soon in the barrens among small pine trees and huckleberry bushes. The soil being chiefly sand and the water level low, fleshy fungi developed lower down in the soil than usual and emerged through the sand and leaf-mold, usually bringing up considerable soil with them. This was particularly true of *Russula delica* and *Melanoleuca equestris*. I learned to look for these species by prying into what appeared to be mole hills.

As the season was dry, very few fleshy fungi were found, but these were mostly of interest. A number of parasitic and woody forms were discovered which will not be listed here.

At about six o'clock, our special car came for us and we dined *en route*, arriving in New York at 9:45 P.M., having enjoyed a delightful and profitable outing and being neither tired nor sobered by the day's exertions.

List of Agarics and Boletes Collected

Venenarius phalloides. Dark form. Found once.
Boletus luteus. Very common.
Lactaria sp. Frequent.
Ceriomyces sp. Found once.
Laccaria laccata. Frequent.
Laccaria ochropurpurea. Frequent.
Venenarius solitarius. Found once.
Venenarius muscarius. Frequent.
Ceriomyces viscidus. Found once.
Cortinarius sp. Found twice.
Russula delica. Very common.
Ceriomyces frustulosus? Found once by Dr. Levine. The pileus was milk-white, the tubes grayish to avellaneous, and the stipe very conspicuously reticulate entirely to the base. The species has previously been known only from Mississippi and Alabama.
Melanoleuca equestris. Very common, growing gregariously in low places and lifting up the soil and pine needles as it emerged. It was usually viscid when wet and very distinctly striate, especially when old, reminding one of *Russula foetens*, but being yellow to latericeous in color. Another marked resemblance to *R. foetens* was a decided odor of bitter almonds, which became very pronounced when the specimens were put in the stove to dry. The taste was at first mawkish, not farinaceous, and became slowly somewhat acrid. The stipe was solid, compact, and yellowish with reddish blotches. The fresh spores were ovoid, smooth, hyaline, uniguttulate, 8–9 $\times$ 5 μ, somewhat larger than recorded for the species. These specimens collected under peculiar conditions in the pine barrens are extremely interesting as indicating to what extent a species may vary. I was fortunate to secure for comparison good colored drawings of these specimens and the same species found growing in the New York Botanical Garden under normal conditions a few days previous.

NEWS ITEMS

Miss Jean A. Cross and Mr. Frank Stoll have been added to the staff of the Brooklyn Botanic Garden.

By the will of Col. Robert B. Woodward, who died at Cooperstown, N. Y., on September second, twenty-five thousand dollars have been added to the endowment funds of the Brooklyn Botanic Garden, the income to be used without restriction, as the trustees may from time to time designate.

A recent number of the *Annals* of the New York Academy of Sciences contains a paper of interest to phytogeographers, by Prof. H. F. Osborn, entitled Review of the Pleistocene of Europe, Asia and northern Africa.

The annual meeting of the Botanical Society of America will be held at Columbus, December 26–31, a special feature of which will be an invitation program consisting of papers by E. W. Reichert on Specificity of proteins and starches in relation to genera, species and varieties; by Wm. Crocker on mechanics of dormancy in plants, and by E. N. Transeau on periodicity of fresh water algae.

Dr. J. N. Rose, of the Carnegie Institution of Washington, has returned from a five months' trip to the east coast of South America. He has brought back large collections of cacti, ferns and mosses.

We learn from *Science* (November 5) that Dr. J. S. Caldwell has been appointed to a position as specialist in fruit by-products investigations at the Washington Experiment Station, at Pullman, Washington.

In Torreya for August, page 182, line three, *Rubus* should be *Rhus*.

We regret to record the death on November 10 at Washington of Dr. E. L. Greene. He was born in Hopkinton, R. I., August 20, 1843, the son of William M. and Abby Crandall Greene. He was graduated from Albion College in Wisconsin in 1866, and in 1895 Notre Dame University conferred on him the honorary degree of LL.D. From 1871 to 1885 he was a clergyman in the Episcopal Church and from 1885 to 1895 he was professor of botany in the University of California, and from 1895 to 1904 at the Catholic University of America. He became connected with the Smithsonian Institution in 1904. Perhaps Dr. Greene was best known as the author of a book of which, unfortunately, he had published only the first volume, the "Landmarks of Botanical History." Easily the best classical scholar among contemporary botanists, he brought to this book a certain, fluent and delightful style. The combination of such broad scholarship and the attractive presentation of his subject makes it difficult to speak with restraint of a work that has already become a classic. His great activity in taxonomic botany, extending over many years, has added an enormous number of species of plants as known to him and his associates and described in *Pittonia* and *Leaflets*, both of which he fathered. In his early days he led a romantic and often dangerous life as a missionary in the far west and southwest. During this period, in which he made very long excursions, he collected thousands of specimens and acquired a field knowledge of plants that few modern botanists can equal.

The Torrey Botanical Club

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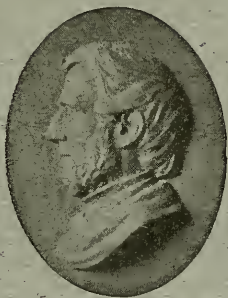
A Monthly Journal of Botanical Notes and News

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR



JOHN TORREY, 1796–1873

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Norman Taylor

Brooklyn Botanic Garden

Brooklyn, N. Y

TORREYA

December, 1915.

Vol. 15 No. 12

SOME OBSERVATIONS ON THE FLORA OF THE NORTHWEST HIMALAYA

By Ralph R. Stewart

During three years' service in an American college in the northern part of the Punjab I found time to spend two summers travelling in the northwest Himalaya and western Tibet. This part of the mountains is much drier than that further east in Nepal, Sikkim and Assam, where the mean rainfall is over 120 inches a year, and the flora is rich in types from western Asia while in the eastern Himalaya there is a large endemic and Chinese element that does not get much west of Simla. Although I travelled about 2,000 miles in the mountains, mostly on foot, I did not go west of Simla and most of my botanical observations are from the valleys of the Jhelam and Upper Indus.

Drude, following Brandis, classified the vegetation of the Himalayas altitudinally into four main regions: (1) an Alpine belt; (2) a temperate forest belt; (3) a subtropical forest belt; (4) a tropical forest belt. As one goes northwest the last two belts become narrower and narrower until at Rawalpindi, near the Afghan frontier, the tropical belt has disappeared and a narrow belt of low scrub is all that remains of the subtropical forest.

This gradual change is correlated with the decreasing effects of the monsoon, due largely to the distance from the sea. In the popular mind India is all a tropical country with palm trees, and tigers looking out of the jungles. In reality one sees practically no picture-book jungle and what is called jungle by the natives is an uncultivated bit which is covered with prickly scrub and

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valueless in every way. In fact one can go from Bombay clear up to the Afghan frontier and then down to Calcutta without seeing what he had expected to find on every hand. There is, of course, jungle in India but it is not the typical thing one sees from the car windows.

In the Punjab and Scinde, huge provinces in the northwest of India, the country is desert or semi-arid, and without irrigation most of the country would be uninhabited. In this region the flora is very similar to that of Arabia and Persia and this condition extends clear up to the tops of the first ridges of the Himalaya without being interrupted by tropical rain forests at the foot of the mountains as is the case toward Calcutta. Fine crops of wheat, sugar cane, millet, peas, mustard, etc., are grown in the Punjab, but they are dependent on the two short rainy seasons and on irrigation. The indigenous flora is surprisingly related to that of the great stretches of desert from northern Africa to Afghanistan. The tropical genera which require plenty of rain are not to be found. Only two or three ferns are reported from the Punjab and although there are 1,600 orchids reported from India scarcely half a dozen are to be found in the plains of the northwest.

The Indian side of the outer ranges of the Himalaya is largely clothed with this desert flora, but strangely enough, the northern side of the first important range is almost entirely different, being clothed with a warm temperate flora right up to the summit so that the tops of the evergreens could be seen plainly from where I lived in Rawalpindi twenty miles away. On the side away from India the forests are much like those in our Eastern States; on the Indian side, there is no true forest, but the trees and shrubs are small and are like those on the plains.

The names of a few of the Punjab types and of those on the other side of the range will show the contrast. On the south side acacias such as *Acacia arabica, catechu* and *modesta* are common. *Capparis aphylla, Tamarix gallica, Zizyphus jujuba, Melia Azederach, Albizzia Lebbek* and *Olea Europea* are among the commonest. On the other side, at Murree, a summer resort on the top and slopes of a mountain, overlooking the plain, I found oaks, maples, poplars, holly, cherry, hawthorn, horse-chestnut and dozens of other genera that reminded me of home.

The cause of this great difference seems to be that the snow, which does not fall at all on the plains, lies much longer on the northern side of the mountains and keeps the ground damp enough for plants to get well started. On the Indian side it does not lie at all after ordinary storms, and there are scarcely any peaks with permanent snow. As a result the climate is much the same as that of the Punjab except for the gradually increasing effect of altitude.

FIG. 1. Even in July the sheltered valleys in Kashmir may have plenty of snow. On the slopes are found alpine plants in great variety. Amarnath, Kashmir.

Each summer we started for Kashmir by two-wheeled cart as soon as college closed in June. Kashmir proper is a wonderful valley about eighty miles long and from twenty to twenty-five miles wide. It is in the heart of the mountains and is nearly 200 miles from the plains by the Jhelam valley route. Politically Kashmir comprises several hundred thousand square miles of mountainous country including western Tibet, but most of the people, and most of the cultivation is in the valley itself.

The first twenty miles is nearly level and the plants I noticed as commonest or most striking were the acacias, *Olea*, *Dodonaea*, *Nerium odorum*, *Cassia fistula*, *Melia*, and *Dalbergia*. As we ascended *Pinus longifolia* became commoner and the wild pomegranate, *Punica granatum*, began to be common and as we got up to about 4,500 the oaks, spruces and other Kashmir types were the important elements of the flora.

The pass over the outermost range which looks out over the plains is 6,000 feet, just 4,300 feet higher than where we started at Rawalpindi, but as mentioned before, the flora is as different as though it were another continent. But going down from the pass to Kohala, which is in the warm valley of the Jhelam, and is only 2,050 feet, such Punjab types as *Acacia arabica*, *modesta* and *albispina*, *Olea Melia* and *Dodonaea* reappear. They occur only in the valleys, however, and the hills are covered with forests of *Cedrus deodara* (which some take to be a variety of the cedar of Lebanon), *Pinus longifolia*, *Juglans regia*, *Prunus Padus*, *Pavia Indica*, *Picea*, *Abies*, *Acer*, *Quercus*, *Berberis* and the other types found near Murree.

The country between the first range and Kashmir is a rugged, well-wooded country with cultivation along the banks of the streams and on the terraced hillsides to which a small stream can be diverted for irrigation purposes. After a hundred and fifty miles of this type of country one comes out into the wonderful valley of Kashmir. It is about eighty miles long and twenty to twenty-five miles wide with a most wonderful circle of peaks that average 15,000 ft.

The valley itself is highly cultivated except for the large shallow lakes which are full of aquatic plants of great variety. The lotus, water lilies, *Euryale ferox*, *Trapa natans*, potamogetons, sagittarias and a host more fill the water so that the horses and cattle wade out to browse on the water plants and the natives fill their boats and use the plants for fodder. Along the banks of the lakes *Iris*, *Euphrasia*, *Spiranthes*, *Menyanthes*, buttercups, polyganums and other new-world genera abound. All kinds of temperate fruits flourish on the hillsides; and pears, quinces, apricots, apples, peaches, plums, almonds, cherries, walnuts and mulberries are for sale in the bazaars and are canned or transported fresh to India if they can stand the rough journey by bullock cart. Curiously enough, the most characteristic trees of the valley, the Lombardy poplar and the chenar (*Platanus orientalis*) are not indigenous but are supposed to have been introduced in Mogul times. Rice is possibly the most valuable crop and the hillsides are terraced and irrigated with great care. Wheat, barley and maize are staple crops and all our common vegetables grow readily.

In Kashmir the tree line is close to 11,500 ft. and *Betula Bhojpattra*, a white birch, forms thickets at the upper limit. *Picea Webbiana* gets up to the extreme limit of forest, and below this are dense forests of *Cedrus Deodara*, *Abies Smithiana*, and *Pinus excelsa* mixed with *Taxus baccata*, *Pavia*, *Juniperus*, *Juglans*, *Celtis*, *Ulmus*, *Prunus*, *Fraxinus*, *Acer* and like temperate types.

A noticeable thing in this part of the Himalaya is the absence of a distinct band of rhododendron. Such a band, in many places so impenetrable that travel is impossible, is found clear along the outer Himalaya from China to the northwest of India. Oaks, too, are nowhere prominent as in the outer Himalaya.

Above the tree line and in the forest glades there are extensive Alpine meadows and there is a wealth of flowering plants that is remarked upon by every traveller. Very few of the genera are peculiar to Asia and almost all of them are related to our own or European types. Many species, even, as *Caltha palustris*, *Batrachium tricophyllum*, *Ranunculus sceleratus*, *Aquilegia vulgaris*, *Papaver dubium*, *Saponaria Vaccaria*, *Malva rotundifolia*, *Geranium Robertianum*, *Epilobium latifolium* and *Stellaria media* are found in both worlds.

After spending a couple of weeks in the valley of Kashmir, which is 5,000 feet or over, we moved on toward the "Great Range" of the Himalayas that separates the wooded, beautiful country that we have just been in from the arid Tibetan wastes on the other side. Beyond Kashmir there is no cart road, and all provisions and baggage have to be taken on the backs of ponies or coolies. The stages where tents can be pitched, or where there are government two-room rest houses, are about fifteen miles apart and it is difficult to travel much farther in a day through so mountainous a country.

As we followed up the Scinde Valley from Kashmir, the mountains became grander and there was more snow in the sheltered valleys and on the mountain tops. Everywhere we found the principle applying, that the northern slopes, where the snow

Fig. 2. Old bridge over the Indus, Khalatze, Western Tibet. Even a desert like the surrounding country can be made to blossom when it is irrigated.

melted more slowly, were better wooded, until we passed the Zoji Pass. The Great Range of the Himalayas is so high that it stops the rain clouds which have passed the lower ranges and almost abruptly we get another change of flora just as we did when we left the plains of India. From a rich flora we passed in a day's march to that of an Alpine desert. There is a transition zone but it is hardly twenty-five miles wide. On the pass Thomson found only six Tibetan plants out of the 110 he enumerated while at Dras, the second stage beyond on the Tibetan side the figures are almost reversed.

Western Tibet or Ladak, while Tibetan in flora, customs, race and sympathy, is politically a part of the Kashmir state, so it is possible for Europeans to get permission to travel, while Tibet proper is still closed to the foreigner. It is a highly mountainous country lying on both sides of the river Indus, and there is very little of a plateau about it. Tibet proper was for a long time supposed to be a vast plateau but it is also a series of mountain ridges with troughs between that have not as a rule been cut down by streams. There are some plains that are probably the beds of extinct lakes but none are very extensive.

The ranges in Ladak are, as a whole, from 17,000 to 19,000 ft. while peaks in all of them go higher. The rainfall is very slight, averaging between three and four inches a year. When there is any precipitation in the summer time, it comes as a slight blanket of snow and only a few drops fall in the valleys. It is so light that in some places the snow line is as high as 20,000 ft. As a result of this aridity cultivation is absolutely impossible without irrigation, and what little there is is found on the alluvial fans built up by lateral tributaries to the Indus and its main feeders. These fans are selected because it is possible to divert the water from the stream bed above the fan and by great toil and ingenuity lead it out on the tiny fields which are most carefully terraced. Sometimes the very soil is brought in baskets to make the little fields. Frequently the ditches are a mile in length and they are conspicuous landmarks because of the tiny band of green which grows up at the sides of the ditch. Desert plants will be found three feet from gentians.

A poor New England farmer would expect to starve on the amount of land a whole Ladaki village has for cultivation. Wheat, barley, buckwheat and legumes are the principal crops, and cultivation extends higher than in any other part of the world. There are villages up to 14,000 ft. and cereals will ripen at that altitude, although the growing season is very short. Above this live Tartar nomads that depend on their yaks, sheep and goats for their food.

Water is all the soil needs, for the finest potato tops I ever remember seeing were in the garden of a missionary doctor. He raised nearly all our common vegetables from German seed, although he lived 11,500 ft. above the sea. He had an experimental plot where he was testing the value of rye for introduction among the native farmers.

Even trees thrive when they can be watered and each village has a little grove of willows and poplars under government control for the benefit of the village. There are a number of other cultivated trees that do well in different parts of the country. These are the apple, walnut, mulberry and apricot, the last being the most important. In the apricot season the roofs of the houses are covered with the yellow fruit drying in the sun, and even the kernels are used for oil or food.

FIG. 3. On the hillsides scarcely a twentieth of the surface is covered with vegetation. The whole country is apparently above the tree line, but with irrigation even trees flourish. Near Dras, Western Tibet.

Indigenous trees are very few. *Myricaria elegans*, *M. germanica*, *Juniperus excelsa* and *Hippophæ rhamnoides* are the commonest. *Elæagnus*, *Betula Bhojpattra*, *Ulmus pumila*, *Lonicera glauca*, and *Fraxinus xanthoxylloides* are local. Four poplars are fairly common, *Populus balsamifera*, *P. alba*, *P. Euphratica* and the Lombardy poplar. There are no forests, and the only thickets are along the streams or on little islands in the streams. The conspicuous plants of these thickets are the two myricarias *Hippophæ rhamnoides* and *Clematis orientalis*, a fine creeper with dark orange brown or yellowish flowers. The most conspicuous plant of the rocky hillsides is a woody rose, *Rosa Webbiana*, with a wealth of pink flowers.

Continuous plant formations of any kind are very rare and are only to be found in the rare places where there is a spring, salt lake or stream. In the open desert scarcely a twentieth of the ground is covered with vegetation and only the toughest species have survived. These are perennials with much more below ground than above, and travellers frequently have to dig them out by the roots to get enough wood for a fire. Annuals are rare except where there is water.

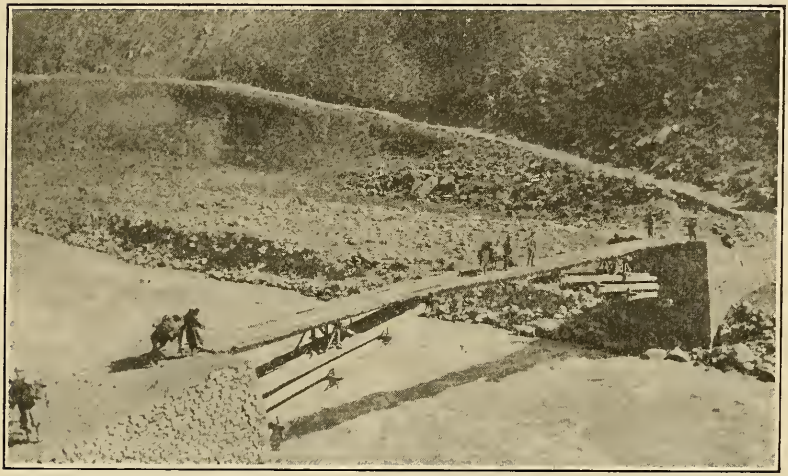

FIG. 4. There are practically no continuous plant formations in Western Tibet. Bridge over the Indus near Himis.

The flora of Ladak is richer than that of Tibet, but its affinities are with that country and Turkestan. It is not an old flora, for there are very few indigenous species, and the geologic history indicates that the present great elevation and the present desert flora is very recent. Composites, mints, peas and grasses are probably the commonest, and the following are some of the types that are most in evidence, *Ephedra*, *Echinops*, *Astragali*, *Capparis spinosa*, *Christolea crassifolia*, *Pedicularis tubiflora*, *Peganum Harmala*, *Eurotia*, *Caragana*, wild rhubarb and perennial potentillas.

Although the flora is not rich, it is a very interesting one, as it shows the ability of plants to adapt themselves to the most difficult circumstances. Some types are found clear up to the snow line which is here close to 19,000 ft. and only perpetual snow is able to stop plant growth. One thing that puzzled me for a long time was the increase of the number of species toward the top of the mountains and passes, instead of a decrease with the increased altitude. This is of course due to the larger amount of rain and snowfall on the summits.

I have not completed my catalog of the species I found in this alpine desert country, but I do not think that it will include more than four hundred forms including the cosmopolitan weeds. In a single valley in Kashmir one can find more types, and so I cannot recommend western Tibet to the hunter for new species. It is a place where the struggle is not between plant and plant, but between the plant world and a hostile environment, and one can examine plant adaptations to some very definite climatic conditions.

NEW SPECIES OF GRASS RUSTS

By J. C. Arthur and F. D. Fromme

In attempting properly to account for all collections in hand while working upon the manuscript for the next rust number of the *North American Flora*, the following forms are found to be sufficiently distinct to be entitled to specific recognition. They are mostly recent discoveries, but such forms as *P. Leptochloae* and *P. unica* have had an uncertain disposition for a number of years.

Uromyces Jacksonii sp. nov.

II. Uredinia amphigenous and caulicolous, scattered, bullate, oblong or linear, 0.3–1 mm. long, tardily opening by slit in the epidermis, yellow; paraphyses none; urediniospores globoid, 21–26 by 24–30 μ; wall pale yellow, moderately thin, 1.5–2 μ, finely echinulate, the pores 6–8, scattered.

III. Telia similar to the uredinia, long covered by the epidermis, blackish-brown; teliospores angularly globoid or ellipsoid, 19–25 by 20–30 μ; wall light chestnut-brown, uniformly 1.5 μ thick, smooth; pedicel colorless, about half length of spore, delicate.

On *Deschampsia elongata* (Hook.) Munro, Orenco, Ore., June 13, *1396*, Corvallis, Ore., July 6, *2658* (type), Glendale, Ore., Aug. 17, *1408*, all in 1914 by H. S. Jackson, and Bremerton, Wash., July 20, 1912, E. Bartholomew *4755* (Barth., N. Am. Ured. *1237*, and Fungi Columb. *4460*); on *Agrostis Hallii* Vasey, Corvallis, Ore., Sept. 4, 1914, H. S. Jackson *1576*. Only the type collection and the one on *Agrostis* show telia in addition to the uredinia. When only the uredinia were known this rust was mistaken for *Puccinia Deschampsiae* Arth., from which it differs notably by the absence of uredinial paraphyses. It somewhat resembles *Uromyces Hordei* Tracy, but may be distinguished by the absence of uneven thickening in the teliosporic wall. The species is dedicated to Professor H. S. Jackson, of the Oregon Agricultural College, whose ability as a collector and keen botanical insight have added greatly to the knowledge of Oregon rusts as well as of other departments of the local botany.

Uromyces Archerianus sp. nov.

II. Uredinia not seen; urediniospores from telial sori globoid or broadly ellipsoid, 19–23 by 21–26 μ; wall golden- to cinnamon-brown, moderately thick, 2–3 μ, finely and inconspicuously verrucose, the pores usually obscure, 2, equatorial.

III. Telia hypophyllous, prominent, oblong or linear, 0.5–10 or more mm. long, early naked, pulvinate, blackish-brown; teliospores globoid to broadly ellipsoid, 18–26 by 25–32 μ, rounded above and below; wall dark chestnut-brown, 1.5–2 μ thick, becoming considerably thicker above, 7–9 μ, smooth; pedicel yellowish or colorless, firm, 3–4 μ thick, once to twice length of spore.

On *Chloris elegans* H.B.K., Mesilla Park, N. Mex., November 12, 1914 (type), February 7 and March 22, 1915, *W. A. Archer*. In gross appearance and in microscopic characters as well, this rust somewhat resembles *Puccinia subnitens* and *Uromyces Peckianus*, both on *Distichlis*. The teliospores of the new species are considerably shorter, often quite globoid, and less inclined to be narrowed below; the urediniospores are generally slightly larger and thicker walled. The most distinctive morphological character is in the uredinial pores, which are two and equatorial, contrasting sharply with the six scattered pores of the other species. The resemblance here indicated led to the sowing of telial material supplied by Mr. Archer upon *Chenopodium album*, aecial host for both *U. Peckianus* and *P. subnitens*. Sowings were made on April 15, from both the November and February collections, but without result. The species is in many ways quite unlike *Puccinia Chloridis* Speg., which occurs in the northern part of New Mexico, and elsewhere, the latter having colorless urediniospores with apical thickening.

All the material and observations for this species were supplied by Mr. W. A. Archer, a freshman student of the New Mexico Agricultural College, now in his sophomore year, who accompanied the authors on a trip to the Organ mountains in March, 1914, and has since done effective service in making known the rust flora of southern New Mexico. The specific name is given in recognition of Mr. Archer's scientific acumen.

Puccinia dolosa sp. nov.

II. Uredinia amphigenous, evenly distributed, small, early naked, cinnamon-brown; paraphyses none; urediniospores angularly globoid to obovoid, 16–21 by 19–24 μ; wall golden- or cinnamon-brown, 1–1.5 μ, echinulate, the pores 3, equatorial.

III. Telia amphigenous, small, tardily naked, dark chestnut-brown; teliospores broadly ellipsoid, often irregular, 19–26 by 30–42 μ, rounded at both ends, slightly constricted at septum; wall smooth, cinnamon- or chestnut-brown, 1–1.5 μ, slightly thickened at apex, 3–4 μ; pedicel fragile, short, slightly tinted or colorless.

On *Paspalum tenellum* Willd., Guadalajara, Mex., Sept. 25, 1903, E. W. D. Holway (Sydow, Ured. *1986*), City of Mexico, Mex., Oct. 11, 1898, E. W. D. Holway *3065;* on *P. paniculatum* L., Cuernavaca, Mex., Sept. 28, 1899, E. W. D. Holway *3514*, Sept. 10–11, 1910, A. S. Hitchcock. The first named collection is taken as the type. The species has heretofore been included with *Puccinia substriata*, from which it differs in the smaller uredinia, and urediniospores. The urediniospores are also paler, thinner-walled, and with the pores uniformly three so far as observed. It appears to be a species confined to central Mexico, while *P. substriata* is a semitropical species extending around the world.

Puccinia Leptochloae sp. nov.

II. Uredinia amphigenous, oval or oblong; urediniospores globoid, 21–24 by 23–26 μ; paraphyses none; wall light cinnamon-brown, moderately thick, 2–2.5 μ, minutely and closely verrucose, the pores usually 4, sometimes 6, scattered.

III. Telia amphigenous, crowded, oval to linear, 0.5–2 mm. long, early naked, blackish-brown; teliospores oblong or broadly ellipsoid, 21–27 by 26–35 μ, rounded at both ends, slightly constricted at septum; wall dark chestnut-brown, 2 μ thick, considerably thicker above, 3–7 μ; pedicel golden, once length of spore.

On *Leptochloa filiformis* (Lam.) Beauv. (*L. mucronata pulchella* Scribn.), Guaymas, Mex., 1887, Dr. Edward Palmer *694*. The species was detected by Dr. P. L. Ricker on a phanerogamic specimen in the National Herbarium some years ago. This host collection is cited in Hitchcock's Mexican grasses (Contr. Nat. Herb. **17**: 349. 1913). Only the type collection is yet known, although the host has an extended range from Virginia to the Pacific coast and southward into South America, including the West Indies.

The species has some resemblance to *Puccinia Jamesiana* Arth., which occurs on *Leptochloa dubia* in central Mexico, but differs in having the urediniospores verrucose instead of echinulate, and with much thicker walls, as well as in other particulars.

Puccinia unica Holway sp. nov.

II. Uredinia not seen; urediniospores intermixed with the teliospores, ellipsoid, 19–24 by 24–29 μ; wall cinnamon-brown, 1.5–2 μ thick, inconspicuously echinulate, the pores 4 or 5, approximately equatorial; paraphyses numerous, intermixed, capitate, 13–18 μ broad above, up to 60 μ long, the wall about 7 μ thick above, becoming 2 μ thick in the pedicel which is often solid.

III. Telia caulicolous and epiphyllous, crowded and often confluent in lines, elliptical or oblong-linear, 0.5–2 mm. long, early naked, pulvinate, blackish-brown; teliospores ellipsoid, 21–26 by 29–39 μ, rounded at both ends, slightly or not constricted at septum; wall dark chestnut-brown, smooth, 2–3 μ thick, slightly thicker above, 3–6 μ; pedicel twice length of spore or more.

On *Aristida longiramea* Presl, Cuernavaca, Mexico, Sept. 27, 1898, E. W. D. Holway *3020*. This collection was early recognized by Professor Holway as doubtless representing an undescribed species. As no comprehensive survey of the American grass rusts had then been made, the publication of the proposed name was withheld. The gross appearance of this rust in its prominent, blackish sori is not unlike that of *Puccinia graminis* Pers. and *P. Aristidae* Tracy, and in the microscopic appearance of both urediniospores and teliospores there is also much resemblance. The numerous capitate paraphyses, however, when coupled with the other characters, easily and strongly separate the species. The host is cited in Hitchcock's Mexican grasses (Contr. Nat. Herb. **17**: 279. 1913) from a phanerogamic specimen with same data, deposited at Washington.

Puccinia Chaseana sp. nov.

II. Uredinia amphigenous, numerous, scattered, oval, 0.3–0.5 mm. long, early naked, cinnamon-brown; paraphyses peripheral, numerous, incurved, cylindric, hyphoid, 5–9 by 30–35 μ, the wall uniformly thin, 1 μ, colorless; urediniospores globoid or broadly ellipsoid, 22–28 by 24–30 μ; wall cinnamon-brown, moderately thin, 1.5–2 μ, closely and finely echinulate, the pores 4, equatorial.

III. Telia amphigenous, inconspicuous, few, long covered by the epidermis; teliospores obovoid or obovoid-clavate, 19–26 by 38–45 μ, truncate or rounded above, somewhat narrowed below, slightly or not constricted at septum; wall cinnamon- to chestnut-brown, darker above, 1–1.5 μ thick, thicker above, 5–7 μ; pedicel tinted, short.

On *Anthephora hermaphrodita* (L.) Kuntze, Jamaica, Lloyd *1118* (type); Spot Bay, Grand Cayman, C. F. Millspaugh *1269*. For the material here cited we are indebted to the kindness of Mrs. Agnes Chase, assistant agrostologist in the U. S. Department of Agriculture, who examined the specimens of *Anthephora* in the National Herbarium and was able to detect evidences of rusts on the two collections cited. This examination was undertaken at the suggestion of the senior author in order to obtain material for study of *Uredo Anthephorae* Sydow, described in 1903 (Ann. Myc. **1**: 22) from a Cuban collection. This form was later found in Hope Gardens, Jamaica, by Eug. Mayor, and verified by him (Mem. Soc. Neuch. Sc. Nat. 5: 577. 1913). Material representing this species of *Uredo* does not yet occur in any American collection. Greatly to my surprise the two West Indian collections detected by Mrs. Chase, one being from Jamaica where Mayor made his collection, are wholly unlike the species described by Sydow, and in fact appear to represent one that is undescribed and very distinctive. We take pleasure in naming this new species in honor of Mrs. Chase as a slight recognition of her devotion to botanical investigations, her eminent services to agrostology, and her disinterested assistance freely given to workers in other lines of research. The species appears to be most closely related to *Puccinia polysora* Underw., on *Tripsacum*, which has larger urediniospores, however, with five instead of four pores, and has not yet been found in the West Indies. The description of *Uredo Anthephorae* given by Sydow and Mayor, if one may venture a guess, indicates that the form may belong to *Puccinia Cenchri* Diet. & Holw., which occurs in the West Indies on *Cenchrus*, but is not reported on *Anthephora*.

Uredo quinqueporula sp. nov.

II. Uredinia amphigenous, scattered, few, elliptical to oblong-linear, 0.5–2.5 mm. long, early naked, chestnut-brown; paraphyses none; urediniospores ellipsoid or oblong-ellipsoid, 19–24 by 25–33 μ; wall moderately thick, 1.5–2.5 μ, golden- to cinnamon-brown, echinulate, the pores 5, sometimes 4, equatorial.

On *Torresia macrophylla* (Thurb.) Hitchc. (*Savastana macrophylla* Beal, *Hierochloa macrophylla* Thurb.), Glendale, Oregon, July 17, 1914, H. S. Jackson *1411*. This non-paraphysate grass rust is especially noteworthy in having the larger part of its urediniospores equatorially five-pored.

Purdue University,
Lafayette, Indiana

SHORTER NOTES

Equisetum in the Florissant Miocene. During years of collecting from the Miocene shales at Florissant, Colorado, we failed to find any material of *Equisetum*, although it could hardly be doubted that it was present in the flora. A few years ago, however, Mr. Willard Rusk was so fortunate as to find a fossil *Equisetum* at Station 13B, Florissant. Unfortunately the sheaths were lost prior to preservation, but the fragment of a fertile stem, showing two and a half joints, is sufficiently characteristic for description.

Equisetum florissantense n. sp.

Fertile stem with joints extremely robust and short, 11.5 mm. long and 13.5 mm. broad; a black or dark ring below articulation of sheath; furrows close and numerous, 25 in lateral view, presumably 50 in all, the ridges minutely longitudinally striate, but not tuberculate.

Related to *E. canaliculatum* Knowlton, from the Yellowstone, but apparently distinct by the short joints, which appear to be mature. Among the living species it may be compared with *E. robustum* and *E. hyemale*.

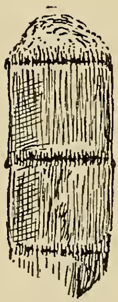

FIG. 1. *Equisetum florissantense* Cockerell.

Seward* remarks that "attempts to define strictly the specific characters of fossil Equisetaceous stems must necessarily result in provisional grouping as regards the majority of specimens, which are too incomplete to furnish adequate taxonomic data." The general type of *Equisetum*, as described by Seward and Lignier in numerous species as far back as the Jurassic, does not seem to have undergone any marked modification up to the present day. Competition with the modern flora has doubtless

* Jurassic Plants from Chinese Dzungaria, Mém. Com. Geol. (Petrograd), 1911, p. 35.

reduced the number of specific types and individuals of *Equisetum*, but has not, apparently, led to any progressive changes. The species from different geological horizons are probably distinct, but owe their distinctness merely to a shuffling of characters presenting new combinations of size, length of internodes, number of furrows, etc.

T. D. A. Cockerell

PROCEEDINGS OF THE CLUB

May 26, 1915

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

The minutes of meetings held April 28 and May 4 were read and approved.

Dr. Barnhart proposed Mr. Frank J. McCarthy, 311 E. 188th St., N. Y. City, for membership, and Dr. M. Levine proposed Miss Louise Kramer, 403 W. 49th St., N. Y. City, Mr. William Downer, 239 Bedford Ave., Brooklyn and Mr. Cullen Adlerblum, 1652 Mt. Hope Ave., Bronx, N. Y. These names were referred to the Committee on Membership.

Mrs. Britton read a communication from M. E. Husnot regarding the temporary suspension of publication of *Revue Bryologique*. The president directed that the exchange relations be continued.

Dr. M. Levine spoke of the advisability of establishing a new class of members to be known as associate members, who should enjoy the privileges of full membership except that of receiving the publications of the Club. Dr. Barnhart and others followed with further discussion of the subject. It was moved to appoint a committee of three to consider the matter. This motion was carried. The president then appointed as such committee Dr. M. Levine, Dr. Marshall A. Howe and Mr. Norman Taylor.

The field committee was authorized to accept into provisional membership subject to the subsequent ratification of the Club persons desiring to become members during the summer months.

Mr. Frank J. McCarthy was elected to membership.

The announced scientific program consisted of a paper on "The Twentieth Anniversary of the New York Botanical Garden," by Dr. N. L. Britton. The substance of this paper has since been published by the speaker under the title "History of the New York Botanical Garden" for distribution among those in attendance at the Twentieth Anniversary Celebration of the New York Botanical Garden, September 6, 1915.

Dr. Britton then submitted the following resolution, which was adopted:

Resolved: That the Field Committee of the Torrey Botanical Club be, and hereby is authorized to solicit and receive subscriptions to defray the expenses of botanists meeting at the New York Botanical Garden during the week commencing September 6, 1915, the celebration of the Twentieth Anniversary of the New York Botanical Garden, in visiting the pine barrens of New Jersey on Friday, September 10.

Resolved: That all details of arrangements for this visit to the pine barrens be referred to the field committee with power.

Prof. W. Bray gave in an informal way an outline of his proposed work on the "New York State Flora."

B. O. Dodge announced a new Gymnosporangial connection. He reported the results of several experiments establishing a connection between *Roestelia transformans* and the foliicolous form of *Gymnosporangium* on *Chamaecyparis* designated as *Gymnosporangium fraternum* Kern.

Dr. A. B. Stout gave a short paper on "Some Notes on *Phellodendron*." Two trees growing in the New York Botanical Garden were found to have largely pistillate flowers. The seeds that had fallen on the ground the previous year had germinated in great numbers. Some of these seedlings were found to be almost entirely without chlorophyll.

Dr. W. A. Murrill then read the following papers by title: "Luminescence in Fungi," "The Validity of *Clitocybe megalospora* Clements." These papers will appear in an early number of *Mycologia*.

Meeting adjourned until October.

B. O. Dodge,
Secretary

NEWS ITEMS

Dr. F. A. Wolf, for the past four years pathologist of the Alabama Agricultural Experiment Station at Auburn, Alabama, has resigned to become head of the department of botany and plant pathology at the North Carolina Agricultural and Mechanical College, Raleigh, N. C. He will take up his new duties on January 1.

Dr. J. S. Caldwell, for the past three years head of the department of botany at the Alabama Polytechnic Institute and plant physiologist to the station, has been appointed biochemist in fruit products investigations in the Washington State College, Pullman, Washington. He will take up the duties of the new position on January 1.

Dr. Theodor Boveri, known chiefly for his work on cytology, died at Würzburg on October 16 in his fifty-third year.

Dr. Henry C. Bastian, one of the few scientists who adhered to the theory of the spontaneous generation of life, died at his home in Chesam Bois, Bucks, on November 17, in his 79th year. He was born at Truro and educated at University College in London, where he later became Professor of Pathological Anatomy and Principles and Practice of Medicine, and from which he retired as Professor Emeritus. Dr. Bastian was also formerly Censor of the Royal College of Physicians in London. He was author of a number of books, the last of which were "The Nature and Origin of Living Matter" and "The Evolution of Life." Dr. Bastian was a Fellow of the Royal Society and a Fellow of the Linnean Society.

In a recent issue of a widely circulated magazine devoted to Arts and Crafts the following appeared as a caption to a photograph: "Another of the many wild flowers that formerly lived in the woods, but are now fully at home in the meadows: the white berries of the buttercup are much appreciated by the marsh birds." The picture is of the fruit of *Actaea alla!*

It is reported in the Notre Dame *Scholastic* that the library and herbarium, consisting of about one hundred thousand specimens, of the late Edward Lee Greene was left by him to the University of Notre Dame. The herbarium is probably the richest private collection in the country.

In connection with the twentieth anniversary celebration of the New York Botanical Garden, Miss Caroline Coventry Haynes presented to the garden the collection of Hepaticae formerly belonging to Dr. Marshall A. Howe, from whom she purchased it in 1909. This collection is especially rich in Californian material and includes most of the specimens described or cited by Dr. Howe in his memoir on "The Hepaticae and Anthocerotes of California," published in 1899. The collection includes, besides, a considerable amount of foreign material received in exchanges with Schiffner, Levier, Heeg, and other European students of the Hepaticae. The pockets of specimens now turned over to the garden number 1,174. The Ricciaceae of this herbarium had already been deposited at the garden. Certain specimens belonging to groups in which Miss Haynes is especially interested are being retained by her for a time, making the total number of pockets of specimens that are eventually to come to the garden about 1,851.

Ecologists and phytogeographers should be warned by the following which appeared in the New York *Times*, November 22. "Professor Will S. Monroe of the Montclair State Normal School has ended another season of planting seeds in various parts of this country. This is the first year in twelve that he has not done international planting, the war having interfered with his hobby. Ever since he was a boy Mr. Monroe has delighted in transposing the seeds of wild flowers and plants and trees, so that the growths indigenous to one section would find a home in another. He formerly took American seeds to European countries and planted them there, returning to this country with seeds from the foreign lands, which he planted in this country. In the Eagle Rock Park, west of Montclair, he has planted many foreign seeds, but most of his planting has been done in the woods of New Jersey, New York, and New England. Mr. Monroe usually goes on his walking trips carrying bags of seeds in his pockets. The seed he tosses broadcast as he walks along. On his frequent railroad trips he carries the seeds from some foreign country in small packages wrapped with tissue paper. These packages, weighted with stones, he tosses from the train windows into the woods bordering the track. His work is recognized by the Essex County Park Commissioners, who have given him the freedom of the reservation."

Word has been received that Dr. Ekman, of Stockholm, has recently ascended the Turquino, the highest mountain in Cuba. The last botanical excursion near this peak in the Sierra Maestra was in 1906 when the region was explored by B. E. Fernow and N. Taylor. An account of that trip appeared in *Forestry Quarterly*, *Journal* of the New York Botanical Garden, and TORREYA. It is reported that Dr. Ekman made large collections, and as he is probably the first botanist to reach the top, these should prove most interesting.

ERRATA

Page 28, line 2, read *xerofotic* for xerophytic.

Page 61, line 31, read *R. H. Howe, Jr.* for R. A. Howe, Jr.

Page 133, lines 23, 31, 33, and on page 134, line 5, read *roestelial* for roestelia.

Page 216, transfer to page 215 the dagger footnote, so as to refer to *C. ilandica maculata* on lines 19 and 20.

Page 219, transfer dagger footnote to page 221, so as to refer to *olivaceous-brown* on line 5.

Page 222, transfer both footnotes to page 221 to refer to *tabulosa* line 12, and *nigrescens* line 14, respectively.

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A monthly journal devoted to general botany, established 1870. Vol. 40 published in 1913, contained 712 pages of text and 26 full-page plates. Price $3.00 per annum. For Europe, 14 shillings. Dulau & Co., 37 Soho Square, London, are, agents for England.

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

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