TORREYA

A Monthly Journal of Botanical Notes and News

JOHN TORREY, 1796–1873

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR

Volume XI

NEW YORK

1911

Press of
The New Era Printing Company
Lancaster, Pa

ERRATA, VOLUME XI

Page 9, 13th line from the bottom, read *carolinensis* for *caroliniana*.

Page 10, 5th line from the bottom, capitalize C in *Cannon*.

Page 12, 6th line from the bottom, read *Byrsonima* for *Brysonema*.

Page 95, 11th line from the bottom, read *Crotonopsis* for *Chrotonopsis*.

Page 95, 10th line from the bottom, after *Panicum* read § for ‖.

Page 95, 12th line from the bottom after *Aster* read ‖ for §.

Page 96, the first five names in the list should precede the four in the second column on page 95.

Page 99, 4th line from the top, read *is* for *are*.

Page 190, last line, read *vegetation* for *vegegation*.

Page 191, 15th line from the top, read *Haberer* for *Harberer*.

Page 194, 7th line from the bottom, read *east* for *west*.

Page 196, 17th and 21st lines from the top, read *Pensauken* for *Penausken*.

Page 203, 15th line from the bottom, read *flowers* for *plants*.

Page 236, 3d line from the bottom, read *Dukinfield* for *Deunkinfield*.

Page 242, 14th line from the bottom, read *Anthurus* for *Arcturus*.

Page 248, 13th line from the bottom, read *R. A. Harper* for *R. H. Harper*.

Dates of Publication

No. 1, for January	Pages 1–22	Issued January	31, 1911
No. 2, February	23–50	February	14, 1911
No. 3. March	51–76	March	21, 1911
No. 4. April	77–100	April	19, 1911
No. 5, May	101–124	May	17, 1911
No. 6, June	125–144	June	19, 1911
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No. 8, August	165–180	August	14, 1911
No. 9, September	181–204	September	12, 1911
No. 10, October	205–224	October	18, 1911
No. 11, November	225–248	November	10, 1911
No. 12, December	249–276	December	20, 1911

Vol. 11 January, 1911 No. 1

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Published for the Club
At 41 North Queen Street, Lancaster, Pa.
by The New Era Printing Company
[Entered at the Post Office at Lancaster, Pa., as second-class matter.]

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Matter for publication should be addressed to

NORMAN TAYLOR
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Vol. 11 January, 1911 No. 1

TORREYA

THE FUNKIAS OR DAY-LILIES

By George V. Nash

Many years ago, past the middle of the eighteenth century, that indefatigable explorer and botanist, Thunberg, visited Japan. During his travels in that then almost unknown country, he found a perennial plant which was of frequent occurrence, both wild and under cultivation. In those days of broadly drawn generic lines, Thunberg without hesitation referred his plant to the Linnaean genus *Aletris*, under the specific name of *japonica*. Some years later, in 1784, he transferred this to the genus *Hemerocallis*, perhaps a nearer approach to its true relationship as understood today; but it was not until 1807 that the first intimation was made that the group to which this plant belonged might be the basis of a new genus, and the name of *Saussurea* was very indefinitely proposed for it by Salisbury. The form in which this proposition was made could not possibly be considered as publication under the rules of nomenclature of the present day. In any event, it is not available, as the name *Saussuria* had been previously employed by Moench for an entirely different group of plants. In 1812 Trattinick proposed the name of *Hosta*, ignoring the fact that Jacquin fifteen years earlier had used it for a genus of the Verbenaceae. These earlier names being disposed of the way is clear for the adoption of the *Niobe* of Salisbury, published in the same year as *Hosta*, and about which the question of priority might have been raised, had not Trattinick's name proved a homonym. Salisbury adequately published his name, it being based on *Hemerocallis japonica* Ker. In spite of this, however, the name of *Funkia*, under which these plants are generally known and which was not published by Sprengel until 1817, is adopted in the Index Kewensis. This arbitrary usage is perhaps responsible for the wide

[No. 12, Vol. 10, of Torreya, comprising pp. 261–292, was issued 23 D 1910.]

acceptance of this name and the continuation of the error. That this name must be abandoned and that of *Niobe* reinstated, is well supported by the above facts.

The genus divides itself into two rather well-marked groups which were considered genera by Salisbury, under the names of *Niobe* and *Bryocles*. The former was applied to the plant known here as *Niobe plantaginea*, in which the flowers are white and have the filaments adnate to the tube for part of their length, while the name of *Bryocles* was given to what is here called *Niobe coerulea*, a group including at the present time several other species, in which the flowers are smaller, colored, and have the filaments free. It is said that in *Niobe plantaginea* there is present a small bracteole at the base of the pedicel, but I find this frequently wanting, so attach little value to it as a generic character. In view of the above, I find it better to adopt the generally accepted view of the present day, and consider the two groups as parts of one genus.

The genus may be briefly characterized as follows:

Niobe Salisbury, Trans. Hort. Soc. 1: 335. 1812

Bryocles Salisbury, l. c.

Hosta Tratt. Arch. Gew. 1: 55. 1812. Not Jacq. 1797.

Funkia Spreng. Anl. Ed. 2, 2^1: 246. 1817.

Libertia Dum. Comm. 9. 1822.

Tufted perennial herbs, forming large masses, with petioled basal leaves, and a racemose inflorescence borne on a naked or leafy stem. Perianth varying from white to deep lavender, tubular-trumpet-form, funnel-form, or campanulate-funnel-form: segments six, shorter or longer than the tube. Stamens six, declinate, from equalling to a little shorter than the perianth, the filaments filiform and free or nearly so, or adnate to the tube for a considerable part of their length: anthers oblong, versatile, introrse. Ovary sessile, oblong, 3-celled. Style filiform, a little thickened at the stigma. Ovules numerous. Capsule narrowly oblong or almost linear, loculicidally 3-valved. Seeds compressed, angled, or almost flat.

Species seven or eight, perhaps more, natives of Japan, China, and eastern Siberia.

The following key will help identify the six species in cultivation:

Perianth white, 8–10 cm. long, tubular-trumpet-form; stamens adnate to the tube for a considerable portion of their length. 1. *N. plantaginea.*

Perianth colored, 3–6 cm. long, stamens free.

Perianth funnel-form, the tube gradually passing into the limb, from white flushed with lavender to pale lavender.

Flowering stem with leaves or with leaf-like bracts, these gradually passing into the bracts of the inflorescence; leaf-blades green.

Leaf-blades lanceolate to ovate-lanceolate, usually equally narrowed at both ends, the nerves on each side of the midrib 3–5; perianth usually less than 5 cm. long. 2. *N. japonica.*

Leaf-blades broadly ovate, the nerves on each side of the midrib 6–10; perianth usually 5 cm. long or more. 3. *N. undulata.*

Flowering stem naked, or sometimes with a single bract at the middle; leaf-blades glaucous.

Scape not or but little exceeding the leaves; petioles usually much exceeding the blades. 4. *N. Sieboldiana.*

Scape much exceeding the leaves; petioles usually not exceeding the blades. 5. *N. Fortunei.*

Perianth campanulate-funnel-form, the tube abruptly passing into the limb, blue. 6. *N. coerulea.*

1. **Niobe plantaginea** (Lam.). White Day-lily. Plantain Lily

Hemerocallis plantaginea Lam. *Niobe cordifolia* Salisb. *Funkia subcordata* Spreng. *Funkia alba* Sweet. *Funkia grandiflora* Sieb. & Zucc.

A showy perennial, with large plantain-like leaves, and racemes of white odorous flowers. Leaves numerous, pale green; blades 15–23 cm. long, 8–13 cm. wide, broadly ovate, cordate at the base, acute at the apex, with 6–8 curved nerves on each side of the midrib; petiole usually exceeding the blade in length: scape 4–6 dm. tall, with 1 or 2 lanceolate bracts near the middle: inflorescence racemose, 1–2 dm. long: flowers up to about 12, each in the axil of an ovate bract 3–4 cm. long, on pedicels 1–2 cm. long: perianth about 1 dm. long, white, its lobes ovate or lanceolate, 3–4 cm. long, but little spreading; stamens shorter than the perianth: capsule about 2 cm. long.

A native of Japan and China. Lamarck, who described this plant under the name of *Hemerocallis plantaginea* in 1789, thought that it had been growing for a few years in the garden of the king, to which it had been sent by M. de Guines from China. This is the first reference found to its cultivation outside of its native country, so its introduction to gardens may be taken as occurring somewhere near that date. It is known in Japan as "tamano kandsaki." The variety *grandiflora* (*Funkia grandiflora* Sieb. & Zucc.) appears to differ only in the somewhat larger flowers, and in having the bracts of the raceme larger and more leaf-like.

From an inspection of the list of synonymy cited above, it will be seen that this plant has had many names. It has frequently been considered the *Hemerocallis japonica* of Thunberg's Flora Japonica, on account of the flowers of that plant being described as white. Thunberg, however, states that in his plant the filaments are attached to the base of the corolla at the edge of the ovary, a condition not existing in the plant here under consideration, in which these parts are adnate to the perianth tube for a considerable portion of its length. Thunberg may have had a pale-flowered form of the plant considered in this paper as *N. japonica.* The name under which this plant is commonly known in gardens in this country and in those of Europe is *Funkia subcordata*, a name descriptive of the shape of the leaves, but not more so than is that of *plantaginea*, here adopted, which refers to the resemblance of these leaves to those of the common plantain of Europe, *Plantago major*, a resemblance striking indeed.

2. **Niobe japonica** (Thunb.). Japanese or Lance-leaved Day-lily

Aletris japonica Thunb. *Funkia lancifolia* Spreng.

A showy perennial forming large dense masses, with elliptic to nearly ovate leaf-blades which are narrowed at the base, and racemes of lavender flowers. Leaves numerous, green: blades 10–15 cm. long, sometimes up to 6 cm. wide, lanceolate or elliptic to ovate-lanceolate, usually equally narrowed at both ends, rarely more broadly so at the base, with 3–5, rarely more, curved nerves on each side of the midrib: scape 4–6 dm. tall, overtopping the leaves, the scattered and distant leaves gradually passing into the bracts of the inflorescence: inflorescence racemose: flowers sometimes up to 20, finally nodding, on pedicels 4–6 mm. long: perianth pale lavender, 3–5 cm. long, the slender tube, less than one half the length of the perianth, narrowed into a broad limb, the segments 1.5–2 cm. long and 8–10 mm. wide, acute: capsule 2.5–3 cm. long, pendulous and appressed to the scape.

A native of Japan. There is a variegated form in cultivation known as variety *albo-marginata* (*Funkia albomarginata* Hook.), which has the leaves margined with a narrow band of white. There is another form which is quite distinct, the variety *tardiflora*, in which the pedicels are longer, the lower ones 10–12 mm. long. It also flowers a little later, so that while the one is in ripe fruit, this variety is still in flower. It is also more resistant to frost.

The synonymy of this plant has perhaps been more tangled than in any other member of the genus, and it was in part the fault of Thunberg himself. In his Flora Japonica, published in 1784, he described a *Hemerocallis japonica*. Previous to this, in 1780, he had published an *Aletris japonica*, but in the Flora Japonica he made no reference to this. As in the later publication he quotes verbatim in part the description given of his *Aletris*, it is quite easy to connect the two. Subsequent to the publication of *Hemerocallis japonica* Thunb., Kaempfer's Icones Selectae Plantarum appeared, published in 1791, and at plate 11 of this work appeared another *H. japonica*, an entirely different plant from that of Thunberg. In 1794 Thunberg renames his plant, calling it *Hemerocallis lancifolia*, and maintains Kaempfer's name for a plant, which, years afterward, was called *Funkia Sieboldiana* by Hooker. It is difficult to understand why Thunberg did this, unless it be that he associated this plate with the description of a plant published by the same author in 1712, but without a binomial. In the Botanical Magazine, under plate 1433, this same association is made. The flowers are there said to be 3 inches long, which hardly agrees with the plate cited in which the flowers are shown to be about 2 inches long—about the size they are in the plant named *Funkia Sieboldiana* by Hooker. This is of course interesting only as a matter of history, for the oldest specific name of this plant published with a description is *japonica*, and this must be adopted.

3. **Niobe undulata** (Otto & Dietr.). Wavy-margined Day-lily

Funkia undulata Otto & Dietr.

A tall showy plant, with long-petioled broad leaves, and numerous pale lavender flowers in a long raceme. Stems up to 1.5 m. tall, bearing 3–5 long-petioled leaves which gradually decrease in size, passing into the bracts of the inflorescence; basal leaves numerous; petioles often more than twice as long as the blades, deeply concave, thin-margined, up to 4.5 dm. long; blades usually 1.5–2 dm. long, up to 13 cm. wide, undulate on the margins, broadly ovate, acute at the apex, abruptly narrowed into the margined petiole, with 6–10 nerves on each side, the nerves depressed above, very prominent beneath, the upper surface dull, the lower shining: raceme up to 5 dm. long: flowers numerous, nodding, on recurved pedicels less than 1 cm. long; perianth 4.5–5.5 cm. long, funnel-form, pale lavender, the narrowly ovate acute segments about one half as long as the tube, the stamens and style recurved at the apex, the former exserted.

A native of Japan. There is a plant, much lower than this, with smaller more strongly undulate leaf-blades, which are marked with large masses of white in the center, and a fewer-flowered raceme. I venture to consider this a variegated form of the above plant, under the name *Niobe undulata variegata*. It is perhaps the most commonly cultivated of all the day lilies, and is frequently used as an edging for paths. Its flowers are identical with those of the above in color, form and size, and they appear at about the same time. The stem is also leafy as in that plant. This is sometimes considered a form of *Niobe japonica*, but that flowers considerably later, and has differently shaped leaves with fewer nerves—characters which would seem to exclude this variegated form.

4. **Niobe Sieboldiana** (Lodd.). Siebold's Day-lily

Funkia Sieboldiana Hook. *Funkia Sieboldii* Lindl. *Funkia sinensis* Sieb.

A showy pereninal forming large masses, with large cordate glaucous leaves, and racemes of pale lilac flowers which protrude little if any above the leaves. Leaves numerous: petioles 2–3 dm. long; blades 2–3 dm. long and 15–20 cm. wide, broadly ovate, cordate at the base, acute at the apex, glaucous on both surfaces, with 12 or 13 curved nerves on each side of the midrib: scape, including the raceme, 3–4 dm. tall, barely equalling or little exceeding the leaves, the lower bracts 4–8 cm. long, finally spreading: inflorescence racemose; flowers 10–15, on pedicels 10–12 mm. long, finally nodding: perianth pale lilac or white flushed with the same color, 5–6 cm. long, the segments about 1.5 cm. long and 6–8 mm. wide: capsule 3–3.5 cm. long.

Native of Japan. Introduced into cultivation at the Botanical Garden at Leyden, Holland, in 1830.

5. **Niobe Fortunei** (Baker). Fortune's Day-lily

Funkia Fortunei Baker.

A showy perennial, forming masses, with pale green glaucous leaves, which are much overtopped by the racemes of pale purple flowers. Leaves numerous: petioles 5–8 cm. long, shorter than the blades; blades 10–13 cm. long and 7–9 cm. wide, pale green, glaucous, cordate at the base, cuspidate at the apex, with 10–12 nerves on each side of the midrib: scape, including the raceme, 4–5 dm. long, much overtopping the leaves: raceme 1–1.5 dm. long, the bracts lanceolate, the lower ones about 2.5 cm. long: flowers on pedicels 6–8 mm. long: perianth pale purple, about 4 cm. long, the segments lanceolate and about one half as long as the tube.

Native of Japan. Introduced into cultivation in 1876. This and *N. Sieboldiana* are frequently confused.

6. **Niobe coerulea** (Andr.). Blue Day-lily

Hemerocallis coerulea Andr. *Funkia ovata* Spreng. *Funkia coerulea* Sweet.

A showy perennial forming large masses, with large cordate or ovate leaves, and racemes of blue flowers. Leaves numerous, green; blades 10–25 cm. long, 8–13 cm. wide, broadly ovate or sometimes cordate at the base, acute at the apex, the margin often wavy, with 6–9 curved nerves on each side of the midrib; petiole up to 30 cm. long: scape 3–6 dm. tall: inflorescence racemose, extending much above the leaves, the bracts 2 cm. long or less: flowers up to 12, on pedicels 5–10 mm. long, finally nodding: perianth pale or deep blue, 4–5 cm. long, the tube, less than one half the length of the perianth, abruptly spreading into a broad ample limb, the segments of which are about 2 cm. long and 8–10 mm. wide, acute: capsule pendulous, 24–36 mm. long.

Native of Japan, northern China, and eastern Siberia. It was first introduced some time prior to 1797 into England from Japan by Mr. G. Hibbert, of Clapham, in whose garden it flowered. It was first cultivated as a hothouse plant, but was later found to be hardy.

This, as was the case with *Niobe plantaginea*, was first published as a *Hemerocallis* in 1797. By some this is considered to be the original *Hemerocallis japonica* of Thunberg's Flora Japonica; but in that the leaves are said to have seven nerves, making this position hardly tenable, as the leaves in this have from 13–19. This is usually known under the name of *Funkia ovata* Spreng. There are forms of this also with variegated leaves. The variety *albo-marginata* has the leaves margined with white.

A word now as to the uses of these plants in horticulture, to which they lend themselves readily and effectively. By selecting the species, flowers may be had continuously from June to the time of frost. The first to flower are *Niobe Sieboldiana* and *N. Fortunei*, closely related species, which are at their prime in June, with white flowers flushed with lavender. As these are waning the deeper lavender flowers of *Niobe undulata* and its variegated variety make their appearance, late in June or early in July, accompanied at almost the same time by the blue bell-shaped flowers of *Niobe coerulea*. Next to appear are the flowers of *Niobe japonica*, and its later-flowering form, the variety *tardiflora*, which carry the flowering period of this interesting genus up to the time of killing frosts. Accompanying these last, and perhaps the most stately of them all, is *Niobe plantaginea*, sometimes known as the plantain lily, from the resemblance of its leaves to those of that plant. This is quite in contrast with the other species, the flowers being much larger, of a different shape, and a pure white, with no trace of coloring. They appear usually early in September, and continue through the month.

Some of the day lilies are desirable foliage plants, in addition to the interest of their flowers. For those who like the rich variegated effect of white and green, perhaps no other plant is more effective than is *Niobe undulata variegata*, planted as an edging to paths or beds. Where a mass of deep green foliage is desired, *Niobe undulata* and *N. coerulea* are desirable; or if a gray green is wished, *Niobe Sieboldiana* or its close relative *N. Fortunei* should not be forgotten. The plants spread rapidly, and delight in a deep rich soil, free from soggy conditions, and are impartial to the bright sun or part shade. Masses of them planted in the corner of a garden or in recesses in a herbaceous border are very effective. They may be readily propagated by division of the old plants, the new ones soon developing into masses rivaling those from which they were taken. They may also be readily grown from seed, which some of them produce freely. It is desirable, however, that the seed be sown soon after collecting, as it does not keep well.

All of the species in cultivation are perfectly hardy in the latitude of New York, requiring no protection whatever, making them especially desirable for a herbaceous border, where permanency is a great desideratum.

New York Botanical Garden.

ADDITIONS TO THE FLORA OF THE CAROLINAS—II

By W. C. Coker

Kalmia cuneata Michx.

This species occurs plentifully on the edge of an open savanna on the south side of Prestwood's Lake, Hartsville, S. C. It appears in scattered slumps along the transition line between the savanna and a typical dense "bay" formation. The soil it stands in is a nearly saturated black humus, and is covered in many places with *Sphagnum*. Associated with the *Kalmia* are *Zenobia pulverulenta*, *Vaccinium australe*, *Azalea viscosa*, *Ilex glabra*, *Ilex coriacea*, *Aronia arbutifolia*, *Myrica cerifera*, *Myrica caroliniana*, *Xolisma foliosiflora*, *Fothergilla carolina*, *Pieris nitida*, etc.

It has been taken previously only from southeastern N. C. The New York Botanical Garden and the Gray Herbarium have it only from Bladen Co., N. C. The Biltmore Herbarium has it also from Cumberland Co. (Hope Mills), and Moore Co. (Aberdeen), N. C.

Pyxidanthera barbulata Michx.

Forms dense and extensive mats at several places in the sand hills north of Hartsville, S. C., *e. g.*, on the Camden road about four miles from town. It grows in very sandy soil associated with such plants as arbutus (*Epigaea repens*) and wire grass (*Panicum neuranthum*). It was known heretofore only from

New Jersey and from southeastern North Carolina. This is one of the most beautiful and interesting of sandy plants.

Mayaca fluviatilis Aubl.

Plentiful in Prestwood's Lake, Hartsville, S. C. Its range has heretofore been given as the Gulf States and Tropical America. The plant grows in delicate, loosely woven masses, quite submerged and, in company with *Myriophyllum heterophyllum*, *Utricularia fibrosa*, *Utricularia biflora*, *Potamogeton diversifolius*, and *P. heterophyllus*.

Helianthemum canadense (L.) Michx.

This is found on sand hills near Kilgore's branch, Hartsville, S. C. April 14, 1910. Typically northern in its range, this plant has not been reported before below North Carolina. It was collected at Florence, S. C., by L. F. Ward (Herb. N. Y. Bot. Garden), and the Biltmore herbarium has it from Florence, S. C., and from near Augusta, Ga.

Pentstemon australis Small.

Dry, poor soil. Chapel Hill, N. C., May 14, 1910. Low, sandy flats, Hartsville, S. C., May 6, 1910. Heretofore published only from the Gulf States and westward, but the Biltmore herbarium has it from Dade City, Fla., Augusta, Ga., and southeastern North Carolina.

Baptisia villosa (Walt.) Ell.

Collected on sand hills across lake, Hartsville, S. C. May 22, 1910, and on sand hills near Kilgore's branch, Hartsville, S. C., April 14, 1910. Heretofore published only from Virginia and North Carolina of the seaboard states and extending westward to Arkansas; but Dr. John K. Small has collected it in Walton Co., Florida.

Rubus betulifolius Small.

Occurs on south side of Prestwood's Lake on the cannon place, April 23, 1910, in flower. Heretofore listed only from Georgia and Alabama, but in the herbarium of the New York Botanical Garden there is a sheet by Gibbs from Cooper River, S. C., that is referred to this species.

Rubus Enslenii Tratt.

In good soil in woods, Laurel Land, Hartsville, S. C. April 24, 1910. This is the one-flowered plant considered by some a form of *R. procumbens*, and I can find no record of its occurrence in South Carolina. The typical *R. procumbens* is found in Chapel Hill, N. C., where it forms dense mats in wet places.

Carex texensis (Torr.) Bailey.

It covers the ground under trees, in the yard of Dr. A. A. Kluttz, Chapel Hill, N. C. So far it has not been published from either of the Carolinas, but Homer D. House has collected it at Clemson College, S. C. It is now known from Southern Illinois to the Carolinas, Georgia, and westward.

This plant makes a good substitute for grass on lawns that are damp and densely shaded.

Oenothera Drummondii Hook.

This beautiful evening primrose was collected in very sandy soil along the trolley way on Sullivan's Island, S. C., Aug. 28, 1909. It has been collected from this island before (Herbarium of the New York Botanical Garden) and from Ormond, Florida (Gray Herbarium) but I cannot find that it has been reported from South Carolina or Florida, or indeed collected from any other of the Southern States east of Texas.

CHAPEL HILL, NORTH CAROLINA.

ADDITIONS TO THE TREE FLORA OF THE UNITED STATES

By John K. Small

In several previously published papers* I recorded a number of trees new to silva of the United States. They were brought to light through exploration in southern Florida, and are as follows: *Serenoa serrulata*, *Quercus Rolfsii*, *Chrysobalanus pellocarpus*, *Alvaradoa amorphoides*, *Suriana maritima*, *Cicca disticha*, *Mangifera indica*, *Rhus leucantha*, *Ilex Krugiana*, *Hibiscus Rosa-*

*Bull. N. Y. Bot. Gard. 3: 419–440: Torreya 7: 123–125; Bull. Torrey Club 37: 513–518.

sinensis, *Tetrazygia bicolor*, *Sapota Achras*, *Solanum verbascifolium*, and *Genipa clusiifolia*. The following additions were discovered during more recent exploration in southern Florida.

Anona palustris L.

The Alligator Apple grows abundantly in open moist hammocks on Long Key (Everglades) and in similar situations west of Camp Jackson (Small & Wilson no. 1648). The plants are easily distinguished from those of *Anona glabra*, which is common in southern Florida, by the flowers; these are usually only about one half the size of those of *Anona glabra* and have more pointed sepals and petals. The outer petals, too, are much longer than the inner ones.

Anona squamosa L.

The preceding species, *Anona palustris*, like *Anona glabra*, is native in Florida. On the contrary, the Sugar Apple, *Anona squamosa*, is most likely an introduced species. While collecting on Lower Metacumbe Key, Florida, in August, 1907, I found specimens of this species thoroughly naturalized in hammocks on different parts of the island. Exploration on other keys long under cultivation would probably yield further stations for this species.

Capparis cynophallophora L.

The Bay-leaved Caper Tree although common in southern peninsular Florida and on the keys seems to be but rarely encountered as a tree. The writer had the good fortune to find it in January, 1909, growing as a tree on both Soldier Key and Key Largo. In both localities it reached a height of about twenty-five feet. Mr. Blodgett found it many years ago on Key West growing to a height of twenty feet.

Brysonima lucida (Sw.) DC.

The Locust-berry, although known to reach the proportions of a tree in the West Indies, in Florida has heretofore been known only as a shrub, and usually a rather small shrub. However, it was found on several of the small keys at the southwestern extremity of the Everglade Keys growing as a tree in January, 1909, by Mr. Carter and the writer. The maximum height it attained was about twenty-five feet.

COLUBRINA COLUBRINA (L.) Millsp.

The several collections of the WILD COFFEE, made both on the keys and the mainland of Florida appear not to have revealed it in any form but a shrub. Mr. Blodgett records it as a shrub on Key West reaching a height of twelve feet. During more recent exploration in the Everglades Mr. Carter and the writer found it on the main island of the Long Key group as a small shrub. During the fall of 1904 the writer found it very common in hammocks about the middle of the homestead country, some fifteen miles southwest of Cutler. Trees thirty to forty feet tall and six to eight inches in diameter were not uncommon.

PARITIUM TILIACEUM (L.) Juss.

The MAHOE, an old world plant established on the Florida Keys for many years, did not reach the proportions of a tree or become established on the mainland, except perhaps in cultivation, until the present century. In 1905 Mr. S. H. Richmond sent me specimens from trees growing in the shore-hammock near Cutler. These trees evidently sprung from seeds brought there by some natural means from the keys. Although this is the only record we have of the tree occurring on the mainland, it is to be expected along the shore of the bay at any point between Cutler and Cape Sable. While in Miami in the summer of 1907 Mr. Richmond gave me additional specimens from the same station.

LUCUMA NERVOSA A. DC.

The EGG FRUIT has evidently been a naturalized member of our flora for a number of years. This fact was brought to light after the severe hurricane which swept over southern peninsular Florida and the upper keys during the fall of 1906. The wind and flood during this storm swept the forests of Elliott's Key clean of the under brush and thus allowed easy access to portions of the hammocks which were hitherto almost inaccessible. At different points in the forest we found fine trees which had evidently become established there many years ago, while young trees were springing up from seed produced by the older trees.

Hamelia patens Jacq.

The Hamelia grows in hammocks in the southern two thirds of peninsular Florida and in the hammocks of the Florida Keys, but it seems never to have been observed except as a shrub. However, the writer has found specimens on the Everglade Keys growing in the dense hammocks between Cocoanut Grove and Cutler, reaching a height of 20 feet and with a trunk diameter of fully 6 inches.

New York Botanical Garden.

TRAGOPOGON PRATENSIS × PORRIFOLIUS

By Earl E. Sherff

So far as the writer can find, the presence in the United States of hybrids between our two well-known species of salsify, *Tragopogon pratensis* L. and *T. porrifolius* L., has not heretofore been observed with certainty. Britton and Brown* state that "an apparent hybrid between . . . [these two species] . . . has been noticed at New Brunswick, N. J." But more recently, Britton† omits mention of this "apparent" hybrid and, similarly, Gray's New Manual‡ fails to record it.

That there exists, however, within the two species in question a potentiality for hybridization, was demonstrated by Linnaeus§ as early as 1759. By removing the pollen of *T. pratensis* and placing upon the stigmas some pollen from *T. porrifolius* he secured hybrids with an intermediate color scheme in the flowers. Instead of the yellow peculiar to *T. pratensis* or the purple peculiar to *T. porrifolius*, the heads of the hybrid exhibited both red and yellow. These colors were somewhat approximated later in spontaneous hybrids observed by J. Lange|| in the Danish

*Illustrated Flora, p. 269. 1898. New York.

†Man. of Flora of Northeastern States and Canada. 1905. New York.

‡Gray's New Manual. 1908. New York.

§Amoenitates academicae, X., p. 126. 1790. Erlangen.

||See Focke, Pflanzen Mischlinge, p. 222. 1881. Berlin.

islands of Fünen and Laaland. The outer flowers were "brown-violet, the inner yellow."

During the month of June, 1910, it was the writer's privilege to make frequent observations upon both *T. porrifolius* and *T. pratensis* along the right-of-way of the C. M. & St. P. R. R. at Elgin, Ill. For a distance of several hundred feet the two species were abundant, the former occurring in the northern half of the tract and the latter in the southern half. Where the two kinds met, there were found not only plants of each species but also some thirty or more plants quite distinct. In size, the last plants more nearly resembled *T. porrifolius*, which in that vicinity was considerably the more robust plant. The flowers possessed, to a remarkable extent, the color pattern observed by Lange in the hybrids of Fünen and Laaland; the outer flowers of each head being a reddish "brown-violet" and the inner a yellow color. The involucral bracts were mostly equal in length to the ray flowers. A remarkable uniformity prevailed in the flower-colorations, size of the mature plants, and proportionate length of the bracts. Individual plants were examined from time to time and in no case were they found to bear pure yellow or pure purple heads. However ramose the plant, its several branches produced heads with uniformly the outer flowers reddish brown-violet and the inner flowers yellow.

It thus becomes obvious that these plants were nothing more or less than hybrids between the two species that abounded in either direction. It is the more obvious because they were found growing only in a small restricted area of about three square rods where the two pure stocks met.

Evanston, Illinois.

SHORTER NOTES

A New Gerardia from New Jersey.—**Gerardia racemulosa.**—Stem slender, 3–6 dm. tall, striate-angled, smooth, branched. Branches slender, elongated, ascending. Leaves narrowly linear to filiform, sparingly scabrous above, those of the stem 1.5–2.5 cm. long, 0.5–1.5 mm. broad, usually curling on drying, with conspicuous clusters in the axils. Inflorescences strongly racemose.

Pedicels 3 mm. long. Calyx-tube campanulate, 3 mm. high, its lobes triangular-subulate to subulate, 0.8–2.0 mm. long. Corolla rose-purple, about 20 mm. long, its lobes spreading, pubescent at base of upper lobes, purplish-spotted below within throat. Capsule ellipsoid-globose, 4–4.5 mm. in diameter.

Type—Parkdale, Camden Co., N. J., F. W. Pennell 2692 Coll. Sept. 27, 1910, in Herb. Acad. Nat. Sci. of Phila.

Moist sphagnous depressions, Pine Barrens of New Jersey; apparently also of North Carolina.

Specimens seen:

New Jersey—Hornerstown, Monmouth Co., *J. H. Grove* 318; Pasadena, Ocean Co., *B. Long;* Forked River, Ocean Co., *B. Long;* Egg Harbor, Atlantic Co., *J. B. Brinton, A. MacElwee, C. Mohr, C. L. Pollard, H. H. Rusby;* Parkdale, Camden Co., *F. W. Pennell* 2692, 2694.

North Carolina—Wilmington, *G. McCarthy* 47.

This plant must be considered as an offshoot of *Gerardia purpurea* L. (abundant through most of the Atlantic Coastal Plain), adapted to, and largely replacing that species in the peculiar environment of the Pine Barren region of New Jersey. The two forms seem quite distinct, and for their better understanding a diagnostic comparison is given. The characterization of *G. purpurea* L. represents the normal form of the plant as occurring about Washington, D. C., on the lower Susquehanna River in Pennsylvania, in Delaware, and in New Jersey.

Stem rather stout, 4–9 dm. tall, usually sparingly scabrellous; branches stiff, spreading; leaves linear or broadly linear, those of the stem 3–5 cm. long, 1.5–3.5 mm. broad, not curling on drying; inflorescences not strongly racemose; calyx-lobes triangular-lanceolate to triangular-subulate; corolla mostly 25–30 mm. long; capsule globose, mostly 6–7 mm. in diameter.
G. purpurea L.

Stem slender, 3–6 dm. tall, smooth; branches slender, elongated, ascending; leaves narrowly linear to fili orm, those of the stem 1.5–2.5 cm. long, 0.5–1.5 mm. broad, usually curling on drying; inflorescences strongly racemose; calyx-lobes triangular-subulate to subulate; corolla about 20 mm. long; capsule ellipsoid-globose, 4–4.5 mm. in diameter . . . . *G. racemulosa.*

Francis W. Pennell.

University of Pennsylvania.

Notes on some Californian Green Algae.—An examination of Collins' recent work on the green algae (F. S. Collins, "The Green Algae of North America," Tufts College Studies **2**: 79–480. *pl. 1–18.* 1909) showed that two very characteristic species which have been collected in central California were not recorded for this state.

The first species is a *Spondylomorum*, probably *S. quaternarium* Ehrenb., the only recognized species of the genus, of which there seems to be no previous record for America. According to Wille (Volvocaceae, Engler & Prantl, Die Natürlichen Pflanzenfamilien, 1^2: 40. 1890), this species occurs only in Europe and Asia.

In 1896, Dr. W. R. Shaw, then instructor at Stanford University, collected at Pacific Grove, near Monterey, a quantity of this species. He made a number of slides, three of which are now in the collection of the University. The specimens agree in all respects with the figures and descriptions of *S. quaternarium*, but are somewhat smaller than the dimensions given by De-Toni in his Sylloge Algarum, where the size is stated to be 36–75μ. The largest Californian specimens hardly exceed 40μ in length. No further collections of *Spondylomorum* have come to my attention.

The second alga to be noted is *Pithophora oedogonia* (Mont.) Wittrock. This species has been collected several times in Felt Lake, a small body of water some four miles from Stanford University. The identification was made by Professor W. A. Setchell.

The species of *Pithophora* are for the most part tropical, but several species have been reported from stations in the eastern and central parts of the United States. So far as I know, the genus has not before been recorded from the Pacific Coast.

Douglas H. Campbell.

Stanford University, California.

REVIEWS

Hough's Leaf Key to the Trees

A little book of interest to teachers that has appeared recently is Mr. R. B. Hough's Leaf Key to the Trees.*

*R. B. Hough. Leaf Key to the Trees of the United States and Canada, and a Botanical Glossary, pp. 1–49. Published by the author, at Lowville, New York, Sept., 1910 Price $.75

The book is "aimed to include all the generally accepted native and naturalized trees north of the latitude of the northern boundary of North Carolina, and east of the Rocky Mountains." The key as drawn up is based on the normal typical leaves, "such as we consider distinctive of the various species and by which we recognize them," . . . "the average specimens on a mature tree, not those on very young or excessively vigorous shoots." Fruit characters are also included in connection with some of the trees "either as essential or accessory parts of the key; though many species can readily be traced without referring to the fruits." The book is intended to supplement the more extensive publications on native trees,—"to enable one to have in a compact and systematic form an aid in the identification of trees by a study of their leaves". The value of this little book to teachers lies in its availability as an aid for field work for older secondary students and for college students. Work on the identification of plants has a disciplinary value much higher than the amount of time usually devoted to it would seem to indicate. Trees offer probably by far the best medium for such work because of their size and usually the corresponding saliency of their distinctive characters, and also because of the greater interest attaching to them than to less conspicuous plants. Of course the value of any particular key for class work will depend in the end upon its workability in actual service, but those who are familiar with Mr. Hough's Handbook will not question his very high qualifications for the preparation of a practicable key. As a matter of fact an examination of his treatment of some of the difficult genera shows that it is as good as would be expected. The differentiation of the species of oak is particularly good. One omission there is which detracts somewhat from the ready usefulness of the key—this is the failure to cite any of the varying different distributions of the trees. So for the oaks, a resident of Massachusetts seeking to identify a red oak would have to decide between four species, one of which is native farther south but which, at least in leaf characters, the red oak may at times resemble. For example I have in mind two large oaks with large flat-saucered acorns growing in the Litchfield hills in northwestern Connecticut, the leaves of which might key out at *Q. digitata*, a southern species. If, however, the range of *digitata* were indicated, its elimination would have been instant.

For many trees, however, this difficulty will not present itself and the book may be heartily recommended. Its size, about five by six and one half inches, and its flexible cover make it a convenient book to carry in the field.

RALPH C. BENEDICT.

Stevens' Diseases of Economic Plants

A new book entitled Diseases of Economic Plants, by F. L. Stevens and J. G. Hall,* of the North Carolina Agricultural Experiment Station, has recently appeared. This work is designed to meet the needs of those students who wish to recognize, wherever this can be done with any degree of certainty, and treat diseases of plants without the laborious process of a detailed microscopic study. Those characters are used in diagnosing diseases which are evident to the naked eye or through the aid of the hand lens, and technicalities are avoided so far as possible, thus making the text a usable one to the agricultural students of the lower grade. The work is confined mainly to the bacterial and fungous diseases.

The introductory chapters contain a brief historical sketch of the development of the science of phytopathology; also statistics regarding the damage caused by fungi, symptoms of disease, methods of preventing diseases, formulae of the various fungicides with directions as to the best methods of applying them, and a discussion of the cost and profit resulting from their use.

The body of the work is devoted to a description of the symptoms of the diseases of plants which are of economic importance with directions as to the best methods of controlling them. These diseases are classified according to the natural relationship of the hosts on which they occur and all of the diseases of a given host are treated under that host regardless of the relationships of the fungi which cause the diseases. The terms used in desig-

*Stevens, F. L., & Hall, J. G. Diseases of Economic Plants. Pp. i–ix+1–513. *f. 1–214.* The Macmillan Co., New York, 1910. Price $2.00.

nating the various diseases are those most commonly used or where these are lacking or ambiguous a name is made by adding the termination "ose" to the generic name of the fungus which causes the disease. The work is thoroughly illustrated, the illustrations being of such a nature as to be of material aid in the diagnosis of the various diseases.

The appendix contains a brief discussion of the differences in the physiology of the chlorophyl-bearing and chlorophylless plants with a few of the most striking morphological characters of the bacteria and fungi. This part of the work is very brief.

One of the points on which the work is to be commended is the fact that the manuscript of the various parts has been submitted to the best specialists in the groups treated for corrections and criticism, thus eliminating many of the errors which might otherwise appear in a work of this kind and ensuring accuracy as to details. The book will doubtless meet the need of a large number of students, especially in our agricultural colleges.

F. J. SEAVER.

Dr. J. A. Harris (Biometrika, November) presents an exhaustive study "On the selective elimination occurring during the development of the fruits of *Staphylea*." The author, keeping in mind the very different problem of the selective elimination of individuals, has striven to show the morphological and physiological value of the selective elimination of certain types of organs produced by individuals. Using statistical methods, now familiar through the work of Francis Galton and Karl Pearson, he recapitulates (in part), after presenting detailed tables of 21,000 locules and their ovules, thus:

"The ovaries with relatively low numbers of ovules are more extensively eliminated than those with high numbers." "The ovaries which remain after elimination are more radially symmetrical than those which are eliminated." "Ovaries with one or more locules with an 'odd' number of ovules are more likely to be eliminated than those with all the locules bearing an 'even' number." "Dimerous ovaries seem less likely, and tetramerous ovaries more likely to develop to maturity than the normal trimerous ones."

So far as the last statement is concerned, the selective elimination there recorded must be of very recent origin, for tetramerous ovaries of the bladder-nut are the exception rather than the rule. And if the elimination continues ever so slowly tetramerous ovaries of the bladder-nut must eventually become perfectly normal abnormalities.

N. T.

PROCEEDINGS OF THE CLUB

November 8, 1910

The meeting was called to order at the American Museum of Natural History at 8:30 P. M., with Dr. E. B. Southwick in the chair. Forty-six persons were present. The minutes of the meeting of October 26 were read and approved.

The announced paper of the evening on "The Native Trees of Northeastern United States" was then presented by Mr. Norman Taylor. The lecture was illustrated by lantern slides.

Adjourned.

Percy Wilson,
Secretary.

NEWS ITEMS

The Naples Table Association for promoting Laboratory Research by Women wishes to call attention to the opportunities for research in zoölogy, botany and physiology provided by the foundation of this table. The year of the Association begins in April and all applications for the year 1911–12 should be sent to the Secretary on or before *March first, 1911*. The appointments are made by the Executive Committee.

A prize of $1,000 has been offered periodically by the Association for the best thesis written by a woman, on a scientific subject, embodying new observations and new conclusions based on an independent laboratory research in biological, chemical or physical science. The fourth prize will be awarded in April, 1911. Application blanks, information in regard to the advantages at Naples for research and collection of material, and circulars giving the conditions of the award of the prize will be furnished by the Secretary, Mrs. A. D. Mead, 283 Wayland Avenue, Providence, R. I.

At the New York Botanical Garden, Dr. Arthur Hollick has gone to Washington on a six month's leave of absence to study Alaskan fossils, and Dr. J. A. Shafer and Mr. Percy Wilson have gone to eastern and western Cuba respectively to continue the botanical exploration of that island. Volume 6, no. 22, of the BULLETIN, containing descriptions of many new Bolivian plants by Dr. H. H. Rusby, was issued 30 of November. Volume 3, part 1 of North American Flora appeared 29 of December. It contains the order by Hypocreales.

The college entrance examination board at its recent meeting appointed the following to prepare examination questions in botany for 1911. W. W. Rowlee, Cornell, chief examiner, M. E. Kennedy, Mount Holyoke, and Louis Murbach, Detroit, associates.

In the recently issued second edition of "American Men of Science," the editor, Prof. J. McKeen Cattell, as the result of an elaborate statistical study, ranks the five leading institutions in the following order of botanical eminence: Harvard, New York Botanical Garden, U. S. Dept. Agriculture, Chicago University, and Cornell University.

Dr. Charles E. Bessey, professor of botany and dean at the University of Nebraska, has been elected president of the 1911 Meeting of the A. A. A. S. to be held at Washington, beginning December 27, 1911.

The Botanical Society of America has elected professor W. G. Farlow, of Harvard University, as its president for 1911.

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 submitting manuscript.

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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. 37 published in 1910, contained 630 pages of text and 36 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 24–37 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. 28–37 three dollars each.

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

(2) MEMOIRS

The Memoirs, established 1889, are published at irregular intervals. Volumes 1–13 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

MR. BERNARD O. DODGE
Columbia University
New York City

Vol. 11 February, 1911 No. 2

TORREYA

A Monthly Journal of Botanical Notes and News

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR

JOHN TORREY, 1796–1873

CONTENTS

Published for the Club
At 41 North Queen Street, Lancaster, Pa.
by The New Era Printing Company
[Entered at the Post Office at Lancaster, Pa., as second-class matter.]

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.

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NORMAN TAYLOR

New York Botanical Garden

Bronx Park, New York City

TORREYA

February, 1911

Vol. 11 No. 2

THE NATURE AND FUNCTION OF THE PLANT OXIDASES*

By Ernest D. Clark

One of the most noteworthy characteristics of living organisms is their ability to carry out many deep-seated chemical changes without the ordinary means of producing such reactions. In other words, the living cell is a laboratory equipped to provide the most varied chemical transformations, yet with none of the relatively crude and violent agents such as high temperatures and strong chemicals which we are forced to use in the test-tube experiments of our man-made laboratories. In no case is this power of the cell more striking than in the oxidative phenomena of plants and animals; the latter especially are continually oxidizing and transforming large amounts of material for the maintenance of their life, and yet these oxidations are accompanied by few of the physical effects associated with oxidation and combustion in daily life or in the laboratory. It is not surprising, then, that the attention of biologists and chemists was early attracted to the investigation of biological oxidations. Beginning with Schoenbein in the fourth decade of the last century, and continuing to the present, numerous have been the theories advanced in regard to these phenomena. However, before proceeding with a discussion of the factors involved in the oxidations of the plant, it is desirable to indicate the means which the cell

* This paper is based on the author's dissertation entitled "The Plant Oxidases," which was published last year in partial fulfilment of the requirements for the degree of Ph.D. in Columbia University.

[No. 1, Vol. 11, of Torreya, comprising pp. 1–22, was issued 31 Ja 1911.]

has at its disposal for carrying out its chemical reactions with such wonderful efficiency.

The fermenting action of certain bacteria and yeasts upon sugars and other substances has long been known and used in the industries. These yeasts were called *organized* ferments, while chemical preparations like pepsin, etc., which exhibit a fermenting or digesting action, were called *unorganized* ferments. This distinction was retained until 1897 when Buchner performed his classical experiment on yeast, showing that by the action of pressure applied in a hydraulic press he was able to obtain a liquid possessing all the fermenting power of living yeast plants even in the absence of the living organisms. This substance or property of the expressed liquid Buchner called an "enzyme." He said that substances of like nature were products of the life-activities of cells, but were *not* dependent on the *living* cell for the exhibition of their characteristic fermenting action. It is to ferments or enzymes like this that the cell owes its great chemical efficiency. Enzymes are members of the class of substances known as "catalyzers" which, by processes that are not fully understood, cause reactions to take place with a speed not shown under ordinary conditions. Generally, catalysts are capable of causing or assisting in reactions without being themselves destroyed by the processes they propagate.

In discussing the oxidases or oxidizing enzymes a somewhat critical attitude is necessary in the face of many conflicting and even contradictory results. To take an example, several of the so-called oxidizing enzymes have been shown to be not enzymes but heat-withstanding inorganic or organic catalyzers. At the present time our knowledge of these substances is being increased almost daily, with the result that we are now in a sort of transitional period, the literature of the whole subject being filled with assertions and denials on the part of equally able investigators. The tendency at present seems to be to consider as enzymes those apparently complex organic substances of non-diffusable nature and of high catalytic power, which are produced during the life processes of plants and animals; but when investigation reveals *definitely* their exact chemical nature, such as the "laccase" of alfalfa, which Euler and Bolin[1] have recently proved to be calcium salts of simple organic acids, then they are referred to as organic catalysts. Bearing this in mind, the writer will use the terms oxidizing enzyme and oxidase interchangeably for convenience and with no implication that they are enzymes according to the strictest definition, or that future investigation may not prove the action of all the classes of oxidizing enzymes to be due to the same substance or property.

In regard to the rôle and the nature of many of the oxidases, we are still ignorant in spite of the study that has been devoted to them. In the case of enzymes like pepsin, trypsin, and lipase, investigation has produced considerable advances in our knowledge of them, but this cannot be said of the oxidases. In fact, there are doubts in some cases whether certain of the oxidases are enzymes at all, because a number of them have been proved to be comparatively simple organic or inorganic substances. However, such oxidases as peroxidase and tyrosinase still hold their places in the category of enzymes. In classifying the oxidases several arrangements have been suggested, many of which led only to confusion. After 1903, a more accurate classification was proposed, for it was then that Bach and Chodat[2] showed that the so-called oxidases of Bertrand are really composed of three separate parts as indicated below:

1. Oxygenase; a preformed organic peroxide resulting from auto-oxidation.

2. Peroxidase; a true enzyme which activates the oxygenase or added H_2O_2, etc.

3. Catalase; a substance decomposing H_2O_2 into $H_2O + O_2$. Since 1903, a great deal of work has been done which shows that this conception of the so-called oxidases is founded on fact.

[1] Euler and Bolin. Zur Kenntniss biologische wichtiger Oxydationen:

(*a*) I. (Same title as the series, Zur Kenntniss, etc.), Zts. Physiol. Chem. **57**: 80. 1908.

(*b*) II. Ueber die Reindarstellung der *Medicago* laccase, Zts. Physiol. Chem. **1**: 1. 1909.

[2] Bach and Chodat. Zerlegung der sogenannte Oxydasen in Oxygenasen und Peroxydasen—V. Ber. Chem. Gesell. **36**: 606. 1903.

In the last edition of Oppenheimer's "Die Fermente"[3] he has adopted the following classification of the plant oxidases, which will be used in this paper:

1. Laccase; phenolase, etc.
2. Tyrosinase, melanin-forming enzymes.
3. "Oxidases."
    (*a*) Oxygenase.
    (*b*) Peroxidase.
4. Catalase.

Laccase

Schoenbein's interest in the problems of oxidation led him to investigate the cause of the coloration of certain mushrooms, and in 1856[4] he published his results. In *Boletus luridus* he found a substance soluble in alcohol that showed the same bluing from injury of the fungus or on treatment with oxidizing agents in the test-tube, that characterizes the bluing of the guaiac tincture; moreover, the same substances decolorize this blued extract as in the case of the blued guaiac tincture. Schoenbein saw the importance of the fact that spontaneous bluing *only* took place in the fungus *itself*, and concluded therefore that there was a substance present in the fungus with power to greatly increase the oxidizing power of the atmospheric oxygen. In *Agaricus sanguinareus* he was also able to find the same sort of spontaneously coloring substance that he noted in *Boletus luridus*. He concluded that, besides the chromogenic substance of these fungi, there is a substance present that can ozonize (activate) atmospheric oxygen; he called such an activating substance a "Sauerstofferreger," or literally an "oxygen-exciter."

The first really careful work on oxidizing ferments was done by Yoshida[5] who, in 1883, investigated the chemistry of lacquer.

[3] Oppenheimer. Die Fermente und ihre Wirkungen, "Die Oxydasen," chap. 7, pp. 337–391, Spezielle Teil, 3d ed. 1909. Also for an excellent treatment of oxidases in general see:

Kastle. The Oxidases. Bull. 59, Hyg. Lab. U. S. Pub. Health and Mar. Hosp. Serv. Washington, 1910.

[4] Schoenbein. Ueber die Selbstblauung einige Pilze, etc. Jour. Prakt. Chem. **67**: 496. 1856.

[5] Yoshida. Chemistry of Lacquer. Jour. Chem. Soc. **43**: 472. 1883.

The lacquer-work of the Japanese has long been a famous and beautiful product of that country. The milky latex of the tree *Rhus vernicifera*, rapidly oxidizes in a moist atmosphere to a black lustrous varnish which is not attacked by any chemical except concentrated nitric acid. In the latex Yoshida found a substance having the composition $C_{14}H_{18}O_2$ which he called urushic acid; besides this, he found a small amount of a nitrogenous constituent, "a peculiar diastatic matter," which rapidly caused the urushic acid to oxidize to the black oxyurushic acid ($C_{14}H_{18}O_3$). This peculiar diastatic matter of Yoshida lost its power to oxidize urushic acid after being heated to 63°; so Yoshida thought it a substance of enzymatic nature, which acted as an oxygen carrier in these oxidations.

Some years later, Bertrand[6] studied the lacquer formation more carefully. He called the substance an oxidizing ferment, which he believed brought about the oxidation of the mother-substance of the black lacquer. He found that the ferment was destroyed by boiling, and also that it was present in gum arabic and gum senegal, as well as in the latex of species of *Rhus*. He named this ferment "laccase" and tested numerous plants for it, finding it present in many cases. Bertrand used the tincture of guaiacum as a test for laccase.

In 1895, Bertrand with Bourquelot[7] tested a great many of the higher fungi for laccase, using guaiacum as a reagent. They found that laccase was widely distributed in these plants as well as in those containing chlorophyll. They also investigated those fungi which become colored when injured, and they believed the phenomenon was caused by a ferment identical with laccase. Bertrand[8] has shown that the oxidizing power of laccase is in some way connected with the manganese present; for, by repeated precipitation with alcohol, he divided his laccase preparation into three

[6] Bertrand. (*a*) Sur la latex de l'arbre à laque. Compt. Rend. Acad. Sci. **118**: 1215. 1894. (*b*) Recherches sur le suc laiteux de l'arbre à laque du Tonkin. Bull. Soc. Chim. [3], **11**: 717. 1894.

[7] Bertrand and Bourquelot. Laccase dans les champignons. Compt. Rend. Soc. Biol. **47**: 579. 1895.

[8] Bertrand. Sur l'action oxydante des sels manganeux et sur la constitution chimique des oxydases. Compt. Rend. Acad. Sci. **124**: 1355. 1897.

fractions of different manganese contents, which with hydroquinone solutions showed activities proportional to their percentages of manganese. Bearing this in mind, other investigators have used mixtures of protein substances and manganese salts to prepare artificial oxidases giving many of the reactions of the natural preparations. It should be noted, however, that Bach and other investigators have prepared oxidases from various plants which, although active, did not contain manganese or iron.

During the last year, Euler and Bolin[9] have shown that the laccase prepared from alfalfa (*Medicago sativa*) is not an enzyme according to the commonly accepted usage of the word. They found that heating did not destroy the activity of the oxidase, and that the protein thus precipitated could be filtered off without lowering the activity in the least. This so-called laccase proved to be mostly calcium glycollate, with traces of the calcium salts of citric, malic, and mesoxalic acids.

If, as Bach and Chodat say, laccase consists of organic peroxides activated by the enzyme peroxidase, then it is the peroxidase part which confers upon laccase what specificity it has. However, laccase is not a specific enzyme in the narrow sense because, besides the laccol of *Rhus spp.*, it will oxidize guaiacol, hydroquinone, guaiac tincture, phenolphthalin, and many phenols and cyclic amino derivatives; still, it is not able to oxidize tyrosin or any of the tyrosin derivatives upon which tyrosinase exerts a truly specific action. So then, laccase is a specific enzyme, in that it acts only upon substances containing a certain grouping in their structure. The fact that laccase acts upon guaiac tincture and upon many other reagents usually employed to detect peroxidases, etc., makes one skeptical in regard to the nearly universal occurrence of laccase claimed for it by the earlier investigators.

Tyrosinase

After Bertrand and Bourquelot had shown that the bluing of *Boletus cyanescens* upon injury was due to the effect of laccase acting with the atmospheric oxygen upon the "boletol" in the

[9] *Loc. cit.*

fungus, they turned their attention to the case of *Russula spp.*, especially *R. nigricans*, the color change of which upon injury is from pink or reddish to black. In different researches they showed that laccase could not produce the same effect, and further, that it was an oxidation of a definite chemical substance in the fungus. Bertrand[10] next showed that the crystalline chromogen in *Russula spp.* was tyrosin and that it was also present in beets, potatoes, etc.; accordingly he named the enzyme which caused this change "tyrosinase," and said that laccase and tyrosinase were two representatives of the group of "oxidases." About this time it was found that rosettes of tyrosin crystals were present in the tissues of the fungus *Russula nigricans*.

At first it was thought that tyrosinase was as wide-spread an enzyme as laccase, but later results show this to be unlikely. Lehman and Sano[11] examined bacteria and higher plants for tyrosinase. A few species of bacteria showed the presence of tyrosinase, but in no case could it be separated from the living bacterial cells. Among the higher plants tyrosinase is present in wheat, barley, potatoes, *Papaver orientale*, *Rhus spp.*, etc. Thus we see, this enzyme is probably concerned in the formation of the black wound-covering over injured areas on potatoes.

The action of tyrosinase results in a yellowish pink coloration, then reddish, then brown, and finally black. This reddish black oxidation or condensation product is called melanin and is closely related to the natural animal pigments in dark hair, etc., and also in the so-called melanotic tumors. This action of tyrosinase and the resulting melanin have attracted a great deal of attention. The first investigators said that the action of the tyrosinase was simply the oxidation of tyrosin to melanin, and that the production of a black coloration in a plant was due to the action of its tyrosinase on tyrosin. However, it soon became clear that the matter was not so simple as at first thought. Certain experiments seem to show that the early change of tyrosin to a pink color

[10] Bertrand. Sur une nouvelle oxydase ou ferment soluble oxydant d'origine végétale. Compt. Rend. Acad. Sci. **122**: 1215. 1896. Also Bull. Soc. Chim. [3], **15**: 793. 1896.

[11] Lehman and Sano. Ueber das Vorkommen von Oxydations-fermenten bei Bakterien und höheren Pflanzen. Arch. f. Hyg. **67**: 99. 1908.

may be caused by an another enzyme and then it is upon this intermediate product that tyrosinase acts, finally giving the black melanin. The earlier workers considered that tyrosinase was a specific enzyme acting only on tyrosin, but in the course of time it has become evident that tyrosinase is specific in the same sense as laccase; namely, it acts upon a group of compounds closely related in structure.

Just as it is possible to obtain anti-toxins, research has shown that we may obtain anti-enzymes. In this place we are concerned only with the anti-oxidases, which have been produced in the usual manner, that is, by the repeated injection of small though increasing amounts of the enzyme preparation into a rabbit or other animal, and the withdrawal of some of the blood after immunity has been established to that particular enzyme. The blood serum from such immune animals prevents or retards the natural oxidizing action of the enzyme under investigation. Gessard[12] obtained anti-tyrosinase and anti-laccase that completely inhibited the oxidizing power of the corresponding plant enzyme preparations. We shall see later that anti-oxidases may play an important part in the physiology of the plant.

Generally speaking, tyrosinase seems to be the nearest to the true enzyme of any of the oxidases with which we are acquainted. It is most specific in its action, most sensitive to exterior conditions, and up to the present, has not been replaced by any artificial enzyme in the oxidation of tyrosin to a melanin. It is usually associated with laccase in plants, but the presence of laccase does not indicate the appearance of tyrosinase, while on the other hand, the latter is almost invariably accompanied by laccase.

As in the case of laccase, Bach[13] claims that the tyrosinase is really composed of two parts, oxygenase and the peroxidase. He found that by the use of alcohol precipitations he was able to reduce the activity of the tyrosinase of the potato, as previ-

[12] Gessard. (*a*) Anti-laccase. Compt. Rend. Soc. Biol. **139**: 644. 1904. (*b*) Sur la tyrosinase. Ann. Inst. Pasteur **15**: 593. 1901.

[13] Bach. Ueber die Wirkungsweise der Tyrosinase. Ber. Chem. Gesell. **41**: 221. 1908.

ously noted by Bertrand; but curiously enough, the addition of hydrogen peroxide to the enzyme solution restored it to its usual activity. This and many similar experiments led Bach to believe that tyrosinase contains the oxygenase and peroxidase complements.[14] Our final conclusion must be then, that tyrosinase may have the usual oxidase complements (oxygenase plus peroxidase) and that its peroxidase may be specific just as the peroxidase of laccase is specific in its action upon substances having a certain constitution.

(*To be continued*)

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REDISCOVERY OF TILLANDSIA SWARTZII BAKER

By N. L. Britton

In "Journal of Botany," **26**: 12, published in 1888, and in "Handbook of Bromeliaceae," 191, 1889, Mr. J. G. Baker described this species, based on a specimen collected many years ago by Swartz in the island of Jamaica and supposed by him to be *Tillandsia paniculata* L. Professor Carl Mez, in his Monograph of the family Bromeliaceae (DC. Mon. Phan. **9**: 884), published in 1896, states that he has seen this specimen, but regards it as doubtful, perhaps referable to the Liliaceae.

The type specimen is preserved in the herbarium of the British Museum of Natural History, and while there in the spring of 1910, I examined it and was inclined to agree with Professor Mez. But, on returning to New York immediately afterward, I found in a parcel of choice Jamaica plants collected early the same year by Mr. William Harris, fine specimens, which I recognized as of the same species, and on sending one of these to Mr. Edmund Baker at the British Museum, he confirmed my identification by a comparison with the type. Mr. Harris found the plant growing on rocks in the Rio Minho Valley, March 3, 1910 (*No. 10,885*), more than one hundred years after its collection in

[14] Recently he found that the salts of manganese, etc., could apparently replace the peroxidase part. In this connection see: Ber. Chem. Gesell. **43**: 366. 1910.

FIG. 1. *Tillandsia Swartzii* Baker.

Jamaica by Swartz, and, presumably, it has not been seen in a living state by any botanist during this long period, a striking illustration of the extremely local distribution of some West Indian species.

It would appear that the plant was correctly referred to the Bromeliaceae at its original description; as Mr. Baker remarks, it is allied, at least in habit, to *Tillandsia utriculata* L., though he places the two in different subgenera. In floral structure it differs from both his subgenera *Platystachys* and *Cyathophora* by having a pair of scales at the base of each corolla-segment, and in this feature agrees with his subgenus *Vriesia*, a group regarded by Professor Mez as of generic rank.

As shown by the specimens collected by Mr. Harris, the inflorescence is about 1.3 meters high, floriferous from about the middle, the lower panicle-branches up to 3 dm. long, the lower bracts of the scape lanceolate, 1–1.5 dm. long, long-acuminate; the basal leaves are narrowly lanceolate, 6–8 dm. long, 4–6 cm. wide and very long-acuminate, glabrous and finely many-nerved; the flowers are sessile and quite widely separated on the slender branches of the inflorescence, their bracts ovate-lanceolate, acutish, about 1 cm. long; the linear sepals are 2 cm. long, and the thin parallel-veined petals 3 cm. long, linear-lanceolate and acuminate, about one-fourth longer than the stamens.

The capsule was described by Mr. J. G. Baker as at least twice as long as the calyx.

New York Botanical Garden.

LOCAL FLORA NOTES—VIII*

By Norman Taylor

Species	*Specimens wanted from*
	Cruciferae
Arabis hirsuta (L.) Scop.	Northern N. J. and N. Y.
Cardamine pratensis L.	N. J. or elsewhere in the range.†

* Continued from Bull. Torrey Club 37: 559–562. N 1910.

† The local flora range as prescribed by the Club's Preliminary Catalogue of 1888 is as follows: All of the state of Connecticut; Long Island; in New York the

Species	*Specimens wanted from*
Cardamine rotundifolia Michx.	Western N. J. and eastern Pa.
Cardamine purpurea (Torr.) Britton.	Northern N. Y. and Pa.
Dentaria maxima Nutt.	Northern N. Y., N. J., and Pa.
Dentaria anomala Eames.	Anywhere in the range.
Dentaria diphylla Michx.	N. J.
Dentaria incisifolia Eames.	Anywhere in the range.
Dentaria heterophylla Nutt.	N. J.
Draba caroliniana Walt.	Anywhere in the range.
Lepidium apetalum Willd.	Anywhere in the range.
Lepidium medium L.	N. Y. and N. J.
Lepidium graminifolium L.	Anywhere in the range.
Roripa americana (A. Gray) Britton.	Northern N. Y. and Pa.
Roripa hispida (Desv.) Britton.	N. Y. and Pa.
Lunaria annua L.	Anywhere in the range.
Arabis patens Sullivant.	Eastern Pa.
Brassica japonica Siebold.	Anywhere in the range.

Sarraceniaceae

Sarracenia purpurea L.	Westchester, Orange, and Rockland counties, N. Y., and from Somerset Co., N. J.

Droseraceae

Drosera filiformis Raf.	Middlesex, Mercer, and Camden counties, N. J.

Podostemonaceae

Podostemon Ceratophyllum Michx.	Anywhere in the range.

counties bordering the Hudson River up to and including Columbia and Greene, also Sullivan and Delaware counties; all of New Jersey; and Pike, Wayne, Monroe, Lackawanna, Luzerne, Northampton, Lehigh, Carbon, Bucks, Berks, Schuylkill. Montgomery, Philadelphia, Delaware and Chester counties in Pennsylvania.

Species	*Specimens wanted from*
CRASSULACEAE	
Tillaea aquatica L.	Anywhere in the range.
Sempervivum tectorum L.	N. J. and N. Y.
Rhodiola rosea L. (Sedum).	Any stations not in Britton's Manual.
Sedum ternatum Michx.	Anywhere in the range.
PARNASSIACEAE	
Parnassia caroliniana Michx.	Anywhere in the coastal plain.
SAXIFRAGACEAE	
Micranthes (*Saxifraga*) *micranthidifolia* (Haw.) Small.	Eastern Pa.
Micranthes (*Saxifraga*) *pennsylvanica* (L.) Haw.	Northern N. J.
Tiarella cordifolia L.	Eastern Pa.
Heuchera Curtisii T. & G.	Anywhere in the range.
Heuchera pubescens Pursh.	Mountains of Pa.
Mitella nuda L.	Northern N. Y.
Chrysosplenium americanum Schwein.	L. I., central N. J., and Pa.
HYDRANGEACEAE	
Hydrangea arborescens L.	New Jersey.
ITEACEAE	
Itea virginica L.	Ocean and Monmouth counties, N. J.
HAMAMELIDACEAE	
Hamamelis virginiana L.	In or near the pine-barrens of N. J. and L. I.
ALTINGIACEAE	
Liquidambar Styraciflua L.	In or north of the highlands of the Hudson.

Species	*Specimens wanted from*
GROSSULARIACEAE	
Ribes lacustre (Pers.) Poir.	Northern N. Y.
Ribes glandulosum Grauer. (*R. prostratum* L'Her.)*	Pa. & N. Y.
Ribes americanum Mill. (*R. floridum* L'Her.)	Northern N. Y. and N. J.
Ribes triste Pall. (*R. rubrum* L.)	N. J. and N. Y.
Grossularia hirtella (Michx.) Spach. (*R. huronense* Rydb.)	N. J. and Pa.
Grossularia (*Ribes*) *Cynosbati* (L.) Mill.	Northern N. J., N. Y., and Pa.
PLATANACEAE	
Platanus occidentalis L.	Ulster, Greene, and Delaware counties, N. Y.

NEW YORK BOTANICAL GARDEN.

REVIEWS

The Plant Life of Maryland†

There are very few states in the Union whose vegetation has been described with any pretense of thoroughness, and in Maryland not even a catalogue of the vascular plants of the whole state had been published before; probably chiefly because the state contains very few rare and perhaps no endemic species, and therefore offers little attraction to the average systematic botanist. Maryland is the northernmost state, south of the glaciated region, which extends all the way from the coast to the mountains (and incidentally probably the only one which contains both *Taxus minor* and *Taxodium*, or *Pinus Taeda* and

*The names used are those maintained in North American Flora **22**: 193–209. 1908. The ones in brackets are those in Britton's manual.

†The Plant Life of Maryland. By Forrest Shreve, M. A. Chrysler, Frederick H. Blodgett and F. W. Besley. Special publication Maryland Weather Service, new series, Vol. 3, 533 pp., 39 plates (including 1 map), 15 text-figures (including 12 maps). Baltimore, 1910.

Abstracts or reviews of it have already appeared in Science II. **32** : 837–868. Dec. 16, 1910 ; Forestry Quarterly **8** : 484–486. 1911 ; and Scottish Geographical Magazine **27** : 1–6. *f. 1–4*. Jan., 1911.

Larix). Although comparatively small in area, it includes parts of such distinct physiographic provinces as the coastal plain, the Piedmont region, and the Alleghany mountains, the last reaching altitudes within the state of over 3000 feet; and the present work throws much light on the local distribution of the plants characteristic of each of these areas, or of two or more of them, and is an important contribution to existing knowledge of the vegetation of eastern North America.

After being delayed considerably beyond the expected time of appearance, as is very often the case with important scientific works, this handsome royal octavo volume, embodying the results of field work which was done mostly in the years 1904–6, was finally given to the public about the middle of last summer, the exact date not being known.

In mechanical make-up the book is fully up to the standard of other recent scientific publications of the state of Maryland, which means that it is practically faultless. The type is large and neat, and the 74 half-tone illustrations of vegetation are well chosen and skillfully executed in nearly every case, the principal exception being that one or two of them are a few degrees out of plumb.*

The principal author and one of the others having been absent from the state and largely engrossed with other matters during the printing, it fell to the lot of Mr. E. W. Berry as editor to bring the several contributions into harmony with each other as far as possible, and to attend to numerous other essential details; a kind of work which can hardly be appreciated by the reader, as it attracts attention only when poorly done.†

Besides the preface, indexes, and other necessary appendages, the book is divided into Part 1, Introduction, 42 pages; Part 2,

* This is a defect often observed in the best magazines, both popular and scientific, and even in text-books; but there would seem to be little excuse for it, as it lies within the power of author, editor, and engraver, each and severally, to remedy it before it is too late.

† The reviewer notes with gratification the editor's independence of an autocratic band of geographical orthographers located about forty miles from him, in spelling the names of the three counties which have possessive endings according to local and official usage, and not according to arbitrary rules.

Floristic plant geography, 30 pages; Part 3, Ecological plant geography, 192 pages; Part 4, Relation of natural vegetation to crops, 9 pages; Part 5, Agricultural features, 53 pages; Part 6, Forests and their products, 17 pages; and Part 7, List of plants, 114 pages. In all of these parts a three-fold division of the state on physiographic grounds (and not climatic, as one might be led to expect from the auspices under which the book appeared) into coastal zone (coastal plain), midland zone (metamorphic or crystalline rocks), and mountain zone (Alleghany plateau) is recognized. The coastal zone is further subdivided by Chesapeake Bay into two perceptibly different parts, and the midland zone into lower and upper (or foot-hills and ridges), corresponding with the Piedmont region and Blue Ridge of the states farther south.

Part 1, by Dr. Shreve, outlines the scope of the work, making a sharp distinction between floristic and ecological plant geography (a point which deserves more attention than has been given to it in the past), and then discusses the climatology, topography, mineralogy, and soils of the state.

Part 2, also by Dr. Shreve, opens with a brief sketch of the history of botanical exploration in Maryland, up to the time when the present authors took the field. Then follow lists of plants which are supposed to be confined to a single zone or to two adjacent zones, plants which reach their northern limits on or near the Delaware peninsula, strand plants, salt-marsh plants, pine-barren plants which seem to skip Maryland, etc. If the systematic list (part 7) represents fully the authors' knowledge of the local distribution of plants within the state, then some of the zonal lists might have been considerably modified or extended. But discrepancies of this kind are almost inevitable in such a large book, in which considerable time must elapse between the writing of the various parts. Kearney's table of the northern limits of "austroriparian" plants, although mentioned approvingly in a footnote on page 93, was apparently not utilized to the utmost in preparing the list of plants whose northern limits pass through Maryland. The list of "pine-barren" plants which are not known between New Jersey and

Virginia is somewhat misleading in that it includes at least half a dozen species which in the southern states are known only in the mountains, and not in the coastal plain, and one or two whose occurrence northeast of Maryland is doubtful. (It is interesting to note that nearly half of the 44 spermatophytes listed as pine-barren plants are monocotyledons, and the proportion would be still larger if the corrections just indicated had been made.) This part closes with an instructive discussion of the factors by which vegetation provinces are differentiated, and a bibliography of works relating to the flora of Maryland and the District of Columbia.

In Part 3, the longest and most important of all, the vegetation of each of the five subdivisions of the state is classified by habitat; Dr. Shreve taking the easternmost, middle and westernmost, Dr. Chrysler the "Western Shore" (that part of the coastal plain west of the Bay), and Dr. Blodgett the upper midland zone.

In the habitat lists prepared by Dr. Shreve, the species, instead of being arranged in taxonomic, alphabetical, or merely haphazard order, as was customary up to four or five years ago (and is yet, to a considerable extent), are divided into trees, shrubs, and herbs (bryophytes and thallophytes being left out of consideration), and arranged in approximate order of abundance (as stated in a rather inconspicuous way in a footnote on page 110). Unfortunately in such lists the trees are mentioned only by their common names, and these are run into paragraphs instead of being arranged in columns like those of the herbs, which makes this part less valuable for purposes of reference than it should be. In order to find from the index all that is said in the book about any particular species of tree its common name has to be constantly borne in mind. The names of the herbs are sometimes run into paragraphs too, but in most cases they are arranged in single columns, thus wasting considerable space which might easily have been filled with condensed information about the structure and adaptations, or even the geographical distribution, of each species. If smaller and more closely set type or double columns had been used for the herbs each habitat list would have been confined to one or two pages, and thus more easily comprehended at a single glance. These details however were probably not left entirely to the judgment of the authors.

In Dr. Chrysler's part some definite ratios of abundance are given for the trees in certain habitats, but the herbs in most of his lists seem to be arranged in Engler & Prantl sequence, with no indication of relative abundance. Dr. Blodgett had to deal with a rather complex region, in which he found it expedient to describe almost every ridge and valley separately, and to mix trees, shrubs, and herbs together in his habitat lists, as if in the same order in which they were observed in the short time available for field work in that region.

The chapter on agricultural features (Part 5), by Dr. Blodgett, although it seems a little out of place in a volume devoted primarily to phytogeography, is a valuable original contribution to economic geography. After the history of settlement and agricultural development of the state there follows a discussion of the influence of soils on civilization, and then notes on the distribution of several of the principal crops, illustrated by maps.

Mr. Besley's remarks on forests (Part 6) are rather brief, but it would be hard to cover the ground any better than he did with the same number of words, and the forest industries of Maryland are probably not important enough at the present time to justify a more exhaustive treatment.

In preparing the list of plants collected and observed, Dr. Shreve did not waste any time ransacking old herbaria with a view of citing every specimen ever collected in Maryland, but included only plants which had been seen by him or his associates or by local botanists still living in the state. The list therefore makes no claim to completeness, but is primarily a taxonomic index to the plants which are classified by habitat in Part 3.

The nomenclature follows Britton & Brown's Illustrated Flora (1896–1898), and all specific names are decapitalized, as has been customary in Washington since 1893, but not so much elsewhere. Numerous arbitrary "common" names which are never seen outside of botanical literature have been inserted in the catalogue, but this practice is not carried to the extreme that it was in some quarters a decade or two ago, for many of the less familiar species are left without such names. Ranges and bibliographic citations or other references to literature are omitted, which is entirely justifiable in such an unpretentious catalogue and in a region so well covered by descriptive manuals.

The information given about the distribution of the several species within the state is not as complete as an interested reader might wish, only about two lines (besides the name) being devoted to each, on the average, and usually not more than one county being mentioned. For over one-fourth of the species the catalogue gives no indication whatever of habitat, and a still larger number are treated in very general terms, like "swamps," "dry open situations," etc., which are not readily correlated with the habitats described in detail in Part 3. It would not be fair, however, to compare such a list with those numerous local floras in which a taxonomic catalogue is the most important feature.

Throughout the catalogue, as well as in other parts of the book, weeds are not distinguished very sharply from native plants, which is unfortunate, though not at all unusual. Weeds are more easily recognized than some persons who have not given the matter much thought may imagine, and a reform in this respect is urgently needed in all our phytogeographical literature.

An extremely conservative course has been followed with regard to the numerous recently described (and perhaps ill-defined?) species of *Panicum*, *Sisyrinchium*, *Rubus*, *Crataegus*, *Viola*, etc., the five genera just named having only 56 species among them in the book.

The catalogue comprises 60 pteridophytes, 13 gymnosperms, 384 monocotyledons, and 980 dicotyledons, or 1437 species and varieties of vascular plants. About 28.2 per cent. of the angiosperms (counting both native and introduced species, for they are not separated) are monocotyledons, which seems to show that the vegetation of Maryland is on the whole considerably nearer the climax condition that that of New Jersey, and farther from it than that of Pennsylvania.

In the general index the only persons mentioned are those whose names occur on the first 20 pages. About 75 others, many of whom are shown in the text to have made important contributions to the knowledge of the Maryland flora, are omitted. This perhaps should not be charged up to the authors, however. The botanical index seems to be complete, except for the plants mentioned on pages 86, 87, and 385 (and these are the ones excluded from the state flora), and in the footnotes on page 164 and in the catalogue.*

With the few exceptions here noted, the Plant Life of Maryland is a model of its kind, and it easily ranks among the foremost of existing local phytogeographical works. It is to be hoped that botanists in other states, especially those whose vegetation has not yet been systematically described, will soon follow the splendid example set by Dr. Shreve and his associates.

ROLAND M. HARPER.

Apgar's Ornamental Shrubs of the United States

In criticising a book we must look at it from the standpoint of the author. The late Mr. Apgar has fully informed us in the preface that his aim has been to produce a work that will reach "that large public who wish to know by name the attractive shrubs cultivated in parks and private grounds, but who are actually afraid of anything called botany." Viewed from this frank avowal of its purpose, the little book before us will fill the need of a large number of people who have not an extended knowledge of botany and its terms. What terms the author has found it necessary to use have been fully explained in the first part of the work and in the glossary at the end. The primary classification is based upon the form and position of the leaves, when these are present; or in their absence keys are provided for deciduous-leaved shrubs, and for thorny or spiny

*Although the present work is not a good illustration of the point, it might not be out of place to remark here that indexing is too often regarded as a mere mechanical process, requiring no intelligence or discretion, and delegated by the author to persons who have no interest in his work.

†Apgar, A. C. Ornamental Shrubs of the United States (Hardy, Cultivated). Pp. 1–352. *pl. 1–4. f. 1–621.* American Book Co. Price $1.50.

plants. Flowers and fruits are assigned a secondary place. Part II is devoted to the "General Opening Key" and the "Keys to the Genera," with instructions as to their use. In Part III are the descriptions of the shrubs, and here a valuable help is offered in the numerous illustrations, made by the author himself, in which he has indicated what are considered the essential characters.

The little work must not be viewed from the scientific standpoint, for the author makes no claim along this line. Considered from the point of view of the author, and of that large class who desire merely to know the names of shrubs, this little volume will be of great use.

George V. Nash.

A recent investigation of the sargasso sea was undertaken by Dr. John J. Stevenson. He says (*Science*, December 9, 1910) that the "indefinite descriptions of the area and mass of seaweed, as well as the extraordinary statements made by some authors in discussing the origin of coal, induced the writer to make an examination of the conditions for himself. The matter is easy, because the steamship route between Barbadoes and the Azores crosses the area diagonally and passes very near the center." His own observations, and the information gained from officers who had crossed the sargasso sea many times, lead him to think that "much depends on the time of year, for weed appears to accumulate while the trades are mild and to be broken up later in the season when the strength of the winds increases. In any case, however, the weed occupies only a small part of the area, the patches being separated by wide spaces of clear water, almost free from weed. Many of the bunches show unmistakably that they had been attached to rock; and the plants have traveled far, since in a large proportion of bunches only a part is living, the dead parts being of a brownish color." It is evidently unusual to find a patch exceeding a half acre in extent. In passing through the Bahamas the seaweed is found to be "much more abundant than along either of the lines followed across the sargasso. The weed is evidently the same, being in circular bunches up to 18 inches diameter arranged in strips according with the direction of the wind, though occasionally in bands or even in patches 8 by 10 feet. The patches are near the large islands."

Mr. Stevenson feels that "At best, the quantity of weed seen at any locality is wholly insignificant. Midway in the sargasso sea, the bunches seen in a width of a mile would form, if brought into contact, a strip not more than 65 feet wide. This, where the weed is most abundant. But the bunches are very loose, the plant material, as was estimated, occupying less than one fifth of the space, so that if the bunches were brought together so that the plant parts would be in contact, each square mile would yield a strip not more than 13 feet wide and 3 or 4 inches thick, or barely 2,500 cubic yards to the square mile. . . . The accumulation of decayed vegetable material from seaweeds must be comparatively unimportant under the sargasso sea; and what there is would be merely foreign matter in mineral deposits."

J. B.

PROCEEDINGS OF THE CLUB

November 30, 1910

This meeting was held at the New York Botanical Garden. Nineteen persons were present. Vice-president Barnhart occupied the chair.

The minutes of the meeting of November 8 were read and approved. Dr. W. D. Hoyt, of Rutgers College, New Brunswick, N. J., was proposed for membership.

The first paper of the announced scientific program was by Dr. N. L. Britton on the "Flora of Pinar del Rio, Cuba." Dr. Britton gave an account of his recent botanical explorations in this province of Cuba in company with Mrs. Britton, Professor F. S. Earle, and Professor C. Stuart Gager. After a sketch of the earlier botanical explorations of Cuba by Charles Wright and others, the general floral features of the province of Pinar del Rio were described and many specimens were exhibited. An account of this work is published in the *Journal of the New York Botanical Garden* for October.

The second paper on "Thistle Hybrids from the Rocky Mountains" was by Dr. P. A. Rydberg. The speaker exhibited specimens of nineteen supposed hybrids in the genus *Carduus*, together with their putative parents. The evidences of hybridity were drawn from intermediate morphological characters, supported in most cases by close association in nature with the supposed parents. Descriptions of these *Carduus* hybrids were published in the *Bulletin* for November.

Adjournment followed.

MARSHALL A. HOWE,
Secretary pro tem.

DECEMBER 13, 1910

The meeting was called to order at the American Museum of Natural History at 8:30 P.M. Tuesday, December 13, 1910, with President Rusby in the chair. One hundred people were present.

After the reading and approval of the minutes of November 30, 1910, Dr. W. D. Hoyt, Rutgers College, New Brunswick, N. J., and Miss Jessie P. Rose, Crystal, Oregon, were elected to membership.

The resignations of Prof. Henry Kraemer, Dr. Raymond H. Pond, and Mrs. L. Schöney were read and accepted.

The scientific program consisted of an illustrated lecture by Dr. Marshall A. Howe on "A Visit to the Panama Canal Zone."

The visit described by the speaker occurred in December, 1909, and January, 1910, and was undertaken under the auspices of the New York Botanical Garden, with the special object of studying and comparing the marine floras of the Atlantic and Pacific oceans, here within less than fifty miles of each other.

The marine algae proving unexpectedly scarce, especially on the Pacific side of the Isthmus, there was considerable opportunity for taking photographs of general botanical interest and the lantern-slides shown illustrated chiefly some of the more striking features of the land flora of the Canal Zone, such as the numerous native palms, the vegetation of the extensive fresh-water swamps between Colon and Gatun, the swampy forests bordering the

Chagres River, and the flora of the rocky islands of Panama Bay, A report covering some of these features of the lecture was published in the *Journal of the New York Botanical Garden* for February, 1910.

The speaker justified a somewhat extended discussion of the Panama Canal and its history by the general interest in the subject both here and on the Isthmus. Among the photographs shown were several of the Atlantic and Pacific entrances to the Canal, the Gatun locks, a flood on the Chagres River, the Culebra Cut, the Ancon Hospital, and the Taboga Sanitarium. The success of modern sanitary methods in combatting yellow fever and malaria was especially dwelt upon. The speaker alluded also to incidents of interest in the romantic early history of the Isthmus and in the building of the Panama Railroad. Photographs of the ruins of Old Panama, located about five miles east of the present city, were also shown.

Adjournment followed.

SERENO STETSON,
Secretary pro tem.

OF INTEREST TO TEACHERS*

COLLEGE BOTANY NOTES

An interesting set of sheets giving some of the directions for freshman and sophomore botany has been provided us by Professor Clements of the University of Minnesota. Drawings form quite a prominent part of the work as might be expected. It is directed that the drawings be drawn to scale—a thing which is more important than most of us realize. The following recommendation is also made: "As a rule, write the answers to the questions first, and make the drawings afterward." The procedure is often exactly the opposite, with the result that the drawing shows but indifferently the characteristics of the plant parts under consideration. Structure and function are too often too widely separated—in time at least—even in general courses in botany. In the work on plant cells and tissues given below

*Conducted by Miss Jean Broadhurst, Teachers College, Columbia University.

one can see clearly that very different drawings would be made before and after answering the questions.

1. Cell and protoplasm (Lat., cella, room: Gr., protos, first plasma form).

   (*a*) Mount a leaf of the water weed, *Philotria*. Note the structure of the cell, the position of the green bodies, chloroplasts, and especially the movement of the protoplasm. Compare various cells.

   (*b*) Mount a stamen of the spiderwort, *Tradescantia*, taking care not to crush it. Note the structure of the stamen-hair, and especially the streams of protoplasm and the nucleus.

   Answer the following questions definitely but briefly: (1) Explain the different shapes of the cells. (2) What indicates that the wall is elastic? (3) Do the streams of protoplasm change their shape, position, or direction? (4) What forms the "banks" of the streams? (5) Find the rate of flow. (6) Does the protoplasm pass from one cell to the next? (7) How and why does it line the cell wall? (8) Explain the position and shape of the nucleus. (9) Does the nucleus move? If it does, explain how. (10) Do the streams center at it? Do they flow into it or over it? (11) What fills the bulk of the cell? Draw to scale a cell of *Philotria*, showing the wall and chloroplasts; draw a cell of the stamen-hair, showing wall, streams of protoplasm, nucleus, etc.

Almost all of the work is carried on in the field and greenhouse. Lectures and books are replaced by independent laboratory (in the widest sense) work by the students. It means time, patience, and real teaching power on the part of the instructors if the students are to solve for themselves the problems of physiology and work out the structural adaptation to function. It is also felt at the University of Minnesota that the students are more interested by and in work of this type than by the usual method of lectures, and text and reference books.

The beneficial effects of soil bacteria have lately received much emphasis. The *Outlook* notes popularly the recent investigation of injurious soil bacteria—(October 29, 1910) at the experiment station at Rothamsted, England. "It occurred to the experimenters at Rothamsted that perhaps there exist similarly in the soil, not only the "good" microbes that can be reinforced at will, but "bad" organisms that, as in the human system, are at warfare with the benefactors. And this was demonstrated to be a fact. Perhaps, then, they thought, we can not only reinforce the helpful organisms by addition from without, but treat the soil with something that will kill or minimize the effect of those undesirable. Isolating the organisms and experimenting with them, it was soon found that various antiseptics, in liquid and in vapor form, will kill or paralyze the undesirable organisms, and hence, if applied to soils, materially increase their yield, even without a reinforcement of the army of their natural enemies, the ammonia-forming bacteria; and at length it was discovered that heat alone will answer every purpose. Partial sterilization of the soil by heat, while destroying some of the desirable bacteria, totally destroys those that prey upon them. Cans of earth from the same field heated to about the temperature of boiling water yield enormous growths of leaf and seed compared with identical samples unheated. Here is the sign-post that points to a most fascinating path of research. Perhaps some way will be found to apply this discovery practically. Experiment will not rest here, although it seems at first thought impossible to *heat* the soil over any large area; yet in greenhouses it might pay, where the area under cultivation is relatively small and the crop relatively very valuable. A lady of our acquaintance found it impossible to grow certain flowers in a pot; the seeds germinated, but the plants failed to mature. Thinking that there might be some worm or grub in the soil that attacked the seeds or the roots, and that heat might kill it, and as fresh soil was not easy to secure in the city, she put the pot in the oven and baked the contents. Afterwards there was no trouble when the seeds were again planted. She had unconsciously confirmed the Rothamsted experiment, destroying the harmful bacteria. Professor

Hall, the writer of the article which is the subject of this review, concludes as follows, after admitting the difficulty of applying this remedy on a large scale: "Sooner or later, our trials will reach a cheap and practical issue. But if we do succeed, we shall have added one more to the number of new discoveries which are as old as time: Virgil in his Georgies describes the advantages to be obtained by mixing the surface soil with weeds and rubbish and burning it gently, and the practice is still followed among the native cultivators in India." This, Mr. Hall concludes means a warfare "against an invisible population, of which the very existence was unsuspected a generation ago." And the results are due to the killing of "unsuspected groups of large organisms of the protozoan class, which feed upon living bacteria," and heating or treatment by antiseptics relieves the bacteria which partially escape the treatment from their attack, allowing them to increase to an enormous degree, with a corresponding rise in ammonia production—and therefore of fertility. —*Science*, September 16, 1909.

The October *Journal of the New York Botanical Garden* contains an article by George V. Nash on "Winter Decorative Shrubs." Over thirty such shrubs are listed with brief descriptions. School grounds are usually planted with summer decorative shrubs, and are consequently not at their best during the greater part of the school year. It is possible to use winter shrubs in such a way as to add to the summer display, and yet leave a well-balanced and pleasing scheme during the winter.

A recent paper by Alma G. Stokey on *Lycopodium pithyoides* notes the fact that in this species the sporangia are cauline rather than folia, through continued inequality in the rate of growth which causes it eventually to take a "position on the stem entirely distinct from the leaf."

The Japanese are going to replace the cherry trees presented to Mrs. Taft by Japan to adorn the Potomac Drive at Washington, and which had to be destroyed on arrival because they were infected by insects.

NEWS ITEMS

We learn from the *Ottawa Evening Journal* of January 19 details of the remarkable expedition of Mr. J. M. Macoun, naturalist of the Geological Survey of Canada. He left Halifax on July 2d, reached Churchill on the twenty-fifth and after botanizing for a month in that vicinity started north. Sailing up Hudson Bay, in the steamer "Jeannie" the party reached Wager Inlet, which is almost on the Artic Circle, and here on the evening of September 5th the vessel was wrecked in a storm. The party rigged up two small boats, rescued from the "Jeannie," and succeeded in reaching Fullerton, about 150 miles southward, in two and a half days. From Fullerton to Churchill it is 450 miles and they made this part of the return trip in a whaler. Finding it impossible to stop at Churchill on account of scarcity of food the party traveled 800 miles overland by snow shoes and sledges to Gimli in Manitoba, a small town on the southerly end of Lake Winnipeg. Here they were within reach of civilization. The botanical specimens were all saved and will prove of much interest as "before no botanist had been on the west coast of Hudson Bay between Churchill and Repulse Bay." At the latter place all the species are arctic. No lives were lost and no one was seriously injured.

The American Fern Society has elected the following officers for 1911: *President*, Philip Dowell; *Vice-president*, Miss Nellie Mirick; *Treasurer*, H. G. Rugg; and *Secretary*, L. S. Hopkins.

In honor of Prof. L. R. Jones, formerly of the University of Vermont, and now professor of plant pathology at the University of Wisconsin, a 450-acre reserve in Vermont has been named the "L. R. Jones State Forest."

During February and March several hundred orchids will be in flower at the New York Botanical Garden. The collection includes many interesting and rare species from all parts of the world.

The editor of TORREYA has accepted the position of Curator of Plants at the Brooklyn Botanic Garden, the appointment to take effect March 16, 1911.

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 submitting manuscript.

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OTHER PUBLICATIONS

OF THE

TORREY BOTANICAL CLUB

(1) BULLETIN

A monthly journal devoted to general botany, established 1870. Vol. 37 published in 1910, contained 630 pages of text and 36 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 24–37 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. 28–37 three dollars each.

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

(2) MEMOIRS

The MEMOIRS, established 1889, are published at irregular intervals. Volumes 1–13 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

MR. BERNARD O. DODGE
Columbia University
New York City

Vol. 11 March, 1911 No. 3

TORREYA

A Monthly Journal of Botanical Notes and News

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR

JOHN TORREY, 1796–1873

CONTENTS

Published for the Club
At 41 North Queen Street, Lancaster, Pa.
by The New Era Printing Company
[Entered at the Post Office at Lancaster, Pa., as second-class matter.]

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.

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NORMAN TAYLOR

Central Museum,

Eastern Parkway, Brooklyn, N. Y.

TORREYA

March, 1911

Vol. 11 No. 3

THE CLOGGING OF DRAIN TILE BY ROOTS

By G. E. Stone

Quite frequently trouble is experienced from roots of various trees entering drain tile, sewers, etc., and this often causes much vexation, labor and expense. The Carolina poplar, which is often planted as a shade tree in cities, frequently becomes a nuisance in consequence of its peculiar habit of working its roots through the joints of tile used for sewerage, etc. It is a comparatively easy matter for roots to gain entrance into the uncemented joints of tile, and even when tile is cemented they often manage to crowd in and fill the tile with a mass of roots which eventually clog the tile and render it useless. Instances are even known of roots penetrating sewers constructed of brick and cement. The roots of other trees besides Carolina poplars are known to be offenders in this respect. Willows, elms and others are responsible for considerable clogging of tile, and grass roots will in a comparatively short time put out of commission the most effective drain. There are also many instances of even fungi and algae clogging up small drains. The writer some years ago had called to his attention a case of *Oscillatoria* constantly clogging tile, much to the annoyance of the landowner; and, is also familiar with a case where the drain tile underlying the steam conduit of a central heating and distributing plant was continually being clogged by root growth. The joints of the six-inch Akron tile underlying the steam heating pipes were not cemented and were four or five feet below the surface. In two or three years after the tile were laid some of them had become clogged with elm tree roots. This clogging prevented the water from flowing through the tile and caused a dam, as it were, resulting in the water flowing back into the conduit and flooding

[No 2, Vol. 11, of Torreya, comprising pp. 23–50, was issued 14 F 1911.]

the steam pipes which greatly interfered with their efficiency. It is necessary, of course, to leave the joints of Akron tile open when used for the purpose of draining the conduit trench since these pipes must take off the water from the trench and prevent it from coming into contact with the steam pipes in the conduit. As long as the joints remain open it is with great difficulty that the roots of trees, etc., are kept from growing in the tile, and sooner or later it is made ineffective.

Tree roots will penetrate tile protected with carefully cemented joints and become a nuisance, as is shown by the following instance. In the city of Newark, N. J., the Shade Tree Commission have been requested by the Department of Sewers and Drainage to omit the planting of Carolina poplars on streets since the roots of these trees proved to be a nuisance to drains. Mr. Edward S. Rankin,* Engineer of Sewers and Drainage of the city of Newark, writes as follows:

"Replying to your letter of the twentieth inst., we find that the roots go through the joints of tile pipe even when carefully cemented and the trouble seems to be increasing. In 1909 we had 15 stoppages caused by roots; for the first 11 months of 1910, 23, of which 5 occurred in the month of November. These stoppages were all in house connections, and in addition to these we have also had a number of cases in our main pipe sewers. The roots after penetrating the pipe seem to spread out and practically fill the whole pipe. I have no way of knowing how long a time it takes for these roots to grow. To the best of my knowledge we have had no trouble with any of our brick sewers. The trouble seems to have been caused in all cases by poplar trees."

There recently came to our attention a notable case of a large drain tile being clogged by the roots of a pear tree. This tile was 12 inches in diameter and was laid about seven years ago to take the seepage waters from a reservoir located in the town of Belmont, Mass. The pipe passed near a pear orchard, and there was a constant flow of water through it summer and winter, although it was never full. At the time the tile was laid the joints were not cemented, and of course there was an opportunity

*See also Municipal Journal and Engineer, vol. 30, no. 1, January 4, 1911.

for roots of various kinds, if so disposed, to penetrate the joints of the pipe and secure an abundant supply of water. During November, 1909, about seven years after the drain pipe was installed, it became necessary to dig up a large part of it on account of its inefficiency and replace it. It was found on digging up this tile that it was badly congested by a profuse root growth. A careful examination of the location showed that this growth

FIG. 1.—Showing pear tree root taken from drain tile.

of roots originated from a single off-shoot of a pear tree located some seven feet away. This enormous mass of pear roots was removed from the tile and carefully laid aside and at our request was presented to our museum, with full data concerning it. The roots were found to measure 61 feet in length. Only a single root entered the tile, it having a diameter of about five-eighths of an inch inside the tile, but where it entered the tile it was somewhat flattened out. The root, on entering the tile, subdivided into innumerable rootlets, and these were again divided into countless smaller roots. At the time the tile was dug up and the roots removed the drain had been in operation seven years, although a cross-section of the root and an examination of the annular rings where it entered the tile, showed that it was only five years old. It required, therefore, only five years for this mass of roots to clog up a 12-inch tile.

The maximum diameter of this mass of roots in the dry state is six or seven inches, but when alive and flourishing in the tile its diameter exceeded this. The roots as they reached the laboratory had a decidedly bad odor, showing that if no sewage was present in the tile there was certainly a considerable amount of organic matter in the seepage derived from the soil or some other source which proved of value as plant food. Soon after the specimens arrived at this laboratory they were spread out on the floor and measured. This was done by laying out on the floor sections five feet in length. The number of roots in each five-foot section was counted. These were multiplied by the length of the section and the whole tabulated (see table). The total length of these roots was 8,498 feet, as shown in the table, which is equal to 1.61 miles. Adding to this the numerous small roots which range from a few to several inches in length and which were not considered in our section count, the total length was estimated to be over two miles.

This enormous development from a single root of a pear tree is greatly in excess of what would take place if the roots were

Table Showing the Growth of Pear Tree Roots in Drain Tile

No. of Section.	Length of Section.	No. of Roots in Section.	Length of Roots in Section.
1	5 ft.	34	170 ft.
2	5	41	205
3	5	73	365
4	5	153	765
5	5	199	995
6	5	313	1565
7	5	373	1865
8	5	447	2235
9	5	141	705
10	5	53	265
11	5	31	155
12	5	36	180
13	1	28	28
Total	61	1922	8498

in the soil, since the conditions of the drain tile stimulate root development very materially. However, the root system of any tree or shrub is far in excess in length and area of what the layman imagines. The profuse growth of roots in water is also seen in cases where old wells become filled with root growth, but the pear tree root in question is one of the best examples which has ever come to our notice of root development in drain tile.

Massachusetts Agricultural Experiment Station,
Amherst, Massachusetts.

THE NATURE AND FUNCTION OF THE PLANT OXIDASES

By Ernest D. Clark]

(*Continued from February Torreya*)

Peroxidase

Besides the laccase and tyrosinase which we have been considering, there are other oxidizing enzymes which are not specific like the two mentioned. They act only in the presence of hydrogen peroxide, and therefore are called peroxidases. These enzymes have also been called "indirect oxidases" in distinction from those substances (Bach's oxygenases) which show their activity without the addition of peroxide as in the case of tyrosinase, etc. In 1903, Bach and Chodat[15] discovered that by fractional precipitation of aqueous extracts of *Lactarius vellereus*, they were able to obtain two precipitates of very different properties. The fraction insoluble in 40 per cent. alcohol proved to be a direct oxidase, while the other fraction, soluble in 40 per cent. alcohol, but insoluble in 95 per cent. alcohol, had no direct oxidizing properties. With hydrogen peroxide and other peroxides, however, the second fraction showed strikingly peroxidase properties. Moreover, the peroxidase fraction, when allowed to act with the direct oxidase fraction, showed all the properties of

[15] Bach and Chodat. Title of series is: Untersuchungen über die Rolle der Peroxyde in der Chemie der lebenden Zellen; V. Zerlegung der sogenannte Oxydasen in Oxygenasen und Peroxydasen. Ber. Chem. Gesell. 36: 606. 1903.

the original oxidizing substance as present in the plant. This research was the beginning of a series of notable contributions to our knowledge of the oxidizing enzymes. In another paper, these authors state that peroxidase is present in nearly every plant. They were able to prepare a pure peroxidase from the horse-radish root, which exhibited great stability towards heat. In further comparative studies they showed that peroxidase greatly augments the power of the natural oxidases, especially that oxygenase from the same source as the peroxidase itself. All of these observations led Bach and Chodat to separate oxidases into two parts, the organic peroxide part, which they called "oxygenase" and the activator of oxygenase and other peroxides, to which alone they gave the name "peroxidase."

Kastle and Loevenhart[16] in 1901 published a very important paper which has not always received due attention from the European chemists engaged in this work. These authors found that the substance bluing guaiacum directly is easily precipitated by alcohol and is destroyed by small amounts of hydrocyanic acid, hydroxyl amine and phenyl hydrazine. It seemed peculiar to them that these substances should be so harmful, but that sodium hyposulphite, silver nitrate and mercuric chloride, substances usually fatal to enzymes, should exert little effect on the constituent of the potato which blues guaiacum directly. In general, those substances which prevented the direct bluing of guaiac tincture by the potato juice also prevented similar action upon guaiacum by the organic and inorganic peroxides with which they experimented. All of these experiments caused them to believe that this direct bluing was not due to enzymes at all, but to organic peroxides which were formed when the juice is exposed to the air, according to Engler's theories of auto-oxidation. Thus we see, the idea that oxidases are made up of an organic peroxide part activated by the enzyme peroxidase receives further confirmation from this work of Kastle and Loevenhart.

In a valuable paper by Kastle[17] on "The Stability of the

[16] Kastle and Loevenhart. On the Nature of Certain Oxidizing Ferments. Amer. Chem. Jour. **26**: 539. 1901.

[17] Kastle. On the Stability of the Oxidases, etc. Bull. 26, Hyg. Lab. U. S. Pub. Health and Mar. Hosp. Serv. Washington, 1906.

Oxidases," it appears that oxygenases of certain fungi are extremely resistant to the influence of both heat and long standing. In the case of the oxygenase from *Lepiota americana*, it was necessary to heat for several minutes to a temperature of about 85° in order to destroy the power of the extract to blue guaiacum directly. Still more striking is the case of the glycerin extracts of certain *Lactarius spp.*, which after standing from 1905 to 1909 were found to be still active towards both guaiacum and tyrosin. It is interesting to note that of the many species of the higher fungi which Kastle tested, only one, *Amanita verna*, did not show any response for the oxidases. This plant is so poisonous that it has been called the "destroying angel."

From all the experimental work of the different investigators it seems probable that peroxidase is an enzyme rather than a simple catalyzer. Little is really known of the nature of peroxidase. Bach[18] has prepared a powerful peroxidase which gave no tests for proteins, nor did it contain iron or manganese. On the other hand, Van der Haar[19] claims his *Hedera* oxidase was a glucoprotein. Resistance to heat seems to be a peculiarity of peroxidase. Heating to boiling is necessary to destroy peroxidase, while oxygenase is destroyed at a much lower temperature. Bach and Chodat noted this fact and also that upon standing after boiling, the peroxidase regained its activity. Woods[20] first discovered this phenomenon while studying the peroxidase of the tobacco leaf, and concluded that in these cases we are dealing with a zymogen or a substance which regenerates the peroxidase upon standing. Aso[21] also found that there were zymogens more stable towards heat than peroxidase itself, which slowly yielded more of the latter after the destruction of the initial supply. A second heating permanently destroys the peroxidase; the stronger the solution of the enzyme, the more resistant it is towards heat.

[18] Bach. Zur Theorie der Oxydasenwirkung: I. Mangan und eisenfreie Oxydasen. Ber. Chem. Gesell. 43: 364. 1910.

[19] Van der Haar. Untersuchungen in Pflanzenoxydasen: II. Die Hederaperoxydase, ein Glucoproteide. Ber. Chem. Gesell. 43: 1321. 1910.

[20] Woods. The Mosaic Disease of Tobacco. Report No. 18 [p. 17], U. S. Dept. Agric. 1902.

[21] Aso. Which Compound Can Liberate Iodine from Potassium Iodide? Beihefte z. Botan. Centralblt. 15: 208. 1903.

The writer has also noted cases of the regeneration of the peroxidase after its apparent destruction by heat, especially in the case of the oxidase of the sweet-potato. Hasselbring and Alsberg[22] have recently found that only in the presence of coagulable protein are the oxidases easily destroyed by heat.

With the exception of catalase there is probably no enzyme more common among plants and animals than peroxidase. There is hardly a plant or any part of its organs that does not blue tincture of guaiacum in the presence of hydrogen peroxide, thus proving the presence of peroxidases. The oxidases also play an important part in many industrial processes. The curing of tobacco, the production of the bouquet of wines, and the formation of commercial indigo from *Indigofera anil* in India, all seem to be somewhat dependent upon the oxidases. Green tea is produced when the freshly picked leaves are immediately spread on hot plates which, of course, destroys the oxidases, while the slow curing with consequent activity of the oxidases yields the black tea of commerce. The aroma of the vanilla-bean and the fragrance of the English meadow-sweet (*Ulmaria Ulmaria*) have also been attributed to oxidase action. Leptomin is really a peroxidase but Raciborski,[23] finding the indirect oxidase localized in the leptome (phloem) of plants, considered it a new enzyme, and one distinct from the direct ox dase. With guaiacum and hydrogen peroxide the strongest bluing is localized in the phloem through which the sieve-tubes pass, the latter acting as carriers of the food materials of the plant. This so-called leptomin is present in largest amount in the phloem of the latex plants. These illustrations will serve to show the distribution and importance of the oxidases in plants.

Catalase

It has long been known that finely divided metals, blood, plant juices and fluids from the animal body cause the rapid decomposition of hydrogen peroxide. But this fact did not

[22] Hasselbring and Alsberg. Studies upon Oxidases [an abstract]. Science II. 31: 637. 1910.

[23] Raciborski. Ein Inhalts-korper des Leptoms. Ber. Botan. Gesell. 16: 52. 1898.

attract special attention at first because it was generally thought that the power to decompose hydrogen peroxide was a property common to all ferments (enzymes). However, beginning in 1888 with Bergengrün, different investigators discovered that the power to decompose hydrogen peroxide into oxygen and water could exist independently of the ordinary activities of such enzymes as the oxidases, diastase, emulsin, etc. Gottstein stated that the power of cells to break up hydrogen peroxide is due to their nucleic acid content and not to any enzyme, and furthermore, this power is shown after the death of the cell as well as during life. In 1901, Loew[24] found, in his studies on the enzymes of the tobacco leaf, that these leaves often caused a very active evolution of gas from hydrogen peroxide, but yielded none of the tests for oxidases, protein digesting enzymes, and other enzymes. This led him to study the matter more fully, with the result that by precipitation of the leaf extracts with ammonium sulphate and subsequent purification by alcohol precipitation, he obtained preparations that were extremely active in decomposing hydrogen peroxide, but which had no other property agreeing with the other classes of enzymes, such as the starch digesting action of diastase, etc. He named this substance "catalase" and considered that it was a new enzyme. Loew then made a more careful study of catalase and found that it apparently existed in two forms, α-catalase, which is insoluble in water, and the β-catalase, soluble in water. In a study of its distribution, Loew found that catalase is of practically universal occurrence in both plants and animals, a conclusion fully substantiated by the work of all later investigators. Recent observations made by Appleman[25] seem to show that catalase may be separated into a water-soluble and -insoluble portion as was previously claimed by Loew.

Euler[26] investigated the catalase of the fungus *Boletus scaber* in a painstaking manner. This catalase proved to be more sensitive to acids than animal preparations, but like them, there seemed to be some connection between the fat content of the

[24] Loew. Catalase, a New Enzyme of General Occurrence. Report No. 68, U. S. Dept. Agric. 1901.

[25] Appleman. Some Observations on Catalase. Bot. Gazette 50: 182. 1910.

[26] Euler. Zur Kenntniss der Katalase. Hofmeister's Beitrage, 7: 1. 1908.

fungi and the amount of their catalase. Like the other investigators, he found that in dilute solutions and with a relative excess of the enzyme solution, the reaction followed the equation for reactions of the first order, thus tending to show that active oxygen was formed. In some cases he found that the physico-chemical constant k' equalled 0.0107 at 15°, this value for k' being identical with that found by Bredig and his collaborators for a colloidal platinum solution containing 0.006 gram of the metal per liter. The enzyme solution used by Euler in this determination contained 0.004 gram of enzyme preparation per liter. This enzyme was associated with globulin, but, taking the molecular weight as 1000, while that of platinum is 195, then 0.006/195 N equals the concentration of platinum and 0.004/1000 N equals the concentration of enzyme. This will give one an approximate idea of the tremendous catalytic activity of both of these substances. Not only do colloidal metal solutions and the vegetable catalases act in the same quantitative manner, but they also show the same sensitiveness to chemicals.

It seems likely that there is an antagonistic action between peroxidase and catalase. Shaffer[27] found that if uric acid were allowed to stand for several days with hydrogen peroxide solution, it was oxidized, but in the presence of catalase and hydrogen peroxide, there was no oxidation of the uric acid. This led Shaffer to believe that the spontaneous decomposition of the hydrogen peroxide results in the formation of traces of active oxygen, while that set free under the influence of catalase is wholly in the molecular (inactive) state. The main point of Shaffer's publication is that the oxygen set free by catalase is not in a nascent state and therefore catalase may have a certain protective power in the oxidation processes carried on by the cell. Herliztka[28] agreed with Shaffer that catalase has a protective action in the presence of peroxides or peroxidases. He also made quantitative studies on the oxidation of guaiacum by peroxidase and found a retarding action in the oxidation whenever catalase

[27] Shaffer. Some Observations on the Enzyme Catalase. Am. Jour. Physiol. 14: 299. 1905.

[28] Herliztka. Richerche sulla catalasi; Sull'antagonismo tra catalasi e perossidasi. Rendic. Accad. Lincei. Atti. V. 16²: 493. 1906.

was present. Bach showed that in a mixture of catalase and peroxidase the latter did not have an appreciable effect upon the action of the catalase. As we shall see in discussing the rôle of catalase in the cell, it is possible that it acts as a brake on the processes carried on by the oxidases.

In the catalytic decomposition of hydrogen peroxide into water and oxygen there has long been a controversy in regard to the nature of the oxygen evolved; that is, whether it is in the active state or in the inactive molecular condition. Now, in the case of catalase we know from the results of Shaffer and others, that no active oxygen is formed in the process, because guaiacum is not blued, and none of the reactions of nascent oxygen are shown; and furthermore, as Shaffer pointed out, if catalase produced active oxygen in the living cell, the protoplasm would probably be killed at once by this extremely active and destructive agent. How are we to harmonize those of the physico-chemical measurements with the results of Shaffer, Liebermann and others? From the physico-chemical data, the oxygen is in an atomic state, while from tests on the reaction mixture, it is apparently in a molecular state! We may say that the greater weight of evidence seems to favor the idea that the oxygen is in the inactive state and not capable of oxidizing *directly*.

In concluding this short discussion of catalase, we are forced to admit that our knowledge of this subject is very imperfect, and Cohnheim[29] voiced the thoughts of many investigators when he said: "It may well be that catalase is not an enzyme at all, but that the catalytic decomposition of hydrogen peroxide is a function of the large surfaces exposed by colloidal molecules, whether of organized matter or of metals in colloidal solution, the 'inorganic ferments' of Bredig."[30]

LABORATORY OF BIOLOGICAL CHEMISTRY OF COLUMBIA UNIVERSITY,
COLLEGE OF PHYSICIANS AND SURGEONS, NEW YORK.

(*To be continued*)

[29] Cohnheim. Lecture at the New York University and Bellevue Hospital Medical College, New York City, December 10, 1909.

[30] Bredig. Die Anorganische Fermente, 1901.

A METHOD OF MAKING LEAF PRINTS

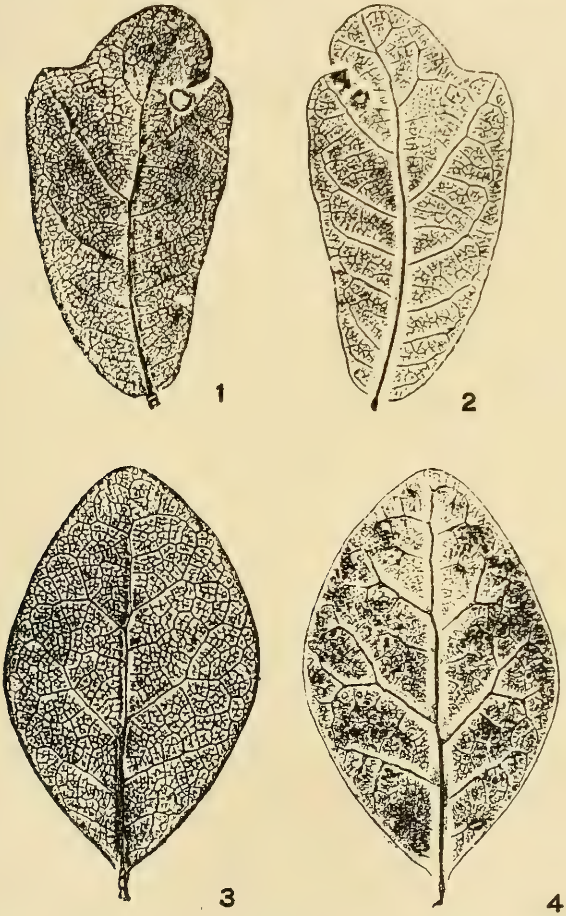
BY EDWARD W. BERRY

The following method of making prints of leaves while not new has much to recommend it and seems worthy of having attention called to it in print. It has proven by far the most satisfactory which I have utilized during a life-long interest in leaf study. I do not know the original discoverer, nor does it matter particularly. The process was described in the Scientific American a decade ago and more recently Julia E. Rogers* in "A New Method of Knowing our Tree Neighbors" gives an illustrated account of how it is done, crediting her information to W. W. Gillette, of Richmond, Virginia. The process was deemed of sufficient utility to form the subject of one of the Cornell Home Nature Study leaflets some years ago and finally it has been utilized abroad for a number of years for the purpose of furnishing cheap and accurate reproductions in paleobotanical works of existing leaves with which the fossil leaf species were compared.

The necessary outfit is cheap and simple and consists of a small quantity of printers' ink, a smooth surface eight to ten inches square on which to distribute it, a piece of glass or slate will answer, or a stone slab can be purchased from any printers' supply house for a small sum. Two rollers are needed—one an inking roller such as is used by printers in "pulling" small proofs. This is known technically as a "brayer" and various sizes can be purchased at prices ranging from fifty cents upward. I find that a fifty-cent one answers my purposes very well. The other roller is one such as is used in photographic work either of rubber or faced with rubber and costing from thirty-five cents upward. A small bottle of benzine for cleaning purposes is also useful. The process is as follows: A small quantity of ink, a teaspoonful or less, is placed on the slab and rolled to a thin film with the proof roller. Then the leaf is laid on the slab and carefully rolled with the same roller until a thin film of the ink uniformly coats both sides. The leaf is then placed between

*Country Life in America **18**: 66, 88. 1910.

two sheets of paper and rolled with the photographic roller, care being taken that the pressure be uniform and the paper be not allowed to slip or wrinkle. The result is an accurate and artistic print of both surfaces of the leaf, which should be allowed to become thoroughly dry before handling as the thick



1 2 3 4

FIG. 1. — 1 and 2. *Quercus Chapmani.* 3 and 4. *Quercus myrtifolia.*

ink offsets and rubs for several hours. These prints when well done can be used for the making of line or half-tone cuts or the same process could be used in making transfers for lithographic purposes. The various advantages of this process are obvious. As a means of interesting both young and old in becoming acquainted with the trees of their neighborhood this method has no equal and need not be dwelt upon in the present connection. As an aid to paleobotanical work it is also extremely useful. It is not necessary to dry the leaves as fresh ones answer equally well, although dried leaves from the herbarium give equally good prints if they are reasonably flat and not too brittle. The prints show both surfaces as the result of a single operation and the varying appearance of the vascular system on the two surfaces is especially valuable for comparison with fossil leaf impressions. From fifty to one hundred can be made within an hour and with a little practise the results are uniformly excellent. The accompanying illustrations are chosen to show this feature although these particular prints are much less artistic than dozens of other leaf species which might have been selected. The upper figures show the upper and under print of a leaf of *Quercus Chapmani* while the lower figures show the corresponding surfaces of a leaf of *Quercus myrtifolia*, both oaks of our extreme southern states.

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A NEW PLUM FROM THE LAKE REGION OF FLORIDA

BY ROLAND M. HARPER

The lake region of Florida,* which was scarcely known to botanists before the researches of Mr. George V. Nash in 1894,† has yielded a rich harvest of plants new to science, probably at least 75 species, about half of which are not at present known outside of this region. By far the greater number of these were discovered in the central part of Lake County by Mr. Nash in the year named, and many of them were described by him.

*The boundaries and most striking characteristics of this region have been indicated by the writer in Ann. Rep. Fla. Geol. Surv. 3: 223–224. *pl. 16*. 1911.

†See Bull. Torrey Club 22: 141–161. 1895.

During the present century very little collecting has been done in this region, but its botanical possibilities are by no means exhausted.

In the southern part of Lake County, especially just west of Lake Apopka, is an area of several square miles characterized by high sandy hills, sometimes known as mountains,* which Mr. Nash never saw. Like most other parts of the lake region, this area is dotted with small lakes, and contains no streams or valleys, and rocks are conspicuous by their absence. The hills under consideration differ from other hills of the region chiefly in being higher and steeper, the summits of some of them being perhaps 150 feet above the lakes at their bases. They are believed by some people to be the highest elevations in Florida, but their altitudes above sea-level have probably never been accurately determined. The vegetation of these hills is uniformly of the "high pine land" type described by Mr. Nash in the paper cited, with the addition of a few species more characteristic of the "scrub," such as *Ceratiola* and *Selaginella*, and a few very local species such as *Polygala Lewtonii* and the shrub presently to be described. The forests have scarcely been touched by civilization, the greater part of them not even having experienced the ravages of the turpentine industry.

On Feb. 19, 1909, just before dark, I first saw these hills from a train on the Tavares & Gulf R. R., which winds about their bases close to Lake Apopka for several miles, and is probably the crookedest railroad in Florida. The next day I walked southward on this railroad from Tavares, the county-seat of Lake County, and reached the northern edge of the hills about ten miles from Tavares and five or six from West Apopka. Almost immediately upon entering the hill country my attention was attracted to some low diffusely branched plum bushes, some of them in full bloom and leafless, and others a little more advanced, with very young leaves and fruit. The bushes were not more than two feet tall, on the average, and about the same in diameter, with branches exceedingly numerous, decidedly

*The most comprehensive description of these hills that I know of, and the one which first called my attention to them, is in Tenth Census U. S. 6: 237. 1884.

zigzag — somewhat as in *Malapoenna geniculata* — and inclined to be spinescent, as in several other species of plums. The flowers were a centimeter or less in diameter, very short-pedicelled, and arranged in few-flowered sessile umbels, much like those of *Prunus angustifolia*.

At this time I had no collecting apparatus with me, and was not going to be back in Tavares for several hours, so that there was no way of preserving any specimens which would be recognizable; and nearly two months elapsed before I had another opportunity to visit this interesting region. On the morning of April 17 I approached the same group of hills from the southwest side, leaving the same railroad at Minneola; and on some of the highest hills about half way between Minneola and West Apopka (which are about four miles apart in a straight line and ten miles by rail) I found my new plum again in abundance. (I had had glimpses of it two days before from a train between Killarney and Minneola.) The leaves were of course full-grown by this time, and the largest had blades about 2.5 cm. long and petioles about a third of that length. Some were very much smaller, but the average dimensions were probably about three-fourths of the maximum. All were oblong, about twice as long as wide, minutely mucronate at the apex, with finely crenate-serrate margins, and most of them were aggregated on very short peg-like branchlets in the manner of many other woody plants of the Rosaceae and allied families. The drupes, although still green, must have been full-grown or very nearly so, and they were practically indistinguishable from those of *Prunus angustifolia* at the same season. They were about 22 mm. long and 18 mm. in diameter, on stout pedicels about 3 mm. long.

At this time I photographed one of the largest bushes, which was about four feet tall and well loaded with fruit, and made several herbarium specimens from it. Wishing to ascertain the size, color, taste, etc., of the ripe fruit, I revisited the place on the twentieth of the following month, but was too late for it that season. A diligent search failed to reveal a single fruit or even a shriveled remnant of one, not even on the same bush which had furnished my specimens a few weeks before. On May

18, 1910, I came across several specimens of the same plant on somewhat similar high sandy hills about 35 miles farther south, near Haines City, Polk County, but was again too late for fruit.

This peculiar little *Prunus* seems to have its nearest relative—in the eastern United States at least—in *P. angustifolia* Marsh. (*P. Chicasa* Mx.), a large shrub or small tree whose favorite habitat is old fields and fence-rows in regions where agriculture has been practiced for a generation or two at least. The native home of *P. angustifolia*, if it has any, is not definitely known, but is supposed to be somewhere west of the Mississippi River.* The new species differs from *P. angustifolia* in being much smaller in almost every way except its fruit, in its diffuse habit and crooked branches, its short pedicels, and especially in being confined to a very limited area of very poor soil, which may not be cultivated for several decades to come.

The description given above, although incomplete in several particulars, and not arranged in conventional order, will be amply sufficient to enable any one to recognize the plant in the field. Several more seasons may elapse before I have a chance to collect flowers and ripe fruit, and it seems best to give the plant a name without further delay, so that it can be mentioned in descriptions of Florida vegetation. I therefore propose to call it **Prunus geniculata**. Specimens collected at the time and place above mentioned have been distributed as no. 31 of my Florida plants, and have been pronounced undescribed by all systematists who have examined them.

I have recently been informed that there is in the Gray Herbarium a flowering specimen of the same species, collected in March, 1889, by Otto Vesterlund near Killarney, which is on the southwest side of Lake Apopka, where the Tavares & Gulf R. R. crosses the "Orange Belt" division of the Atlantic Coast Line, a few miles southeast of West Apopka.

*For notes on its supposed origin, present habitat, etc., see Michaux, Fl. Bor. Am. **1**: 284–285. 1803; Pursh, Fl. Am. Sept. 332. 1814; Nuttall, Genera **1**: 302. 1818; Elliott, Bot. S. C. & Ga. **1**: 542. 1821; Sargent, Tenth Census U. S. **9**: 66. 1884; Silva N. A. **4**: 25–26. 1892; Mohr, Contr. U. S. Nat. Herb. **6**: 551. 1901; Harper, Ann. N. Y. Acad. Sci. **17**: 115, 228. 1906; Bull. Torrey Club **35**: 350. 1908.

PROCEEDINGS OF THE CLUB

January 10, 1911

The first meeting of the Club for 1911 was held at the American Museum of Natural History, beginning at 8:25 P.M., President Rusby in the chair. There were nineteen persons present. Dr. C. A. Darling, of the department of botany, Columbia University, was nominated for membership.

This being the annual meeting, reports were presented by the various officers.

The report of the Treasurer was presented and upon motion referred to an auditing committee.

The Secretary reported that fifteen meetings had been held during the year with a total attendance of 467, as against 411 in 1909, and an average attendance of thirty-one, as against twenty-seven last year. Twelve persons have been elected to membership, and eight resignations received and accepted. Six illustrated lectures were delivered during the season at which the combined attandance was 319, as against 251 at seven meetings last year.

The Editor reported that the Bulletin for the year 1910 contains 630 pages and 36 plates, and that the expense of its publication was less than the amount allowed for it by the Budget Committee. He also reported that only one paper had been published in the Memoirs, this being a paper by Dr. O. Butler on The Californian Vine Disease. The Editor declined to be considered for reëlection. His detailed report is appended.

The Editor of Torreya presented a special report for that periodical. The volume of Torreya for 1910 contained 292 pages.

The chairman of the Field Committee reported that twenty-three meetings were advertised during the year, one of which was an afternoon lecture at the New York Botanical Garden. Eight meetings were not held on account of stormy weather or from other causes. At the fourteen field meetings actually held there was a total of 103 persons present, making an average attendance of a little more than seven at each meeting.

As chairman of the Local Flora Committee, Dr. N. L. Britton gave a brief report of the investigations being carried on by Mr. Norman Taylor on the local flora.

Election of officers for the year 1911 resulted as follows:

President, H. H. Rusby.

Vice-presidents, Edward S. Burgess and John Hendley Barnhart.

Secretary and Treasurer, Bernard O. Dodge.

Editor, Philip Dowell.

Associate Editors, John Hendley Barnhart, Jean Broadhurst, Ernest Dunbar Clark, Alexander William Evans, Tracy Elliot Hazen, Marshall Avery Howe, Herbert Maule Richards and Norman Taylor.

The following committees were appointed by the President for the year 1911:

Finance Committee, John I. Kane, H. M. Richards.

Program Committee, Elizabeth G. Britton, Fred J. Seaver, Tracy E. Hazen and Jean Broadhurst.

Field Committee, E. B. Southwick, William Mansfield and Norman Taylor.

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

Budget Committee, H. H. Rusby, E. S. Burgess, J. H. Barnhart, B. O. Dodge, Philip Dowell and N. L. Britton.

A motion was made by Dr. M. A. Howe that for the ensuing year the offices of secretary and treasurer shall be held by one person; that the secretary and treasurer shall be instructed to assist the editor by preparing the annual volume indexes for the Bulletin and Torreya, by selecting the titles and preparing the copy for the Index to American Botanical Literature, and by distributing to subscribers the Card Index; that in consideration of the demands upon his time and attention, the secretary and treasurer shall receive from the funds of the Club the sum of $300 a year, payable in equal monthly instalments, and that this amount shall be held to include any disbursements by him for clerical assistance.

The motion was carried.

Resignations were read and accepted from Mr. Macy Carhart and Mr. Gifford Pinchot.

Adjourned.

PERCY WILSON,
Secretary.

OF INTEREST TO TEACHERS*

THE SCIENTIFIC SPIRIT

Under "Practical Science" Professor John M. Coulter discusses (*Science*, June 10, 1910) the scientific attitude of mind or the scientific spirit. He describes three of its useful characteristics: First, that it is a spirit of inquiry, and in connection with this he makes the statement that it "is not the spirit of unrest, of discomfort, but the evidence of a mind whose every avenue is open to the approach of truth from every direction. For fear of being misunderstood, I hasten to say that this beneficial result of scientific training does not come to all those who cultivate it, any more than is the Christ-like character developed in all those who profess Christianity. I regret to say that even some who bear great names in science have been as dogmatic as the most rampant theologian. But the dogmatic scientist and theologian are not to be taken as examples of 'the peaceable fruits of righteousness,' for the general ameliorating influence of religion and of science are none the less apparent."

Second, it is a "spirit which demands that a claimed cause shall be demonstrated. It is in the laboratory that one first really appreciates how many factors must be taken into the count in considering any result, and what an element of uncertainty an unknown factor introduces. Even when the factors of some simple result are well in hand, and we can combine them with reasonable certainty that the result will appear, we may be entirely wrong in our conclusion as to what in the combination has produced the result. For example, the forms of certain

* Conducted by Miss Jean Broadhurst, Teachers College, Columbia University.

plants were changed at will, by supplying to their surrounding medium various substances. It was easy to obtain definite results, and it was natural to conclude that the chemical structure of these particular substances produced the result, and our prescription was narrowed to certain substances. Later it was discovered that the results are not due to the chemical nature of the substances, but to a physical condition developed by their presence, a condition which may be developed by other substances or by no substances, and so our prescription was much enlarged."

Professor Coulter calls attention to the fact that the "prevailing belief among the untrained is that any result may be explained by some single factor operating as a cause. They seem to have no conception of the fact that the cause of every result is made up of a combination of interacting factors, often in numbers and combinations that are absolutely bewildering to contemplate." Though it is fortunate when leaders, as in public opinion, "have gotten hold of one real factor," this habit of "considering only one factor, when perhaps many are involved, indicates a very primitive and untrained condition of mind."

Third, this spirit keeps one close to the facts. "There seems to be abroad a notion that one may start with a single well-attested fact, and by some logical machinery construct an elaborate system and reach an authentic conclusion, much as the world has imagined that Cuvier could do if a single bone were furnished him. The result is bad, even though the fact may have an unclouded title. But it happens too often that great superstructures have been reared upon a fact which is claimed rather than demonstrated. Facts are like stepping stones; so long as one can get a reasonably close series of them he can make some progress in a given direction, but when he steps beyond them he flounders. As one travels away from a fact its significance in any conclusion becomes more and more attenuated, until presently the vanishing point is reached, like the rays of light from a candle."

Such 'vain imaginings' are "delightfully seductive to many people, whose life and conduct are even shaped by them. I have been amazed at the large development of this phase of emotional insanity, commonly masquerading under the name of 'subtle thinking.' Perhaps the name is expressive enough, if it means thinking without any material for thought. And is not this one great danger of our educational schemes, when special stress is laid upon training? There is danger of setting to work a mental machine without giving it suitable material upon which it may operate, and it reacts upon itself, resulting in a sort of mental chaos. An active mind, turned in upon itself, without any valuable objective material, certainly can never teach any very reliable results. It is the trained scientific spirit which recognizes that it is dangerous to stray away very far from the facts, and that the farther one strays away the more dangerous it becomes, and almost inevitably leads to self-deception.

This Professor Coulter feels is the attitude of mind that scientific training is contributing to the service of mankind—contributing as an ideal which is already yielding tremendous results, and as a force accumulating momentum for a larger expression.

In response to appeals from various scientific bodies, the Smithsonian Institution has concluded the preparations for a biological survey of the Panama Canal Zone. Friends of the Institution have contributed funds for the expenses of the investigators, as it is felt a properly conducted survey would yield important scientific results. "It is known that a certain number of animals and plants in the streams on the Atlantic side are different from those of the Pacific side, but as no exact biological survey has ever been undertaken, the extent and magnitude of these differences have yet to be learned. It is also of the utmost importance to determine exactly the geographical distribution of the various organisms inhabiting those waters, as the Isthmus is one of the routes by which animals and plants of South America have entered North America and *vice versa*. When the canal is completed the organisms of the various watersheds will be offered a ready means of mingling together, the natural distinctions now existing will be obliterated, and the data for a true understanding of the fauna and flora placed forever out of reach."

"By the construction of the Gatun Dam a vast freshwater lake will be created, which will drive away or drown the majority of the animals and plants now inhabiting the locality, and quite possibly exterminate some species before they become known to science."

Miss Graham, studying *Conocephalum conicum (Fegatella conica)*, finds that at Ithaca, N. Y., the gametophores begin to appear in June, that fertilization takes place about the first of July, that the spores are fully formed before the beginning of winter, and that in the following May the gametophore stalk rapidly elongates. This elongation is quickly followed by the elongation of the stalk of the sporogonium. The venter of the archegonium is two-layered at the time of fertilization, and soon becomes a massive calyptra. The first division of the fusion nucleus gives rise to free nuclei, which may lie parallel with or transversely to the major axis of the archegonium. A cell wall is not laid down until some little time has elapsed after division of the fusion nucleus; when the wall appears, it is transverse. By successive transverse divisions a filament of four or five cells is formed. This observation differs from that of Cavers, who described an octant stage. The first longitudinal walls appear in the outer or capsule end of the filament. At the time of separation of the mother cells, the growth of the capsule is checked, while the calyptra continues growth, leaving quite a space between capsule and calyptra. The capsule and seta soon resume growth, fill the cavity, and distend the calyptra. No pseudoperianth, such as is found in *Marchantia*, is present. A sheath, which is a specialized portion of the gametophore, invests the calyptra. (W. J. G. Land, *Botanical Gazette*, February.)

Duncan S. Johnson, in the December *Journal of the New York Botanical Garden* calls attention to a heavy flood (November and December, 1909) in the Blue Mountain region of Jamaica, in which "scores of acres of coffee fields were stripped to the bare rock" and "even the primeval forest of the valley bottoms was swept out and carried down to the sea." The "gray desert" appearance in June, 1910, is described, and the sparse and hardly typical new growth is noted. It is expected that this "occupation of a virgin soil by a new plant covering" will prove as interesting as that previously described after the volcanic disturbances at Krakatoa. It certainly adds a new type to the work previously done at Krakatoa and along the ocean, and to that now being conducted at the Salton Sea.

A paper by C. V. Piper on botany in its relation to agricultural advancement, too varied to be abstracted here, appeared some months ago in *Science* (June 10, 1910). Hybrids, sports, and other plant variations—especially with reference to cultivated or agricultural plants are discussed in a way to be interesting even to the general reader.

The Nature Study Review for November, 1910, contains two articles of interest to high school teachers. One is by Alice J. Patterson on potatoes and oats as nature study topics. It includes much in subject matter and method that would be helpful in the first year high school classes. The cuts are especially interesting. The first is of the first potato introduced into Europe from a water color of 1588 by Clusius; the second shows potato *fruits*, about one inch in diameter.

The second article is by Frederick L. Holtz on weeds, the common kinds, and the methods of eradicating them. It is in a form suitable for high school reading.

The question of coastal subsidence is discussed again in a recent *Science* (January 6, 1911) by H. H. Bartlett. Conditions near Buzzard's Bay where fresh water peat is found fourteen feet below sea level are given as proof of subsidence which is still going on. The controversy is continued in the same journal (January 13 and February 24). In the latter issue D. S. Johnson writes to explain some of the facts used by Mr. Bartlett, in a way that leaves coastal subsidence very much of an open question.

NEWS ITEMS

From a recent number of the *Times* we learn that the United States Bureau of Fisheries will send the steamer Albatross on a scientific cruise, and by special arrangement the American Museum of Natural History of New York will coöperate. The Albatross will sail from San Diego, Cal. Collecting parties will be landed in lower California to gather specimens of birds, reptiles, mammals and of the plant life of the coast. The New York Zoölogical Society and the New York Botanical Garden will be represented in these landing parties. The Gulf of California will be explored and the pearl shell fisheries studied with a view to transplanting pearl shell oysters to Florida waters.

Professor V. R. Gardner has been appointed associate professor of pomology at the Oregon Agricultural College to succeed Professor C. A. Cole, who has resigned.

During 1910 over three million persons visited the Royal Botanic Gardens, Kew. The greatest day's attendance was 152,454.

The University of Colorado Mountain Laboratory at Tolland, Colorado, begins its third session June 19, 1911. Courses in systematic botany, plant ecology, algology and field biology (plant and animal). The laboratory is at 8889 ft. and offers varied conditions for study. Pamphlet may be obtained from Dr. Francis Ramaley, University of Colorado, Boulder, Colorado.

Recent visitors at the New York Botanical Garden include Dr. Ezra Brainerd, Dr. W. C. Coker, Dr. Marie Stopes of Manchester, and Dr. C. F. Millspaugh en route to the Bahamas. Dr. and Mrs. N. L. Britton have gone to Cuba, and Dr. Small has returned from explorations in Florida.

The board of the University of Iowa has definitely decided to provide a special building for the collections of Prof. Calvin and Dr. T. H. Macbride, whose work on the geology and botany of Iowa has heretofore been handicapped by lack of adequate room.

Contributors to TORREYA are requested to note the change of address of Mr. Norman Taylor, the editor. After March 16 letters should be sent to Central Museum, Eastern Parkway, Brooklyn, N. Y.

Volume 1, No. 1 of *Phytopathology*, the official organ of the American Phytopathological Society has just appeared. The editors are L. R. Jones, C. L. Shear, and H. H. Whetzel.

The biological laboratory of the Brooklyn Institute of Arts and Sciences at Cold Spring Harbor, L. I., announces summer courses in botany as follows: Cryptogamic botany, Ecology, special advanced work in either of these subjects, and other studies of a more general character. For further information address Prof. F. W. Hooper, Academy of Music, Brooklyn, N. Y.

The Torrey Botanical Club

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OF THE

TORREY BOTANICAL CLUB

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(1) BULLETIN

A monthly journal devoted to general botany, established 1870. Vol. 37 published in 1910, contained 630 pages of text and 36 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 24–37 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. 28–37 three dollars each.

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

(2) MEMOIRS

The MEMOIRS, established 1889, are published at irregular intervals. Volumes 1–13 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

MR. BERNARD O. DODGE

Columbia University

New York City

Vol. 11 April, 1911 No. 4

TORREYA

A Monthly Journal of Botanical Notes and News

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR

JOHN TORREY, 1796–1873

CONTENTS

Published for the Club
At 41 North Queen Street, Lancaster, Pa.
by The New Era Printing Company
[Entered at the Post Office at Lancaster, Pa., as second-class matter.]

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TORREYA

April, 1911

Vol. 11 No. 4

SOME FLORAL FEATURES OF MEXICO*

By H. H. Rusby

At a rough estimate, two thirds of Mexican territory is arid, and nearly half of this can be considered a desert, in that it cannot naturally support grazing animals.

The fertile region includes (1) the lowland of the south, with a tropical climate, and amidst which there are numerous mountains possessing a subtropical, or some of them even a temperate climate, and which gradually changes into an arid region as it rises into the central table-land; (2) an eastern or Gulf Coast strip which, gradually narrowing, extends from the southern tropics clear up into Texas; (3) a Pacific Coast strip which, narrow at all points, gives way northward to the desert region of and adjacent to the Peninsula of California.

Within these boundaries, and stretching to the Rio Grande, is the arid region, of which more than the northern half, and especially the northwestern portion, is a real desert.

This, with the exception of its western part, is the region best known to tourists and visitors, for the reason that the main lines of travel run directly through it from north to south. It presents the same general aspect as the country through which the Southern Pacific Railroad runs from western Texas to Los Angeles. If one passes through it toward the close of the dry season, which extends in its most favorable sections from December to July, and in its most unfavorable ones begins nearly two months earlier, he encounters a region of torrid heat and

*Abstract of an illustrated lecture delivered to the Torrey Botanical Club, February 14, 1911.

[No. 2, Vol. 11, of Torreya, comprising pp. 51–76, was issued 21 Mr 1911.]

intense dryness, in which every motion stirs up a copious, fine, penetrating dust which keeps one covered as long as he remains in it. At this time, the landscape is almost unvaryingly bare and of various shades of gray, brown and red. Flowers are almost wanting, although this is a favorite blooming time with many cactuses, and there are some other succulents, such as jatrophas, which then begin to bloom.

Not only does the period of rains differ greatly in different parts of this arid region, but the amount of rain shows remarkably wide limits of variation. Even where there is but little, a surprising change occurs in the aspect of the country after its occurrence. Within a month, the ground acquires a more or less nearly complete covering of grasses and is carpeted in patches, often large ones, with solid masses of bloom, and the appearance of the surface is abundantly broken by patches of flowering shrubs.

The most conspicuous objects on these plains are yuccas, agaves, flat and cylindrical jointed opuntias, covilleas, *Proso-*

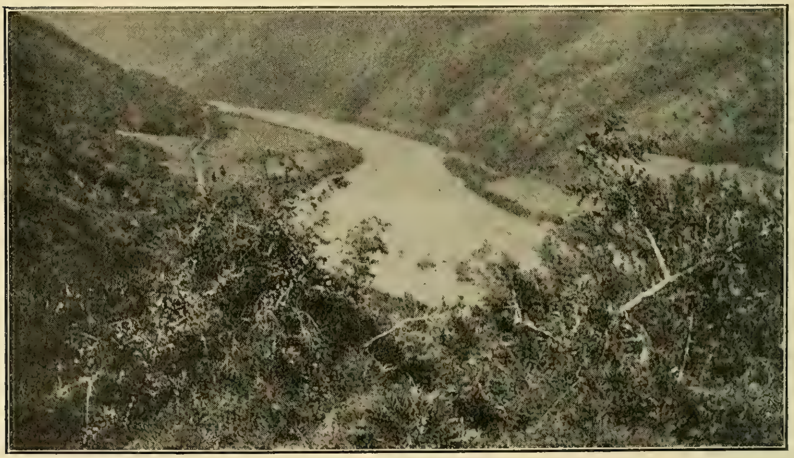

Fig. 1. The Balsas River.

pis, and artemisias. The opuntias grow almost everywhere. yuccas of some species are almost as generally distributed, though the very large and conspicuous ones are confined to certain districts. Agaves are mostly confined to the mountains or rocky places. Of all these plants, the most striking is a giant branching yucca, reaching a height of twenty feet or more, which bears its dense panicles of white flowers, more than a yard in length and two thirds as broad, in a strictly pendulous position. The larger shrubby growth is mostly mimosaceous, consisting of *Prosopis* and *Acacia*, with smaller mimosas and calliandras about their bases.

Very frequently the *Prosopis* attains the dimensions of a good-sized tree, though this more commonly occurs as we are entering the fertile or semi-fertile southern districts. It is very rare that we encounter streams in this region, though arroyos, carrying water in the rainy season, are seen in all directions. In such locations, where there is a water supply not too far below the surface, a fringe of cottonwoods and pepper trees may be seen.

The herbaceous patches of bloom, to which reference has been made, consist chiefly of Compositae, especially *Pectis*, *Actinella*, *Layia*, *Melampodium*, and taller *Baileya*, *Coreopsis*, *Grindelia* and *Gymnolomia*. There are also many tuberous rooted ipomeas and oxalids.

Everywhere in sight are mountains of enormous height, many of their slopes being apparently inaccessible. Their appearance, for the most part, is even more arid than that of the plains, but since they receive much more frequent and copious showers, their upper portions probably possess a rich and interesting flora. It has never been my lot to ascend any of them.

The northwestern desert region I have never visited, and I must say the same of the eastern coast, so that I shall not attempt a description of those regions.

The transition from this desert table land, where the production of cultivated crops without irrigation is impossible and where water for irrigation is not to be had, by any present methods, is of great interest. It must be stated, however, that in some places portions of the desert have been brought under cultivation by means of a water supply obtained either from rivers or artesian wells, and here the soil has been found of great fertility, so that there is hope of eventually redeeming a large portion of this desert.

The first change noticed, a little more than half-way from the United States border to the City of Mexico, is a more liberal water supply, encouraging extensive tillage by irrigation methods. A little farther south we find that although irrigation is very largely resorted to, it is possible to produce such crops as corn through the unaided agency of the rainy season. The rapidity with which such crops grow and attain maturity at this time is indeed remarkable.

Most of my own field work in Mexico has been performed in this semi-arid region, so that I have had an opportunity to become rather well acquainted with the general features of its

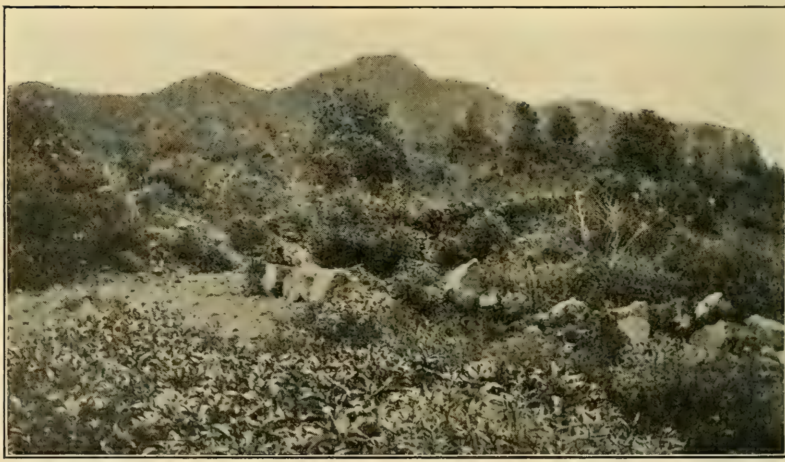

FIG. 2. Lava Beds along Cuernavaca R. R.

flora, while not having found time to determine many of the species encountered. One of the most noticeable sights to the visitor from the north is that of the vast fields of maguey or century plant, used for the manufacture of the fermented beverage pulque and its distillate, mezcal. Its buds, taken just before flowering, resembling huge cabbages and occasionally a hundred pounds or more in weight, are baked into a sugary mass which is eaten as a sort of sweet conserve. In these cultivated lands, the *Prosopis* becomes a tree, much resembling a spreading oak, or even a large apple tree. These trees are left standing in the cultivated ground and their branches become the support for stacks of hay or other fodder, thus placed out of reach of marauding animals.

In the vicinity of Iruapato, vast areas are devoted wholly to the culture of the strawberry, irrigation by the use of shallow wells being resorted to, and the delicious fruit being supplied throughout the year. The natural aspects of the vegetation here have largely disappeared, owing to the fact that the land is almost wholly cultivated, but in the waste places there is a rich and varied herbaceous and suffrutescent flora. In many places the steep hillsides and narrow valleys are used only for grazing purposes and here there is often a dense covering of large shrubs or small trees. In some places these trees consist largely of junipers, intermingled with *Acacia*, *Prosopis*, *Arctostaphylos* and cotton-woods, while along the edges of the streams the beautiful and often enormous Mexican cypress begins to appear. A specimen of the last-named tree, growing in Oaxaca and called "the Tule," is one of the largest trees in the world. A strange and very showy effect is sometimes produced amidst this arborescent hill growth by the abundance of loranthaceous parasites which it supports. Much of this parasitic growth consists only of *Phoradendron*, and is merely green or yellowish green, but at times the crowns of the trees in all directions will be seen invaded by masses of brightly colored members of this family, the entire mass glowing with brilliant scarlet, crimson or yellow. Sometimes almost the entire crown of a juniper tree will be occupied by such a growth. During the rainy season many of the natural hollows will be converted into pools, sometimes acquiring the dimensions of small lakes. In addition to these natural deposits of water, artificial ones are created by the farmers, wherever there is a sloping surface which can be dyked with mud at its lower boundaries, so that one sees so much water as to create the impression that he is in a country of marshland. Around the margins of such pools, especially the natural ones, there is frequently seen a broad band of pink or purple *Cosmos*, sometimes a hundred yards or more in breadth and presenting a solid mass of color. Similar patches of yellow *Helianthus*, *Coreopsis* and related genera are abundant.

These are the conspicuous features of the flora, as viewed by one who is passing through it. When we dismount and walk over these hills and through the valleys, our interest centers in the wonderful variety of small annual and perennial herbs, both as to species and larger groups, which crowd into every undisturbed spot.

In the foothills of the mountains of this region, the botanist becomes quite lost in the profusion of unfamiliar plants. The acacias and Prosopids exist in undiminished abundance and, growing among them so thickly as to make travel difficult, are numerous species of *Terebinthus*, or *Bursera*, spiny erythrinas bearing long moniliform pods showing brilliant scarlet seeds through their half-opened sutures, stinging jatrophas, intricately thorny Rubiaceae and small silk-cotton trees, and all these frequently bound together by twining *Clematis*, *Passiflora*, *Thomaea* and leguminous vines. Many of the smaller shrubs also are leguminous, among them the beautiful *Brongniartia*, with silky-white herbage and lovely dark chocolate-colored flowers. In some places the arborescent growth is almost wholly of the Palo Amarillo rubber-tree, *Euphorbiodendron fulvum*. Extremely varied are the lantanas, their flowers ranging in color from pure white or white with a golden eye, through various shades of pink and purple, even to brilliant orange or vermilion. Almost equally abundant and varied are the species of *Stevia*. Among the herbaceous vegetation, purple flowered *Oxalis* exists in great variety, with many Geraniums, purple flowered ruellias and Nyctaginaceae, and yellow *Tribulus*. Ferns of the hardier kinds, such as rigid pellaeas and notholaenas, are frequent, but not nearly so abundant as farther south. Where the canyons open out into valleys leading to the plains, the Cactaceae comprise the greatest bulk and the most interesting feature of the flora. In places the entire surface over many acres is so intricately covered with opuntias that travel is slow and difficult. At first sight, and until one has become accustomed to their examination, all seem to be slightly variable forms of a single species, but one presently becomes aware that the variations, however numerous and slight, are constant. If he is then fortunate enough to secure the companionship of a competent and experienced mountaineer, he will learn that all these forms, and more than he has differentiated, are distinguished by names and that the differences between them, such as the shade of green of the surface, the form and relative thickness of the joints, the shade of color of the flowers, their time of appearing and the color, especially the internal color, of the fruits, and their edible properties, are all well defined by the natives. I am strongly of the opinion that the relation between the present state of our knowledge of the Mexican opuntias, and that of the future, is much like that of our knowledge of American *Crataegi*

FIG. 3. *Vitis blanco* Munson.

of ten years ago as compared with that of the present. Some of these flat-jointed opuntias are old and large trees, with trunks two feet or more in diameter. The huge, widely and densely branching *Myrtilocactus* is often conspicuous and abundant. Its small, delicious fruit is an important article of trade, under the name of "Garambulla."

As we approach the valley of Mexico, we come into a more fertile region, producing tropical fruits and other products indicating the rich luxuriance which we are to encounter after another day's journey to the south or east. The mountain flora of the vicinity of Mexico is of special interest and beauty. Here there are many species of salvia, oxalis, verbena, geranium, *Solanum*, etc. Terrestrial orchids are decidedly numerous, though scarcely abundant, and the instant that we penetrate to the warm and moist valleys, even quite near to the city, interesting and handsome arboreal species begin to appear. Arboreal ferns, tillandsias and other bromeliads are also numerous. In rich places among the rocks dahlias of various colors are common and abundant.

(*To be continued*)

THE NATURE AND FUNCTION OF THE PLANT OXIDASES

By Ernest D. Clark

(*Continued from March Torreya*)

Function of the Oxidases in the Plant

Physiology

It is evident from the preceding chapters that oxidizing enzymes are very widely distributed. Since enzymes generally seem to be produced by plants or animals for some definite purpose in the life of the organism, it was natural that speculation should arise regarding the function of the oxidizing enzymes. Their usefulness to the plant probably lies in their power to act as accelerators of the ordinary processes of oxidation as we shall see in a closer study of their function in the plant.

The oxidases, more especially peroxidase and occasionally oxygenase, are found in seeds and seem to bear some relation to the age of the seed, state of germination, etc. Brocq-Rousseu and Gain[30a] examined the seeds of species of plants from many different families. They used both guaiac tincture and guaiacol with the addition of hydrogen peroxide as tests for peroxidase or "peroxydiastase," as they called it. Peroxidase was present in nearly all seeds examined, the amount decreasing with their age; however, in kernels of corn they found peroxidase after the corn had been standing for over two hundred years. They further noted that oxygenase was rarely present in the seeds, and also that the strongest test for peroxidase was given by the embryo. Bialosuknia[31] made glycerine extracts of resting and germinating seeds, testing these extracts for oxidases with guaiac tincture, indophenol reagent, benzidin, etc. Peroxidase was present in the resting seeds and at all stages of germination, while oxygenase (direct oxidase) could not be detected in the seeds before the second day, after which it was always present. Deleano[32] also made a study of the germination of seeds, getting the same results as those obtained by Bialosuknia. The catalase increased rapidly and then disappeared along with the fat. He found further that reductase (reducing enzyme) was present and that it was localized in the protein part of the seed. Issajew[33] made a careful study of the oxidase of germinated barley, his results agreeing with those of the other investigators already noted. He found the same increase of oxidases after germination and confirmed the presence of the so-called reducing enzymes under these conditions.

In the study of oxidizing substances and enzymes in biological materials, it soon became apparent that in many cases there occurred reducing substances along with the oxidases, etc. Frequently these reducing substances were called enzymes and given special names, such as the "philothion" of Rey-Pail-

[30a] Brocq-Rousseu and Gain. Sur l'existence d'une peroxydiastase dans les graines seches. Compt. Rend. Acad. Sci. **145**: 1297. 1907.

[31] Bialosuknia. Ueber Pflanzen-Fermente. Zts. Physiol. Chem. **58**: 487. 1908.

[32] Deleano. Recherche chemique sur lar germination. Centralbl. f. Bakt., II. Abt. **24**: 130. 1909.

[33] Issajew. Ueber die Malzoxydase. Zts. Physiol. Chem. **45**: 331. 1905.

hade,[34] who in 1888, announced that in beer yeast he had found a substance which caused the evolution of hydrogen sulphide from sulphur, even in the cold. In the potato, egg-plant, etc., Kastle and Elvolve[35] found that there were substances which reduced nitrates to nitrites, the most favorable temperature for this action being from 40° to 50°; the action being retarded by acids and much increased by benzaldehyde and benzyl alcohol. Action is also completely checked by boiling, but the authors hesitated to say that this action is due to an enzyme; they classified this reducing substance with those compounds that are unstable and easily oxidized, and which reduce nitrates, but not in unlimited quantity. This statement might also be applied to the so-called reducing enzymes found by Irving and Hankinson[36] in the Gramineae. In the action of both yeast and bacteria, reducing substances probably play a part, since they are usually present.

We may say, then, that reducing substances are of common occurrence in plants, both in the higher and lower representatives. In many plant juices there occur reducing substances which, in the test for oxidases with the color reagents, gradually decolorize all the mixture except a zone near the surface of the liquid; this upper colored part being immediately bleached if the solution is thoroughly shaken, but it reappears upon standing. These reducing substances, as well as catalase, may act as a check upon the activity of peroxidase in the living cell, but after death or narcosis, the production of reducing substances is lessened and the oxidases develop pigments, *i. e.*, oxidize the chromogens to colored compounds. It seems doubtful that these reducing substances are enzymes, since we know that ordinary reducing substances resulting from metabolism are present in practically all animal and plant cells. Such substances

[34] Rey-Pailhade: (*a*) Nouvelle recherche physiologique sur la substance organique hydrogénant le soufre à froid. Compt. Rend. Acad. Sci. **107**: 430. 1888. (*b*) Sur une corps d'origine organique hydrogénant le soufre à froid. Compt. Rend. Acad. Sci. **106**: 1683. 1888.

[35] Kastle and Elvolve. The Reduction of Nitrates by Certain Plant Extracts, etc. Am. Chem. Jour. **31**: 606. 1904.

[36] Irving and Hankinson. The Presence of Nitrate Reducing Enzymes in Green Plants. Biochem. Jour. **3**: 87. 1908.

may be formed by photosynthesis and in the metabolism of the plant. Heffter[37] believed that the so-called reducing enzymes are not enzymes at all, but that the reducing action is due to the decomposition products of protein, especially those containing the SH group. This, however, is denied by Fränkel and Dimitz[38] who believe that the reducing power of cells is due to their unsaturated fatty substances.

It seems likely that the oxidizing ferments assist in carrying on the oxidative processes of respiration by increasing the rapidity of the combination of oxygen with the oxidizable substances in the plant. It has long been known that there are certain plants which at times develop a temperature above that of their surroundings, representatives of the Araceae showing this peculiarity in a striking manner. Hahn[39] investigated this phenomenon in *Arum maculatum*, the spadix of which is often from 20° to 27° C. warmer than the surrounding air. He used press-sap from the spadix of the plant and found that upon exposure to the air, the liquid rapidly became greenish black; so he concluded that an oxidizing enzyme (tyrosinase) was present. Hahn allowed the press-sap to remain at 25° for several days and at the end of that time the content of sugars, originally high, dropped to nothing, with accompanying loss of weight in the carbon dioxide evolved. This process could be entirely prevented by heating the press-sap to 60° for half an hour before allowing it to stand. Furthermore, the same process took place in an atmosphere of hydrogen; so Hahn thought he was dealing with a case of intra-molecular respiration carried on by oxidizing enzymes. Krause[40] noticed a similar elevated temperature with loss of dry weight [probably carbohydrates] in *Arum italicum* and Knoch[41] did so in the case of the flower of *Victoria Regia*

[37] Heffter. Die reduzierenden Bestandtheile der Zellen. Med. Naturwiss. Arch. 1: part 1, p. 15. 1907.

[38] Fränkel and Dimitz. Gewebatmung durch Intermediärekörper. Wiener klin. Wochensch. 1909: No. 51, p. 1777.

[39] Hahn. Chemische Vorgänge im zellfreien Gewebsaft von *Arum maculatum*. Ber. Chem. Gesell. 33: 3555. 1901.

[40] Krause. Ueber die Blütenwärme von *Arum Italicum*. Abhandl. Naturfor. Gesell. zu Halle, 1882, p. 16.

[41] Knoch. Untersuchungen über den Physiologie, etc., der Blüte von *Victoria Regia*. Diss. Marburg, 1897.

at the time of the opening of its petals. As we have seen, the many striking changes of color in plants after injury with the resulting exposure to the atmospheric oxygen, have long been subjects of investigation, but until recently such research was confined to studies of the enzymes involved, to the consequent neglect of the chromogens affected by these enzymes. In studying the rôle of the oxidases, if we were to consider only the enzymes, we should be neglecting the other half of the problem, for the chromogens occurring in plants are the sources of all the colorations and may very well act as oxygen carriers in the metabolism of the plant. Even in 1882 Reinke[42] interested himself in the substances in the plant which gave colored oxidation products under the influence of oxidases and of the air. The juice of the potato and of the white beet contained a chromogen which became dark upon standing in the air, but it was easily changed back to its original colorless state by reducing agents or by certain bacteria. He thought that the colorless condition of the chromogens in the living cell is due to accompanying reducing substances, or else that the cell is able to oxidize the chromogens through the colored state to a more highly oxidized colorless condition.

To show the distribution of these chromogens among plants this outline, adapted from Chodat,[43] is given (the changes being from colorless to that indicated):

Yellow, to green, then to blue—*Boletus spp.*

Red, violet and then black—many of the higher fungi, especially Agaricaceae; wheat seedlings, potatoes, apples, nuts, *Lathyrus niger*, secretions of certain ink-fish, etc.

Brown, then black—*Rhus succedana*, etc.

Violet-red—*Jacobinia spp.*[44]

Black—the higher fungi, especially *Hygrophorus spp.*; *Monotropa uniflora* and *Viburnum lantana.*

[42] Reinke. Ein Beitrag zur Kenntniss leicht oxidirbarer Verbindungen der Pflanzen-körpers. Zts. Physiol. Chem. **6**: 263. 1882.

[43] Chodat. Chapter on the "Oxydases" in Abderhalden's Handbuch der Biochem. Arbeitsmethoden, III, 2d part, p. 42 ff. 1910.

[44] Parkin. On a Brilliant Pigment Appearing after Injury in Species of Jacobinia Report Brit. Ass'n Advancem. Sci. 1904, p. 818.

Palladin[45] and his collaborators have taken up the question of the rôle of the chromogens and the oxidases in the respiration of the plant. They have followed out the general line of thought first conceived by Reinke. They have published many papers on the subject which cannot be abstracted here in detail, but a general outline of their results and conclusions will be given. In the anaerobic respiration of seeds, alcohol, acetone, and substances of aldehyde nature were obtained. Oxygenase increases with the growth of the part containing it. Both oxygenase and peroxidase are much increased by feeding the plant freely with sugars. The chromogens also increase under such circumstances. Palladin made a systematic search for the respiratory chromogens, and found they were very wide-spread and were generally red or brown when oxidized. To detect the chromogens he ground the plant material under water and thus obtained a light-colored solution to which he added peroxidase (from horse-radish) and hydrogen peroxide; if the chromogen were present, it was soon oxidized and caused the solution to darken. In this manner he found that of seventy-one different plants examined, sixty-seven contained chromogens and that the parts with an active respiration like flowers, young shoots, etc., showed the greatest amount of respiratory chromogen. Chloroformed plants soon began to show coloration due to the oxidation of their chromogens. These chromogens seem to be derivatives of the cyclic series, and Palladin considered that they often occur in the form of glucosides, which, by the action of glucoside-splitting enzymes, are separated from the sugars and then take up oxygen by the aid of the oxidases, thus becoming colored. During the normal life of the plant there is a coördinated action of these hydrolytic, oxidizing, and reducing enzymes, which prevents oxidation of the chromogens, but during narcosis or after death,

[45] Palladin: (*a*) Die Atmungspigmente der Pflanzen. Zts. Physiol. Chem. **55**: 207. 1908. (*b*) Die Verbreitung der Atmungschromogene bei den Pflanzen. Ber. Bot. Gesell. **26a**: 378. 1908. (*c*) Ueber das Wesen der Pflanzenatmung. Bioch. Ztsch. **18**: 151. 1909. (*d*) Ueber die Bildung der Atmungschromogene in den Pflanzen. Ber. Bot. Gesell. **26a**: 389. 1908. (*e*) Die Arbeit der Atmungsenzyme der Pflanzen, etc. Zts. Physiol Chem. **47**: 407. 1906. (*f*) Ueber die Prochromogene der Pflanzen-Atmungschromogene. Ber. Bot. Gesell. **27**: 101. 1909.

the inter-relation of these enzymes is disturbed, with the result that the respiratory chromogens become evident by their color. The fact that these respiratory chromogens may take up oxygen and later give it up again under the influence of reducing substances, led Palladin to call the respiratory chromogens the "phyto-haematins" because he thought they were similar to the oxygen-carrying pigments of the blood of animals.

This work of Palladin and his students upon respiratory chromogens is a valuable contribution to our knowledge of the respiration of plants. His conception of the respiratory pigments as being cyclic compounds bound to the sugars in the form of glucosides which are insoluble, seems to be founded on fact. In the case of indigo-blue, according to Walther[46] and also in the case of many other pigments, the chromogen is held in the insoluble glucoside form, from which it is separated by the hydrolytic enzymes to give sugars, and then the oxidases attack the chromogen thus set free, imparting to it a definite color. In *Schenckia blumenaviana*, Molisch[47] found that the green plant became red upon treatment with chloroform vapor. This result he attributed to the action of an enzyme upon a chromogen in the plant. In certain of the Dipsacaceae, Miss Tammes[48] demonstrated the presence of a colorless chromogen dipsacan which, under the influence of oxidases, was changed to a blue pigment called dipsacotin by this investigator. Miss Wheldale[49] believes that the red colorations of certain leaves and flowers are caused by anthocyan, a pigment resulting from the coördinated action of oxidases and hydrolytic enzymes. She also considers that the color or lack of color in the offspring of such plants is due to the action of oxidases and reducing substances, etc., as factors in heredity. Overton[50] and also Tswett[51] came to the con-

[46] Walther. Zur Frage der Indigo-bildung. Ber. Bot. Gesell. **27**: 101. 1909.

[47] Molisch. Ueber ein neues, einen karminroten Farbstoffe erzeugendes Chromogen bei *Schenckia blumenaviana*. Ber. Bot. Gesell. **19**: 149. 1901.

[48] Miss Tammes. Dipsacan und Dipsacotin, ein neues chromogen und neues Farbstoffe der Dipsaceae. Recueil. Trav. Bot. Néerland. **5**: 51. 1908.

[49] Miss Wheldale. Plant Oxydases and Chemical Relationships of Color Varieties. Prog. Rei. Botan. **3**: 457. 1910.

[50] Overton. Beobachtungen und Versuche über das Auftreten von rothem Zellsaft bei Pflanzen. Jahrb. Wiss. Botan. **33**: 171. 1899.

[51] Tswett. Ueber den Pigmente der Herbstlich-vergilbten Laubes. Ber. Bot. Gesell. **26a**: 98. 1908.

clusion that the beautiful autumn colors of leaves are due to this same process, when the slowing up of the metabolic processes of the plant by the frost tends to hasten the formation of the oxidized pigments. It should be noted that in many cases the tannins act in this manner when oxidized, after being set free from their glucoside form. In a very recent study of the rôle of the glucosides in the plant, Weevers[52] concludes that these substances may be considered as reserve foods, the cyclic compounds being attached to glucose-yielding substances of low diffusibility, thus serving to accumulate sugar, etc., for future use.

Besides this coördinated action of the hydrolytic and oxidizing enzymes just described, there also seems to be an antagonistic action between the oxidases and the reducing substances in the cell; this antagonism tending to keep each sort from getting the upper hand during life, but after death when the production of reducing substances ceases for a time, the oxidases run riot, and blackening as well as colorations of various sorts result. The blackening of the foliage of many plants after a frost, and the production of the red and gold of our autumn forests, are doubtless due to the killing of the leaves or to an interference with their metabolism by the low temperature, and consequent excessive activity of the oxidases upon tannins and other substances.

Finally, Czapek[53] has brought to light a most interesting example of the part played by oxidases in the life of the plant. He found that geotropically and phototropically stimulated plant organs always contained more reducing substances and also showed weaker tests for oxidases than similar organs unstimulated. Later he proved that the reducing substance which accumulated after stimulation was homogentisic acid, and that, after stimulation, it did not seem to be destroyed by the oxidases as it had been before. What caused this accumulation of easily

[52] Weevers. Die physiologische Bedeutung einiger Glycoside. Recueil. Trav. Bot. Néerland. 7: 1. 1910.

[53] Czapek: (*a*) Ueber einen Befund an geotropsich gereizten Wurzeln. Ber. Bot. Gesell. 15: 516. 1897. (*b*) Stoffwechselprocesse in der geotropisch gereizten Wurzelspitze, etc. Ber. Bot. Gesell. 20: 464. 1902.

oxidizable substances in the stimulated plant parts? By a series of careful experiments Czapek demonstrated that there was no decrease in the *amount* of oxidases present, but that they were inhibited by some influence, this influence later proving to be an anti-enzyme. He showed that the anti-enzyme thus formed really neutralized the oxidizing enzyme in definite proportion; that it was specific for that one plant, less so for the genus and not at all for distantly related plants; that heating a mixture of anti-enzyme and enzyme to 62° destroyed the former, the latter then regaining its original activity. Czapek demonstrated also that the anti-enzyme does not exist at all in unstimulated parts of the same plants, but later is produced in them upon stimulation. This anti-enzyme has the power of inhibiting the normal oxidation of the homogentisic acid in the plant, so that after stimulation, both the homogentisic acid and the anti-enzyme make their appearance and accumulate. However, Graefe and Linsbauer[54] report that they were unable to find the increase of reducing substances in stimulated parts as claimed by Czapek.

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(*To be continued*)

CHONDROPHORA VIRGATA IN WEST FLORIDA

Roland M. Harper

Ninety-three years ago that sagacious botanist, Thomas Nuttall, proposed as a new species *Chrysocoma virgata*,* describing it at some length, and remarking that it was allied to *C. nudata* Mx., but might easily be confounded with *Solidago tenuifolia*. The locality given for it was "On the borders of swamps in New Jersey, near the sea-coast." In 1836 A. P. DeCandolle included this species and a few others in his new genus *Bigelowia*,† and cited a specimen collected "in Florida prope Savannah."

[54] Graefe and Linsbauer. Zur Kenntniss der Stoffwechseländerungen bei geotropischer Reizung. Sitzber. Wien. Akad. I. Abt. **118**: 907. 1909.

* Gen. **2**: 137. 1818.

† Prodr. **5**: 329. 1836.

About the same time specimens corresponding very well with Nuttall's description were collected in Louisiana by Hale and in Texas by Riddell and by Drummond, and these were doubtless taken into consideration by Torrey & Gray in describing the range of their "*Bigelovia nudata*,"* for they did not regard the plant in question as specifically distinct.

No such plant has since been found within sixty miles of Savannah (Georgia), or within several hundred miles of New Jersey. The Louisiana and Texas specimens are still preserved in the Torrey Herbarium, but unfortunately, as in the case of many others collected in the first half of the nineteenth century, they are accompanied by no information about where they came from other than the name of the state. The omission of all data about habitat is especially disappointing, since in this particular species its habitat is one of its most important characters, as will be shown presently.

At various times in the second half of the 19th century our plant was mentioned in floras of the northeastern and southeastern states, usually as a variety of *C. nudata*, and in the absence of any accurate information to the contrary, it was assumed to have about the same range and habitat as its better-known relative, namely, the pine-barrens of the coastal plain. In 1894 Dr. Britton substituted Rafinesque's name *Chondrophora* for DeCandolle's *Bigelowia* (which was a homonym), and the following year Prof. Greene† restored our plant to specific rank, at the same time restricting the genus *Chondrophora* to these two species, *nudata* and *virgata*.

Twenty years ago, although the fact was probably not realized at the time, *Chondrophora virgata* was as completely lost to science as *Franklinia*, *Elliottia*, *Chrysopsis pinifolia*, *Pentstemon dissectus* and *Mesadenia diversifolia*, for no botanist then living had ever seen it growing. But on Sept. 15, 1892, Dr. Charles Mohr found on the rocky banks of Little River on Lookout Mountain in DeKalb County, Alabama, about 1,600 feet above sea-level, specimens of a plant which he identified with some hesitation

*Fl. N. A. 2: 232. 1842. See also Gray, Syn. Fl. N. A. 1^2: 141. 1884.

†Erythea 3: 91. 1895.

as this long-lost species of Nuttall's,* and a few years later Mr. Henry Eggert collected immature specimens of the same thing in the same general region.† In the spring of 1901 Mr. T. G. Harbison found it "in shallow soil in the glades and along rocky streams" on Sand Mountain in Marshall County, Alabama;‡ and in the winter of 1905–6 I saw it in Marshall, DeKalb and Cherokee Counties,§ always on Carboniferous sandstone along streams on the plateaus, as my predecessors had found it.

Up to 1903 the only known stations for this plant (excluding those in New Jersey, Louisiana and Texas as unknown) were in the mountains of Alabama. In that year, however, I collected it on outcrops of Altamaha Grit in Tattnall and Dooly Counties in the coastal plain of Georgia,|| and in 1906 I saw it in similar situations in Washington and Coffee Counties, in the same region.¶ At each of these places some of its associates were the same as in the mountains of Alabama, although the general aspect of the surrounding country was very different.

The only known exposure of Altamaha Grit in Florida is at Rock Hill, which is about 4½ miles southeast of Chipley; and up to last fall this interesting spot does not seem to have ever been visited by a botanist.** Having heard something of this place through geological literature, I visited it on Sept. 24, 1910, to see how it compared with similar places in Georgia.

*See Bull. Torrey Club **24**: 28. 1897; Contr. U. S. Nat. Herb. **6**: 79, 771. 1901.

†I saw one of Eggert's specimens in the herbarium of the New York Botanical Garden several years ago, but it has since been misplaced or destroyed, and I do not remember the exact data on the label.

‡Biltmore Bot. Stud. **1**: 153. 1902.

§Torreya **6**: 112, 114, 115. 1906.

||See Bull. Torrey Club **32**: 168. 1905; Ann. N. Y. Acad. Sci. **17**: 42, 43, 146. 1906. These two localities have since been included in the new counties of Toombs and Crisp, respectively. In 1900 (Bull. Torrey Club **27**: 423) I inadvertently designated this species as an inhabitant of moist pine-barrens in Sumter County, Georgia; but my specimens proved to be nothing but the common *C. nudata.*

¶See Torreya **6**: 243, 244. 1906.

In the Plant World for April, 1902 (5**: 71), Mr. A. H. Curtiss reports having collected *Cheilanthes Alabamensis* "on top of a tower like rock" at Cedar Grove, a few miles south of Chipley. There happens to be a tower-like rock on one side of Rock Hill, but there are no ferns on it, and Mr. Curtiss's rock must have been of a very different sort, probably limestone

Rock Hill is one of a group of several peculiar isolated hills in the northern part of Washington County, Florida.* I would estimate its dimensions roughly as about one-fourth mile long (approximately north and south), one-eighth mile wide, and 50 feet high. Like the country for several miles in all directions, it is covered with open forests of long-leaf pine, now badly damaged by lumbermen, so that the rocks on it can be seen from a considerable distance. On its slopes there are several horizontal ledges of a pine-bark-colored rock which seems to differ from the typical Altamaha Grit of Georgia† only in being a little more sandy, and this difference is apparent only on close inspection. Like the corresponding rock in Georgia, too, it never appears on the summit of a hill, but always on slopes. (See illustration.)

It seems to be generally true that the flora of any particular habitat is richest near the center of distribution of that habitat.‡ This principle is illustrated by the vegetation of Rock Hill, which is about 100 miles from any other known outcrop of the same kind of rock. On the bare rocks, and on the thin soil which covers them on gentle slopes, I identified the following species (which are here arranged approximately in order of abundance):

TREES

Pinus palustris	Quercus geminata

SHRUBS

Gaylussacia dumosa	Batodendron arboreum
Vaccinium nitidum	Callicarpa americana
Chrysobalanus oblongifolius	Serenoa serrulata
Symplocos tinctoria	

HERBS

Aristida stricta	Pteris aquilina
Chondrophora virgata	Aster sp.§
Chrotonopsis spinosa?	Laciniaria gracilis
Panicum dichotomum?‖	Campulosus aromaticus

*See Tenth Census U. S. **6**: 224. 1884.

†See Bull. Torrey Club **32**: 134–144. 1905; Ann. N. Y. Acad. Sci. **17**: 22–23. 1906.

‡See Bull. Torrey Club **32**: 149 (second paragraph). 1905; Ann. N. Y. Acad. Sci. **17**: 55, 78, 89. 1906; Torreya **7**: 43, 44. 1907.

§One of the dichotomous panicums, at any rate. In July, 1906, I saw what is probably the same thing on an outcrop of the same kind of rock in Washington County, Georgia.

‖With rather large blue heads and narrow leaves.

Fimbristylis puberula
Fimbristylis laxa
Gerardia filifolia?
Afzelia cassioides
Muhlenbergia expansa
Anthaenantia villosa
Trilisa odoratissima
Chaptalia tomentosa
Agave (Manfreda) virginica

LICHENS

Cladonia sp.

Nearly all of these plants are common in ordinary dry pine-barrens in the neighborhood, the only ones especially characteristic of the rocks being the *Chondrophora*, *Crotonopsis*, *Fimbristylis laxa*, and perhaps the *Panicum* and *Agave.*

Next to the wire-grass, our *Chondrophora* seemed to be the most abundant plant. It was in bloom at the time, and I secured plenty of specimens, which agree with those from Georgia and Alabama in every particular.

In some places on the slopes of Rock Hill a little water seeps out, making a suitable habitat for a moist pine-barren flora, of the kind that is characteristic of Southeast Georgia, West Florida, etc. One of the commonest plants in such habitats, from North Carolina to Mississippi, is *Chondrophora nudata.* Here at Rock Hill, as well as in Crisp County, Georgia,* it could sometimes be found within a few feet of its rock-loving relative; and there being no marked difference between them except in the width and number of their basal leaves, they could hardly be distinguished a few feet away.

This suggests an interesting problem in evolution. If *Chondrophora virgata* were known only from the two localities last mentioned, one might reasonably assume that it was merely a narrow-leaved extreme of the common *C. nudata*, developed in direct response to its rocky habitat. But the fact that it is most abundant in the mountains of Alabama, far removed from any *C. nudata* (which is strictly confined to the coastal plain, and does not even approach the fall-line very closely, as far as known), would seem to make this hypothesis untenable. For all we know, our plant may have been growing on the Carboniferous sandstones long before the coastal plain—or the pine-barren

*See Bull. Torrey Club **32**: 168. 1905. What is now Crisp County was then included in Dooly.

portions of it at least—emerged from the sea. An alternative hypothesis would be that *C. nudata* was evolved from *C. virgata* at a comparatively recent period, geologically speaking, and being in some manner adapted to a widespread habitat became widely

FIG. 1. Ledge of Altamaha Grit on west side of Rock Hill, Florida. *Chondrophora virgata* is common on top of these rocks.

distributed. This however does not account for the remarkably disjointed distribution of *C. virgata*, unless we ascribe to it extraordinary facilities for dissemination. Evidently there are some unknown historical factors still to be taken into consideration.

The known distribution of *Chondrophora virgata* may now be summed up by saying that it is known from three counties in the mountains of Alabama, four in the coastal plain of Georgia, and one in West Florida, always on non-calcareous rocks. (I have seen it myself in all these eight counties, and have collected it in half of them.) The re-discovery of the long-lost stations in Louisiana and Texas is greatly to be desired, especially in view of the fastidiousness of this plant as to habitat. It would appear from statements in geological literature that a rock similar to the Altamaha Grit occurs in several places in Louisiana (possibly also in Texas), and it is in just such places that the plant should be sought.

Its eastern limit may be placed at the Ohoopee River in Georgia, at least until the mystery of the type-locality is solved. Now it happens that Nuttall was in all probability the first botanist who ever saw an outcrop of Altamaha Grit;* and knowing this, one might jump to the conclusion that he really found the plant in Georgia, and ascribed it to New Jersey through a mixture of labels or an error of his printers. But unfortunately for this theory, the supposed date of his exploration of the Altamaha Grit country is several years subsequent to the publication of his "Genera"; although it would appear from statements in this book (1: 231, for instance) that he had already visited Augusta and Savannah.

University, Alabama.

NEWS ITEMS

The old house in which Asa Gray lived for forty years, in the botanic garden of Harvard University, is to be taken down to avoid the danger from fire to the adjacent Gray Herbarium. This building, for many years the home of the university herbarium and of Dr. Gray's collections, is to be rebuilt elsewhere without much change in its form.

Dr. and Mrs. N. L. Britton have returned from a collecting trip to Cuba where explorations have been carried on in connection with the studies on the West Indian flora. Most of the collections were made in the western end of the island.

Mr. Lowell M. Palmer has given the Brooklyn Botanic Garden a collection of evergreens consisting of over five hundred plants. Many of these are rare forms in cultivation and their acquirement through the generosity of Mr. Palmer, will materially increase the beauty and educational value of the new garden's collections.

*See Torreya 4: 138–141. 1904.

Dr. Marie C. Stopes, lecturer on paleobotany in the University of Manchester, and Dr. R. R. Gates, of the Missouri Botanical Garden, were married on March 18 in Montreal.

The biological laboratory at Woods Hole, Massachusetts, are offering the usual number of courses in botany and related subjects for the coming summer session.

At a meeting of the section of biology of the New York Academy of Sciences Prof. C. Stuart Gager recently exhibited photographs of an abnormal plant of *Onagra biennis* that appeared in a pedigreed culture, following exposure to radium rays of the ovule employed in producing the plant. The plant possessed two primary shoot-systems (rosettes and subsequent cauline stems) of equivalent value, but manifesting entirely unlike morphological characters. That the effect was due to the exposure to radium rays was held to be possible, though not conclusively shown. The antecedent history of the plant, and the fact that hybrids between the two unlike halves manifested the characters of only one of the parent shoots, was interpreted to emphasize the fact, already recognized, that the inheritance of a character and its expression are two quite different phenomena. This paper will appear in full in a forthcoming number of the BULLETIN.

Dr. R. M. Harper, whose monograph on the peat formations of Florida has lately appeared, spent several weeks consulting the collections at the New York Botanical Garden. His present address is University, Alabama.

A meeting of men interested in the advancement of biological teaching in secondary schools was held at the Harvard Union, Cambridge, February 4. The relation of school biology to civics, the sequence of laboratory experiments, outdoor work with classes, and college requirements were the topics informally discussed. Those present were Professor G. H. Parker (Harvard University), Principal Irving O. Palmer (Newton Technical High School), Dr. H. R. Linville (Jamaica High School), R. H. Howe, Jr. (Middlesex School), Samuel F. Tower (Boston English High School), S. Warren Sturgis (Groton School), Head Master Frank E. Lane and W. L. W. Field (Milton Academy, Milton, Mass.). The last named was authorized to communicate with other teachers with a view to establishing a series of conferences, to be held probably alternately in Boston and New York.

Mr. J. J. Levison will deliver the fourth in a series of six lectures on the Cultivation and Preservation of Trees, on April 20, in the Brooklyn Academy of Music Lecture Hall. The special topic of the evening will be "Selection and Grouping of Trees for Streets, Parks and Lawns," and it will be illustrated by lantern photographs.

The alfalfa weevil introduced into this country six or seven years ago is spreading rather rapidly in the northwestern states. The damage in Utah last year is estimated at half a million dollars. Prevention seems impossible, owing chiefly to the adult habit of hiding in hay and similar commerical articles; twenty-seven were taken from the vestibule of one sleeping car at Salt Lake City last summer.

Mrs. H. L. Britton, the mother of Dr. N. L. Britton, director of the New York Botanical Garden, died April 7 at Venice.

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PUBLICATIONS. Bulletin. Monthly, established 1870. Price $3.00 per year; single numbers 30 cents. Of former volumes only 24-36 can be supplied entire. Certain numbers of other volumes are available, and the completion of sets will be undertaken.

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Torreya. Monthly, established 1901. Price $1.00 per year.

All business correspondence relating to the above publications should be addressed to Dr. William Mansfield, College of Pharmacy, 115 W. 68th St., New York City.

Vol. 11 May, 1911 No. 5

TORREYA

A Monthly Journal of Botanical Notes and News

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR

JOHN TORREY, 1796–1873

CONTENTS

Published for the Club
At 41 North Queen Street, Lancaster, Pa.
by The New Era Printing Company
[Entered at the Post Office at Lancaster, Pa., as second-class matter]

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 should be addressed to

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TORREYA

May, 1911

Vol. 11 No. 5

THE NATURE AND FUNCTION OF THE PLANT OXIDASES

By Ernest D. Clark

(Continued from April Torreya)

Pathology

In most of the cases first considered, the oxidases played a beneficial or useful part in the activities of plant life, but we are now to see that under certain conditions they may cause pathological processes. There is a disease of tobacco known as the "mosaic disease" which is characterized by the checkered appearance of the green leaves, these checkered places being yellow. In 1902, Woods[55] showed that rapid growth caused by cutting back often induced this disease, which he attributed to the abnormal activity of the oxidases. He believed the trouble was caused by an excessive activity of these enzymes due to lack of nitrogenous and other foods in the cells, which if present in normal quantities, seem to enable the cells to keep the oxidases within bounds. The diseased portions of the leaves showed the presence of great quantities of oxidases, but exhibited a striking lack of starch, nitrogenous matter, etc. In the so-called "mulberry dwarf" disease of the mulberry tree in Japan, Suzuki[56] found the same state of affairs. When the mulberry trees were repeatedly cut back, they developed a wrinkled and yellow appearance of the leaves, accompanied by a great increase of oxidases in the yellow portions, and also by a lack of plant foods in the diseased places. Suzuki thought that anything inter-

[55] Woods. Observations on the Mosaic Disease of Tobacco. Bull. 18, Bur. Plant Industry, U. S. Dept. Agric. 1902.

[56] Suzuki. Mulberry Dwarf Troubles in Japan. Bull. Agric. Coll. Tokyo, 4: 167 and 267. 1900.

[No. 4, Vol. 11, of Torreya, comprising pp. 77–100, was issued 19 April 1911.]

fering with the proper translocation of foods to rapidly growing parts would permit an abnormal development of oxidases and a consequent yellow or diseased condition. Woods[57] discovered that oxidases, when acting in the sunlight, have the power to destroy chlorophyll and cause yellow spots on leaves; a condition noted on the foliage of the Bermuda lily, carnation, tomato, etc. Punctures of leaves by insects or the presence of parasitic fungi, most of which contain oxidases, result in the decomposition of chlorophyll and the production of such yellow spots. Oxidases may exist in the soil or plant remains for several months, and thus cause infection if the new plants are not in a healthy condition. Recently Hasselbring and Alsberg[58] found that there is a disease of cabbage and spinach somewhat like the "mosaic disease" of tobacco. They also noted an apparent increase of oxidase content in the diseased spots, but thought this result might be caused by a decrease of anti-oxidases in the affected area.

Experimental Part

The historical part of this paper makes it evident that there has been no lack of effort to determine the distribution and nature of the oxidizing enzymes. However, many previous investigations were carried out with the use of but one reagent, which was generally guaiac tincture; besides, adequate checks upon the reagents or upon the plant juices were not made. Any one familiar with the use of the oxidase reagents realizes that the most sensitive of them, such as the indo-phenol reagent and phenolphthalin, are so easily oxidized that constant care must be taken that the action of atmospheric oxygen be not interpreted as a positive test for a weak oxidase. Furthermore, in all investigations involving the use or comparison of colors, one must be alert to detect differences due to a personal factor or to the illumination. Our investigation was undertaken with the purpose of examining and extending previous work upon the distribution of the oxidases; studying the conditions of their activity, and their effects upon different reagents, etc.

[57] Woods. The Destruction of Chlorophyll by the Oxidizing Enzymes. Centralblt. f. Bakt. II Abt. 5: 745. 1899.

[58] Hasselbring and Alsberg, *loc. cit.*

The Nature of the Investigation

The object of our experiments may be formally stated as follows:

(*a*) To study the distribution of the oxidases and of catalase in the higher plants, beginning with the lowest; using representatives of as many available orders and families as possible. To make the data more systematic and to reveal, if possible, any natural relationships, the results are tabulated according to the botanical classification.[59]

(*b*) To examine as many plant parts as possible, to see if there is a localization of the oxidases in special organs.

(*c*) To use a series of different oxidase reagents upon each sample, and to repeat all tests, under parallel conditions, with boiled controls in every case. Our purpose in this was to detect any differences in the behavior of the several reagents when used under controlled conditions upon a large number of materials of plant origin.

(*d*) To determine the extent of the distribution of those chromogens in plants which are oxidized to colored compounds by the natural oxidase of the plant itself. These chromogens are the so-called "respiration pigments" of Palladin.

The Methods of the Investigation

The method of preparing the enzyme solution varied with the nature of the material. Fleshy parts that were sufficiently large were run through a meat-chopper, smaller ones were grated on a vegetable grater, while leaves, flowers, etc., were macerated in a mortar. Control experiments proved that the iron of the grater had no effect. In whatever manner the material was finely divided, it was then treated with distilled water and allowed to stand for fifteen minutes. The volume of distilled water varied with the amount and nature of the material. After standing for fifteen minutes with distilled water, the extract

[59] For full details of experimental work and for the arrangement of results according to the botanical classification see the original dissertation upon which this paper is based.

thus obtained was filtered through muslin.[60] These clear solutions were made up to 50, 100 or 200 cubic-centimeters, depending upon the amount of material used in the preparation of the extracts.

The tests were carried out in the following manner: 5 c.c. of the plant extract were placed in each of a series of test-tubes and to each such portion of extract ten drops of reagent were added from a dropping bottle. This was a test for the *oxygenases* (direct oxidases) and was repeated in every detail, except for the addition of five drops of 1 per cent. pure hydrogen peroxide solution,[61] when testing for peroxidase. The latter treatment caused an increase of coloration, when compared with the corresponding oxygenase effects, if *peroxidase* were present. Boiled portions of the enzyme solutions were tested in precisely the same manner for control purposes. Portions of the extracts were tested again after standing one hour, and once more after the lapse of twenty-four hours, to reveal any subsequent change in the action of the oxidases. The presence of *catalase* was shown by the evolution of gas when five drops of 1 per cent. hydrogen peroxide solution were added. Any change of color indicating chromogens or any peculiar appearance of the plant juices were noted.

It became evident very early in our work that failure to obtain a positive test for oxidases usually indicated the presence of acids; so we determined the acidity of many of the extracts by titrating ten cubic-centimeter portions with $N/10$ potassium hydroxide solution, using phenolphthalein as the indicator. To serve as a further check on our results, all of these tests were made on *another* day with *another* sample of the material to obviate the effects of any psychological differences on the observer's part, or individual variations in the plants examined.

[60] This muslin had previously been treated with boiling dilute hydrochloric acid solution. It was then washed with water, treated with boiling dilute ammonium hydroxid solution, washed with distilled water until neutral, and finally dried in a dust-free place.

[61] The best hydrogen peroxide is the "Perhydrol" of Merck, containing 30 per cent. of H_2O_2. It was diluted with twenty-nine volumes of water. This product is practically neutral and contains no preservative.

Naturally, the collection and recording of all these data pertaining to over a hundred separate plants and plant parts was no mean task, and to facilitate the process as much as possible we had mimeographed sheets prepared with appropriate columns so that the labor of recording and preserving many hundreds of observations was reduced to a minimum.

As reagents for the oxidases, we used ordinary *guaiac tincture*, also tincture of guaiacum which had been boiled with bone-black to remove peroxides,[62] α-naphthol, the hydrochloride of para-phenylene-diamine, phenolphthalin, the indo-phenol reagent and phenol. Both the ordinary and purified guaiac tinctures were 2 per cent. solutions of gum guaiacum in absolute alcohol. These tinctures give a blue color when oxidized.

The *α-naphthol reagent* had a concentration of 1 per cent. of the substance in a 50 per cent. aqueous solution of alcohol. It gives a lavender color when oxidized.

The *para-phenylene-diamine* solution contained 1 per cent. of the hydrochloride in distilled water. This reagent yields a greenish color when oxidized.

The *phenolphthalin reagent* was made according to Kastle's method.[63] We treated a pinch of phenolphthalin with 1 c.c. of N/10 NaOH solution, dissolved as much of it as possible, then added 25 c.c. of water, filtered and made up to 100 c.c. We used 5 c.c. of this solution plus 10 c.c. of the extract to be tested for the oxidase, let the mixture stand fifteen minutes, then made it alkaline with N/20 NaOH solution, when the mixture, in the presence of oxidases, acquired a pink or red color due to the phenolphthalein resulting from the oxidation of the colorless phenolphthalin.

The *indo-phenol reagent* was applied by adding two or three drops of a 1 per cent. solution of α-naphthol in 50 per cent. alcohol and an equal amount of a 1 per cent. aqueous solution of para-phenylene-diamine hydrochloride to the extract to be tested, then making the mixture slightly alkaline with sodium

[62] Moore and Whitley. The Properties and Classification of the Oxidizing Enzymes, etc. Biochem. Jour. 4: 136. 1909.

[63] Kastle, Chemical Tests for Blood. Bull. 51, Hyg. Lab'y, U. S. Pub. Health and Marine Hospital Service, Washington, 1909, p. 25 ff.

carbonate solution, which caused the purple oxidation product to dissolve.

Phenol was used in a 5 per cent. aqueous solution and became reddish brown in twenty-four hours if oxidized.

The phenolphthalin and indo-phenol reagents oxidize spontaneously in the air and must be freshly prepared for satisfactory use.

In testing for the chromogens in the various plants we merely allowed some of the juice to stand for twenty-four hours, when the chromogens became evident by being changed by the oxidases to the colored state, generally brown, reddish or black.

For the detection of oxidases in plant sections, under the microscope, one may use the α-naphthol reagent described above, either with or without hydrogen peroxide. Under these conditions oxidizing tissues or cells soon stain violet or lavender and make a beautiful picture until the diffusion of the oxidases is complete and the whole preparation becomes dark. Sections of vines containing much food-conducting tissue, such as *Aristolochia macrophylla*, stain very strikingly as a result of this treatment.

Summary of Oxidase Tests

Specimens Examined	Oxygenase	Peroxidase	Catalase	Chromogens
All parts (110)	**55**	**78**	**105**	**30**
Leaves (17)	12	12	16	6
Floral organs (20)	8	11	20	7
Tubers, bulbs, etc. (21)	14	20	19	7
Fruit (41)	13	28	40	7
Other parts (11)	8	7	10	3

Study of the Effect of Acidity upon Oxidases

In the course of our systematic search for the oxidases, it soon became evident that an acidity in the plant juices and extracts greater, per 10 c.c. of plant liquid, than the alkalinity of 0.8 c.c. of N/10 KOH solution, with phenolphthalein as the indicator, usually indicated the absence of oxidases in the plant part under examination. These observations led the writer to study this phenomenon further. It was found that 10 c.c. of lemon juice required 18.5 c.c. of N/10 KOH solution for neutralization, and did not show the presence of oxidases either before or after neutralization. Three or four drops of a coffee-bean extract showing a very high oxidase activity were added to 10 c.c. of fresh lemon juice, with the result that the oxidase action was inhibited, but immediately after neutralization the oxidase caused a faintly positive test. This same experiment was repeated, using 9.25 c.c. of N/5 acetic acid solution, the N/5 solution being used to make the total acidity equal to that of the lemon juice and to keep the total volume always the same (10 c.c.), with the addition of distilled water and a few drops of coffee-bean extract as before. To our surprise this apparently did not affect the oxidase at all, for a very strong coloration was obtained with guaiac tincture, etc. Then the experiment was repeated in exactly the same manner upon mixtures containing 9.25 c.c. of N/5 H_2SO_4, HCl, and citric acid solutions. The results were the same in the three cases: the oxidase reaction was completely inhibited and after neutralization with calcium carbonate or potassium hydroxid, a faint bluish coloration of guaiacum was detected in the citric acid test-tube. The rest were negative after neutralization. The sulphuric acid mixture was neutralized with calcium carbonate and divided into two portions, to one of which fresh coffee extract was added, to the other some fresh guaiac tincture; no bluing was produced in either case, nor was it obtained in several repetitions of the experiment.

To determine more exactly the influence of different acids upon the bluing of guaiacum by the oxidase of the coffee-bean, a series of experiments were made in the manner already described. In all cases the results obtained were consistent and showed the inhibiting effect was traceable to the activity of the hydrogen ions from the acids in aqueous solution. We conclude, therefore, that the failure to find oxidases in most plant juices, when the acidity is greater per 10 c.c. than that equal to the alkalinity of 0.6 to 0.8 c.c. of N/10 KOH solution, is due to the effect of the different acids upon the peroxidases, etc., and this influence is probably not specific for the acids, but depends upon their dissociation and consequent yield of hydrogen ions. In the following table we indicate the known comparative accelerating effects of these common acids upon the inversion of sucrose, and their relative retarding effects upon the oxidase tests. The names are arranged in the order of the corresponding activities:

Acceleration of Sucrose Inversion	Retardation of Oxidase Test
HCl (greatest)	HCl (greatest)
H_2SO_4	H_2SO_4
Citric acid	Citric acid
Acetic acid	Acetic acid.

Summary of General Conclusions

1. The oxidases are of very wide distribution among the flowering plants; peroxidases, especially, being present in about seventy-five per cent. of all the specimens examined, while oxygenases (direct oxidases) are less widely distributed, being found in one-half of the plants used. Catalase may be said to be universally distributed, since there were only a few cases in which it was not found.

2. The leaves, stems, roots and food-storage organs of the plants seemed to contain the greatest amounts of the oxidases. The flowers and fruit were in many cases comparatively poor in oxidases. In regard to the fruits this statement must be qualified because dry seeds of somewhat uncertain age were the only available material of certain species.

3. Our experience with a great many parallel tests, using the different oxidase reagents upon a great variety of vegetable tissues show that all of the reagents seem to detect the same substance or substances, for if one reagent gave a positive test the others generally acted in like manner. The phenolphthalin and indo-phenol reagents gave positive results in more cases than the others. This is undoubtedly due to their greater ease of oxidation, for they are spontaneously oxidized by the air.

4. It is probable that in the presence of acid juices in the plant the latter does not form oxidases or else that they are immediately destroyed by the acid. It was shown that the inhibiting effect of acids upon the action of oxidases seemed to be a function of the concentration of the hydrogen ions.

5. Among plants the chromogens are found to the greatest extent in certain orders such as the Liliales, Orchidales, Ranales, and most frequently of all in the latex plants of the Convol-

vulaceae, Boraginaceae, Labiatae, Solanaceae, Rubiaceae, Compositae, etc. Active oxidases are also likely to be associated with chromogens in the latex plants. These conclusions are interesting because of the bearing they have upon Palladin's theory that these chromogens play an important part in the respiration and the metabolism of plants.

The writer wishes to express his deep indebtedness to Professor William J. Gies for suggesting the nature of this investigation and for the aid received from him during its course. The sincere thanks of the writer are likewise due to Doctor N. L. Britton of the New York Botanical Garden, for material obtained from the Conservatories, and also for the other privileges of the institution.

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SOME FLORAL FEATURES OF MEXICO*

By H. H. Rusby

(*Continued from April Torreya*)

One of the most beautiful spots that I have ever visited is that of the lava beds a few miles south of Mexico City, on the railroad leading to Cuernavaca. This has been one of the favorite collecting grounds of our Mr. Pringle, for which reason alone it should always possess a deep interest for American botanists. As I remember, Cuernavaca is distant from the City of Mexico in a straight line only about fifteen miles, but, since the train has to pass over a summit more than ten thousand feet in height, about three thousand feet higher than Mexico, we travel some fifty miles in reaching it. The mountain thus traversed consists of the roughest kind of lava formation, full of deep gullies and ravines which are bordered by rugged and often overhanging walls, with sharp pockets, sometimes caves, and innumerable abrupt and jagged projections. Were this surface to be viewed with its vegetation wholly removed, it would appear as though the growth of ordinary vegetation upon it was almost impossible, yet it bears a flora of the richest character and greatest interest, and one that is varied in every sense of the term. Much of its surface is covered with a fine forest of good sized pines, with some cypress and other coniferous evergreens. At places this gives way to arborescent *Arctostaphylos*, with many oaks. Its shrubs grow densely and represent so many families and genera that from a systemic point of view this growth is scarcely characteristic. It is, however, the herbaceous growth which is most varied and interesting. If everything but the ferns were removed the appearance would still be that of an abundant vegetation. Taking only five or six good specimens of each species, I could have loaded my portfolio within an area of a hundred yards square. This is the natural home of the dahlia and one is bewildered by the variety which it displays. It is impossible to say whether the different forms are mere variations, or hybrids, or numerous closely related species. Acres are covered with them and they are often from six to eight feet in height. They are for the most part of very slender habit. Pentstemons, lamourouxias and other scarlet-flowered figworts are very conspicuous. Verbenas are abundant and varied, as are castilleias, and there are dazzling golden patches of composites lying flat upon the ground. Beautiful asters and flea-banes abound. The cool, damp, open places at the higher altitudes are densely carpeted with a free blooming, large-flowered *Stellaria*. Upon the summit of this range there is a kind of table land which for many miles forms an open prairie. The predominent grass grows in very large and high bogs or hummocks in the rich black soil. The roots of this grass are shipped by train loads to Germany, it is said for the manufacture of some sort of a brush or broom. Abruptly descending upon the southern side of this range, we cross a broad cultivated valley or plain and there follow

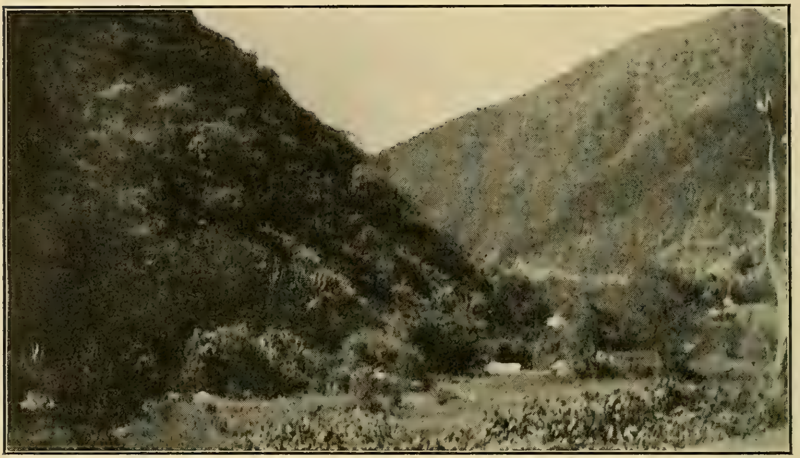

FIG. 4. The Great Oaxaca Canyon.

a river through a deep canyon which traverses a range which appears of even greater height than that previously crossed. Upon the other side we continue down this river valley until it empties into the Balsas, at the town of Balsas, which is the end of the railroad line. I made no stop in this second range but it was very evident that its flora is totally distinct from that of the Cuernavaca Mountains. At Balsas we are distant about fifty miles from the Pacific, though as the river runs, the distance is much geater. We are in the midst of a multitude of gigantic mountains, which continues without interruption almost to the ocean's edge. Except in the immediate vicinity of the streams this mountain region is very arid. The rainy season is of short duration and the rains are usually not at all copious. The ground therefore has but a slight permanent supply of moisture, springs are scarce, and the vegetation dries up with surprising quickness at the close of the rainy season. Nevertheless, while the season lasts, this vegetation is fairly abundant and varied. It is, moreover, rather peculiar to the region, therefore of special interest. Not only the herbaceous vegetation, but the shrubs and trees, are of strange relationship. Among the smaller trees, an extremely poisonous species of *Rhus* is perhaps most noticeable. Near the water the alligator pear grows spontaneously and reaches a rather large size. The canyons and gulches are full of beautiful white-flowered or violet-tinted acacias. A small arborescent *Malpighia*, with edible fruit, is abundant. The ground is covered in many places with gorgeous *Tribulus*,

FIG. 5. Balsas Mountains, Guerrero.

in others with *Ruellia*, and very often with some plant related to *Allionia*, but with handsome rose-purple flowers as large as ordinary morning-glories. Many Asclepiadaceous vines twine among the shrubbery. The *Echinocacti* are of peculiar type, scarcely projecting above the ground and crowned with woolly tufts.

I twice visited Limon Mountain, about four miles from the town of Balsas, and the crowning peak of the region. Its sides are extremely steep and for the most part densely clothed with small trees and shrubs, Mimosaceae predominating. One of these small trees is a *Clerodendron*, or ally thereof, with very showy flowers. Another tree is a beautiful new species of *Hauya*. A new species of *Linociera* bore excellent edible fruit. The open spaces were clothed with composites and shrubby heliotropes and a graceful bamboo grows freely. *Vitis blanco* is a very peculiar grape, with massive but inedible fruit. Upon the rich shaded banks beautiful *Achimenes* intermingle with a plant related to *Tradescantia*, its broad fleshy leaves lying flat upon the ground and beautifully variegated with purple and several shades of green. Here grew upon the rocks, in sunny places, a peculiar *Opuntia*, unlike any that I have seen elsewhere, and about the edges of cliffs were robust growths of *Plumiera*. Quite a collection of plants was obtained upon this mountain but I have found no opportunity of studying them.

Returning to Mexico City, and traveling thence *via* Puebla, we pass down into the state of Oaxaca, a region which is really a continuation of the Balsas district, though farther south and correspondingly hotter. Its conditions of aridity are about the same as those of Balsas. Like Balsas, too, it possesses a formidable mountain range. In the highlands about Puebla, we are surprised to see the otherwise bare ground densely carpeted with a bright rusty yellow *Cuscuta*. It probably lives upon grass rhizomes.

Approaching Oaxaca, we pass for many miles through one of the greatest of mountain canyons, in some places approaching in depth and grandeur our Grand Canyon of the Colorado. Some of the summits in the vicinity of this canyon are said to be almost inaccessible, while others can be scaled only on foot and by a few circuitous routes. Several days were spent in this canyon. My special work was laborious and exacting, but I managed to snatch a collection of nearly a hundred species. These and the very many that I saw without being able to collect them, have left me with an intense desire to spend some time in that region. The proper time to collect here is from late June to September. In the bottoms of the canyons and along the sides of the shaded ravines, where one can traverse them, he finds a profusion of strange forms and many exceedingly beautiful ones. When he succeeds in passing over and among the mountain tops he finds forests of oak, mingled with a great variety of other trees and thickly clothed with epithytes, including many orchids, ferns and bromeliads. Wherever he encounters a little stream or some boggy ground, there is a world of little things which add

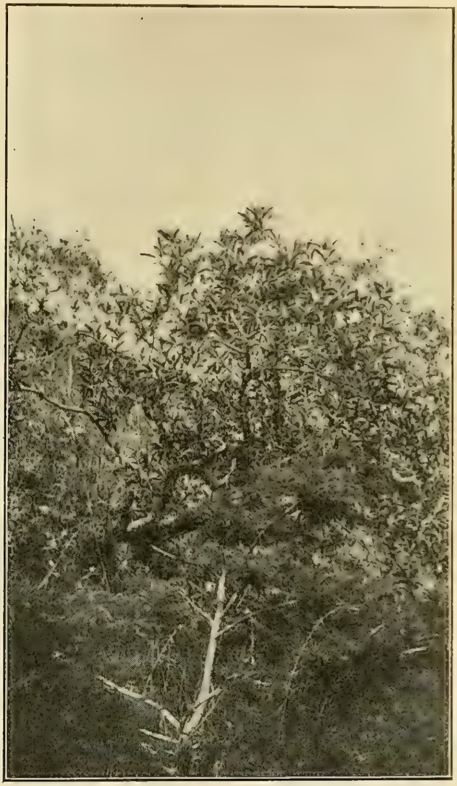

FIG. 6. *Byrsonima Karwinskiana.*

a peculiar charm to the day's study. Along the larger streams we see many trees at whose affinities we can hardly guess. One of them is heavily clothed at the ends of the branchlets with tufts of thick, shining linear leaves resembling in outline and size the fruits of the catalpa, and having dense masses of fruits resembling small, unopened cotton bolls. The shrubbery in the river bottom is completely covered with what we take to be wild grape vine but which proves to be a broad-leaved bignoniad. Among the lower hills we find a dense growth of horrible *Jatropha* shrubs and tangled among their bases a peculiar *Pedilanthus*. Plumieras are also abundant and like the two last-named are capable of yielding some rubber. Every bank is gay with *Tribulus* and Nyctaginaceae. Asclepiadaceous vines and ipomeas are every-

FIG. 7. Near the summit of Limon Mountain, Guerrero.

where. In one of the gulches I found an undescribed species of mulberry.

The plains and lower hills of this valley are almost exclusively occupied by a cactaceous growth. Although there are many Opuntias, the predominant forms are of the giant *Cereus* type. The most conspicuous and truly gigantic of them is locally known as "cardon" and is, I believe, a species of *Pachycereus*. I have seen a single tree under which, I believe, almost an entire company of mounted cavalry might gather. These species bear, for the most part, delicious edible fruits. Among the rocks on the hillsides, great numbers of mammillarias and other dwarf species are encountered.

We cannot get much farther south than Oaxaca without getting into the truly tropical vegetation of the lowlands. Indeed, we have only to cross the great mountain range south of this canyon, a distance of some fifteen miles, to find ourselves in the fever infested fens of the Tuxtepec valley.

Here of course the flora is almost totally distinct from anything that has been described. The trees are the huge giants which characterize our American tropics and the vines which bind them together are great woody climbers with trunks several inches in diameter and branches extending for hundreds of feet. A variety of palms, some of them of exceeding beauty, occupy the slopes and among them are gigantic, as well as curious and beautiful aroids and superb cycads. Huge ferns, fuchsias, begonias and oxalids occupy the ledges and steeper banks, and both terrestrial and arboreal orchids are abundant. The rivers are bordered by great *Fici*, and several species of spondias, and the swamps are filled with the peculiar Glumaceae and showy aquatics which characterize similar situations throughout our tropics. Of this tropical region, time will not permit me to speak, but I can say that, while its general character is like that of Central America, its specific characters are largely unknown.

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PROCEEDINGS OF THE CLUB

January 25, 1911

The meeting of January 25 was held in the museum building of the New York Botanical Garden at 3:45 P.M. President Rusby occupied the chair. Twenty-two persons were present.

The minutes of the meeting of January 10 were read and approved. The name of W. W. Eggleston was proposed for membership. It was then voted to accept the resignations of Mr. S. B. Parish and Miss Louise Bruckman.

President Rusby, chairman of the committee on the "budget" for 1911, submitted a report on a special meeting held January 21.

The report was approved and the recommendation of the committee to borrow $400 from the permanent fund was adopted by unanimous vote.

The application of Norman Taylor for a grant of $200 from the Esther Herrman fund to enable him to make further investigations on the flora of the Catskill Mountains and of New Jersey was read and ordered forwarded to the Council of the New York Academy of Sciences with the unanimous approval of the club.

A communication was read annnouncing the death of Frederic Ehrenberg and the secretary was authorized to extend the sympathy of the members of the Club to the relatives of the deceased.

Dr. William Mansfield was unanimously elected delegate to the Council of the New York Academy of Sciences, and Dr. C. A. Darling and W. W. Eggleston were elected to membership in the club.

First on the announced scientific program was a discussion of "Two New Species of Edible Fruits" by Dr. H. H. Rusby.

These fruits were both from Mexico, one being *Morus mollis* Rusby, the other *Linociera macrocarpa* Rusby. Their descriptions will appear in an early number of the *Bulletin*.

The second number on the program was "Notes on Cuban Ferns" by R. C. Benedict. An abstract prepared by the speaker follows:

"Cuba promises to be especially rich in ferns. At present it is not very thoroughly explored botanically, but by comparing the number of species in certain genera now known from Cuba with the total number of species in these genera known from North America, it appears probable that eventually Cuba will prove to be as rich in ferns as Jamaica is now known to be.

"To illustrate with one genus, *Anemia* as presented in the North American Flora, Volume 16: part 1, is recognized as having twenty-six North American species, with ten in Cuba. Recent collections for the New York Botanical Garden have included material of three species not accredited to Cuba in the Flora. The list of Cuban anemias now stands: (previously recorded) *A. phyllitidis*, *A. Underwoodiana*, *A. obovata*, *A. pastinacaria*, *A. Wrightii*, *A. cicutaria*, *A. speciosa*, *A. cuneata*, *A. coriacea*, *A. adiantifolia;* (to be added) *A. nipeënsis* Benedict (new), *A. aurita* (either this or undescribed), and *A.* sp. (probably undescribed).

"Thus, Cuba now has thirteen out of twenty-eight, and in the total number, there are several species now found in neighboring islands, and which may be expected in Cuba.

"Some of the Cuban species of *Anemia* are especially interesting. For example, *A. pastinacaria* has been found in the West Indies only in Cuba, but is native also in Mexico and South America. *A. speciosa* has a somewhat similar distribution. Mrs. N. L. Britton has collected in Cuba material here identified as *A. speciosa* which exceeds Mr. Maxon's North American Flora description, in that it has leaves twice-pinnate below instead of merely pinnate.

"*Anemia nipeënsis* Benedict, was collected by Dr. J. A. Shafer in the Sierra Nipe, a hitherto botanically unexplored Cuban mountain range. The plant indentified as *Anemia aurita* is similar to small Jamaican specimens of this species but is not certainly the same."

The next number on the program was "Reviews of Recent Moss Literature," by Mrs. N. L. Britton.

Mrs. Britton gave a brief abstract of three recent publications which contain references to or descriptions of North American Mosses as follows:

"1. The mosses of Swedish-Lappland by Arnell and Jensen contains a reference to *Polytrichum gracile* var. *anomalum* with a record of its occurrence in Maine. The ecological studies and tables are of much interest and the nomenclature follows that of Lindberg's mosses of Scandinavia of 1879 and adopts the oldest specific name and the original generic name in its primitive sense.

"2. The non-European or exotic mosses by Dr. Georg Roth as a sequel to his European mosses in which an attempt is made to describe and figure all mosses from original specimens. In the first part, the genus *Andreaea* is treated, including 102 species of which 5 are North American and 28 from South America, all but 13 of these illustrations have been drawn from original material and the coöperation of many prominent bryologists and botanical institutions has been secured so that this publication will be of great value to American students.

"3. In the December number of the *Journal of Botany*, Mr. H. N. Dixon has a new genus of mosses and a contribution to the bryology of India, including some from the Mitten Herbarium. As Mr. Dixon and Monsieur Cardot are the two most prominent bryologists who have recently followed the 'Kew Rule' in the nomenclature of mosses, we welcome the statement made on page 303 that "The nomenclature of Brotherus in Engler and Prantl Pflanzenfamilien has been and will be followed hereafter in these lists."

"4. In the *Bulletin* of the Botanical Society of France, Memoir 17, Monsieur Dismier has recently published a revision of *Philonotis* of America including 8 species and 4 subspecies from North America with an extension of range northward into Florida, Louisiana and Texas of *P. gracillima*, *P. sphaerocarpa* and *P. tenella* and the description of two new subspecies *P. fallax* and *P. americana*. Stations and numbers of specimens are cited in detail and M. Dismier promises to continue the study of the genus."

Dr. W. A. Murrill then exhibited a specimen of an interesting fungus which had grown in total darkness in a mine. It was completely sterile not even having conidia. The specimen which he called *Elfvingia megaloma* showed several regions of growth corresponding to the age in years of the plant.

Dr. N. L. Britton showed several specimens of *Zamia* and Miss Pauline Kaufman exhibited several varieties of edible nuts recently appearing in the markets of New York City.

Adjourned.

B. O. DODGE,
Secretary.

FEBRUARY 14, 1911

The meeting of February 14, 1911, was held at the American Museum of Natural History at 8:30 P.M., with President Rusby in the chair. Eleven persons were present. The minutes of the meeting for January 25 were read and approved.

The announced paper of the evening on "Floral Features of Mexico" was then presented by Dr. H. H. Rusby and illustrated by lantern-slides. This paper appears on another page of TORREYA.

Meeting adjourned.

B. O. DODGE,
Secretary.

MARCH 14, 1911

The meeting was held at the American Museum of Natural History. The meeting was called to order by 8:15 with Dr. E. B. Southwick in the chair. Twenty-eight persons were present.

The minutes of the meeting for February 14 were read and approved. On the motion of Mr. G. V. Nash the regular order of business was dispensed with for the evening.

The scientific program consisted of a lecture on "Orchids, Wild and Cultivated," by Mr. Geo. V. Nash. The lecture was illustrated by a large number of beautiful lantern slides. An abstract of the lecture prepared by the speaker follows:

"By the general public any odd or strange flower was considered an orchid, and as an illustration of this common error nepenthes and bromeliads were cited. [The large division of endogenous plants to which the orchids belong was illustrated with a slide of the lily, this being taken as typical. Especial attention was called to the stamens and pistil which are distinct in this flower. As an illustration of a typical orchid flower a slide of *Cattleya* was shown. The uniting of the stamens and pistil into one organ, known as the column, was pointed out as the distinctive character of the orchid.

"Another interesting feature is the diversity of the lip-form. The lip is one of the petals. In some forms, such as *Odontoglossum*, it much resembles the other petals. In *Oncidium* it is markedly different in size and color; in *Cattleya* it becomes more modified by the inrolling of the base into a tube which surrounds the column; in *Dendrobium* a still greater modification occurs in the inrolling of the margins of the lip into a saccate organ; and in *Cypripedium* this tendency is greatly magnified, giving us the "slipper."

"The stem or leaves of orchids are frequently thickened, thus serving as storage organs for water. The water supply of many orchids, on account of their habitat on trees and rocks, is very uncertain, and those thickened leaves or stems carry the plants safely through periods of drought. When the thickened stems are short, and round or oval, they are known as pseudobulbs.

"Some orchids grow in the ground and are known as terrestrial. These are commonly found in temperate regions, where dangers from frost exist. The majority, however, are epiphytic, that is, they grow on trees, and are found in warm temperate and tropical regions. The number of species is between 6,000 and 7,000, of which about 150 are found in the United States. The two great centers of their occurrence are: in the New World, in northern South America, northward into Central America, and in the West Indies; in the Old World, in India and the Malay region. A series of slides was then exhibited illustrating some of the common wild and cultivated forms."

Meeting adjourned,

B. O. Dodge,

Secretary.

FIELD MEETINGS

The following excursions are advertised by the field committee:

May 13.—Edenwald, N. Y. Meet at Terminus of 3rd Avenue Elevated R. R. at Botanical Garden, at 1 P. M. Fare 20 cents. Guide, Dr. P. A. Rydberg.

May 20.—Springfield, L. I. For Orchids. Meet at East 34th Street Ferry, New York side, 1 P. M. Guide, DR. E. B. SOUTHWICK.

May 27.—Summit, N. J. Lackawanna R. R. Meet at West 23rd Street Station, at 9 A. M. Guide, MR. SERENO STETSON.

June 3d.—To Staten Island, N. Y. Guide to determine Station. Fare 20 cents. Meet at Staten Island Ferry, N. Y. side, 9 A. M. Guide, MR. B. O. DODGE.

June 10th.—To Hollis, L. I. Meet at East 34th St. Ferry, N. Y. side, 9. A. M. For study of Fungi. Guide MR. F. J. SEAVER.

June 17–21. Slide Mountain, Ulster Co. This excursion may involve camping on the summit of the mountain for two nights. All those desiring to attend please communicate with the guide MR. NORMAN TAYLOR, Central Museum, Eastern Parkway, Brooklyn, by May 30th in order that the necessary arrangements may be made.

The Field Committeee.
E. B. SOUTHWICK,
Chairman.

NEWS ITEMS

We learn from the *Tribune* (May 1) of the death of Dr. Pehr Olsson-Seffer in a train, wrecked and shot at by Mexican revolutionists. The week-end special train for Cuernavaca, seventy-five miles south of Mexico City, was stopped by the firing of a volley through it and its derailment. Dr. Olsson-Seffer, who was widely known for his work in tropical botany and agriculture, was born in Finland, went to Australia and subsequently to California where he became instructor in Stanford University. Latterly he made a tour of the tropical world to study the rubber industry, and was recently appointed to the chair of botany in the newly created Mexican University.

The following public lectures are advertised at the New York Botanical Garden, Bronx Park. They are at 4 P. M. May 20. "The Reef-building and Land-forming Seaweeds," by Dr. Marshall A. Howe. May 27. "The Influence of Soil Acidity on Plant Distribution," by Mr. Frederick V. Coville. June 3. "How Plants are Distributed," by Prof. Carlton C. Curtis. June 10. "The Royal Gardens at Kew, England," by Dr. William A. Murrill. June 17. "Collecting in the High Mountains of Colorado," by Mr. Fred J. Seaver. June 24. "Past Climatic Conditions Indicated by Fossil Plants," by Dr. Arthur Hollick.

At an arbor day celebration in the Central Museum, Brooklyn, held on April 27, more than 1,600 school children actually heard and saw the exercises. Nearly 2,500 more, who could not be accommodated, were obliged to go home, although some of this excess crowd took part in a tree-planting in the adjacent Botanic Garden grounds.

In TORREYA for January, page 9, bottom line, the name *Panicum neuranthum* should be *Aristida stricta*.

Dr. C. B. Robinson of the Philippine Bureau of Science expects to return to this country about the end of July. Dr. Robinson was formerly an assistant curator at the New York Botanical Garden, and has been in the Philippines for the last three years, giving much of his time to fiber investigations. He is now collecting along the Indo-China coast.

According to the *New York Evening Post* a gift of $25,000 from an anonymous donor makes possible the immediate construction of a two-story addition to the Gray Herbarium building, in which the botanical library will be housed.

At the annual meeting of the Naples Table Association, held at Smith College on April 30, the table for 1911–12 was awarded to Miss Mary Edith Pinney, B.A. Kansas 1898, M.A. 1910. Miss Pinney is now studying at Bryn Mawr for her Ph.D. degree, and has just received the M. Cary Thomas European fellowship for 1911–1912.

Mr. K. F. Kellerman of the Bureau of Plant Industry sailed for Europe on April 25 to study recent progress in soil bacteriology. He will visit Germany, Russia, France and England.

Professor Eduard Zacharias, director of the Botanical Institute of Hamburg and author of numerous papers on cytology, has died.

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 submitting manuscript.

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Vol. 11 June, 1911 No. 6

TORREYA

A Monthly Journal of Botanical Notes and News

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR

JOHN TORREY, 1796–1873

CONTENTS

Published for the Club
At 41 North Queen Street, Lancaster, Pa.
by The New Era Printing Company
[Entered at the Post Office at Lancaster, Pa., as second-class matter.]

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TORREYA

June, 1911

Vol. 11 No. 6

A NOMENCLATORIAL PROBLEM WITH A DESCRIPTION OF A NEW FORM, PETALOSTEMUM PURPUREUM F. ARENARIUM*

By Frank C. Gates

Individual plants of a given species occupying different habitats may become considerably modified, giving rise to variation among themselves. This is usually conceded to be an adaptation, induced by the local habitat, in the individual plant. To a taxonomist, the resulting form is but an extreme variation from the type and no general advantage is secured in giving it a name. A specific name is inapplicable, as complete series of intergrading forms are frequently present. To an ecologist, however, the matter stands in a very different light. He is dealing primarily with plants in their habitats. The ability of a single species to live in more than one habitat may often be an important factor in determining the relationships of the vegetation.

The usual form of a species tends to grow in the preferred habitat of that species. Widely varying forms are likely to be results of associational succession. The forms are consequently given the terms relics or invaders according to their position in the genetic series of succession. The form of the relic species changes because some of the external conditions have been changed by the successful invasion of an association. The invasion of the forest upon the prairie furnishes many excellent examples through the persistence of a number of prairie species

* Contributions from the Botanical Laboratories of the University of Michigan No. 124.

Submitted with the spelling in accordance with recommendations of the Simplified Spelling Board, and changed to conform to the editorial policy of Torreya. —N. T.

[No. 5, Vol. 11, of Torreya, comprising pp. 101–124, was issued 17 May 1911.]

in spite of the unaccustomed shade. Relic species are frequently very tenacious of life and will struggle for a long time before they succumb. They are usually able to reproduce vegetatively.

The status of invaders is only a little different. The invader must be able to cope advantageously with the new conditions from the beginning, in order to maintain its life. This may induce extreme variation, which is not mutation because there are usually all stages of transition from the usual form to the new form. Furthermore, when the succeeding association becomes dominant in an area in which the extreme form originally developed, only usual forms occur. Conclusive evidence is at hand to show that the vegetative structures of a perennial plant,

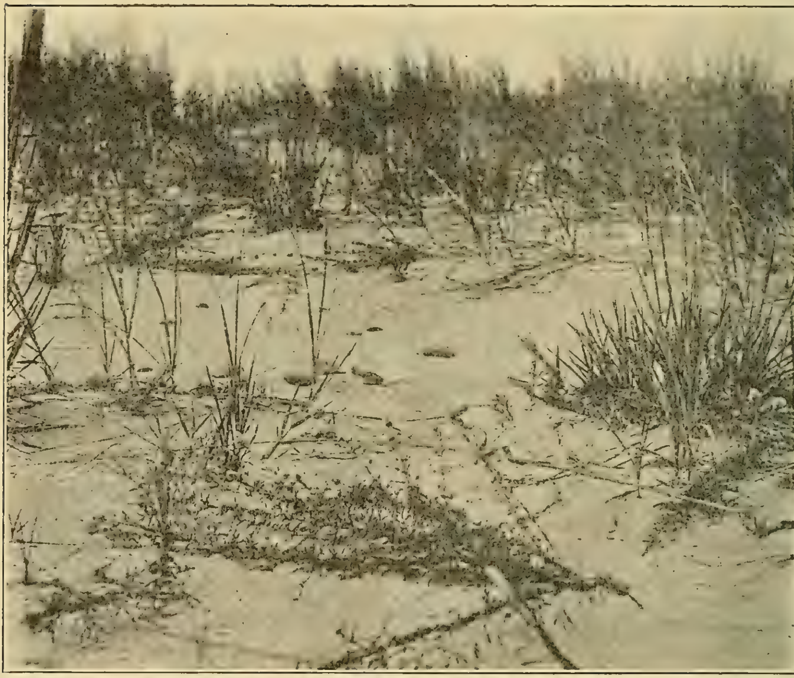

FIG. 1. *Petalostemum purpureum* f. *arenarium* growing among the bunches of *Andropogon scoparius* in the bunchgrass prairie. Waukegan, Illinois.

acting as an invader, may be strikingly different from the structures of the same plant after the successful invasion of the association, of which it is a characteristic species, takes place. This would seem to indicate that such forms are responses to environment. Consequently their distinguishing characteristics are not characters of organization. If this were not so, such forms would hold valid claims to specific rank. Such modifications occur constantly, but only occasionally are they of important ecological significance. It may happen to several, and sometimes to all, of the species growing in a certain habitat. There need be no taxonomic relationship between the species so involved.

The modifications most frequently observed tend towards the conservation of water supply. These are observed on soils made up chiefly of sand and gravel. The plants themselves are usually smaller. They are frequently more pubescent than usual. The leaves are narrower, thicker, often rolled, and frequently assume positions of protection from the noonday sun. The root system is more extensively developed, the flowers and fruit, however, do not ordinarily exhibit noticeable differences from the ordinary type. There is frequently a tendency to bloom more freely unless the growing conditions are extremely severe.

PETALOSTEMUM PURPUREUM f. **arenarium** FORMA NOVA*

	Petalostemum purpureum (Prairie plant)	*Petalostemum purpureum* f. arenarium
Root	tap root	larger and more bulky tap root
Crown	composed of a few upright stems	composed of many (20–38) radiating stems
Stems	stout and upright	shorter, wiry, divaricate, *i. e.*, standing at an angle of less than 45° with the earth from the commencement of growth. When growing on little hillocks the stems project below the horizontal
Leaves	divaricate, lancolate-trifoliolate	appressed, linear-trifoliolate
Heads	cylindrical, larger	cylindrical, smaller relatively
Flowers and Fruit	no appreciable differences	

An ecologist meets with such a state of affairs quite frequently, and these extremely varying forms may occasionally be of such

* Planta caule procumbente ab initione, foliolisineariis, arenariam incolat.

significance that they must be distinguished from the usual forms, in any critical discussion of the vegetation. For this reason they deserve a name. As a single condition produces similar variation, it seems most logical to apply the same term to the results of similar conditions. Accordingly I propose that the term "arenarius" be used to designate those forms of species of plants in which xerophytic adaptations are induced by growth in sand. I append a description of such a form which has come under my observation.

TYPE. (Gates 2922) growing in sandy soil in the *Andropogon scoparius* consocies of the bunchgrass prairie at Waukegan, Lake County, Illinois, August 7, 1908.

PHOTOGRAPHS. Gates 163 (August 17, 1909) and Gates 347 (August 13, 1910), the latter of which accompanies this article as figure one.

Specimens may be consulted at the Herbarium of the University of Illinois, the Field Museum of Natural History in Chicago, (type) and the author's private herbarium.

A similar form of *Apocynum hypericifolium* was commented upon by Schaffner.* It may be termed *Apocynum hypericifolium* f. **arenarium.** Other such forms are under observation.

These forms are always easily recognized in the field, but herbarium specimens illustrating them are difficult to prepare. Consequently ordinary herbarium material, unless fully labeled does not furnish satisfactory data. This difficulty is in a large measure obviated by the use of the camera and the notebook in the field.

UNIVERSITY OF MICHIGAN.

THE BOTANICAL NAME OF THE WILD SAPODILLA

BY N. L. BRITTON

The wild sapodilla or wild dilly, recorded by different authors under various names, is of the genus *Mimusops*, and occurs in southern Florida and through the Bahama Archipelago from Abaco and Great Bahama to the Caicos Islands and Inagua.

*Ohio Naturalist **10**: 184. June 1910.

In the writings of Dr. Chapman, Dr. Gray, Prof. Sargent and Dr. Small, it is recorded from Florida as *Mimusops Sieberi* DC., a tree which is apparently restricted to the island of Trinidad and recently referred by Pierre to a variety of *Mimusops balata.* It is recorded from the Bahamas by Grisebach, by Dolley, and by Mrs. Northrop as *Mimusops dissecta* R. Br., which is an Asiatic species, and I have accepted for it (North American Trees 782) the name *Mimusops parvifolia* (Nutt.) Radlk.

The tree was first illustrated and described by Catesby in the second volume of the "Natural History of Carolina, Florida and the Bahama Islands" at plate 87. Professor Sargent (Silva 5: 184) identified this plate with the tree under consideration. Like most of Catesby's plant illustrations, the figure is not wholly characteristic, but it is unmistakable to one familiar with the Bahama flora.

Sloanea emarginata of Linnaeus was based wholly upon this plate 87 of Catesby, but erroneously attributed by him to Carolina, and as this has priority over all other names given to the species, it should be used. Its synonymy is as follows:

Mimusops emarginata (L.)

Sloanea emarginata L. Sp. Pl. 512. 1753.
Mimusops parvifolia Radlk. Sitz. Akad. Wiss. Muench. **12**: 344 (misprinted *parviflora*). 1882. Not R. Br.
Achras Zapotilla parvifolia Nuttall, Sylv. **3**: 28. 1849.
Achras bahamensis Baker in Hook. Ic. **18**: *pl. 1795*. 1888.
Mimusops floridana Engl. Bot. Jahrb. **12**: 524. 1890.
Mimusops bahamensis Pierre, Not. Sapot. 37. 1891.
Mimusops depressa Pierre, Not. Sapot. 37. 1891.

Examination of the Cuban coastal flora at many localities has up to the present time failed to disclose the occurrence of this species there.

New York Botanical Garden.

SHORTER NOTES

An Undescribed Opuntia from Jamaica.—**Opuntia jamaicensis** Britton & Harris *sp. nov.* Erect, dull green, 1 m. high or less, subcylindric below, the several branches ascending, Joints obovate, much narrowed at the base, flat, rather thin, readily detached, 7–13 cm. long, 5–7.5 cm. wide; areoles about 2.5 cm. apart, those of the lower parts of the joints usually without bristles, the others bearing 1–5 (usually 2) acicular, unequal white spines 2.5 cm. long or less, with yellowish-green tips, the numerous glochides fulvous; flowers about 4 cm. broad, opening at 11 o'clock A.M. and beginning to close at 4 P.M.; sepals small, green, scale-like; petals 16–18, in about 3 series, those of the two outer series yellowish-green, triangular, 1.2 cm. long or less, apiculate; those of the inner series 6, light lemon-yellow with a reddish-brown streak at the middle, obovate-orbicular, 2.5 cm. long; filaments greenish-white; anthers white; style white, longer than the stamens; stigmas 7 or 8, creamy-white; fruit pyriform, concave at top, red, much narrowed at the base, 3.5–4 cm. long, 2–2.2 cm. thick, its areoles about 1 cm. apart, bearing many yellow-brown glochides; seeds densely persistently woolly, biconvex, brown, 4 mm. broad, 1.5 mm. thick, the raphe prominent.

Roadside plains near Salt Ponds, St. Catharine, Jamaica, *Britton & Harris, 10,887*, August 31, 1908 (type); same locality (*Britton 3069*); flowered at Hope Gardens, Jamaica, January, 1910, and fruited in April, 1910.

I tentatively refer the species to the series *Divaricatae* Salm-Dyck, from all of which it differs, however, in its erect habit and subcylindric trunk.

N. L. Britton.

New York Botanical Garden.

Some Records from the Potomac District.—The following collections made in the vicinity of Washington, D. C., during the summer of 1910, have seemed worthy of record.

Eleocharis flaccida (Spreng.) Urban, determined by Dr. N. L. Britton [= *E. ochreata* (Nees) Steud, of our manuals] collected at the mouth of Cameron Run, near New Alexandria, Fairfax Co., Va., Aug. 13, 1910, *Philip Dowell 6454*, *Pennell 2589*.

Growing in shallow water in company with a small *Eriocaulon*, possibly *E. Parkeri* Robinson.*

Veronica scutellata L. Same locality and date (*2591*). This species, as shown by specimens in the National Herbarium, has been collected several times previously along the Potomac River in the vicinity of Washington. As it occurs frequently in the mountain district of Pennsylvania and New Jersey, occasionally below this as at Tullytown, Bucks Co., Pa., and along the lower Susquehanna River, the range of this species in the manuals must be extended considerably southward.

Galinsoga caracasana (DC.) Sch. Bip.—In a moist corn field along the Potómac River above Great Falls, Fairfax Co., Va., collected Aug. 7, 1910 (*2519*), in company with *G. parviflora hispida* DC. F. W. PENNELL.

UNIVERSITY OF PENNSYLVANIA.

PROCEEDINGS OF THE CLUB

MARCH 29, 1911

The meeting was held at the museum building of the New York Botanical Gardens at 3:30 P.M. Vice President Barnhart occupied the chair. Thirteen persons were present.

The minutes of the meeting of March 14 were read and approved.

The following communication from Miss Caroline C. Haynes was then read:

"Sixteen East Thirty-sixth Street,
New York City.

MR. BERNARD O. DODGE,
Secretary and Treasurer,
Torrey Botanical Club, Columbia University.

Dear Sir: It is desired by a number of the members of the club and by others interested, to establish a fund in memory of

* According to the determination of Dr. J. K. Small this is *Eriocaulon Parkeri*. The plant was heretofore known only from near Camden, N. J., and from near Bordentown, N. J., where it was collected by the writer of this footnote in August, 1910. Mr. Pennell's discovery of this plant near Washington, D. C., increases its known range about two hundred miles, and also reduces the number of plants strictly endemic in the local flora range.—N. T.

the late Professor Lucien Marcus Underwood, the income of which may be used to aid in the illustration of the Club's publications. It is hoped that this fund may reach at least $5,000.

I ask that you obtain from the Club its consent to administer such a fund, and enclose my check for $100, as an initial subscription drawn to the order of the Torrey Botanical Club.

Sincerely yours,

(Signed) (Miss) CAROLINE C. HAYNES.

February 15, 1911."

Dr. M. A. Howe made a motion that the Club establish a Lucien Marcus Underwood fund, the income of which shall be used in illustrating the publications of the Club, and that the secretary be instructed to convey to Miss Haynes the hearty and appreciative thanks of the Club for her generous initial subscription. The motion was unanimously adopted.

The resignations of Elizabeth Billings, Alice Knox, W. L. Sherwood and Rev. L. T. Chamberlain were read and accepted.

Dr. H. H. Rusby reported having received several acceptances to his invitations to become sustaining members of the Club.

First on the announced scientific program was a paper on "Virginia Fungi," by Mr. B. O. Dodge. After reviewing the literature relating to Virginia fungi the speaker gave a report on the fungi collected on the estate of Mr. Graham F. Blandy at White Post, Clark Co., Va., last September.

The second number on the program was on "A Little-known Mangrove from Panama," by Dr. M. A. Howe. The mangrove in question, *Pelliciera Rhizophorae*, a member of the Tea or Camellia Family, was found in association with *Rhizophora*, *Aviunnia*, etc., near the Pacific terminus of the Panama Canal. Specimens and photographs were exhibited. A description and discussion of this mangrove appeared in the April number of the JOURNAL of the New York Botanical Garden.

Meeting adjourned.

B. O. DODGE,
Secretary.

REVIEWS

The Codiaceae of the Siboga Expedition, including a monograph of the Flabellarieae and Udoteae*

The recent phycological work issued under the above title is one of the extensive series of monographs, now approaching completion, that embody the zoölogical, botanical, oceanographic, and geological results of the scientific expedition to the Dutch East Indies in 1899–1900 under the leadership of Dr. Max Weber, professor of zoölogy in the University of Amsterdam. The study of the specimens of the interesting family Codiaceae of the green algae obtained on this expedition was entrusted to Mr. and Mrs. Gepp of the Botanical Department of the British Museum. The numerous comparisons necessary for the proper determination of these East Indian specimens and the unexcelled advantages for a review of the species of the world offered by the collections of the British Museum and the Royal Botanic Gardens at Kew led quite naturally to a general monographic treatment of the principal sections of the family. And as these groups are particularly well represented in tropical and subtropical America the monograph will prove of much interest and importance to American students of the marine algae.

The general introduction to the monograph includes suggestive "genealogical trees" indicating the authors' views as to the relationships of the genera and of some of the species. The presence or absence of calcification is considered of primary importance and two series are accordingly recognized. The synopsis of genera shows sixteen groups of generic rank, as contrasted with the eight of Wille's treatment in the Engler & Prantl Natürlichen Pflanzenfamilien (1890) and the ten of his recent (1910) Nachträge to that work. *Flabellaria* Lamour. has been revived for a group of two species typified by the chiefly Mediterranean plant commonly known as *Udotea Desfontainii*. For a group of three species (two newly described) typified by Kützing's West Indian *Rhipilia tomentosa*, Kützing's generic

* A. & E. S. Gepp. The Codiaceae of the Siboga Expedition, including a Monograph of the Flabellarieae and Udoteae.

Siboga-Expeditie, Monographie 62: 1–150. *pl. 1–22.* F 1911. E. J. Brill, Leiden. 4to. Price, fr. 15.50.

name *Rhipilia* has been restored. *Rhipiliopsis*, *Rhipidodesmis*, and *Boodleopsis* are new generic names proposed for groups in which the authors have recognized no American species.

The treatment of the genera and species of the Codiaceae is based on years of careful study of the plants and the relevant literature and is characterized by historical accuracy, by usually successful efforts to examine original specimens, by a scrupulous regard for nomenclatorial types in applying generic and specific names, by a grasp of the really diagnostic characters, and by an eminently fair and judicial attitude toward the views of other workers in the same field. The authors are particularly generous in their acknowledgments of the efforts of the present reviewer toward an orderly and natural arrangement of the plants of this family. The confusions that have resulted from insufficient materials and from wrong application of the older names are being gradually cleared away, but much as to the life-histories and modes of reproduction of these attractive plants remains to be learned by some patient investigator who may have the opportunity to keep living specimens under more or less continuous observation for extended periods of time.

The admission that the paper under review is one of the very best types of a modern taxonomic monograph does not, of course, preclude the possibility of an honest difference of opinion as to some of the minor points involved, even among those who are in possession of the same basal facts. Whether or not *Avrainvillea sordida* Murray & Boodle *p.p.* is preferred to *Avrainvillea levis* Howe is simply a matter of codes of nomenclature or of their interpretation. The case is a complicated one and none of the prevalent rules of nomenclature is altogether definite as to its solution. But the reviewer has little doubt that many supporters of the Vienna Rules may be found who will hold that the combination *Avrainvillea sordida* was first effectively published by Mazé and Schramm and that its proper application is determined by the citation of the previously published diagnosis of *Udotea sordida* Mont. and not, as the Gepps hold, by the citation of a numbered specimen. The Vienna Rules, as is well known, avoided a definite and precise application by ignoring the idea of nomenclatorial types and they certainly contain no warrant for asserting that the first specimen cited by Mazé and Schramm, which may or may not exist in any herbarium, "stands good as type" of *Avrainvillea sordida* Crouan. *Avrainvillea sordida* Crouan being really according to the Gepps' showing, a mix-up of five species, and the later *Avrainvillea sordida* Murray & Boodle being a mix-up of three, the adoption of "*Avrainvillea sordida* Murray & Boodle *p.p.*" as the "oldest specific name to which no doubt can be attached" strikes the reader as a trifle odd.

The adoption of the name *Avrainvillea Mazei* Murray & Boodle for the species for which the reviewer and Mr. F. S. Collins have of late used the name *Avrainvillea longicaulis* (Kütz.) Murray & Boodle *p.p.* hinges on the authors' doubts as to the identification of Kützing's *Rhipilia longicaulis*. Kützing's description and figures of this plant seem at first sight not altogether easy to harmonize with any one of the species recognized today. The original specimen or specimens, collected in the West Indies, apparently do not exist in the Kützing herbarium, now owned by Madame Weber van Bosse, and the authors of the monograph under review state that they have not seen them. Kützing in publishing *Rhipilia longicaulis* cited "Herb. Sonder." The reviewer, a few years ago, learning that the Sonder herbarium had become part of the National Herbarium of Victoria, Australia, wrote an inquiry to the acting curator of the latter herbarium who courteously replied that there was in the Sonder collection a specimen from Antigua bearing the name *Rhipila longicaulis* Kütz. He furthermore kindly enclosed small fragments, sufficient for a microscopic examination, from both flabellum and stipe. A study of these fragments led to the adoption of the name *longicaulis* for the species described by Murray and Boodle as *Avrainvillea Mazei*. The authors of the new monograph, relying upon Kützing's figure of flabellum filaments, which from the scale of magnification used appear to be much more slender that those of *A. Mazei*, have expressed doubts as to the correctness of the reviewer's interpretation of *Rhipilia longicaulis* and have suggested the disturbing possibility that the name *longicaulis* may have to be taken up for the species which they call

Avrainvillea sordida. The reviewer believes that a study of what is presumably the original specimen would convince them that no such unhappy step will be necessary and also that *longicaulis* is the legal specific name for the plant that they are calling *Avrainvillea Mazei.* The flabellum filaments of the Sonder plant have a diameter of 28–55μ, while those of *A. levis* (*A. sordida*) have a diameter of 6–24μ. Filaments with slender rhizoidal endings of the size and nearly the form figured by Kützing may be found in the stipe of the Sonder plant as well as in the stipes of most of the plants that are referred to *A. Mazei.* The true explanation of the peculiar character of the filament figured by Kützing is probably that although the filament may have come from the "Phyllom" as alleged, it came from so near the stipe as to have the characters of the stipe filaments. Furthermore, the natural-size figure given by Kützing, although the bifid flabellum depicted is rare and abnormal, has decidedly the habit of plants of the species called *A. Mazei* by the authors of the monograph and not the habit of plants of the species called *A. sordida.*

Under the discussion of *Penicillus* one finds the unexpected statement that the specimen in the British Museum issued as no. 1482 of the Phycotheca Boreali-Americana under the name *Udotea conglutinata* represents a diminutive and deceptive state of *Penicillus capitatus.* Mr. F. S. Collins in "The Green Algae of North America" has recently referred this number to *Udotea cyathiformis* and the present reviewer agrees with Mr. Collins in this determination. The specimen under this number in the New York Botanical Garden set of the Phycotheca is, like that in the British Museum, diminutive and possibly a "starveling," but the reviewer has seen and collected several intermediates between this condition and the larger explanate states of *Udotea cyathiformis.* The last-named species is often strikingly *Penicillus*-like in its structural characters, being scarcely more than a *Penicillus* with a cup-shaped or much flattened head, though its filaments are more coherent than in any recognized species of *Penicillus.*

Börgesen's "ingenious" but unsupported theory that *Clado-*

cephalus scoparius Howe is probably a condition of *C. luteofuscus* (Crouan) Börg. "developed under peculiar, most probably unfavourable external conditions of life" has been rejected by the authors of the monograph as also by Mr. F. S. Collins, though unfortunately it has been adopted by Wille in his recent Nachträge to the Engler & Prantl Natürlichen Pflanzenfamilien. In this connection it may be remarked that if any real evidence is ever brought forward to show that *Cladocephalus scoparius* and *C. luteofuscus* are forms of one species it may be contended with some justice that the legal name for the species will be *Cladocephalus scoparius*, inasmuch as the *Flabellaria luteofusca* of the Mazé and Schramm list remained essentially a *nomen nudum* until after the publication of *C. scoparius*.

An appendix to this admirable monograph contains Latin descriptions of the new genera and species proposed in the body of the work. Re-publication in this form has been considered desirable in order to conform to the requirements of the Vienna Rules, though it is pleasing to note that the authors have not ventured to reject a certain recently proposed specific name simply because it has never been accompanied by a Latin diagnosis.

Twenty-two handsome lithographed plates supplement in a most helpful manner this notable contribution to phycological literature.

MARSHALL A. HOWE.

OF INTEREST TO TEACHERS*

BIOLOGY FOR COLLEGE ENTRANCE

The new plan for admission to Harvard, which aims to improve articulation with secondary schools, especially public high schools, reduces the examinations to four, which must be taken at one time. A satisfactory record in these examinations will admit to Harvard College without conditions: (*a*) English, (*b*) Latin, or for candidate for the degree of S.B., French or German, (*c*) Mathematics, or Science (Physics or Chemistry), (*d*)

* Conducted by Miss Jean Broadhurst, Teachers College, Columbia University.

any subject (not already selected under (*b*) or (*c*) from the following list: Greek, German, History, Mathematics, Chemistry, Physics. It will be noticed that botany (or zoölogy) is not mentioned here. Why is a question that might bring various answers, opening discussion and criticism of methods, adaptability and advisability of subject matter, and the cost of laboratories and biological materials. Many prominent teachers will also disagree as to the desirability of such intensive work in either botany (or zoölogy) as a position on the favored list may be supposed to indicate. Nevertheless there is no reason why the "open door" should not be offered to the biological sciences, be the applicants few or many.

In a discussion regarding the order of high school science courses (*School Science and Mathematics*, February, 1911) W. Whitney describes the science groups recommended by the principals of the Chicago high schools and recently adopted by the Board of Education of Chicago. It surely is, as the author indicates, "the first time any secondary school has systematically offered such opportunities in science."

"It must be understood that this science group is only one of some eleven groups of courses from which pupils are to make their selection by groups. The first year's work is to include physiology a half year and physiography a half year. In the second and following years there are to be offered one and one half years each of botany, zoölogy, physics, and chemistry and a year of physiography. A half year of each of the first four is to be of a practical or applied nature. The student on reaching the second year may choose between the biological and the physical sciences. If he chooses the biological, he will take three years' work in these sciences and two years of the physical. If he chooses the physical, he will take three or four years of the physical and one or two years' work in biological science. In any event, he must have six years of science.

"All will agree with the claim that in any scientific course of studies, if it be is to worthy of the name, there should be opportunity for a second year's work in, at least, one physical and one biological science. There is no good reason why opportunity for advanced work should be given in business courses or in language courses and denied in the science courses. Science plays a large part in the affairs of man and should be given liberal treatment in any scheme of education."

An abstract of Dr. D. T. MacDougal's address before the Society of American Naturalists is given in *Science*, January 20, 1911. As an introduction the abstract lists the recent events in the field of evolution; gives brief statements of the present presentation of long-recognized evolutionary theories, such as isolation, geographical distribution, natural selection, and inheritance of acquired characters; and recent work showing organic responses, including the plant changes secured by MacDougal in treating the reproductive elements of seed plants with various solutions, by Gager in using radium, and by Zederbauer on *Capsella* by climatic changes. The different mutants of *Oenothera* secured in Amsterdam and New York are explained by the statement that "*latency* and *recessivity* of any character may be more or less influenced by the conditions attendant upon the hybridization." The abstract ends with a discussion of the permanency of acquired characters. Not all "environic effects induced in the laboratory or by transplantation are heritable, although these may be carried over for two or three generations: and no satisfactory basis has yet been found upon which it might be predicted that any effect would be ephemeral or permanent."

Speaking of color photography in botanical work, Franics Ramaley (*Science*, February 17) recommends that botanists "make use of the new color photography especially in studies of ecology and plant breeding. Many features of vegetation are brought out much more clearly than by ordinary photography. Thus, a moor with scattered shrubs or a lake-margin surrounded with belts of different plants can be well shown. In plant-breeding experiments the appearance of the different hybrids and extracted forms can be reproduced with much faithfulness. Colored plates from books are easily reproduced upon lantern slides. The exposure required is about 200 times that for an extra rapid isochromatic plate. Hence no 'snap shots' can be taken, but if the light is good there need be no difficulty in securing good results. Development can be carried out in an ordinary dark room. The solutions used are inexpensive and easily prepared."

The August (1910) issue of the *Popular Science Monthly* contains an article on the rôle of selection in plant breeding. Another on the rôle of hybridization follows it for October. Deprecating the lack of discrimination in a public, with a "reputation for always looking for the dollar sign," the writer wonders that horticultural novelties of limited use and small importance are received with loud acclaim, when new agricultural productions of great economic value are almost unnoted. As an example of the latter class a ten per cent. increase in yield in corn might be given—an increase which would add $100,000,000 yearly to the wealth of the nation.

The discussion of selection and hybridization are well illustrated with photographs—chiefly corn and tobacco. The lack of proper credit mentioned above is probably due to insufficient knowledge concerning these two methods; ignorance which these articles are well adapted to destroy, with regard to range in variation, technique, the difficulties to be overcome, their relation to the natural method of flower pollination, the evils of inbreeding, and the interpretation of results in the newer phraseology—such as Mendel's law.

Cereal cropping and soil sterilization (*Science*, February 10) are discussed by H. L. Bolley of the North Dakota Agricultural College. He mentions (1) the large yields of high quality on new soils, (2) the deterioration in amount and quality that soon sets in, (3) that neither the exhaustion theory nor the toxin theory can satisfactorily account for the failure of such virgin soils to produce the earlier characteristic yields, (4) the improvement in such soils due to soil sterilization, (5) the difference in conclusions reached by the Rothamsted workers and by Mr. Bolley; the injurious effect (after soil sterilization) upon the first growth of the (wheat) seedlings is thought to be due to fungi, parasitic upon the wheat itself rather than in the soils—fungi which with soil fungi account for the deterioration of wheat and other cereal crops, instead of protozoa affecting the ammonia-making bacteria as claimed by the Rothamsted workers.

In a paper read before Section G at Minneapolis Mr. Bolley describes several genera of imperfect fungi responsible for cereal crop deterioration (*Science*, February 17). The fact that quack-grass is a common host for most of these is thought to account for the destructive influence attributed to that plant.

The January *Plant World*, which by the way is appearing in a much more attractive cover, contains an article by Professor F. E. Lloyd on the behavior of tannin in persimmons. Recently several scientific papers have printed short articles on tannin, or have referred to problems connected with the presence of tannin in plant tissues. Professor Lloyd does not consider this paper his final word on the subject; nevertheless among his conclusions are: (1) the colloid character of tannin, (2) the cause of its insolubility (intimate and complete association with a second carrier, also a colloid), and (3) the absence of intercellular tannin in normal tissue.

Under "Some Useful Plants of Mexico" Dean Rusby describes (*Journal of New York Botanical Garden*, January, 1911) a large number of interesting plants of economic value in Mexico.

The Hawaii Agricultural Experiment Station calls attention to the perennial character and the vegetative propagation of the cotton plants grown there—older plants yielding sometimes a hundred cuttings each. The continuous growing season makes it possible to regulate the harvest time by judicious pruning—a great commercial gain.

Under "Soil Productivity" (*Science*, February 10) T. C. Chamberlin discusses (1) the early origin of soils and of soil vegetation; (2) the sources, wasting, and mixing of soils, the direct relation between film-water and productivity; (3) the great relative contact of soil air and the special advantage of its action; (4) the minute forms of plant and animal life which themselves more or less parasitic or predatory on each other modify the inorganic activities, and the fact that the "productivity of soils is measured more by the efficiency of its complex of activities than by any mere measure of its inorganic constituents"; (5) the importance of the capillary cycle in maintaining the supply of potash and phosphorus in the soils, and the selective action of certain soils in concentrating potash and phosphorus surfaceward; (6) that the capillary cycle and the plant cycle contribute to a potash and phosphorus cycle, and that "it is not, in the main, the *material substance* of the soil that is needed for food, but the *energy* locked up in grains, fruits, etc.," and therefore that the return of plants or their products to the soil is a most effective mode of maintaining soil productivity; (7) and that, despite alarming reports to the contrary, the lands most densely inhabited and intensely cultivated—at home and abroad—do, unit for unit, show an increase in productivity.

In answer to this Professor Cyril G. Hopkins has written a lengthy answer (*Science*, March 17) quoting the experiments at the Illinois State College and Rothamsted. At the latter place in a four-year rotation, including always a legume crop, "the yield of turnips decreased from 10 tons in 1848 to less than 1 ton per acre as an average for the last 20 years; that the barley decreased from 46 bushels in 1849 to 14 bushels as an average for the last 20 years; that the clover has decreased from 2.8 tons per acre in 1850 to less than one half-ton average since 1890; and that the wheat produced 30 bushels in 1851, and 33 bushels average during the next 12 years, but only 24 bushels since 1890, and 20 bushels per acre since 1900.

"As an average of the last twenty years the value of the four crops on the unfertilized land at Rothamsted is $33.83 (from four acres), but where the same crops were grown on adjoining land to which mineral plant food had been applied the average value is \$76.83, the increase being 140 per cent. above the cost of the minerals."

Professor Hopkins therefore questions encouraging the Whitney "doctrine" that it is never necessary at any time to introduce fertilizing material into any soil for the purpose of increasing the amount of plant food in that soil.

NEWS ITEMS

At the University of Chicago the following promotions have been made in the department of botany: C. J. Chamberlin from assistant to associate professor; H. C. Cowles from assistant to associate professor; W. J. G. Land from instructor to assistant professor; and William Crocker from instructor to assistant professor.

Mr. E. L. Morris, curator of natural sciences at the Brooklyn Institute Museum, has been appointed acting curator-in-chief to fill the vacancy occasioned by Dr. F. A. Lucas's resignation. Dr. Lucas has been appointed director of the American Museum of Natural History, New York.

The University of Michigan's announcement for the summer session of its Biological Station includes several courses in botany under Dr. H. A. Gleason. The Station will be located in a tract stretching from Douglas to Burt Lakes, Cheboygan Co., Michigan. The session will extend from July 3 to August 25.

Mr. Carl Sherman Hoar has been appointed as an assistant in botany at Harvard University, and the following have been appointed Austin teaching fellows for 1911–1912: R. H. Colley, A. J. Eames, and E. W. Sinnott.

We learn from *Science* (June 9) that a party from the University of Nebraska will spend the time from June 15 to September 15 in making an ecological survey of the central and western parts of the state. Recording instruments will be set up at intervals and a particular study of the ecology of the sandhills will be undertaken. The party includes R. H. Wolcott, F. H. Shoemaker, R. J. Pool, and C. V. Williams.

Cyrus Guernsy Pringle, for many years a collector for the American Museum and Harvard University, died May 15 at Burlington, Vt. Professor Pringle, who was seventy-three years old, made very extensive collections in Mexico and in parts of New England. In 1906 he received an honorary degree of Doctor of Science from the University of Vermont at which institution he was curator of the herbarium.

According to the *Evening Post* (June 10) Professor D. W. Johnson, of Harvard, will undertake a survey of the Atlantic coast. Special efforts will be made to determine the recently much-discussed question of coastal subsidence. Work will be carried on from Newfoundland to Florida.

From the same source we learn that Professor C. S. Sargent has been elected an honorary member of the Société Nationale d'Acclimation de France and of the Royal Irish Academy.

Professor R. A. Harper, of the University of Wisconsin, visited the Brooklyn Botanic Garden on June 4.

Alfred S. Goodale (Amherst, '98) has been appointed professor of botany at Amherst College.

On Saturday afternoon, May 13, the grounds of the Brooklyn Botanic Garden were opened to the public for the first time. Of the ten sections that will ultimately comprise the Garden's out-door collections, three are already established, at least in part. They consist of a Morphological Section, illustrating the forms and structures of plants; an Economic Section, including our common vegetables, medicinal plants, condiments, and fibers; and a Local Flora Section. The latter is an attempt to grow as many of our native wild plants as it is possible to get established under cultivation, and includes an artificial bog for the growing of plants requiring such an environment.

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 submitting manuscript.

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OTHER PUBLICATIONS

OF THE

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(1) BULLETIN

A monthly journal devoted to general botany, established 1870. Vol. 37 published in 1910, contained 630 pages of text and 36 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 24–37 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. 28–37 three dollars each.

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

(2) MEMOIRS

The MEMOIRS, established 1889, are published at irregular intervals. Volumes 1–13 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

Vol. 11 July, 1911 No. 7

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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Published for the Club
At 41 North Queen Street, Lancaster, Pa.
by The New Era Printing Company
[Entered at the Post Office at Lancaster, Pa., as second-class matter.]

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NORMAN TAYLOR

Central Museum,

Eastern Parkway, Brooklyn, N. Y.

TORREYA

July, 1911

Vol. 11 No. 7

HERBARIUM SUGGESTIONS

By Edward L. Morris

This article is presented not with the idea of establishing anything specially new to those interested in herbarium work and equipment, but with the hope that the solutions suggested will answer some of the problems which many of us have run across from time to time.

Nearly everyone who has consulted American herbaria has noticed the enormous pigeon hole boards, indicating the contents of the herbarium, usually arranged by families. These large boards, if made of the size of the pigeon hole and hanging from the top of a full package, are awkward, unsightly, and have the disadvantage of being heavy, if made strong enough to stand wear and tear. We have also witnessed the other extreme, in some herbaria, by finding nothing whatever to indicate the contents of this or that tier of spaces in the cases; or, if such indication were fastened on the outside of the case, experience has often taught us that the location of such signs has not kept progress with the growth and redistribution of the covers in the series of pigeon holes.

Figure 1 indicates a very mild form of overhanging tags to show the location and sequence of plant families. The main difficulty is the readiness with which these tags are torn off, if fastened, or drop out, if merely slipped into the first genus cover. Uniformity is highly desirable, and when a system of family boards is once installed, the space alloted to such installation will remain constant.

Figure 2 is submitted with the suggestion that each family board takes little space, is of light weight and, in the use of the

[No. 6, Vol. II, of Torreya, composing pp. 125–144 was issued 19 June 1911.]

storage case, is sufficiently readable to meet any demand. The entire series of class, order, and family names has been printed on

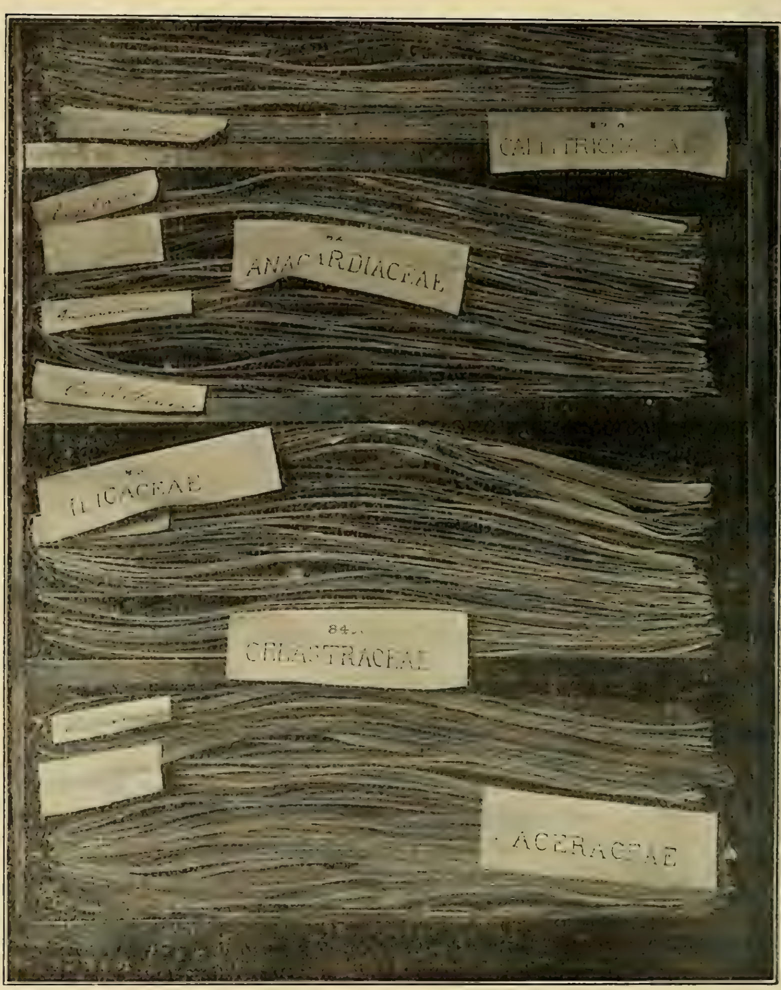

FIG. 1. Old style of Order and Family tabs.
Courtesy of Central Museum of the Brooklyn Institute of Arts and Sciences.

large sheets, so spaced that with the ordinary form of "compo board" the printing occupies the proper space on the edge of a $16\frac{1}{2} \times 11\frac{1}{2}$ inch sheet of compo board. Experience with us has shown that only the utmost carelessness on the part of a visiting student will result in the displacing of one of these boards from its proper location at the beginning of a family.

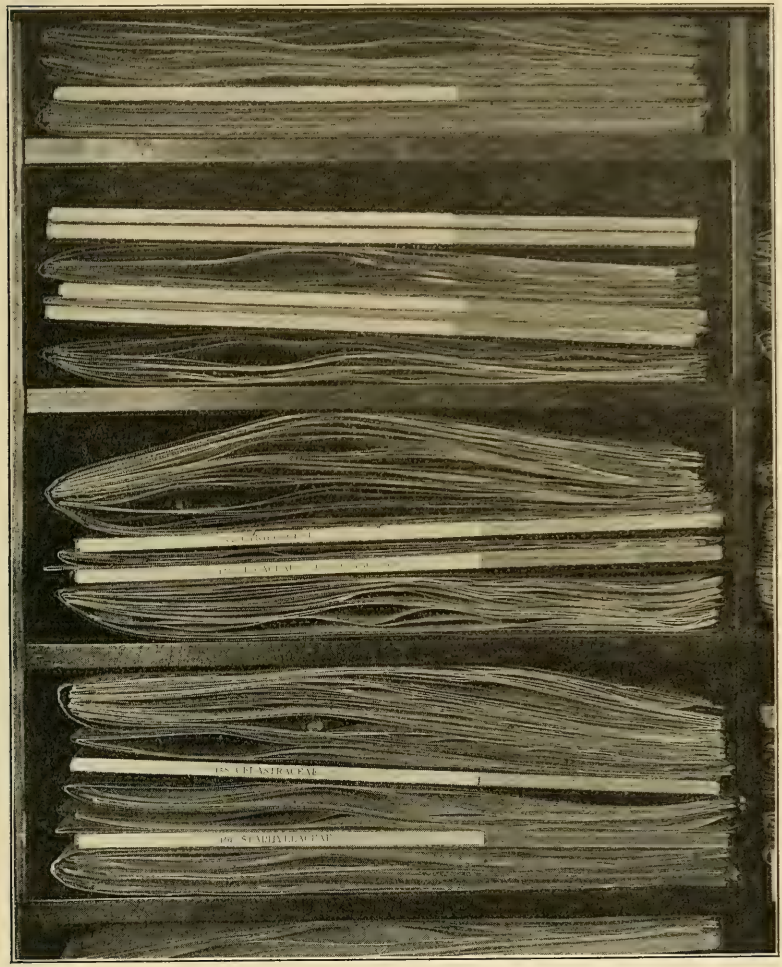

FIG. 2. Uniform Order and Family Boards.
Courtesy of Central Museum of the Brooklyn Institute of Arts and Sciences.

Under the old system of large hanging signs, if several families consisting of only a few species, appear in the same pigeon hole their names must be presented in series on one end board, or on a sufficient number of tags to require their being placed in alternating positions. The compo board sheets, as suggested in

3672. LUPINUS

[**Tournefort** ex L., Syst. ed. 1 (1735).]
Linnaeus, Sp. Pl. ed. 1 (1753). 721.

Catalog card, reduced from the regular 75×125 mm. size.

3672. LUPINUS

[**Tournefort** ex L., Syst. ed. 1 (1735).]
Linnaeus, Sp. Pl. ed. 1 (1753). 721.

FIG. 3. Genus cover slip, reduced from 75×125 mm.
Courtesy of Central Museum of the Brooklyn Institute of Arts and Sciences.

Figure 2, will give all the family names in one vertical arrangement.

Genus covers are often entered in so many handwritings that their records are confusing, or at least trying. Uniform cards, arranged alphabetically in a catalog, give ready reference by the sequence number to the sequence itself in the proper family, that number and genus name being readily seen and recognized if the genus label is placed at the lower left hand corner.

Figure 3 is presented with sample reprints of a legible and durable catalog card and its genus cover slip duplicate. The mere matter of the card being printed at the top, and the slip being printed at the bottom, for more ready reference in their respective places, is but a matter of slight ingenuity on the part of any capable printer in adjusting two sets of guides on his platen so that both sets may be printed without removing the locked form from the press. The difference in thickness of card and slip is, of course, obviated by the proper make-ready on the platen. It often happens that herbaria, even those of a private nature, specialize in some local range or limitation. The ordinary buff genus cover does not require any discussion. Local species may be well distinguished from those of more general range by placing them in a genus cover of different color which may be placed immediately above the regulation buff one. "Red rope paper" is suggested as durable and suitable for such local indication and will wear as well as the ordinary buff tag board.

The writer will be very glad, through the generosity of the Central Museum of the Brooklyn Institute of Arts and Sciences, to furnish sample copies of the family lists, and representative genus cards and slips to those who have the intention of incorporating such a system for the more convenient use of their herbaria.

Central Museum of The Brooklyn Institute of Arts and Sciences,
Brooklyn, N. Y.

A RARE AND LITTLE-KNOWN PUBLICATION

By Arthur Hollick

About sixty years ago a monthly publication was issued under the title "The People's Medical Journal and Home Doctor," edited by Frederick Hollick, M.D., and published by T. W. Strong, 98 Nassau St., New York.

Volume I, Nos. 1–12, includes the period from July, 1853, to June, 1854. Volume II, Nos. 1–6, from July to December, 1854, when it terminated. A complete series is in my possession, and I have never seen, elsewhere, even a single copy of any one of the numbers.

The contents cover rather a wide range of subjects; many statements of fact are curiously at variance with our present knowledge, and much of the diction appears quaint and at times crude, according to our modern ideas of style and expression. Doubtless, however, it was classed as a reliable popular scientific journal at the time of its publication, and it probably reflected, more or less accurately, the popular ideas and scientific conceptions then prevalent on the subjects treated.

Among these subjects are many relating to botany. One series of articles is included under the title "Medical Botany of the United States," illustrated by a number of woodcuts of medicinal plants, with the scientific and popular names under which they were then known. The species figured are *Hepatica Hepatica*, *Hydrastis canadensis*, *Ranunculus acris*, *Coptis trifolia*, *Cimicifuga racemosa*, *Magnolia virginiana*, *Berberis vulgaris*, *Caulophyllum thalictroides*, *Podophyllum peltatum*, *Papaver somniferum*, *Sanguinaria canadensis* and *Eupatorium perfoliatum*. Their recognized and traditional properties and uses are described, and some of the remarks are interesting, when read in the light of what we have learned during the last half century. In connection with *Berberis*, for example, is the statement that "many people suppose that the pollen, or dust of the flowers, will cause *rust* in wheat, but the most careful experiments have proved this notion to be entirely without foundation." The alleged use by the Indians of so many different plants is commented upon as follows: "We would here ask how it is that the Indians were supposed to have so much experimental knowledge of medicinal plants . . . if they really found out all that is attributed to them they must have been tolerably well afflicted and for a long time. The fact is these "*Indian Remedies*" are, for the most part, gross humbugs, and were never known until the white men compounded them."

Other series of articles are entitled "The Natural History of Perfumes and Flowers," and "Chapters on the Physiology of the Origin of Life." From the latter we learn that "the vegetable kingdom is divided by the philosophical botanist into two great classes, the *cellulares* and the *vasculares;* the former containing the lowest, and therefore the least complicated forms . . . some orders of *algae*, the *Desmidae* and *Diatomaceae*, for example, are equally claimed by the botanist and the zoologist, so uncertain is it to which department of science they truly belong."

In describing the systematic position of plants both the natural and the Linnaean systems of classification are used, as for example: "ANISUM. *Pimpinella anisum.* Anise. Belongs to the natural family *Umbelliferae* and to the Linnaean class and order *Pentandria Digynia.*"

"ANTHEMIS. *Anthemis nobilis.* Chamomile. Belongs to the natural family *Compositae* and to the Linnaean class and order *Syngenesia Superflua.*"

There are also directions for growing "simples" and how to prepare various lotions, emulsions, salves, tinctures, etc., from them.

In his farewell editorial the editor says that "he finds it utterly impossible, once a month, to prepare the matter for a No. of the Journal . . . he cannot bestow that attention upon his task which it requires, and assistance of the right kind cannot be procured . . . in addition to the above reason, we also find that a monthly issue is liable to many irregularities . . . our subscribers mostly receive their Nos. by post, or rather *should do so* . . . but a large portion of them never reach their destination and have to be sent again, sometimes two or three times over.

The trouble and loss which is thus experienced is incalculable, and only becomes greater as our subscribers increase." From which we infer that the scientific and business trials and tribulations of an editor were similar then to those of today.

New York Botanical Garden

SHORTER NOTES

Opuntia Tracyi sp. nov.—Low, diffusely much branched, pale green, about 2 dm. high or less. Older joints oblong to linear-oblong, flat, 6–8 cm. long, 1.5–2.5 cm. wide, about 1 cm. thick; young joints scarcely flattened or terete, 1 cm. thick; areoles elevated, 5–10 mm. apart; spines 1–4, acicular, light gray with darker tips, 3.5 cm. long or less; glochides numerous, brownish; corolla pure yellow, 4 cm. broad; ovary 1.5 cm. long, bearing a few triangular acute scales similar to the outermost sepals, which are 2 mm. long; sepals triangular-ovate, 5–15 mm. long, the outer green, the inner yellowish with a green blotch; petals obovate, apiculate, 2–2.5 cm. long; filaments light yellow, 1 cm. long, anthers white.

In sandy soil near the coast, Biloxi, Mississippi, *S. M. Tracy*, May, 1911; flowered at New York Botanical Garden May 12–13, 1911 (*33786*, type). The plant was collected some years ago by Mr. C. L. Pollard near the same locality (*1139*) and distributed as *O. Pes-corvi* LeConte, which differs in having larger flowers, longer and wider joints and stouter, dark brown spines.

N. L. Britton.

FIELD MEETINGS FOR JULY AND AUGUST

The field committee announce the following field meetings from July 22–August 26 inclusive. The work of the committee would be greatly facilitated if those able and willing to act as guides would send their names to the chairman. Kindly state the days you could serve, whether whole- or half-day trips, and the localities with which you are familiar.

July 22. Wakefield, N. Y. Meet at Grand Central Station, 1:15 P. M. Meet guide, Mr. R. S. Williams, at Wakefield Station.

July 29. Springfield, L. I. Meet at Long Island Ferry, 34th St., 9 A. M. Guide, Mr. F. J. Seaver.

August 5. Mosholu, N. Y. City. Meet at 155th Station Elevated R. R., 1 P. M. Guide, Dr. William Mansfield.

August 12. New Baltimore and Coxsackie, N. Y. Meet at New Baltimore Hotel, 9 A. M., August 12. Fare, $5.00. Hotel rates, $2.00 per day. Guide, Dr. E. B. Southwick.

August 19. Pelham Bay Beach. Meet at Bartow Station, Pelham Bay Park, 1 P. M. Guide, Dr. M. A. Howe.

August 26. Moonachie, N. J. Meet at Rutherford Trolley, Hoboken, 1 P. M. Guide, Mr. G. V. Nash.

E. B. Southwick, *Chairman.*

The Arsenal, Central Park,
N. Y. City.

PROCEEDINGS OF THE CLUB

April 11, 1911

The meeting of April 11, 1911, was held at the American Museum of Natural History at 8:15 P.M. Dr. E. B. Southwick presided. Thirty-two persons were present.

The regular order of business was dispensed with and the announced lecture of the evening on "Poisonous Mushrooms," by Dr. W. A. Murrill, was then presented. The lecture was illustrated with many lantern slides. An abstract of the lecture prepared by the speaker follows. A more complete discussion of the subject by Dr. Murrill may be found in the November number of Mycologia for 1910.

"Considering its importance, it is remarkable how little is really known about this subject, most of the literature centering about two species, *Amanita muscaria* and *Amanita phalloides*, which have been the chief causes of death from mushroom eating the world over.

"As the use of mushrooms in this country for food becomes more general, the practical importance of this subject will be vastly increased, and it may be possible to discover perfect antidotes or methods of treatment which will largely overcome the effects of deadly species. This would be a great boon even at the present time, and there will always be children and ignorant persons to rescue from the results of their mistakes. Another very interesting field, both theoretical and practical in its scope, is the use of these poisons in minute quantities as medicines, as has been done with so many of the substances extracted from poisonous species of flowering plants, and even from the rattlesnakes and other animals. Thus far, only one of them, the alkaloid muscarine, has been so used.

"The poisons found in flowering plants belong chiefly to two classes of substances, known as alkaloids and glucosides. The former are rather stable and well known bases, such as aconitine from aconite, atropine from belladonna, nicotine from tobacco, and morphine from the poppy plant. Glucosides, on the other hand, are sugar derivatives of complex, unstable, and often unknown composition, such as the active poisons in digitalis, hellebore, wistaria, and several other plants.

"The more important poisons of mushrooms also belong to two similar classes, one represented by the alkaloid muscarine, so evident in *Amanita muscaria*, and the other by the deadly principle in *Amanita phalloides*, which is known mainly through its effects. Besides these, there are various minor poisons, usually manifesting themselves to the taste or smell, that cause local irritation and more or less derangement of the system, depending upon the health and peculiarities of the individual.

"The principal species of poisonous fungi were illustrated by colored lantern slides, the series containing *Amanita cothurnata* Atk., *Amanita muscaria* L., *Amanita phalloides* Fries, *Amanita strobiliformis* Vittad., *Clitocybe illudens* Schw., *Inocybe infide* Peck, *Panus stypticus* Fries, *Russula emetica* Fries, and several other poisonous species of interest."

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

April 26, 1911

The meeting of April 26, 1911, was held in the museum building of the New York Botanical Garden at 3:30 P.M. Vice-president Barnhart presided. Twelve persons were present.

The minutes of the meetings of March 29 and April 11 were read and approved.

The first number on the announced scientific program was a paper on "Fern Collecting in Cuba," by Mrs. N. L. Britton. This paper is published in full in the *American Fern Journal*, Vol. I, p. 75.

The next number was a discussion of "Fern Venation," by Miss Margaret Slossen. A more complete discussion of the subject by Miss Slossen may be found in her book "How Ferns Grow."

The meeting then adjourned to the Fern House of the New York Botanical Garden under the guidance of Mrs. N. L. Britton for a further study of ferns.

B. O. DODGE, *Secretary.*

REVIEWS

Hunter's Essentials of Biology and Sharpe's Laboratory Manual in Biology

Essentials of Biology* is the title of a new and fuller book by George William Hunter, designed also apparently to fit the New York City syllabus. It is accompanied by Richard W. Sharpe's Laboratory Manual in Biology.†

Hunter's volume is a great improvement over his earlier book in content, illustration, and correlation of the three subjects, botany, zoölogy and physiology. The problem idea which runs throughout is a good one, but all the subject matter does not lead itself readily to this arrangement (*e. g.*, the patent medicine discussion). Fertilization is not really explained by the text (p. 36) and alternation of generations as treated under mosses can mean nothing until after the following chapter on ferns has been completed. There are also a few misleading statements, such as the storing of proteids for future use (p. 345), the implied "osmosis of starch" (p. 106, p. 356) and that plants absorb only useful substances (p. 32). These graded reference lists are helpful, and the varied illustrations add much to the value of the book.

* Hunter, George William. Essentials of Biology Presented in Problems. Pp. 448. American Book Company. 1911.

† Sharpe, Richard W. A Laboratory Manual for the Solution of Problems in Biology. Pp. 352. American Book Company. 1911.

The manual is most attractively spaced; and unusually well-illustrated for a laboratory manual. The questions and special reports are varied and interesting. Some of the questions (*e. g.*, on nutrition) seem too difficult; as do one or two of the graphic charts; and ray flowers and petals are confused (p. 31). Some good tables, directions, etc., are included; the clay-pipe charcoal experiment is one of several neat devices.

These books ought to do much to secure sufficient uniformity of treatment of the "syllabus" to enable New York City teachers to estimate its real value. They must also prove a great help to many of the present uncertain interpreters of it and of "nature" and should lead to great improvement in the content and presentation of first-year biology.

JEAN BROADHURST.

OF INTEREST TO TEACHERS*

Professor E. L. Thorndike discusses methods of testing the results of the teaching of science (*School Science and Mathematics*, April). It contains much that is helpful to biology teachers in estimating the results obtained, but only the definite suggestions are quoted here.

"The topic which I am to discuss is one of enormous complexity. The changes in human beings which result from the teaching of science in schools are real, are measurable, and will some day be defined in units of amount as we now define changes in the rate of a moving body or in the density of a gas. But they include thousands of different elements; they vary with every individual; some of them can be demonstrated only long after school is completed; and at present units and scales in which to state changes in knowledge, power, interests, habits and ideals are mostly matters of faith. An adequate measurement of the changes wrought in one class by one course in physics would be a task comparable to a geological survey of a state or an analysis of all the materials in this building."

* Conducted by Miss Jean Broadhurst, Teachers College, Columbia University, N. Y. City.

Professor Thorndike's suggestions fall "into two divisions according as one searches for means of measuring the specific information, skill, interests, and habits added by courses in science, or the more general changes in total mental make-up—in, for instance, open-mindedness, accuracy, zest for verification and the like.

"The specific changes are, of course, the easier to measure. Indeed, my first suggestion is that we make scientific use of the measurements that we already make. For example, the regular school examinations are, or should be, careful scientific measures of important changes in our pupils. If we would test our classes with the examinations set by other teachers, have the pupils' work graded by other teachers, and print questions, work and grades, we should be making a start toward a real measurement of educational achievement. If examinations are worth giving at all, they are worth giving, at least occasionally, in such a way as to measure not only how well a pupil has satisfied some particular person, but also what he really is or knows or can do in certain special fields.

"We need thousands of significant questions, in each science, thousands of 'originals' in physics, chemistry and biology like the originals of geometry; and above all we need to have thousands of classes tested by outside examiners; for if an examination, instead of being a hasty, subjective selection of questions, graded still more personally (and alas, how hastily), were made a serious educational measurement, the examination papers of a year would alone give us a large start toward knowledge of what science teaching actually does.

"Knowledge may, however, be measured more conveniently than by the examination of notebooks, essays, or replies to questions of the ordinary sort. These have the merit of adequacy and richness, but the defects of measuring too many things at once and too indefinitely. Greater uniformity in the use of the test, quickness in scoring it, and freedom from ambiguity in the numerical value assigned can be secured by the exercise of enough ingenuity. I will mention two tests as samples of the many that are possible. The first is an adaptation of a test, devised by Ebbinghaus to measure mental efficiency in general, in filling in words omitted from a passage. From even the hastily devised sample presented here it will be seen that this form of test is scored with reasonable ease. The speed of an individual in selecting words to fill the gaps and the appropriateness of his selections together measure his knowledge. The former is scored with no effort at all and the latter with far less effort than is required to evaluate answers to questions, essays or experimental work. The paragraphs and omissions therefrom should be arranged with care and improved after trial, but it may be of interest to some of you to compare the ratings obtained in six or eight tests of five minutes each like the following:

"A body changing its position in space moves in a certain ....at a certain .... A..............in the ....called acceleration. To change either the ....or the......................of a moving ....requires...... Suppose a pound of lead to be held at rest 500 feet above the surface of the ocean by a string to be cut. The body will..................toward the and etc.

"The second is a very simple development of so-called association tests which I have used with good success in regular examinations in psychology for a number of years. It needs no explanation other than a sample.

"Write after each of these words some fact which it suggests to you.

acceleration	gravity	current	lever
density	expansion	elastic	inclined"

"This test may be modified by selecting given words much less easily provocative of thoughts about facts of science, and being mixed, if necessary, with words that would call up facts of science only in a person absorbed by scientific interests.' Of course if 'such association tests are to be used to measure interest, they should not be used previously in the form calling definitely for facts about science.' These tests of interest may be used to measure both special interest in particular sciences and general interests, as in fact rather than fiction, knowledge rather than opinion, or verification rather than dispute.

"Of course means of measuring the general changes wrought by the study of science I will mention only two. The first concerns the power to utilize experience well in thought.

"What is needed for this purpose is a series of problems or tasks, relative success with which depends as much as possible upon having power to use experience and as little as possible upon having had certain particular experiences. For example, relative success with the problem, "Which is heavier, a pint of cream or a pint of milk?" is determined largely by ability to select in thought the essential fact that cream rises and to infer its obvious consequence. The data themselves are possessed adequately by all, or nearly all, pupils alike.

"To get such problems we wrote some time ago to one hundred teachers of science, half in universities and colleges, and half in secondary schools. I quote some of them:

"Rain drops are coming straight down. Will a car standing still or one moving rapidly receive in one minute the greater number of drops on its roof and sides?

"Since it is possible, for a person to float in water why is it possible for him to sink?

"A cylinder and a cone equal in base and in altitude rest on a plane surface. Which is harder to tip over?

"A magnet attracts two iron nails. If the magnet is removed will the nails attract each other?

"Does an iron ball weigh more when it is hot than when it is cold?

"If a bottle of gas which is lighter than air be placed with its open mouth upward, will the gas escape from the bottle or will the heavier air press the gas back into the bottle?

"Will a ship that will just barely float in the ocean, float on Lake Erie?

"Will a pound of popcorn gain or lose weight or stay the same after it has been popped?

"The second means of measuring changes in general power to think is an adaptation of one devised by Professor R. S. Woodworth, in which the pupil picks out from such a series as that below, the statements that are logically absurd, not possibly true. It will be seen that statements could be chosen which would test the power of analysis and of thinking things together in any field of science from the most specialized to the most universal. Following is an example of this form of test.

"Put a mark in the margin opposite each of the following sentences which is absurd:

"Though armed only with his little dagger, he brought down his assailant with a single shot.

"Silently the assembly listened to the orator addressing them.

"While walking backwards he struck his forehead against a wall and was insensible.

"I saw his boat cleaving the water like a swan.

"With his sword he pierced his adversary, who fell dead.

"The storm which began yesterday morning has continued without intermission for three days.

"That day we saw several ice-bergs which had been entirely mèlted by the warmth of the Gulf Stream.

"Our horse grew so tired that finally we were compelled to walk up all the hills.

"Many a sailor has returned from a long voyage to find his home deserted and his wife a widow.

"The two towns were separated only by a narrow stream which was frozen over all winter.

"The great advantage of these means of measuring intellectual ability lies in their rapidity and objectivity. If well devised, only two answers are possible, the pupil is measured easily, rapidly, and independently of subjective factors, and his condition is defined in terms of a simple numerical value.

"There is no time for me to discuss methods of making, recording and utilizing these or the hundreds of other equally worthy measurements of educational achievement, that is, of changes produced or prevented in human nature. Nor is this a proper occasion to outline the precautions that are required by the complexity and variability of facts of intellect and character and the absence of well-defined scales with equal units and known zero points, in which to measure facts of intellect and character. For our present purpose it is enough to know that, in spite of difficulties, the measurements can be made, and that a man of science can, if he will, be as scientific in thinking about human beings and their control by education, as in thinking about any fact of nature."

THE BEST METHODS OF TEACHING BOTANY TO SCHOOL STUDENTS*

It would seem that the title of the present address should read The Method of Teaching Botany, since I should argue that there is only one method deserving mention, namely the experimental. Perhaps I should say that I do not underestimate the value of purely observational processes; but unless these lead up to some sort of experimental trial or test it would seem that such method is inadequate in scientific education. Students of agriculture are concerned chiefly with the behavior of plants rather than with the form of plants. One can scarcely imagine circumstances under which a farmer would find it necessary to describe in technical language the form of a leaf or the structure of a flower. The important thing for him is to know what the functions of the various parts are and how they behave. If he knows this, he may then go further if he will. The inference from this is that our education should aim at cultivating the habit of mind which looks for the exact behavior of plants and is able to sift out the causes of variation in behavior. In the brief time at my disposal, I can do no more than to point out some fundamental ideas underlying the successful application of the method of experimentation.

In the first place, the proper attitude of mind in the teacher is most essential. He must have constantly before his mind the fact that plants are living organisms. To be sure they do not move as do animals and we therefore are sometimes slow to regard them as being as much alive as animals are; and one of the practical difficulties in education is to get our pupils to realize this. If plants are living, then the idea of change constitutes

* From an article by Professor F. E. Lloyd in a report on Agricultural and Industrial Education, Department of Agriculture, Montgomery, Alabama.

the key-note of our thought about them. It is the purpose of experiment to determine how these changes are related to changes in the environment, how the organism adapts itself into the circumstances surrounding it. A science which has to do with such phenomena should be vividly alive itself; its methods should be plastic and should not be hampered by custom or habit. The essential point is to get at the truth, and the way to get at the truth is to observe carefully what goes on in nature, realizing all the time that organic nature is nothing but a complex experiment, or to observe by means of special experiment, consciously undertaken. . . .

Teachers are very frequently overawed by what they assume to be the difficulty of conducting experiments. They very easily give way to fear that it involves too much apparatus and it is assumed too frequently that experimentation involves large expenditures of money for apparatus. Aside, however, from exceedingly abstruse work, a vast amount of good experimentation can be done with very little apparatus, if indeed we may call it that at all. The simplest means frequently answer the purpose as well as elaborate apparatus.

The feeling is frequently entertained also that experimentation is too complex for a young student, that it is altogether too difficult and that therefore the work of young pupils must be confined to pure observation. The answer to this is obvious. The real difficulty of science lies not in the method by which knowledge is gained but by the complexity of materials with which it happens to deal. A successful teacher in this regard is one who can skillfully select the materials and subjects for experimental work. In fact, scientific workers are constantly on the out-look for favorable material, as it is called, that is to say, material which gives the desired result with the greatest ease. For example, we choose the grain of Indian corn for work with pupils because it is large and because the young plant is easily studied for the same reason. We might get the same facts by studying the germination of millet but this would entail the use of a magnifying glass or even a microscope while Indian corn may be studied equally well with the naked eye. If on the other hand, we are studying the behavior of a plant toward the light, we choose one which responds readily and grows quickly. Here millet would perhaps be better than Indian corn. . . . Knowledge is to us real in precise proportion to our actual contact with the things themselves. The most vivid ideas about plants are gained by experimenting with the plants themselves; not even reading a full account of an experiment will take the place of doing it, however successful or unsuccessful that may be. The teacher can always rest upon one certainty, namely that the experiment always tell the truth. To be sure, it may not come out as we expect, but it comes out exactly as it should. Our business is to know what the conditions are and we find this out sometimes only by means of a so-called insuccessful experiment.

The result of this kind of teaching cannot be over-estimated. An agricultural class made up of thoughtful farmers who are willing to experiment for themselves would mean a very great advance in mental development and in material prosperity. This is one of the great aims of agricultural education, namely to cultivate a critical and inquiring frame of mind. We hardly say too much when we declare that success in this direction will be a measure of the amount and the character of experimental work that is done in our schools.

NEWS ITEMS.

Robert A. Harper, Ph.D., now professor of botany in the University of Wisconsin, is to become Torrey professor of botany at Columbia University; succeeding the late Lucien M. Underwood. He was graduated from Oberlin College in 1886, received the degree of Ph.D. at Bonn in 1896, and after service in Gates College, and secondary schools, became in 1891 professor in Lake Forest University. In 1898 he went to the University of Wisconsion.

Dr. John W. Harshberger, assistant professor of botany at the University of Pennsylvania, whose monumental work on the plant geography of North America has just appeared, has been advanced to professor of botany.

The announcement is out for the Bradley Bibliography of woody plants issued by the Arnold Arboretum. The work is a "guide to the literature of woody plants, including books and articles in the proceedings of learned societies, and in scientific and popular journals, published in all languages to the end of the nineteenth century." The completed work is in five volumes, the first of which will appear in July, and the succeeding volumes as rapidly as possible.

Professor W. R. Dudley of Leland Stanford University died June 4 at the age of 62. Professor Dudley was born at Guilford, Conn., studied at Cornell, Strasburg and Berlin, and was appointed professor of botany at Stanford in 1893. He was specially interested in the plants of central California in relation to distribution and descent, and in the forests of California.

Professor Fernald, of the Gray Herbarium, is the leader of a party consisting of Professor Wiegand, Messrs. E. B. Bartram, Bayard Long, and H. T. Darlington, which is to explore the northeast coast of Newfoundland. The party left Boston on June 30.

The Gray Herbarium of Harvard University is to have a new two-story fireproof structure, sixty feet long and thirty wide, for laboratory work. The lower floor will be devoted to systematic and geographic botany and the upper floor will house the herbarium of the New England Botanical Club. The building, together with $10,000 for equipment, is the gift of Mr. G. R. White, of Boston. Casimir de Candolle has presented a bust, by Hugues Bovy, of his father, Alphonse de Candolle, in remembrance of the friendship between his father and Asa Gray.

The Torrey Botanical Club

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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. 37 published in 1910, contained 630 pages of text and 36 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 24–37 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. 28–37 three dollars each.

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

(2) MEMOIRS

The MEMOIRS, established 1889, are published at irregular intervals. Volumes 1–13 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

MR. BERNARD O. DODGE
Columbia University
New York City

Vol. 11 August, 1911 No. 8

TORREYA

A Monthly Journal of Botanical Notes and News

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR

JOHN TORREY, 1796–1873

CONTENTS

Published for the Club
At 41 North Queen Street, Lancaster, Pa.
by The New Era Printing Company
[Entered at the Post Office at Lancaster, Pa., as second-class matter.]

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 should be addressed to

NORMAN TAYLOR

Central Museum,

Eastern Parkway, Brooklyn, N. Y.

TORREYA

August, 1911

Vol. 11 No. 8

SEED WEIGHT IN STAPHYLEA AND CLADRASTIS

By J. Arthur Harris

In an interesting paper on light and heavy seeds in cereals Waldron* concludes that in oats, plants with shorter culms, shorter heads, and a smaller number of grains per head bear on the whole grains of greater weight. Waldron's interest in the problem was that of the plant breeder, concerned in determining the results of selecting large or small seeds for planting, but they seem suggestive for the physiologist as well.

The explanation which the physiologist would at once suggest is that the competition of an abnormally large number of seeds for the available plastic material has, as a necessary result, a limitation of the size of the individual seeds. While this seems a very reasonable interpretation, one who has had experience in the actual study of such phenomena will hesitate in accepting it without further evidence. The discrimination and measurement of the individual factors underlying such functions as fertility and seed weight is an exceedingly difficult problem. As an example, take the following case. If the seeds are smaller in the larger inflorescences of Waldron's cereals because of the finer partition of the available plastic material, one would *a priori* expect that there would generally be a negative correlation between the number of fruits per inflorescence and the number of seeds which these fruits produce. So far as observations are available this is not the case.

For a series of the climbing bitter sweet, *Celastrus scandens*,† the correlations are:

* Waldron, L. R. A Suggestion regarding Heavy and Light Seed Grain. Amer. Nat. 44: 48–56. 1910.

† Ann. Rept. Mo. Bot. Gard. 20: 116–122. 1909.

[No. 7, Vol. II, of Torreya, comprising pp. 145–164, was issued 19 July 1911.]

Flowers formed per inflorescence and seeds developing per fruit,

$$r = .033 \pm .013.$$

Fruits maturing per inflorescence and seeds developing per fruit,

$$r = -.012 \pm .013.$$

For large series of *Staphylea trifolia* from the Missouri Botanical Garden the correlations have been determined both between number of fruits developing per inflorescence and number of seeds maturing per locule and between position of fruit on the inflorescence axis and number of seeds maturing per locule. The same relationships for the ovules per locule are available for comparison.* Table I. shows how slender the relationships are.

TABLE I

Character of Inflorescence	Character of Fruit	
	Seeds per Locule	Ovules per Locule
Number of fruits per inflorescence:		
General sample, 1906, 2,059 fruits..	$-.0474 \pm .0086$	$+.0391 \pm .0086$
General sample, 1908, 4,033 fruits..	$-.0494 \pm .0061$	$+.0633 \pm .0061$
General sample, 1909, 2,082 fruits..	$+.0626 \pm .0085$	$-.0539 \pm .0085$
Mean for 20 individual shrubs of 1906 series....................	$-.0399 \pm .0080$	$+.0192 \pm .0185$
Position of fruit on inflorescence:		
General sample, 1906, 2,059 fruits..	$-.0148 \pm .0086$	$-.0501 \pm .0086$
General sample, 1908, 4,033 fruits..	$-.0077 \pm .0061$	$-.0519 \pm .0061$
General sample, 1909, 2,083 fruits..	$+.0128 \pm .0085$	$-.0895 \pm .0085$
Mean for 20 individual shrubs of 1906 series....................	$-.0310 \pm .0088$	$-.0733 \pm .0177$

A comparison of these results shows how great caution should be used in discussing the factors underlying seed development, and how urgently further quantitative data are needed. The accumulation of such data necessarily proceeds slowly and the cooperation of many workers is desirable. The purpose of this

* The data upon which all these constants are based, with discussions of their significance, are to be found in three papers by the writer of this note: Further Observations on the Selective Elimination of Ovaries in *Staphylea.* Zeitschrift f. Ind. Abst- u. Vererbungslehre **5**: 173–188. 1911. Observations on the Physiology of Seed Development in *Staphylea.* Beihefte z. Bot. Centralbl. In press. The Influence of the Seed upon the Size of the Fruit in *Staphylea.* Bot. Gaz. In press.

note is to put on record the results of a couple of series of weighings which seem of interest in this connection.

The pods of the American bladder nut, *Staphylea trifolia*, are characterized by the production of few seeds. In a large series of countings it will be found that the great majority of fruits produce one or two seeds only; those with more than six are very rare. This is shown in Table II. for 4,024 fruits collected

TABLE II

Total Seeds per Fruit	Number of Fruits	Total Seeds per Fruit	Number of Fruits
0	4	8	16
1	1,585	9	9
2	1,240	10	5
3	637	11	2
4	310	12	1
5	125	13	—
6	59	14	—
7	30	15	1

from eleven shrubs in the North American Tract of the Missouri Botanical Garden in the fall of 1905. The polygon is very skew, the pronounced mode being a single seed while the frequencies fall off rapidly as the number of seeds become larger. In the collections from individual shrubs the empirical mode is sometimes on two instead of one, but the conspicuous skewness is a feature of all of the several series of *Staphylea* fruits hitherto examined. The same skewness is observed in Table III. for number of seeds per locule (of which there are three per fruit).

TABLE III

Seeds per Locule	Number of Locules	Seeds per Locule	Number of Locules
0	5,684	4	72
1	4,593	5	19
2	1,387	6	4
3	313		

I have been able to study fruits from only a single tree of the yellow wood, *Cladrastis tinctoria*, in the Arboretum of the Missouri Botanical Garden. Possibly because of its isolation, the fruiting of this individual is not typical of the species, but in the 2,128 pods examined to determine the number of seeds developing (Table IV.) one notes a skewness of distribution similar to that in *Staphylea*.

TABLE IV

Seeds per Pod	Number of Pods	Seeds per Pod	Number of Pods
1	1,423	4	25
2	560	5	4
3	116		

Now it seems of interest to determine whether (in fruits which produce on an average so few seeds and among which those producing several are very rare) the weight of the individual seeds is in any degree dependent upon the number formed in the fruit.

The seeds of *Staphylea* are particularly suited to work of this kind. They are hard, smooth and clean; seeds which have an imperfect development—so far as can be ascertained by external examination—are exceedingly rare. *Cladrastis* seeds are not so suitable for weighing. Here as in many Leguminosae ovules which have failed to mature completely are sometimes found. All apparently blighted seeds were picked out before the weighings were made and we are consequently dealing with a sample of apparently sound seeds. The discarding of these should not vitiate the results.

TABLE V

Total Seeds per Fruit	Number of Seeds Weighed	Mean Weight	Total Seeds per Fruit	Number of Seeds Weighed	Mean Weight
1	150	.05978	5	150	.05265
2	150	.05988	6	150	.05145
3	150	.05662	7	100	.05377
4	150	.05353	8	50	.04680

Table V. shows the average weight of seeds of *Staphylea* from pods with different numbers of seeds per pod. The material is that of the fall of 1905. The results here seem to show very clearly that the difference between the weight of seeds produced in pods maturing one and two seeds is not very great, but when more than this number are developed the weight of the seed materially decreases.

In *Cladrastis* the seeds were classified not merely according to the number produced in the pod, but according to their position in the pod, the positions being numbered from the proximal to the distal end. Table VI. gives the results. When only one seed is produced the mean weight is higher than when the pod contains two or more. There is no essential difference between 2- and 3-seeded pods. Within a pod containing 2–4 seeds the mean weight decreases from the proximal towards the distal position.

TABLE VI

Seeds per Pod	Position of Seed in Pod				
	1	2	3	4	All
1	($N=500$) .03385				($N=500$) .03385
2	($N=500$) .03267	($N=500$) .03134			($N=1000$) .03201
3	($N=100$) .03257	($N=100$) .03183	($N=100$) .03163		($N=300$) .03201
4	($N=22$) .03209	($N=22$) .03086	($N=22$) .03013	($N=22$) .02945	($N=88$) .03064

The weights could not be determined for the seeds individually to allow of obtaining the probable errors which are much needed where differences so slight as those given here are involved. They were weighed in groups of 25, and when these individual samples from different kinds of pods or positions are compared, the results emphasize the general trustworthiness of the conclusions drawn above.

The exact degree of interdependence between number of seeds per pod or position of the seed in the pod and seed weight cannot be determined from this series of data since the variability in seed weight is unknown.* It is evident, however, that in the absolute size of seed only very slight (although definite) differences are referable to characteristics of the pod. I think that *a priori* physiologists would have expected greater differences.

COLD SPRING HARBOR, L. I.,
July 14, 1911.

* Data for another species in which this point has been determined are now in hand.

LOCAL FLORA NOTES—IX

By Norman Taylor

Species	*Specimens wanted from*
	Rosaceae
Spiraea tomentosa L.	Anywhere on the coastal plain.
S. salicifolia L.	Anywhere in the range.*
S. alba Du Roi.	Anywhere in the range.
S. corymbosa Raf.	Known in New Jersey?
Aruncus allegheniensis Rydb.	Mountains of Pennsylvania.
Porteranthus trifoliatus (L.) Britton.	Pennsylvania and central New Jersey.
Potentilla pumila Poir.	Anywhere above 1,000 ft.
P. simplex Michx.	The region northwest of the "fall-line."
Comarum palustre L.	Anywhere in the range.
Fragaria canadensis Michx.	Mountains of Pennsylvania.
F. americana (Porter) Britton.	New Jersey.
Sibbaldiopsis tridentata (Soland.) Rydb.	Below 1,000 ft. elevation.
Dasiphora fruticosa (L.) Rydb.	The Catskills or northern New Jersey.
Drymocallis agrimonioides (Pursh) Rydb.	Northern New Jersey.
Sanguisorba canadensis L.	North of the "fall-line."
Rubi	The Catskills and northern Pennsylvania.†
Dalibarda repens L.	Below 1,000 ft. elevation.

* The local flora range as prescribed by the Club's Preliminary Catalogue of 1888 is as follows: All of the state of Connecticut; Long Island; in New York the counties bordering the Hudson River up to and including Columbia and Greene, also Sullivan and Delaware counties; all of New Jersey; and Pike, Wayne, Monroe, Lackawanna, Luzerne, Northampton, Lehigh, Carbon, Bucks, Berks, Schuylkill, Montgomery, Philadelphia, Delaware and Chester counties in Pennsylvania.

† In the genus *Rubus* material is also needed from throughout the range to aid in determining, not only the perplexed question of hybridity, but also to ascertain if possible endemisms in this difficult group, are not rather common.

Species	*Specimens wanted from*
Waldsteinia fragarioides (Michx.) Tratt.	Orange, Sullivan and Delaware counties, N. Y.
Agrimonia pumila Muhl.	Chester Co., Pa.
A. Brittoniana Bicknell.	Below 1,000 ft. elevation.
A. parviflora Soland.	Anywhere in the mountains.
Rosa blanda Ait.	The south shore of L. I. and from N. J.
R. canina L.	Anywhere in the range. How extensively naturalized?
R. humilis Marsh.	See footnote.*
POMACEAE	
Sorbus americana Marsh.	Below 1,000 ft. elevation.
Pyrus communis L.	Is it anywhere an established escape?
Malus coronaria (L.) Mill.	From the Hudson and Delaware valleys.
M. angustifolia (Ait.) Michx.	Anywhere in the range.
M. Malus (L.) Britton.	Is the apple an established escape?
Aronia nigra (Willd.) Britton.	The coastal plain region.
A. atropurpurea Britton.	See footnote.†
Amelanchier sanguinea (Pursh) Lindl. (*A. rotundifolia*).	Northern New Jersey and the mountains of Pennsylvania.
Crataegi	Species from the limestone regions of New York and New Jersey. Also from the serpentines of Pennsylvania.

* A form of *Rosa humilis* obviously not the variety *villosa* merits attention from local flora enthusiasts. It has very much larger flowers than the typical form, and its petals are extremely fugacious. Specimens have been collected near Farmingdale, N. J., and recently from near Spring Valley, N. Y. Otherwise the plant is unknown, at least in herbaria.

† A somewhat critical species, said to differ from our common *A. arbutifolia* in having oval to globose, purple-black fruits rather than short-pyriform, bright red ones. The difficulty of distinguishing such characters in dried specimens is obvious. Material is needed, particularly with accurate notes on color and form of fruit, from anywhere in the range.

Species	*Specimens wanted from*
	Drupaceae
Padus (*Prunus*) *virginiana* (L.) Roem.	The coastal plain.
Prunus americana Marsh.	Northern New Jersey.
P. cuneata Raf.	Westchester Co., N. Y.
Prunus maritima Wang.	See footnote.*
P. Gravesi Small.	Long Island, Staten Island or the coastal region of N. J.
P. angustifolia Marsh.	North of Salem Co., N. J.
P. alleghaniensis Porter.	Between New Jersey and Connecticut.
P. pennsylvanica L. f.	Below 1,000 ft. elevation in N. Y. or N. J.
P. pumila L.	Long Island or Staten Island.
	Caesalpinaceae
Cercis canadensis L.	Anywhere in the range as a true wild plant.
Cassia marylandica L.	Northern N. J., N. Y., and Pa.
C. Chamaecrista L.	North of the coastal Xlain.
C. nicticans L.	The Catskills or the mountains of Pennsylvania.
	Papilionaceae
Meibomia ochroleuca (M. A. Curtis) Kuntze.	North of Salem Co., N. J.
M. glabella (Michx.) Kuntze.	Passaic, Sussex, or Warren counties, N. J.
M. sessilifolia (Torr.) Kuntze.	Long Island or New Jersey.

* The beach plum, often almost a tree along the coast, becomes a mere straggling shrub inland. It is known from near New Egypt, Ocean Co., N. J., from West Point, N. Y., and from near Bordentown on the Delaware. Special interest attaches to the occurrence of this maritime plant inland, and any specimens from inland localities, together with notes as to its proximity to streams, will be welcome. It is known from a number of stations in the pine-barrens, which are perhaps explainable by the peculiar geological history of that region.

Species	*Specimens wanted from*
M. stricta (Pursh) Kuntze.	Middlesex or Mercer counties, N. J.
M. laevigata (Nutt.) Kuntze.	Somerset or Warren Counties, N. J.
M. obtusa (Muhl.) Vail.	North of the coastal plain.
Cytisus scoparius (L.) Link.	From anywhere in the range.[1]
Trifolium carolinianum Michx.	Near Philadelphia, Trenton or Bordentown.
Amorpha fruticosa L.	Luzerne or Schuylkill counties, Pa., as a wild plant.
Astragallus carolinianus L. (*A. canadensis*).	Northern New York or New Jersey.
Stylosanthes biflora (L.) B.S.P.	Northern shore of Long Island.
Lespedeza Brittonii Bicknell.	Anywhere in the range.
L. simulata Mackensie & Bush.	See footnote[2].
Lespedeza angustifolia (Pursh) Ell.	Long Island or Staten Island.
Vicia americana Muhl.	Anywhere in the range.
V. caroliniana Walt.	In the Hudson Valley.
Lathyrus palustris L.	Anywhere in the range.[3]
L. venosus Muhl.	Central and northern N. J.
L. maritimus (L.) Bigel.	Anywhere away from the coast.[4]
Bradburya virginiana (L.) Kuntze.	North of Ocean Co., N. J.

[1] Very rarely becoming thoroughly naturalized in our range. A large mass of it, apparently persisting for many years, was recently discovered growing luxuriantly in the grounds of the Brooklyn Botanic Garden.

[2] A plant only recently known as from the range. In the Connecticut Botanical Club's list of the plants of that state it is reported from Groton and Southington. Mr. K. K. Mackenzie has also collected it at Haworth, Bergen Co., N. J. The plant is otherwise unknown from the area.

[3] Apparently isolated, so far as our specimens show, at a single station in New Jersey. It is supposed to be in New York but no records are extant. The New Jersey specimen is peculiar as it was taken from an "island" of shrubs and trees completely surrounded by salt marsh.

[4] The farthest inland record of this sea-beach plant is White Plains, Westchester Co., N. Y. Any further inland extension of the range would be interesting.

Species	*Specimens wanted from*
Clitoria Mariana L.	Middlesex Co., N. J.
Galactia volubilis (L.) Britt.	New Jersey.

BROOKLYN BOTANIC GARDEN.

SHORTER NOTES

A SECOND SPECIES OF HERNANDIA IN JAMAICA.—The discovery of a species of *Hernandia* in the western part of the island of Jamaica, some years ago,* the existence of the genus in that island having been in doubt for many years, was of much interest, and the more recent finding of a second species in the mountainous parts of the eastern end of the island is of no less. This tree may be described as follows:

Hernandia catalpifolia Britton & Harris sp. nov.

A tree, up to 16 meters high, the trunk straight, rather widely branched above the middle. Leaves broadly ovate, chartaceous, puberulent when young, becoming glabrous, strongly 5-nerved from the rounded or subtruncate base, short-acuminate at the apex, 2 dm. long or less, not at all peltate, the stout petiole nearly as long as the blade; panicles ample, convex, often broader than long, their branches divaricate-ascending, slender, puberulent; involucral bracts oblong, obtusish; sepals white, oblong, obtuse, 5 mm. long; fruit subglobose, 2 cm. long.

Mountain woodlands, Parish of St. Thomas, Jamaica (*Harris and Britton 10.588, type; 10.566; 10.685; Britton 4061*).

This is probably the tree referred from Jamaica by previous authors to *H. Sonora* L., of Porto Rico and the Lesser Antilles, which has peltate leaves, somewhat larger flowers and larger fruit.

N. L. BRITTON.

STANGERIA OR STANGERA, AND STANGERITES OR STRANGERITES? TWO QUESTIONS OF NOMENCLATURE.—In T. Moore's "List of Mr. Plant's Natal Ferns" (Hook. Journ. Bot. and Kew Gard.

* Bull. Torrey Club **35**: 338. 1908.

Miscellany 5: 225–229. 1853), on page 228, may be found a description of a new genus, *Stangeria*, named in honor of Dr. Stanger.* Subsequently Stevens altered the spelling of the name to *Stanggeria* (Proc. Linn. Soc. 2: 340. 1854) and, later still, A. Voss changed it to *Stangera* ("Vilmorin's Blumengärtnerei" ed. 1. 3: 1244. 1896).

Stevens' name, *Stanggeria* has, of course, no standing in nomenclature and need not be further considered; but the question may possibly be raised whether *Stangera* Voss should be substituted for *Stangeria* Moore?

A somewhat similar question also arises in connection with the fossil genus *Strangerites* Borneman ("Ueber Organische Reste der Lettenkohlengruppe Thüringens" 59. 1856), which he founded to include certain hitherto supposed fossil ferns, with the expressed intention of indicating, in the name, their probable relationship to the genus *Stangeria*. The spelling of his new generic name was so obviously due either to carelessness or to a typographical error that, apparently, all subsequent writers ignored it, beginning with Oldham and Morris ("Paleont. Indica, Foss. Fl. Rajmahal Ser." 32. 1862), who wrote it *Stangerites*, but credited it, in the amended form, to Borneman.

The question is, therefore, whether *Stangerites* Oldham and Morris should be substituted for *Strangerites* Borneman, or whether the latter name should be regarded as representing a typographical error and be corrected to *Stangerites* Borneman?

ARTHUR HOLLICK.

* One species, *paradoxa*, was included in the genus, and this specific name, also, has an interesting history. The species was known to other botanists previous to the date of Moore's publication and was generally regarded as a fern, the fructification not having been found and the nervation of the leaves (pinnately arranged and forking) strongly suggesting a fern rather than a cycad. G. Kunze (Linnaea **10**: 506. 1836) referred it to *Lomaria coriacea* Schrad., but later (*Ibid.* **13**: 152. 1839) described it as a new species under the name *L. eriopus*. Moore appears to have been the first to suspect that it might be a cycad and says (*loc. cit.*) that it "would seem to be either a fern-like *Zamia* or a zamia-like fern," and renamed it *Stangeria paradoxa*. Subsequent discovery of the fructification proved that Moore's suspicions were well founded and that it was a cycad and not a *Lomaria*. Kunze's specific name, however, having priority over that of Moore, required that the latter be dropped and the binomial *Stangeria eriopus* be adopted (Nash, Journ. N. Y. Bot. Gard. **9**: 202. 1908; **10**: 164. 1909).

REVIEWS

Some Recent University of California Publications*

The first ten numbers of volume 4 of the "University of California Publications in Botany" represent a considerable variety as to subject matter, with, however, a decided preponderance, so far as the titles are concerned, of papers relating to the marine algae of the Pacific Coast.

Dr. H. M. Hall's "Studies in ornamental trees and shrubs" includes descriptions and illustrations of some of the more common and desirable of the cultivated ornamental trees and shrubs of California. There is probably no state in the Union in which cultivated, largely exotic, trees and shrubs are relatively so conspicuous to the casual visitor, at least, as in California, and any paper that assists in their identification will be welcomed by many. The species treated are largely of Australian and New Zealand origin and many are of the genera *Pittosporum*, *Hakea*, *Callistemon*, and *Melaleuca*. The species of *Eucalyptus*, of which about 100 are said to be cultivated in California, are omitted, whether because they are not considered sufficiently ornamental or because they are held to be adequately treated elsewhere

*Hall, H. M. Studies in ornamental trees and shrubs. Univ. California Publ. Bot. 4: 1–74. *pl. 1–11* + *f. 1–15*. 19 Mr 1910.

Wilson, H. L. *Gracilariophila*, a new parasite on *Gracilaria confervoides*. *Loc. cit.* 4: 75–84. *pl. 12, 13*. 26 My 1910.

Brandegee, T. S. Plantae Mexicanae Purpusianae, II. *Loc. cit.* 4: 85–95. 26 My 1910.

Gardner, N. L. *Leuvenia*, a new genus of flagellates. *Loc. cit.* 4: 97–106. *pl. 14*. 26 My 1910.

Setchell, W. A. The genus *Sphaerosoma*. *Loc. cit.* 4: 107–120. *pl. 15*. 26 My 1910.

Gardner, N. L. Variations in nuclear extrusion among the Fucaceae. *Loc. cit.* 4: 121–136. *pl. 16, 17*. 26 Au 1910.

McFadden, A. S. The nature of the carpostomes in the cystocarp of *Ahnfeldtia gigartinoides*. *Loc. cit.* 4: 137–142. *pl. 18*. 25 F 1911.

McFadden, M. E. On a *Colacodasya* from southern California. *Loc. cit.* 4: 143–150. *pl. 19*. 25 F 1911.

Hoffman, E. J. Fructification of *Macrocystis*. *Loc. cit.* 4: 151–158. *pl. 20*. 25 F 1911.

Twiss, W. C. *Erythrophyllum delesserioides* J. Ag. *Loc. cit.* 4: 159–176. *pl. 21–24*. 8 Mr 1911.

seems not to be definitely stated by the author. Presumably, however, the implication of incompleteness in the modest title is a sufficient explanation of the absence of the eucalyptus and certain others.

Harriet L. Wilson's paper on "*Gracilariophila*, a new parasite on *Gracilaria confervoides*" describes the structure and development of a small red alga that is parasitic on a larger red alga to which it appears to be closely related. The parasite forms on the surface of the *Gracilaria* colorless tubercles resembling adherent particles of sand or small grains of rice. Three sorts of tubercles, antheridial, cystocarpic, and tetrasporic, distinguishable from each other only under the microscope, occur. Rhizoidal processes penetrate the host plant and evidently serve not only for attachment but for drawing nourishment from the host. The parasite is described as *Gracilariophila oryzoides* Setchell & Wilson, new genus and species, and is referred to the same suborder to which its host belongs.

In "Plantae Mexicanae Purpusianae, II," Mr. T. S. Brandegee describes twenty-two new species of spermatophytes, nearly all collected by Dr. C. A. Purpus in the state of Puebla, near the boundary line of Oaxaca, Mexico. One of the species represents a new genus, *Amphorella*, of the Asclepiadaceae.

Dr. N. L. Gardner, in his paper on "*Leuvenia*, a new genus of flagellates," describes and figures in much detail the structure and development of a curious microscopic fresh-water organism, the affinities of which are uncertain. Specimens of the organism had been distributed in the Phycotheca Boreali-Americana under the name *Osterhoutia natans*, but, learning that the name *Osterhoutia* had been previously given to a genus of spermatophytes, Dr. Gardner avails himself of another one of Professor W. J. Van Leuven Osterhout's names in coining the substitute generic name *Leuvenia*.

Professor Setchell, as would appear from his paper on "The genus *Sphaerosoma*," was led by a study of a Californian ascomycetous fungus, at first supposed to be an undescribed species of *Sphaerosoma*, to a critical review of the pertinent literature and the available specimens referred to this genus. Among his results are the restriction of the generic name *Sphaerosoma* to two (or three?) already published European and American species and the description of the Californian plant as *Ruhlandiella hesperia* sp. nov.

Dr. N. L. Gardner's paper on "Variations in nuclear extrusion among the Fucaceae" sets forth the results of a study of the formation of the oöspheres in the commoner Californian representatives of the rockweed family. Decaisne and Thuret, in a paper published in 1845, were pioneers in a comparative study of the number of oöspheres to an oögonium in the Fucaceae, and as one of the results of their researches defined four genera having their respective numbers of oöspheres in a beautiful geometrical series: *Cymaduse* (= *Bifurcaria*) with one oösphere to the oögonium, *Pelvetia* with two, *Ozothallia* (= *Ascophyllum*) with four, and *Fucus* with eight. Gardner finds that some of the Californian Fucaceae do not fit into this scheme very well. In the plant that has been known as *Fucus Harveyanus* eight nuclei are formed by divisions of the original oögonium nucleus, but only two oöspheres are developed; these are of very unequal size, the larger containing a single large nucleus and the smaller seven small nuclei. It is presumed that only the larger oösphere is capable of fertilization. Chiefly on these grounds, *Fucus Harveyanus* is considered the type of a new genus *Hesperophycus* Setchell & Gardner. In a somewhat similar way, while the typical *Pelvetia fastigiata* of California agrees essentially with the European *Pelvetia canaliculata* in forming two practically equal oöspheres to an oögonium, the plant that has been known as *Pelvetia fastigiata* forma *limitata* Setchell produces two very unequal oöspheres, which had led to assigning it to a new genus *Pelvetiopsis* Gardner. These results suggest to the reviewer the possibility that similar accurate investigations of the number and character of the oöspheres of the remaining Fucaceae of the world might lead to discovery of grounds for several other similar generic segregations and that a large number of genera thus based might prove rather impracticable and unnatural. But there is scarcely more ground for disputing about genera than about tastes and it would certainly be premature to venture any very positive judgment in the matter until the facts in the case are all known.

The title of Ada Sara McFadden's paper "The nature of the carpostomes in the cystocarp of *Ahnfeldtia gigartinoides*" gives a fair idea of the subject matter of her brief dissertation. The peculiar openings of the cystocarp of this marine red alga are said to average as many as forty-two to a cystocarp. They are possibly formed by decomposition. Incidentally, the author sets forth the ample grounds for considering the Pacific American *Ahnfeldtia gigartinoides* specifically distinct from *Ahnfeldtia concinna*, originally described from Hawaii.

In continuation of the notable studies of parasitic red algae being made at the University of California, Mabel Effie McFadden publishes as her thesis for the degree of master of science a paper "On a *Colacodasya* from southern California." The paper is devoted to describing and figuring *Colacodasya verrucaeformis* W. A. Setchell and M. E. McFadden, sp. nov., parasitic on *Mychodea episcopalis* J. Ag. This parasite was first detected by Professor W. G. Farlow, but the description is based on abundant material collected later at San Pedro by Dr. N. L. Gardner.

Edna Juanita Hoffman, in her account of the "Fructification of *Macrocystis*," describes the character of the fertile leaves and the nature of the sori of Californian and Peruvian specimens of the Great Kelp—*Macrocystis pyrifera*. In Californian plants the sporangia occur on basal leaves differing from the upper leaves in the absence of bladders or in the possession of a branching blade. In Peruvian specimens collected by D. G. Fairchild in 1899, sori are found on leaves of about the ordinary type. In neither do the reproductive bodies occur in "furrows," as described in 1895 by Misses Smith and Whitting.

The main results of the study of "*Erythrophyllum delesserioides* J. Ag." by Mr. Wilfred Charles Twiss is that the plant belongs among the Gigartinaceae, where originally placed by J. Agardh, instead of among the Dumontiaceae to which it was doubtfully referred by Schmitz in "Die natürlichen Pflanzenfamilien" of Engler and Prantl. Mr. Twiss thus confirms the opinion expressed by Professor Setchell in 1899 in distributing mature specimens of *Erythrophyllum* in the Phycotheca Boreali-America. It appears that *E. delesserioides* J. Ag. (1871) was based upon a fragment of a young sterile plant, while the later *Polyneura californica* J. Ag. (1899) was described from older, mostly fertile, representatives of the same species. MARSHALL A. HOWE.

NEWS ITEMS

Professor W. Johannsen of the University of Copenhagen is to give in October and November a course of lectures and seminar conferences on "Modern Conceptions of Heredity," at Columbia University. These will be under the joint auspices of the departments of botany and zoölogy, and will consist of four public lectures on October 13, 20, 27, and November 3. Eight seminars of a more technical nature will be open to a limited group of investigators. The latter will be more fully announced later.

Dr. F. J. Collins has resigned as assistant professor of botany at Brown University to accept a position in the Bureau of Plant Industry as forest pathologist.

Miss Jean Broadhurst of Teachers College, and manager of the department "Of Interest to Teachers" in TORREYA, is spending the summer in England. Dr. Philip Dowell, editor of the BULLETIN, is at the United States National Herbarium.

At the New York Botanical Garden the following lectures will complete the summer course: August 12, "The Paris Botanical Garden," by W. A. Murrill; August 19, "A Visit to the Panama Canal Zone," by M. A. Howe; August 26, "Evergreens: Their Uses in the Landscape," by G. V. Nash.

The Brooklyn Institute Museum herbarium has recently unearthed from storage several thousand sheets of material dating all the way from 1818 to 1876. These specimens are now mounted and will soon be incorporated in the regular series of the herbarium. It is worthy of note that some of this was collected by Torrey, Cooper, and L. C. Beck.

Dr. N. L. Britton, director of the New York Botanical Garden, sailed for Europe on August 9, to continue studies on the West Indian flora.

The Torrey Botanical Club

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WILLIAM MANSFIELD

Vol. 11 September, 1911 No. 9

TORREYA

A Monthly Journal of Botanical Notes and News

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR

JOHN TORREY, 1796–1873

CONTENTS

Published for the Club
At 41 North Queen Street, Lancaster, Pa.
by The New Era Printing Company
[Entered at the Post Office at Lancaster, Pa., as second-class matter.]

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 should be addressed to

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Central Museum,
Eastern Parkway, Brooklyn, N. Y.

TORREYA

September, 1911

Vol. 11 No. 9

GERMINATION OF CAT-TAIL SEEDS

By E. L. Morris

Those who roam afield in the fall, especially along marshes, have often seen the masses of down and seeds which so freely scatter from the cat-tail heads at any shock. Nature's commonest way of scattering these seeds, of course, is the force of the wind, either in actually blowing the seeds from the head or so shaking the plants that the seeds are lost out. The point of this paragraph is, however, the sprouting of the seeds while still in position in the cat-tail head. About the time of seed ripening this particular head must have been broken off until it just touched the ground, and, in the unusually dry spring of this year, the seeds failed to germinate. The early summer rains raised the water level of the marsh sufficiently to keep the fruiting head entirely moistened and, with the direct sun pouring down, the conditions became proper for the seeds to sprout. As shown in the illustration, they sprouted from the surface of the head then uppermost. Looking closely, one sees that the axis of each seedling is bent into the characteristic elbow for protrusion from the seed coat. At the time of taking, a few of the elbows had straightened out and the primary root had begun to grow through the mass of bristles into the wet soil on which the head lay. At this time, each of the seedlings was probably only a day or two old, as is indicated by the nearly uniform size of all the seedlings, none seeming to have had an advantage over the others, and the fact that the most of them were still in the "elbow stage." This specimen was collected in a swamp beside the track a few rods west of the Valley Stream station of the Long Island Railroad. The measurements of these seedlings at the time of taking were 8–10 mm.

[No. 8, Vol. 11, of Torreya, comprising pp. 165–180, was issued 14 August 1911.]

FIG. 1. Fallen Cat-tail, with the seeds germinating *in situ*. (*Typha augustifolia* L.)

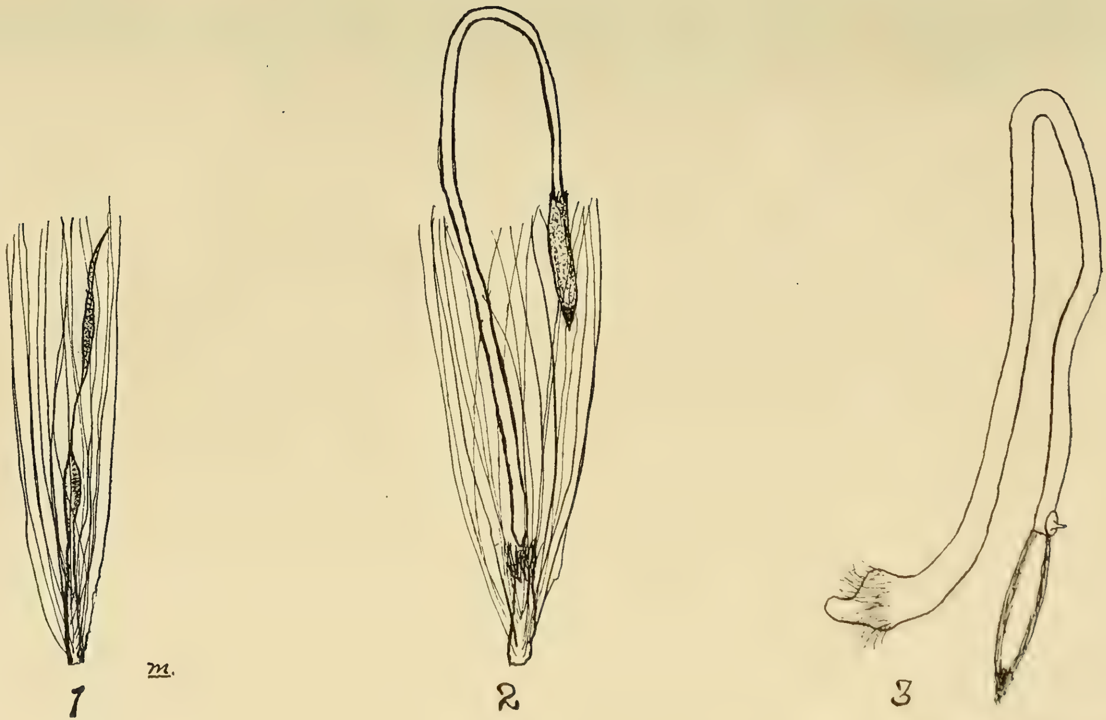

FIG. 2. 1. Unfertilized pistillate flower. 2. Germinated seed protruding from the macerating flower. 3. Seedling. (*Typha angustifolia* L.)

Corresponding germination of seeds, still within the ripe head of the parent plant, is not particularly common unless unusually favorable conditions for germination exist under which the heads are, through some abnormal circumstance, held captive. Such a case is shown by specimens in our collection of the heads of the common burdock.

Museum of the Brooklyn Institute
of Arts and Sciences

THE FERTILIZATION OF THE EEL-GRASS

[The availability of the subjoined extract for Torreya has been a matter of considerable speculation and not a little misgiving. It is one of thirty diminutive essays, all in a similar vein, and all highly charged with the imaginative poetry of the greatest of our modern mystic poets. The editor would have had little misgiving if the acceptance of the "botany" of this excerpt were as sure as its instant recognition as literature of a particularly charming style. Doubtless there are botanists who will question the writer, with a degree of vehemence measured by their antipathy to things of the imagination, when applied to their chosen science. But whatever of alleged "nature-faking" the unbeliever thinks he reads into the paragraphs below, it were well to remember that the writer, except for a trivial error, enclosed in square brackets, is perfectly correct as to his facts, and that it is only with his interpretation of them that one has any true quarrel. And it is precisely at these interpretative features of the essay that many botanists will become most excited. Not a few will immediately wax expansive over the perfectly irrelevant commonplace that plants do not "feel," nor "see," nor do a score of things that an imaginative writer may credit them with doing. All the while forgetting, that by the exercise of his imagination, a writer with a somewhat different perspective from that of the average botanist, may so change the point of view, so visualize the every-day, common thing, that the reader will never quite look at it with his customary indifference; never quite put it into the category of those interesting things that nearly everyone forgets. It is just this quality of forever fixing in one's mind the fertilization of *Vallisneria* that has made the printing of this essay a privilege.

N. T.]

"We must not leave the aquatic plants without briefly mentioning the life of the most romantic of them all: the legendary *Vallisneria*, an hydrocharad whose nuptials form the most tragic episode in the love-history of the flowers. The *Vallisneria* is a rather insignificant herb, possessing none of the strange grace of the water-lily or of certain submersed verdant plants. But it seems as though nature had delighted in giving it a beautiful idea. Its whole existence is spent at the bottom of the water, in a sort of half-slumber, until the wedding-hour comes, when it aspires to a new life. Then the female plant slowly uncoils the long spiral of its peduncle, rises, emerges, and floats and blossoms on the surface of the pond. From a neighboring stem, the male flowers, which see it through the sunlit water rise in their turn, full of hope, towards the one that rocks, that awaits them, that calls them to a fairer world. But when they have come halfway, they feel themselves suddenly held back: their stalk, the very source of their life, is too short; they will never reach the abode of light, the only spot in which the union of the stamens and pistils can be achieved!"

"Is there any more cruel inadvertance or ordeal in nature? Picture the tragedy of that longing, the inaccessible so nearly attained, the transparent fatality, the impossible with not a visible obstacle! It would be insoluble, like our own tragedy upon this earth, were it not that an unexpected element is mingled with it. Did the males foresee the disillusion to which they would be subjected? One thing is certain, that they have locked up in their hearts a bubble of air, even as we lock up in our souls a thought of desperate deliverance. It is as though they hesitated for a moment; then with a magnificent effort, the finest, the most supernatural that I know of in all the pageantry of the insects and the flowers, in order to rise to happiness they deliberately break the bond that attaches them to life. They tear themselves from their peduncle and, with an incomparable flight, amid bubbles of gladness, their petals dart up and break the surface of the water. Wounded to death, but radiant and free they float for a moment beside their heedless brides and the union is accomplished, whereupon the victims drift away to perish, while the wife, already a mother, closes her corolla [calyx], in which lives their last breath, rolls up her spiral and descends to the depths, there to ripen the fruit of the heroic kiss." [From Maurice Maeterlinck's essay on the "*Intelligence of the Flowers*" in "*The Measure of the Hours.*" Dodd, Mead & Co., 1910.]

LOCAL FLORA NOTES—X

By Norman Taylor

Species	*Specimens wanted from*
GERANIACEAE	
Geranium Robertianum L.	The coastal plain.
G. sibiricum L.	Established in the range?*
G. pusillum Burm.	New York or northern New Jersey.
G. Columbianum L.	Pennsylvania
G. Bicknellii Britton.	Anywhere in the range.
G. Pyrenaicum L.	Is it known in the range?
Erodium cicutarium (L.) L'Her.	Northern New York or New Jersey.
OXALIDACEAE	
Oxalis Acetosella L.	Below 1000 ft. elevation.
O. Bushii Small.	New Jersey.
O. rufa Small.	Anywhere in the range.
O. stricta L.	Above 1000 ft. elevation.

* The local flora range as prescribed by the Club's Preliminary Catalogue of 1888 is as follows: All of the state of Connecticut; Long Island; in New York the counties bordering the Hudson River up to and including Columbia and Greene, also Sullivan and Delaware counties; all of New Jersey; and Pike, Wayne, Monroe, Lackawanna, Luzerne, Northampton, Lehigh, Carbon, Bucks, Berks, Schuylkill, Montgomery, Philadelphia, Delaware and Chester counties in Pennsylvania.

Species	*Specimens wanted from*
LINACEAE	
Linum humile Mill.	Is it an escape?
L. grandiflorum Desf.	Is it established in the range?
L. striatum Walt.	The Hudson Valley.
L. floridanum (Planch) Trelease.	New York or New Jersey.*
L. medium (Planch) Britton.	North or northwest of the coastal plain.
L. sulcatum (Riddell) Small.	Northern New York or New Jersey.
ZYGOPHYLLACEAE	
Tribulus terrestris L.	Anywhere in the range.†
RUTACEAE	
Zanthoxylum americanum L.	From the coastal plain region of New Jersey.
Ptelea trifoliata L.	Anywhere in the range.
POLYGALACEAE	
Polygala lutea L.	Long Island or Staten Island.
P. brevifolia Nutt.	Long Island.
P. incarnata L.	New Jersey, particularly in the pine-barrens.
P. Curtissii A. Gray.	Anywhere in the range.‡
P. Mariana Mill.	Pine-barrens of New Jersey.
P. Senega L.	Anywhere in the range.§
P. paucifolia Willd.	The northern part of the range.

* This unfamiliar plant is now known from two stations on Long Island but not otherwise known from the range.

† Three stations are represented by specimens and there seems a fair chance of this plant becoming established in waste places.

‡ Perhaps not distinct from *P. viridescens* L. Supposed to be in Pennsylvania and doubtfully in New Jersey, but no specimens are extant from the range that can unhesitatingly be placed here.

§ The form described as *latifolia* is also unknown in our area.

Species	*Specimens wanted from*
	EUPHORBIACEAE
Phyllanthus carolinensis Walt.	Anywhere in the range.*
Croton capitatus Michx.	Anywhere in the range.
Crotonopsis linearis Michx.	Eastern Pennsylvania and adjacent New Jersey.
Acalypha gracilens A. Gray.	New Jersey or New York.
A. ostryaefolia Ridd.	Middlesex or Somerset counties, New Jersey.
Euphorbia glyptosperma Engelm.	New York or northern New Jersey.
E. humistrata Engelm.	Anywhere in the range.
E. corollata L.	Middlesex, Mercer, or Monmouth counties, New Jersey.
E. marginata Pursh.	Is it established as an escape?
E. dentata Michx.	Pennsylvania or New Jersey.
E. Ipecacuanhae L.	In sand north or west of the "fall line."
E. Darlingtonii A. Gray.	Southern New Jersey.
E. commutata Engelm.	Anywhere in the range.
E. lucida L.	New Jersey and Pennsylvania.
	CALLITRICHACEAE
Callitriche Austinii Engelm.	Long Island or Westchester Co., New York.
	EMPETRACEAE
Corema Conradi Torrey.	The northern part of the pine-barrens.
	LIMNANTHACEAE
Floerkea proserpinacoides Willd.	Northern New York or from Sussex County, New Jersey.

* Credited to the range in the Club's Preliminary Catalogue of 1888, but otherwise unknown. Reported from eastern Pennsylvania.

Species	*Specimens wanted from*
	ANACARDIACEAE
Rhus aromatica Ait.	Anywhere in the range.
R. hirta (L.) Sudw.	Northern New Jersey.
Ilex opaca Ait.	Long Island; as a wild plant from Connecticut.
I. monticola A. Gray.	Mountains of New York or New Jersey.
I. glabra (L.) A. Gray.	Long Island.
I. bronxensis Britton.	See footnote.*
Illicoides mucronata (L.) Britton.	The coastal plain region.
	CELASTRACEAE
Euonymus americanus L.	North or west of the coastal plain.
	ACERACEAE
Acer pennsylvanicum L.	South of the highlands of the Hudson.
A. spicatum Lam.	In Westchester Co., New York, or in northern New Jersey.
A. carolinianum Walt.	See footnote.†
A. nigrum Michx.	Anywhere in the range.

* A species very doubtfully distinct from *I. verticillata;* originally described from near Woodlawn, N. Y. City. Said to differ from the common plant by obovate instead of oblong or oval leaves, and by its orange-red instead of scarlet fruits. Dr. Britton has recently expressed grave doubts as to the specific validity of *Ilex bronxensis.*

† The pine-barren and southern New Jersey form of the common red maple. It is known from as far north as Spotswood, Middlesex Co., N. J., but no farther. Are any records extant indicating its extreme northern limits?

BROOKLYN BOTANIC GARDEN.

REVIEWS

Harshberger's Phytogeographic Survey of North America*

This long expected work on North American plant geography by Professor Harshberger has at last appeared under date of 1911. The writer has divided his work into four parts, and for purposes of review, it will be convenient to consider these divisions in their proper order; reserving for the end some general conclusions.

I. History and Literature of the Botanic Works and Explorations of the North American Continent. To this historical first chapter (pp. 1–39), dealing with the rise and development of North American floristic botany, much might still be added, and then one would continue to feel the inadequacy of the treatment. For instance, the failure to mention Fernald's work in the Gaspé peninsula (p. 4), Rydberg's on the Canadian Rockies (p. 5), or of Hollick's explorations in Alaska (p. 7) all leave something to be desired in an essay on the history of Canadian and northern botany. Coming down to New England, a fairly comprehensive survey of botanical activity in that section is given, stretching from John Josselyn's "New England Rarities," 1672, to the work of Robinson and Fernald, of our own times. In a book the preface of which is dated October, 1910, one would have hoped to find some mention of the recent admirable catalog of Connecticut plants, issued early in 1910, by the Connecticut Botanical Club, but the author does not seem to have known of it, or perhaps not soon enough to get it into his work.

It is in covering the Middle Atlantic States that we should expect the historical portion of this work to be the most precise and of greatest value, as it is here that the records of over a hundred years are rich and varied. Tracing the early period of Green, LeConte, Hosack, and Torrey down to the mid-nineteenth

* Harshberger, J. W. Phytogeographic Survey of North America. A consideration of the phytogeography of the North American continent, including Mexico, Central America and the West Indies, together with the evolution of North American plant distribution. Pp. i–lxiii + 1–790. Pl. I–XVIII + f. 1–32, and colored map. William Engelmann, Leipzig, and G. E. Stechert, New York. Price, unbound, $13.00. [Vol. XIII. Die Vegetation der Erde, A. Engler and O. Drude.]

century, the writer then takes up more recent developments No mention is made of the very intimate relations between the Torrey Club and the New York Botanical Garden (not "Botanic Museum"), and of the fact that the president of the former must *ipso facto* be on the board of managers of the latter. That the Bronx Garden owes its very existence to a movement started in the Club many years ago is a well known piece of historical gossip. His treatment of the Garden itself and of the Club also, is somewhat inadequate, as no mention is made of the work of Murrill, or Hollick, at the former; and it were pertinent to remind the writer that there have been two editors of the *Bulletin* since Dr. Barnhart resigned some years ago as editor-in-chief of the Club. Of a more serious nature is the omission of any mention of the comparatively important floras of Utica, by Harberer, and of Troy, by Wright and another by Eaton; and the inclusion of the inconsequential little pamphlet on the flora of Central Park, New York City, by E. A. Day! Similarly, the failure to mention the work of Stewardson Brown and Miss Keller, on the flora of the vicinity of Philadelphia, is somewhat surprising.

E. L. Greene's work on the flora of the Rocky Mountains, and Nelson's recent book on that subject (p. 23), are also ignored. Again, Rydberg, in his flora of Montana and the Yellowstone does something more than "give an account of the herbaria consulted, the botanists engaged in field work, and the localities visited." This information is confined to the preface, whereas in the body of the work are such data as a catalog of the plants, with stations cited, together with habitats, altitudinal distribution, etc. Notwithstanding editorial curtailment of space, we should have expected to see mention, at least causally, of the work of LeRoy Abrams in California, of Transeau, Shreve, Cannon and Lloyd in Arizona, and of Von Turckheim and perhaps Wercklé in Central America.

It must not be inferred from this catalog of things and names omitted from the history that the work is not without much value, for it is something to have brought together the imposing array of facts and names that Dr. Harshberger has accumulated and there is presented a fairly comprehensive history of floristic botany in this country so far as its broad outlines are concerned.

A rather meager account of the history of plant geography, physiography, altitudinal distribution, and phenology is perhaps to be accounted for. These subjects lend themselves to historical treatment with difficulty, and the obvious scantiness of the data must be accepted as an excuse for the all too brief record (7 pages) that the author has set down.

There follows then, in chapter two (pp. 45–92), a bibliography of North American Botany, separated into (*a*) general works, and (*b*) special works on the territories; the latter under the eight sectional divisions into which Dr. Harshberger has divided the continent. Each of these parts of the bibliography is alphabetic-chronologic in arrangement, and it is the latter feature of the lists that attracts instant attention. All, or nearly all, the important works are listed up to 1908; from then onwards one finds nothing. The bringing of a bibliography only up to within nearly three years of the date of publication is open to some question, at least, as to timeliness; but the failure to list later and more complete editions of old works is positively misleading to the seeker after bibliographic facts, who has reason to expect approximate completeness, at least up to 1908. A case well illustrating this is the citation, both in the bibliography and throughout the rest of the book, of Gannett's Dictionary of Altitudes of the United States as Bulletin 160 of the U. S. Geological Survey, 1899, when a new edition, nearly twice as large, was published in 1906 as bulletin 274 of the same series.

Many minor inaccuracies are to be found, such as the date of Grisebach's Flora of the British West Indies. It is given as 1864, when it is a well known fact that the work appeared in six parts, five of which were issued before the close of 1861. Of the forms of citation used here and throughout the body of the work, it may be said that it is usually fairly clear just what is referred to, and this in spite of the fact that sometimes the forms used in zoölogical literature are adopted, sometimes other forms, presumably the author's, but almost never the form of citation adopted at the Madison meeting of the A. A. A. S., section G, 1893, which has received practically universal acceptance among American botanists. The bibliography, as a whole, however, will be invaluable to future students, in that it brings together, in one place, and for the first time, most of the important books and articles that have been printed, thereby making it possible to get bibliographic information on any given subject almost at a glance.

II. Geographic, Climatic and Floristic Survey. The first chapter of this part is a brief (pp. 93–130) geographical description of the continent and need not detain us, as it is necessarily a compilation from such authorities as Tarr, C. W. Hayes, J. W. Powell, Adams, Wright, R. T. Hill, Keane, and some of the publications of the Bureau of American Republics. The essay draws attention to all the more important physiographic features of our varied topography, and especially to those that have or have had a bearing on the distribution of American plants.

The selection of material for the second chapter on the climate of North America (pp. 130–165) presents some interesting sidelights on the author's point of view, and his conception of what are the chief climatic factors in the distribution of plants. After a rehearsal of the main climatic features and of some of the general principles of climatology, the book takes up the continental divisions in more detail. This is elaborated mostly from the reports of the United States Weather Bureau, and is as comprehensive, along certain lines, as the most critical could desire. The thing that strikes the curious note is the absolute failure to record any of the conclusions of Abbe on the relation between climate and crops, published in 1905, and which have revolutionized our ideas as to the effects of temperature on plant distribution. That maximum and minimum temperature, and that any method of reckoning accumulative temperature or heat units, are not the vital factors in this problem, has been discussed at length in numerous papers within the last three or four years. And the almost general consensus of opinion that the length of the growing season is the most important factor seems to have escaped the writer's notice. This is much to be regretted, as charts or tables for small areas, such as those in recent papers by Shreve, Gleason, or the reviewer, showing the number of days between the last killing frost of spring and the first one of autumn, would have been, in the case of Dr. Harshberger's vastly greater range, of the utmost possible usefulness in the orientation of our ideas on plant "life-zones" of the North American continent north of the frost line. In connection with the discussion of rainfall, it would have added interest to make some mention of the relative evaporating power of the air over different soils, as this has a very marked bearing on the ultimate amount of water available to the vegetation.

The West Indies and Central America present some difficulties when generalizations are attempted as to their climate. The one important factor, so far as a plant geographer is concerned, is the prevailing northeast trade-wind, as this has a greater effect on the plant distribution than almost any other single agency. Under this section, Dr. Harshberger makes only incidental mention of this wind, but later (pp. 672–704) he ascribes to it a more important position. The times and seasons of the rains in the larger West Indies are controlled by this moisture-laden wind, rolling in from the Atlantic and precipitating its water on windward slopes, leaving the drier southwesterly areas, on most of the islands, all but deserts. Of all this, nothing, in the account of West Indian climatology. Furthermore, in the Journal of the New York Botanical Garden for January, 1910, some little account of the temperature and rainfall of Santo Domingo was published, based on carefully kept records for two or more years, but no mention is made of this. Another feature of West Indian climatology that may excite some question, as presented by the writer, is the statement that the typical hurricanes originate in the open Atlantic. Many meteorologists have considered that these destructive storms originate in the Caribbean, just west of the coast of South America, in a gigantic heat vortex, cyclonically filled up by a sudden in-rushing of cooler air.

The third and shortest chapter (4 pages) of this part contains synopses of the most important tabulations as to the number of native and introduced species in North America, brought down as mentioned above, only to 1908.

III. Geologic Evolution, Theoretic Considerations and Statistics on the Distribution of North American Plants. If the historical factors, climatic, geological, and ethnological, have been the most important in the fixing of the permanent complexion of our vegetation, then this part of the book will doubtless be considered as of chief interest, for it deals with the most fascinating part of the origin and development of the North American flora. To the botanist, or even to the intelligent general reader, Dr. Harshberger has presented, almost dramatically, a picture of the beginnings of things floral on this continent, that will perhaps evoke criticism, but must meet with general admiration. The alternate rising and falling of the earth's crust, the encroachment of inland oceans over what is now dry land, the upheavals of our great mountain chains, the advance and recession of the continental glaciers, and many other minor geological phenomena, have had profound and fundamental influences on the migration of whole floras, the creation of interesting endemisms, and the struggle between heat- and cold-resisting floras.

The Cretaceous and Tertiary floras are first discussed (pp. 120–182), and a general review of the fossil-bearing strata, together with a list of the better known preglacial plants, is given. This list, to the botanist, will convey a very fair idea of the state of North American vegetation just before the beginning of the southward extension of the great continental glacier; and it serves also to fix in one's mind the vast climatic significance of the encroaching ice-sheet. That such genera as *Anona*, *Araucaria*, *Artocarpus*, *Bombax*, *Casuarina*, *Dalbergia*, *Eugenia*, *Inga*, *Grewia*, *Sabal*, and *Sterculia* should ever have flourished in what is now temperate America is evidence of the far-reaching change wrought by the ice.

The second chapter (pp. 182–203) deals with the development of the flora during the glacial periods, and calls attention to the facts of the alternate encroachment and recession of the glaciers and of the consequent see-sawing of heat- and cold-resistant types of plant life. The treatment of the endemisms created by the final recession of the glacier and of the formation of glacial bogs, is well written and the author gives frequent acknowledgment to the excellent work of Transeau on this interesting problem.

In the third and longest chapter (pp. 203–311) of this part, the post-glacial and recent history of the North American flora is traced with some detail. That this part of the work, dealing with the forces that finally shaped our present condition of things floristic, should contain even a few errors or omissions is unfortunate. Attention should especially be called to the fact that south of the terminal moraine on Long Island the region is mostly Tertiary, and even more modern in formation, and not Cretaceous.*

In the consideration of the strand flora of New Jersey, which Dr. Harshberger has studied in some detail, he makes the statement that *Hibiscus moscheutos* followed the shore line of the old Penausken Sound, and that this circumstance explains the occurrence of this maritime plant in the middle of New Jersey. The explanation is ingenious enough, but it does not easily overcome the fact that near Spotswood, N. J., which is almost directly in the middle of the bed of Penausken Sound, the plant is thoroughly established.†

Lack of space forbids mention of many things discussed in this part of the work, although they are of surpassing interest to the phytogeographer and ecologist. It is enough to say that the writer takes up each section of the continent, and gives what he considers to have been the final adjustments of the flora to its environment, and tells us what, to him, have been the underlying factors in the development of the ultimate floristic characteristics of the country.

Such minor inaccuracies as the statement (pp. 276 and 621) that *Crossosoma* is confined, for the most part, to the Californian islands, when really there are at least two other species on the

* This error occurs throughout the work. See pp. 218 and 421. According to geological survey maps, the only outcroppings of Cretaceous on Long Island are a few small ones on the north shore, near the western end of the island.

† Dr. Harshberger makes no mention of the interesting and suggestive observations of Harper on the relation between the flora of the glaciated and unglaciated region along the Atlantic coast.

continent, and that *Artemesia tridentata* is of the "senecoid composites" (p. 188), instead of being in the tribe Anthemideae, do not necessarily detract from the usefulness of the work, for these are questions of taxonomy, and not details that one must expect every phytogeographer to record with unerring accuracy.

After describing, in chapter four (pp. 311–341), the affinities of the North American flora, comparing each of the sections with neighboring regions,* or those further removed that have contributed floral elements, the author takes up, in the fifth chapter, the classification of North American phytogeographic regions. Citing among others, those previously published by Grisebach, Engler, Drude, Merriam (whose classification, by the way, was as much zoölogical as botanical), and Clements, with the statement that Engler's classification of 1902, seems to the author "the most complete and satisfactory," Dr. Harshberger writes thus: "The classification presented herewith (his own) represents, the writer believes, the present status of our knowledge concerning the geographic distribution of American plants. In it is incorporated all that is good in the classifications that have preceded, without sacrificing originality."

IV. North American Phytogeographic Regions, Formations, Associations. The fourth and much the longest part of this work is taken up with a particular description of the vegetation as it is to-day and as it impresses the author. There are many who will cherish the thought that this enormous amount of labor (pp. 347–704) might well have been left to form the nucleus of another book. And this, not only because the minute description of plant formations and associations is as much ecological as phytogeographic, but also because of the vast amount of more or less stereotypic repetition that must ensue in the description of closely related areas which differ only in minor details; a repetition almost wearisome, in a book of this character, but interesting enough in a sketch of more or less limited areas, or a small series of them. The account of the vegetation of the Arctic tundra and of the peculiar formations of Alaska, Labrador,

* The citing of *Phyllospadix* of the Zosteraceae, on page 313, as an example of endemism, under arctic algae, is an unhappy slip of the pen.

and Hudson Bay regions is valuable; but he must be an ardent believer who can, with complete mental composure, read a description of the lake, swamp, bog, coniferous forest, and deciduous forest formations each seven or more times, the salt marsh, alpine, barren, strand, and dune formations each five times all in the second and third chapters (pp. 360–516), dealing with the vegetation east of the Mississippi and some of its tributaries. Add to this dozens of minor formations, scores of associations, areas, circum-areas, etc., and the indigestibility of the whole mass may be imagined. Granting, however, the suitability of this vast bulk of minutiae in a work on North American phytogeography, the problem has been handled with as much skill, at least as to form, as the almost hopeless nature of the task would permit.

Some statements challenge attention in this part, as, for instance, the assertion (p. 372) that *Drosera rotundifolia*, *Prunus pennsylvanica*, and *Fragaria virginiana* are true alpine plants, that *Opuntia Rafinesquii* is found on Nantucket (p. 380), that *Clintonia borealis* is a bog plant (p. 385), that *Potamogeton Vaseyi* and *Spirillus* are truly Laurentian* in distribution (p. 392), that *Sassafras* is typically pine-barren (p. 415), and, most important of all, the statement (p. 481) that in West Virginia there is a series of ponds and lakes which represent water-filled kettle-holes of glacial origin!

The third and fourth chapters of this part continue, with a nearly similar completeness, the description of the vegetation stretching to the Pacific Coast, including the Californian islands. Chapter five considers the Mexican subtropic zone and mountain region, and chapter six, the tropical Mexican and Central American regions. The last four chapters (pp. 516–672) are necessarily briefer than those dealing with better known regions, but they give a valuable account of their respective areas as we know them to-day. While it is true that our knowledge of the West Indian region is still somewhat limited, we should have expected Dr. Harshberger to have availed himself more fully

* Both are found within the Laurentian area, but neither is typical of this area, as they are both found far south of it. The citation of *Potamogeton* distribution as indicative of or resulting from any particular formation, is open to question, as most aquatics may be found far from what is their conjectural center of distribution, and for obvious reasons.

in chapter seven (pp. 672–704) of the results of the extensive explorations, in nearly every West Indian island, by various members of the staff of the New York Botanical Garden.

So much for a very meager record of the most important phytogeographical work that has appeared in this country. If the review seems to be little more than a catalog of errors and omissions, it must be stated that only the more important errors of fact have claimed attention, and that scores of minor inaccuracies have been glossed over owing to lack of space.

In the recently issued first part of a history of botany by E. L. Greene, we have become familiar with a style of writing that has set a high literary ideal for all future botanical works in this country. The warmest admirer of the present book can never, unfortunately, claim for it consideration as a piece of literature. Note for example the following quotation, exactly copied as to punctuation and wording. "For facility in treatment and also for the purpose of classification the following broad arrangement will be followed in presenting the historic facts which concern this chapter with the following broad classification of material according to geography:" . . . . (p. 1). Besides the two pages of corrections published in the beginning of the work, the reviewer has found at least as many more typographical errors that escaped the reader of the proofs. It is perhaps almost impossible to guard against such things in a book written here and printed and edited in Germany.

The eighteen plates are notable contributions to the illustration of North American plants and their habitats, but of the thirty-two text figures, thirteen are from *Die Natürlichen Pflanzenfamilien* or *Das Pflanzenreich*, and lack altogether phytogeographical or ecological significance. The rest are from photographs and much more valuable.

A very complete index of plants (pp. 704–790 is most useful, but a similarly complete index of localities, formations, associations, etc., and of persons would have been of the greatest utility.

In conclusion, the book may be said to be of far-reaching usefulness in that it attempts what no other work has heretofore attempted. That it will fill a long felt want is a foregone conclusion.

NORMAN TAYLOR

NOTES AND NEWS ITEMS

The *Experiment Station Record* for June has this to say editorially of recent work with the respiration calorimeter. "Of late a new line of experiments has been undertaken with the respiration calorimeter, which marks a departure in studies of this kind and indicates a broader application of the apparatus. These new studies relate to the ripening of fruit, and are being carried on in coöperation with the Bureau of Chemistry. They have shown that the apparatus is suited to studies of the changes going on during ripening, and that as a living body the functions of the plant as well as of animals may be observed."

"A number of bunches of green bananas were placed in the respiration chamber and kept under observation until the ripening process was completed to the usual commercial stage, which requires three or four days. During this time the oxygen consumption, the carbon dioxid excretion, and the heat elimination were determined in a manner not previously possible, throwing interesting light on the chemical process of ripening."

"These experiments have been repeated sufficiently to check the results and suggest the nature of the changes. Important data have already been obtained regarding the respiratory quotient, the carbon dioxid thermal equivalent, and the amount of energy liberated by the bananas during the ripening process. The indications are that physical and chemical factors which are of the greatest value in the study of this problem, important from a practical as well as a theoretical standpoint, can be accurately measured with the respiration calorimeter. The results will assist in the interpretation of analytical studies and throw a new light on the problems involved in the ripening and storage of fruit. As the method is applicable, not only to fruit of all kinds, but to vegetables and other products, it is believed to have a wide range of possibilities."

"It has been suggested furthermore that some of the changes taking place during the germination of seeds, a subject which has been studied in other ways, could be more accurately determined. The heating of grain in storage is also a problem to the study of which the apparatus lends itself. With certain adaptations, which are believed mechanically possible, the apparatus might be used in connection with growing plants to study their transpiration, respiration, etc., as well as the energy required for these different physiological processes. But little is known regarding the energy changes of plant activity, and this apparatus seems to afford means of extending knowledge along that line. Indeed, the possibilities for the study of the respiratory exchange and energy production of vegetable products and plant life are well-nigh unlimited, and open up a line of investigation of great importance."

The seeds and plants imported by the Bureau of Plant Industry in the early part of 1910 make, with their descriptions, an eighty-page booklet which is supplied free of charge by the Department of Agriculture.

Volume one, number one, of the Journal of the Washington Academy of Sciences has just appeared. It is " . . . a medium for the publication of original papers and a record of scientific work in Washington [D. C.]. It accepts for publication (1) brief papers written or communicated by resident or non-resident members of the academy; (2) abstracts of current scientific literature published in or emanating from Washington; (3) proceedings and programs of the affiliated societies; and (4) notes of events connected with the scientific life of Washington." The journal is a semi-monthly, costs six dollars a year to non-members of the academy, and is not offered in exchange. Very little botanical is found in this first number, but there are abstracts of W. H. Kempfer's paper on the preservative treatment of poles, and of F. G. Plummer's Forest Service Bulletin No. 85 on "Chaparral: Studies in the dwarf forests, or elfin wood of Southern California."

Bulletin 87 of the Forest Service deals with the Eucalpyts in Florida. It contains nearly fifty pages of interesting reading, illustrations, and a table showing the various species, their uses, rate of growth, climatic and soil requirements, etc.

Some time ago the Alabama Polytechnic Institute issued a circular on school improvement. The joint authors, R. S. Machintosh and P. F. Williams, have given good general advice for the successful work and maps showing various treatments of plots of various sizes. The short descriptive list of trees, shrubs, vines, and herbs adds much to the value of the pamphlet and suggests that such a boooklet would be useful for every state and prevent the mistakes often made—not only in the planning of the grounds but in the yearly Arbor Day work. Too often schools have little or nothing to show for the energy spent in such exercises, or else a quantitative success with a tiresome sameness.

Investigating the assimilation of atmospheric nitrogen by fungi, L. H. Pennington (BULLETIN Torrey Botanical Club, March) worked with several common molds and secured results "in harmony with the generally accepted notion that fungi do not have the ability to assimilate atmospheric nitrogen." The definite reports to the contrary may be explained by experimental error; or probably by variation in the different strains of fungi. With this last explanation in view distinct strains are being isolated to test variations in this ability.

Protective enzymes have been studied in pomaceous and other fruits by several workers from the Delaware Agricultural Station (*Science*, April 10). The work was suggested by experiments on the toxicity of tannin, and the conclusions follow: (1) Normal living fruits contain two enzymes, a catylase and an oxidase. (2) Tannin, as such does not exist in any part of the normal uninjured fruit previous to maturity, except possibly a small amount in the peel. (3) The oxidase acts only in an acid solution; it helps form a tannin or tannin-like substance which can precipitate proteid matter and form a germicidal fluid. (4) These changes may be caused by injuries to normal immature fruits by fungi, insects and mechanical agencies.

Under "A Universal Law" Wilder D. Bancroft calls attention in the Journal of the American Chemical Society to the universal law known to biologists as the survival of the fittest and to physicists, chemists, business men, etc., by various other names. A wide range of illustrations is given, taken almost entirely from the biological sciences and grouped under such topics as pressure and concentration, temperature, light, moisture, food and fertilizers, secretions, climate, and non-adaptability. The biologist's point of view is discussed, and spontaneous variation is described as "merely another way of expressing our ignorance" due to the fact the present and transmitted effects of external conditions are known but incompletely. The article was reprinted in *Science* and has been the cause of much commendatory discussion.

Professor Bessey has corrected the plant group estimates given in *Torreya*, adding (approximately) 1,300 to the ferns, 70 to the gymnosperms, 3,700 to the monocotyledons, and 18,000 to the dicotyledons. These, with a few other changes, make a total estimate of 233,000 instead of 210,000.

Frederick V. Coville (*Science*, May 5) suggests growing trailing arbutus in acid soils. Successful experiments were conducted with these plants—so rarely seen in cultivation—by using an acid soil, nine parts kalmia peat and one part clean sand. By March seeds from the previous July had produced plants unusual in size (seven-eighths of an inch in diameter) and fragrance. Mr. Coville incidentally describes the fruit of the arbutus as juicy instead of dry and states that the dehiscence is not loculicidal. At the lecture on June 3, at the New York Botanical Garden, Mr. Coville showed many interesting lantern photographs, and demonstrated more extensively on the cultivation of numerous plants of the heath family and of some of our local orchids in acid soils.

The following single sheet publication of the Department of Agriculture is attracting wide notice: "A New Kind of Corn from China." "A small lot of shelled corn, of a kind that is new to this country, was sent to the U. S. Department of Agriculture from Shanghai, China, in 1908, and tested the same season. It proved to have qualities that may make it valuable in breeding a corn adapted to the hot and dry conditions of the Southwest. The plants raised in the test averaged less than 6 feet in height, with an average of 12 green leaves at the time of tasseling. The ears averaged $5\frac{1}{2}$ inches in length and $4\frac{1}{3}$ inches in greatest circumference, with 16 to 18 rows of small grains. On the upper part of the plant the leaves are all on one side of the stalk, instead of being arranged in two rows on opposite sides. Besides this, the upper leaves stand erect, instead of drooping, and the tips of the leaves are therefore above the top of the tassel. The silks of the ear are produced at the point where the leaf blade is joined to the leaf sheath, and they appear before there is any sign of an ear except a slight swelling.

"This corn is very different from any that is now produced in America. Its peculiar value is that the erect arrangement of the leaves on one side of the stalk and the appearance of the silks in the angle where the leaf blade joins the sheath offer a protected place in which pollen can settle and fertilize the silks before the latter are ever exposed to the air. This is an excellent arrangement for preventing the drying out of the silks before pollination. While this corn may be of little value itself, it is likely that, by cross-breeding, these desirable qualities can be imparted to a larger corn, which will thus be better adapted to the Southwest.

"The discovery of this peculiar corn in China suggests anew the idea that, although America is the original home of corn, yet it may by some means have been taken to the Eastern Hemisphere long before the discovery of America by Columbus. From descriptions in Chinese literature corn is known to have been established in China within less than a century after the voyage of Columbus. But this seems a short time for any plant to have become widely known and used. Besides, this particular corn is so different from anything in the New World that it must have been developed in the Old World, and for that to happen in a natural way would take a very long time. These ideas are brought out in Bulletin 161 of the Bureau of Plant Industry, which gives also an account of some cross-breeding experiments with the new corn and the changes which crossing produces in the grains the same season."

The Torrey Botanical Club

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A monthly journal devoted to general botany, established 1870. Vol. 37 published in 1910, contained 630 pages of text and 36 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 24–37 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. 28–37 three dollars each.

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(2) MEMOIRS

The Memoirs, established 1889, are published at irregular 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.

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Vol. 11 October, 1911 No. 10

TORREYA

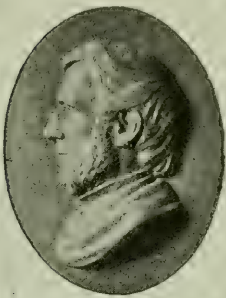
A MONTHLY JOURNAL OF BOTANICAL NOTES AND NEWS

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR



JOHN TORREY, 1796–1873

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PUBLISHED FOR THE CLUB
AT 41 NORTH QUEEN STREET, LANCASTER, PA.
BY THE NEW ERA PRINTING COMPANY
[Entered at the Post Office at Lancaster, Pa., as second-class matter.]

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 should be addressed to

NORMAN TAYLOR

Central Museum,

Eastern Parkway, Brooklyn, N. Y.

TORREYA

October, 1911

Vol. 11 No. 10

A BOG IN CENTRAL ILLINOIS*

By Frank C. Gates

At the headwaters of Lake Matanzas, a bayou of the Illinois River in Mason County, Illinois, about forty miles south of Peoria, is situated a bog which the writer visited during July, 1910. The bog is of interest because it is so far south of the usual southern limits of peat-bog plants, as outlined by Transeau.† In it occurs a curious mixture of swamp, bog, and mesophytic plants. The many attempts to separate swamps and bogs by purely physical factors have always virtually proved futile. The plants themselves are the indices and there need be no difference in the environmental factors.

The bog proper is an area, 0.04 of a square mile in extent, in which the soil is a water-soaked muck, imperfectly drained towards Lake Matanzas. The drainage lines are indicated during the summer by small creeks, without open water but hidden by very dense growths of *Leersia oryzoides*. Occasionally a few plants of *Cinna arundinacea* accompany the *Leersia*. This association ends abruptly at the edge of the running water. (Fig. 1.)

The historical factor has the greatest weight in accounting for this bog, for it is known that in times past central Illinois was vegetated by northern plants. Following the retreat of the glaciers this northern vegetation has been displaced by

* Contributions from the Botanical Laboratory of the University of Michigan No. 128. Submitted with the spelling in accordance with the recommendations of the Simplified Spelling Board, and changed to conform to the editorial policy of Torreya—N. T.

† Transeau, E. N. "On the Geographic Distribution and Ecological Relations of the Bog Plant Societies of North America." Bot. Gaz. **36**: 401–420. 1903 (with a map).

[No. 9, Vol. 11, of Torreya, comprising pp. 181–204, was issued 12 Sept. 1911.]

prairie and deciduous forest types of vegetation. There still remain, however, isolated spots, under peculiar local conditions, in which the northern plants persist as relics. At Lake Matanzas the bog is located in soggy ground, fed by cold-springs at the base of the bluff, bordering the lake on the eastward. Only a part of the area is occupied by bog plants, at the present time, and the evidence goes to show that swamp plants are gradually displacing them.

FIG. 1. A portion of the Matanzas Bog, showing a stream course marked by *Leersia oryzoides*, bounded by *Saururus*, back of which are shrubs (*Cephalanthus*) and trees (*Betula nigra*). July 24, 1910.

The ground at the foot of the bluff, kept relatively cold by the water from the springs, is occupied by a luxuriant growth of *Berula erecta*, a northern bog plant. The compound leaves of the first-year plants form a dense mat over a strip about two meters wide from which the flowering stalks of the second year arise. Usually this growth occupies the entire space but not infrequently, especially on the side away from the springs, there were other low herbaceous plants of which the most abundant were *Mimulus glabratus jamesii*, *Galium trifidum*, *Poa* sp., *Eupatorium perfoliatum* and *Aspidium thelypteris*. Less important species were *Pilea pumila*, *Impatiens biflora*, *Bidens vulgata*, *Scutellaria lateriflora*, *Carex lurida*, *Bidens comosa*, *Veronica scutellata*, *Saururus cernuus*, *Eupatorium* sp., *Oxypolis rigidus*, *Peltandra virginica*, *Rumex Britannica*, *Iris versicolor*, *Sagittaria*

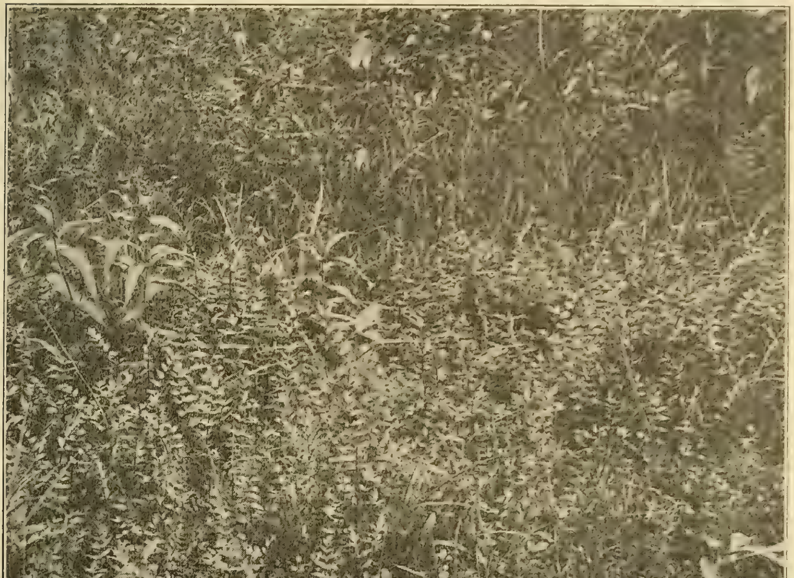

FIG. 2. A portion of the cold-spring area showing *Berula erecta* with *Mimulus glabratus jamesii* and the inroad of swamp plants on the side away from the springs. July 24, 1910.

brevirostra, *Agrostis alba*, *Cicuta bulbifera*, *Boehmeria cylindrica*, *Ranunculus pennsylvanicus*, *Steironema ciliatum* and *Cinna arundinacea*. (Fig. 2.)

In a few places in the *Berula* area there are invading thicket plants which indicate the trend of succession. The thickets are usually formed by *Salix* with *Sambucus* but three were formed by very dense recurving growths of *Decodon verticillatus* about 1.9

meters high. In the center of one of these thickets were plants of *Mentha arvensis canadensis* and *Chelone glabra*, over two meters high, whose exceptionally slender stems were supported by the surrounding *Decodon.*

Bordering the *Berula* association on the side away from the springs and along the creeks just beyond the running water, the *Saururus* association has developed. This association is composed of exceptionally well-developed plants of *Saururus cernuus*, growing somewhat more than a meter high, with large leaves, many long flowering spikes and numerous seeds. With the *Saururus* were virtually no other plants. (Fig. 1.)

Bordering the narrow strip of *Saururus* was a somewhat wider strip of thicket plants, most important of which were *Salix longifolia*, *Cephalanthus occidentalis*, *Cornus amomum* and *Rosa carolina.* In any given spot one of these usually grows to the exclusion of the others, but all of them occupy the same relative position in the vegetation. *Cephalanthus* and *Cornus* occur more abundantly on the springy boggy soil nearer the headwaters of the little creeks, while the *Salix* is very much more abundant nearer Lake Matanzas and along the nearby Illinois river. Thicket plants occur over nearly the entire area but they produce their characteristic appearance only near the creeks, for elsewhere trees are rapidly assuming dominance. Usually the ground is bare of plants and consists of muck together with the debris which the lower sprawling stems of the bushes have sifted from the flood waters of the Illinois river. A sparse growth of herbaceous plants may be present in openings which admit sufficient light to reach the ground. Most important of such species are *Asclepias incarnata*, *Boehmeria cylindrica*, *Peltandra virginica*, *Apios tuberosa*, *Cicuta maculata*, *Iris versicolor*, *Steironema ciliatum*, *Ranunculus abortivus*, *Pilea pumila*, *Eupatorium perfoliatum*, *Lippia lanceolata*, *Verbena hastata*, and in addition, seedlings of *Betula nigra*, *Acer saccharinum*, *Fraxinus nigra* and *Fraxinus americana* may also be present.

The greater part of the bog is covered by the bottomland woods. Although the usual bottomland trees are present, the association does not appear normal as it has not yet become entirely adjusted to the increase of water level following the establishment of the Chicago Drainage Canal.

The *Platanus occidentalis* association is represented fairly well in the bog area by a number of seedlings in the thickets and along the little creeks, and by a few young trees between the *Cephalanthus* and the *Ulmus-Acer* association. *Platanus* persists quite readily as a relic after the *Ulmus-Acer* association obtains dominance. Both the *Platanus* and the *Ulmus-Acer* associations occupy the drier portions of the bog area and there they readily obtain dominance over the thickets.

The *Ulmus-Acer* association is represented by several of the species of trees which characterize it. The proncipal ones involved are *Acer saccharinum*, with many, well-developed, medium-sized trees, 2–3 dm. in diameter, furnishing an abundance of seedlings; *Ulmus americana; Ulmus racemosa*, with a few small trees, 1.0–1.5 dm. in diameter and several young trees; *Fraxinus nigra*, with a few fair-sized trees and several small ones; *Fraxinus americana*, with several fair-sized and many small trees; *Betula nigra*, with a few medium-sized and several small trees; *Quercus platanoides*, with a few small trees; *Tilia americana*, with a few small trees and one large one; and *Platanus occidentalis*, with a few large relics. Of these the *Acer*, *Betula*, *Ulmus* and *Tilia* incline towards the higher and consequently drier ground, often forming oases in the bog. In such places the shade is very dense and the undergrowth is entirely absent. There is usually considerable undergrowth elsewhere, although but little of it is characteristic of the *Ulmus-Acer* association. This undergrowth is a curious mélange of several species from different associations and formations. In point of numbers the thicket elements are probably best represented with numerous plants of *Cornus amomum*, *Rosa carolina*, *Cephalanthus occidentalis*, *Salix discolor* and *Salix longifolia*. Several young trees are present, notably *Juglans nigra*, *Gleditsia triacanthos*, *Celtis occidentalis*, *Diospyros virginiana* and *Betula nigra*, all of which are characteristic trees in the mesophytic forests of central Illinois. The herbaceous flora includes such a typically northern bog plant as *Spathyema foetida* mixed in with typical swamp plants, as *Asclepias incarnata*, *Spar-*

ganium eurycarpum, *Amsonia tabernaemontana*, and *Impatiens fulva*, meadow and thicket plants as *Onoclea sensibilis* and *Steironema ciliatum* and mesophytic woodland plants as *Tecoma radicans*, *Laportea canadensis* and *Ranunculus abortivus*. Some of these plants, as *Spathyema*, occur here near their southern limits, while others, as *Amsonia* and *Tecoma*, are at their northern limits.

FIG. 3. A general view of the Matanzas Bog from the bluff, showing the succession from the *Berula* in the foreground, through the shrubs to the trees. July 24, 1910.

Doubtless many other interesting points could be brought out during the spring and fall but the region was investigated only in midsummer.

The presence of *Spathyema* and *Berula* is especially interesting because it is an occurrence of northern plants far south of their normal southern limits of their characteristic associations. They serve as indices to show the character of the former vegetation of central Illinois. That one should find these northern plants mixed in with southern ones near their northern limits is significant as it demonstrates that vegetation representing different provinces can exist under the same environmental factors.

University of Michigan

TWO SUBMERGED SPECIES OF UROMYCES

By Frank D. Kern

About twenty-five years ago Professor F. L. Scribner, of the U. S. Department of Agriculture, sent samples of several grasses infested with forms of Ustilaginales and Uredinales to Messrs. Ellis and Everhart for study. Among these was a rust on the leaves of *Aristida* from New Mexico which they were unable to refer to any published species and which they therefore described as a new species, *Uromyces Aristidae* Ellis & Ev.* There is throughout the United States east of the Rocky mountains a rather well-known *Uromyces* on species of *Aristida* which has, since the publication of the name by Ellis and Everhart, naturally passed as *U. Aristidae.*

Recently the writer had opportunity to examine the type specimen of *Uromyces Aristidae* Ellis & Ev. which is in the Ellis collection at the New York Botanical Garden and was much surprised to find that it is not at all like the ordinary form which has received that name in most mycological collections. Only uredinia can be found on the type specimen but they are so essentially different from the uredinia of the common *Uromyces*, especially in the presence of paraphyses and in the surface markings of the urediniospores, that there can be no possibility of their belonging to the same species. Since there are no telia on the type specimen it is not even certain that it is a *Uromyces;* it might as well be a *Puccinia* so far as any character present would indicate. Ellis and Everhart doubtless mistook the urediniospores for the teliospores of a *Uromyces*, an error not infrequently made by the earlier mycologists.

Strangely enough among all the specimens of rust on *Aristida* not a one, belonging either to *Uromyces* or *Puccinia*, has been

* Jour. Myc. 3: 56. 1887.

found which has uredinia agreeing with the type specimen of *Uromyces Aristidae* Ellis & Ev. There is an unnamed *Puccinia* from central Mexico which is like it in possessing paraphyses but which has the characters both of the paraphyses and urediniospores so different that there is scarcely a possibility of their identity. It is, therefore, impossible to dispose of the *Uromyces Aristidae* Ellis & Ev., of which there is known but the one specimen consisting of uredinia only, in any definite way without additional material and further study. It is certain, however, that the name *U. Aristidae* Ellis & Ev. can no longer, in the face of the foregoing facts, be applied to the real *Uromyces* on *Aristida*. Through the work of Arthur* this *Uromyces*-form has been culturally connected with an *Aecidium* on various species of *Plantago*. According to the practice followed by some mycologists the specific name of the aecial stage may become the name of the species provided the telial form has never received a name. In this instance, however, no such procedure is possible there being no available aecial name. The American aecia on *Plantago* have passed under the name *Aecidium Plantaginis* Ces. but they are distinct from that form. It is, therefore, necessary to supply a name for the *Aristida-Plantago* species which may be described as follows:

Uromyces seditiosus sp. nov.—O. Pycnia amphigenous, gregarious, inconspicuous, honey-yellow becoming brownish, subglobose, 80–100μ in diameter by 100–112μ high.

I. Aecia amphigenous, gregarious, cupulate or short-cylindric, 0.2–0.3 mm. in diameter; peridium colorless, margin erose, erect or somewhat recurved; peridial cells rhombic in longitudinal section, 28–35μ long, the outer wall thick, 10–13μ, transversely striate, the inner wall thinner, 4–5μ, verrucose; aeciospores subglobose or broadly ellipsoid, 14–18 $\times$ 16–22μ, the wall colorless, rather thin, 1.5μ, finely verrucose.

II. Uredinia epiphyllous, scattered, linear or oblong, cinnamon-brown, naked; urediniospores globoid, 19–26μ in diameter, the wall cinnamon-brown, moderately thick, 2–2.5μ, minutely verrucose, appearing almost smooth when wet; pores rather indistinct, 4, equatorial.

III. Telia epiphyllous, scattered or sometimes crowded and

* Bot. Gaz. 35: 17–18. 1903.

irregularly confluent, oblong, or linear 0.2–0.4 mm. wide by 0.5–1 mm. or more long, early naked, compact, pulvinate, dark chocolate-brown; teliospores broadly ellipsoid, or obovoid to nearly globoid, 15–21 × 23–39μ, rounded or obtuse at both ends, the wall chestnut-brown, usually with a slightly paler umbo, about 1.5–2μ thick, much thicker at apex, 5–10μ; pedicel tinted, rather stout, once to twice length of spore.

O and I on PLANTAGINACEAE: *Plantago aristata* Michx., Missouri (*Galloway*), Texas (*Long*); *P. eriopoda* Torrey, Montana (*Kelsey*), Wyoming (*Nelson*); *P. Purshii* R. & S., Nebraska (*Bates*), Texas (*Long*); *P. Rugelii* Dcne., Missouri (*Galloway*); *P. Tweedyi* A. Gray, Montana (*Jones*), Wyoming (*True*); *P. virginiana* L., Illinois (*Seymour*), Missouri (*Galloway*), South Carolina (*Ravenel*).

II and III on POACEAE: *Aristida basiramea* Engelm., Kansas (*Carleton*), Nebraska (*Bates*); *A. dichotoma* Michx., Arkansas (*Bartholomew*), Kansas (*Norton & Thompson*); *A. oligantha* Michx., Kansas (*Bartholomew*), Texas (*Long*); *A. purpurascens* Poir., Alabama (*Stone*), Kentucky (*Short*), New Jersey (*Ellis*).

Type collected at Wakeeney, Kansas, on *Aristida oligantha*, Sept. 15, 1906, *E. Bartholomew* (Barth. Fungi Columb. *2390*).

The uredinia of the *Uromyces Aristidae* Ellis & Ev. have paraphyses intermixed with urediniospores, the urediniospores are ellipsoid, 23–26 by 27–30μ, the wall is 2.5–3μ thick, finely and bluntly echinulate, and has 5–7 scattered pores.

Spartina is one of the most interesting genera of grasses from the mycologist's point of view on account of the unusually large number of species of rust which inhabit it. At least three species of *Puccinia* and two species of *Uromyces* have been described on it.* The validity of the three species of *Puccinia* is unquestionable but this can not be said of the *Uromyces*-forms. It is debatable whether *U. acuminatus* Arth. and *U. Spartinae* Farl. should be regarded as two species or whether they represent races of a single, somewhat variable, species. The results of cultures† might perhaps be interpreted as grounds for keeping the two forms separate but morphologically they intergrade in such a way as to throw doubt on that disposition. Without attempting

* For an account of the species inhabiting *Spartina* see Bot. Gaz. 34: 1–20. 1902.
† See Mycologia 2: 221–222, 229. 1909.

to settle that point the writer wishes now to call attention to a *Uromyces* which is undoubtedly distinct from either *U. acuminatus* or *U. Spartinae.* Its distinctive characters are the brownish or purplish spots which are produced about the sori and the few equatorial pores of the urediniospores. Neither *U. acuminatus* nor *U. Spartinae* produces such spots and both have numerous scattered pores. The new form comes from southern Florida and may be characterized thus:

Uromyces argutus sp. nov.—O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous, scattered, on rather large brownish or purplish spots, linear, 1–4 mm. long, rather tardily naked, slightly pulverulent, cinnamon-brown; urediniospores broadly ellipsoid, 19–23 × 25–32μ, the wall rather thick, 2–3μ, light cinnamon-brown, finely echinulate; pores 3, occasionally 4, approximately equatorial.

III. Telia amphigenous, scattered, sometimes on discolored spots like the uredinia, linear, 1–2 mm. long, rather tardily naked, pulvinate, blackish; teliospores ellipsoid or obovoid, 16–19 × 24–32μ, usually narrowed both above and below, the wall dark chestnut-brown, 1.5–2μ thick, much thickened at apex, 7–10μ, smooth; pedicel tinted, about twice length of spore.

Type collected at Miami, Florida, on *Spartina glabra* Muhl., March 25, 1903, *E. W. D. Holway.*

PURDUE UNIVERSITY,
LAFAYETTE, INDIANA

REVIEWS

Duggar's Plant Physiology*

Professor Duggar's "Plant Physiology" occupies a zone of tension between pure and applied science, and it is not easy to do the book entire justice in a review, owing in part to the fact that it is quite unlike anything else we have, and the reviewer has continually to adjust his orientation. It seems to the writer that the book would be less liable to misinterpretation if the title by which it was announced in advance, "The Physiology of Plant Production," had been retained on the title-page. As

* Duggar, Benjamin M. Plant Physiology, With special reference to plant production. Pp. i–xv + 1–516, frontispiece and figs. 1–144. New York. The Macmillan Co. 1911. Price $1.60.

a college text-book on plant physiology it would be quite inadequate, but as text on the physiology of plant (crop) production it is a distinct success. The point of view of the entire book may be inferred from the statement on page 495, where, in discussing growth movements, the author says: "A study of the phenomena is more important educationally in liberalizing our views of plant relations than of any direct assistance in special problems of plant production."

At various points throughout the text one queries as to whether or not the student is expected to have had a college course in elementary botany. If so, much of the pure physiology of the book will be of the nature of a review to him, except in so far as he follows out the admirable suggestions for collateral reading, given at the close of each chapter. If an elementary course is not taken for granted, then one may question the possibility of the reader understanding a discussion of proteoses and peptones, amides, Leguminosae, degradation products, amino and amido acids (p. 261), and "the curve of CO_2 excretion" (p. 287). In like manner the quotation on pages 309–310, from Coulter and Chamberlin, seems much too technical.

In discussing the relation of pruning to growth (p. 236), there is no reference to the very pertinent topic of the self-pruning of many trees; and the large amount of experimental work that has been done, in this country and in Europe, on the effects of the electric current in soil and air, on crop-production, and the very considerable literature that exists on the subject would seem to merit at least a passing reference in a book of this scope.

On page 69 turgor is attributed to hydrostatic pressure, though on page 67 osmotic pressure is correctly said to vary "with the number of particles in the solute." Growth is held to involve differentiation (pp. 307–308), thus taking no account of a fundamental distinction quite commonly held elsewhere, and especially necessary to recognize for many lower plants. In the first table on page 431 the meaning of the figures and of the column-headings is not obvious; the character μ, used in the table at the bottom of page 423, is nowhere explained in the book; and in the table on page 405 it is not clear what units of time are referred to.

The definition of adsorption, on page 440, restricts it to the reduction of toxicity by solid particles.

In Chapter XVI, on "The Temperature Relation," the importance of the length of the growing season (the period between the last killing frost of spring and the first one of autumn) is not emphasized. All temperatures are given in degrees Centigrade, and no reference is made to Professor Abbe's work of 1905.

The statement on page 468 that "great diversity of opinion prevails with regard to the magnitude [*sic*] of the variations by means of which progress in selection is maintained," tends, in the light of the preceding paragraph, to perpetuate the error that the difference between mutation and fluctuation is one of degree; and the assertion on page 469, that "Many deny permanence to this type of selection" (of fluctuating variations in sugar-beets) seems quite too mild, in view of recent work.

On page 474 it is stated that "the extreme supporters of the mutation principle . . . actually exclude the possibility of any such phenomenon as transmissible fluctuation," yet de Vries, himself, has said* that "The answer to the question whether acquired characters are inherited, is that they are not so in their entirety, but with a reduction, the amount of which is indicated by Galton's law"; and he later calls attention to the fact that if there were no inheritance of fluctuating variation, the improvement of horticultural races would not be possible.

The laboratory directions at the end of each chapter are well adjusted to the text, and especially so to the class of students for whom they are intended. One wonders, though, how many hours of credit should be allowed the poor "Agric." who is required (p. 378) to "make a careful count of the number of blossoms produced" by an apple tree! A number of investigators would be glad to learn how to determine "the moment of wilting" of a plant (p. 62); and a knowledge on the part of the student of the precautions necessary in order to weigh a number of slightly wilted leaves "accurately upon a delicate balance" (p. 63) can hardly be taken for granted. On pages 223 and 224

* De Vries, Hugo. The Mutation Theory. Eng. Translation. Vol. II, p. 136. 1911.

it is implied that starch-accumulation is synonymous with photosynthesis. A paragraph on page 433 is headed "Etiolation," but this term is not referred to or defined in the paragraph nor elsewhere in the book, nor does it occur in the index.

At numerous places the literary style and the English are such as to suggest that the text might have been dictated and not subsequently revised with sufficient care. Thus we find "this element" (p. 195), without any element being previously referred to in the paragraph; "The strong flavor of radishes . . . are also modified" (p. 426); "It is not always possible to distinguish positively between the two types, or the movement may be the result of conjoint stimulus" (p. 495).

However, the fact that is was so easy to single out the above points only means that the book is one of conspicuous merit. Since Johnson's "How Crops Grow" and "How Crops Feed," nothing of similar nature has appeared, and Professor Duggar has rendered distinct service in bringing forward in concrete form, with a carefully worked out solution, the whole question of a suitable presentation of plant physiology to agricultural students. Especially has the author made a very happy choice in the topics selected and excluded, and the book cannot help but conduce to clearer thinking, and a more intelligent practice on the part of the student and reader.

The text has distinct vitality because so much of it comes direct from the author at first hand, the illustrations are apt, and the book is sure to meet with the wide and warm welcome which it justly merits.

C. Stuart Gager

TAYLOR'S REVIEW OF THE PHYTOGEOGRAPHIC SURVEY OF NORTH AMERICA: A REPLY

The long and detailed review of my recent book in Torreya covering ten pages of the September, 1911, number of the journal is a surprising one, because the mark of a true critic is to give the other man the benefit of a doubt. Some of the points taken by Taylor in his review are justly made, but many of them are not. With reference to the omissions to which he alludes, I would call his attention to the text and editor's footnote on pages 38 and 39, where the following will be found: "The above historic summary does not claim to be complete. The most salient facts have been chosen, which illustrate the development of knowledge of the several phytogeographic regions of North America. . . . The attempt has not been made to furnish a complete synopsis of the literature dealing with the phytogeography of North America." Then he should read the statement in the footnote by Professor Drude: "Auf besonderen Wunsch der Herausgeber hat Prof. Harshberger die ursprünglich ausfühlicher gehaltene Liste der floristischen und pflanzengeographischen Literatur noch beschränkt, wie es auch in den anderen Bänden der V. d. E. gebräuchlich ist." Originally the book was limited to 480 pages, later the publishers agreed to print 640 pages, while the actual number which they undertook to print reached 790 pages and 63 pages of the synopsis in German by Professor Drude, and yet much had to be omitted to keep the book within a convenient size. It was, therefore, impossible to notice the more important recent books and papers, because many of them appeared while the book was in press. Frequently it happened that the author would see the book while the paged proof was in hand, and if a footnote could be added, as for example, the one on page 669 about Wercklé and Costa Rican vegetation, it was added, but frequently it was impossible without entirely rearranging the printed page to make such additions. The editors and publishers were unusually kind to me about such changes.

To see such a bulky book through the press required a long time and the criticism of the reviewer on this score will be found to be unfortunate when I give the most important dates connected with its publication. The letter requesting me to write the volume was dated Berlin, October 4, 1901. The typewritten manuscript was expressed to Dresden on September 12, 1906, and the first proof sheet beginning Part I was received by the author on September 26, 1908. The galley proofs were returned as follows: Chapter I, Part II, on November 6, 1908; Chapter I, Part III, on December 23, 1908; Chapter I, Part IV, on September 28, 1909, and the last sheet of the text on May 25, 1910. The last galley proof of the index was mailed to Dresden on February 8, 1911. The corrections, title page, table of contents and preface were received after the entire book had been printed, and this statement refutes one of the points of criticism made by Taylor. I received the first bound copy of the volume on June 8, 1911.

Taylor mentions the fact that *Hibiscus moscheutos* occurs at Spotswood, N. J., in the middle of the bed of Pensauken Sound (notice the spelling in two places Penausken) is not well taken, for the plant which I supposed followed the shore line of the ancient sound might well have spread to the middle of the sound as the waters gradually retreated. The note on page 197 of his review is misleading, if the text is read again more carefully. I do not say on page 372 of the book that *Drosera rotundifolia, Prunus pennsylvanica, Fragaria virginiana* are true alpine plants, but give them in a list of the alpine plants of Mt. Katahdin.

I am glad that Taylor has given his opinion of my volume of Die Vegetation der Erde, and I hope what he has said will invite botanists to buy and read a volume which I trust will take its place as a sound contribution to North American phytogeography.

John W. Harshberger

University of Pennsylvania

[That I did not take into consideration the time necessary for such a large work to go through the press is perfectly correct. The dates given above by Professor Harshberger fix the time when the book left his hands, information most welcome,—as there is no indication of these important dates in either the preface or title-page of the work.]

N. T.

STEWART'S BOTANICAL SURVEY OF THE GALAPAGOS ISLANDS*

Mr. Stewart was the fortunate botanist appointed for this special expedition to the Galapagos Islands. He gives a brief history of the Flora of the Islands dating from Darwin and Hooker and follows with an account of the vascular plants annotated for the publications where the species were first published, and for the localities on the various islands of the group where the numbered specimens were collected. Following this annotated list he gives a series of tables showing the distribution of the vascular plants, these tables presenting columns assigned respectively to the different islands in which are marked the specimens, or records of occurrence by previous authors. The species are arranged in this list alphabetically, by genera, under each family, the families are presented in the general sequence of Engler & Prantl. Following the tables of distribution he presents a discussion of the botanical regions, distinguishing ecologically the dry from the transition and these in turn from the moist and grassy, etc., listing under each the commonest or most noticeable during the time of the Expedition.

Mr. Stewart then takes up in the order of families those interesting plants, or those genera or even whole families which present special points, as the number of species represented in proportion to other families characteristic of this region, or the citing of those which are conspicuous for the large and pure stands, or for their distribution over large areas and notes particularly that the Compositae are strongly represented in the moist regions, the chief representation of which are to be found in the extensive forests of *Scaesia.* Following, he presents a record of the weather conditions and the variety which these have presented at various times and the effects of the different periods of weather so far as indicated by the conditions of vegetation.

The Bibliography of three pages and a full Index by genera and families and a map of the Galapagos Islands with mountain

* Stewart, A. The Botanical Survey of the Galapagos Islands. Proc. Calif. Acad. Sci. IV. 1: 7–288. January 20, 1911.

elevations and ocean depths, and nineteen plates complete the volume.

This paper is characteristic of the usual good typography and uniform quality of paper of the publications of the California Academy of Sciences.

E. L. Morris

NOTES AND NEWS ITEMS

We learn from the *Review of Reviews* of the appointment of Professor F. P. Daniels as a travelling fellow on the Kahn Foundation. The itinerary of each fellow is expected to include Europe, Egypt, Japan, India and other Oriental countries and to take at least a year. Professor Daniels, now professor of romance languages in Wabash College, has done considerable botanical work in the middle west.

The death of Dr. Raymond Haines Pond is recorded as having occurred by his own hand, at College Station, Texas, on July 25. Dr. Pond received the degree of Ph.D. from the University of Michigan in 1902. From 1903 to 1907, he was professor of botany and pharmacognosy in the College of Pharmacy of Northwestern University; in 1908–'09 he held the position of biologist of the Metropolitan Sewerage Commission of New York City; and since 1909 he had been plant pathologist at the Texas Agricultural Experiment Station. A considerable part of the time between 1905 and 1908 was spent by him in carrying on researches in physiological botany at the New York Botanical Garden and at the universities of Bonn and Strassburg, and he had made several contributions to the literature of this department of botany. Dr. Pond was for a time a member of the Torrey Club.

In the recently issued annual report of the New York State Botanist is recorded the spread of the chestnut disease to Marlborough, Ulster Co., which, "with one exception is the most northern station for it in this State." The report summarizes the work of the past year, and includes among other things a list of about 80 plants new to the State herbarium, most of which are fungi. A brief account is also given of the changes going on in the transformation of areas now water surfaced to land, particularly of the important part played in the process by swamps and bogs.

A History of Gardening in England, by Hon. Mrs. Evelyn Cecil (third and enlarged edition. Pp. 393. Illustrated. E. P. Dutton & Co., New York, 1910) which first appeared in 1896 is, as its title states, a history of gardening in England. The chronological bibliography itself, is, with its quaint titles, fascinatingly suggestive, and there is enjoyment and to spare, both for the long summer days and the winter fireside, in the four hundred pages describing monastic gardening and the gardens of the thirteenth to the sixteenth centuries, the early garden literature, the kitchen gardens, the dawn of landscape gardening, and the development of modern gardening.

The January *Science* contains two articles of interest to teachers of botany. The first on "The Method of Science" was delivered by Professor Charles S. Minot at the Minneapolis meeting (A. A. A. S., December), and is of interest to any science teacher, emphasizing as it does (1) the "concentration of interest upon novel practical results" not wholly favorable to science, (2) the need of encouraging the "pursuit of pure science" which "will not be compelled," and (3) that science differs from every day life in definiteness and the importance given therefore to the preservation of evidence. The steps in valid scientific work are "*first*, the record of the individual personal knowledge; *second*, the conversion of the personal knowledge by verification and collation into valid impersonal knowledge; *third*, the systematic coördination and condensation of the conclusions," and an interesting amplification of these points follows.

The Clarendon Press has just issued a small volume (*Vocabulaire Forstier*. Francais-Allemand-Anglais by J. Gerschel, Oxford, 1911. Price $1.75) which well covers its field of activity. About fifty pages are devoted to definitions of French forestry words, seventy-eight to German words, and sixty-two to English words. This difference in the number of words used by the three peoples furnishes a significant suggestion as to the relative importance among them of forestry.

The recently issued prospectus of the Brooklyn Institute of Arts and Sciences for 1911–12 includes, under the department of botany, 16 illustrated lectures, 4 illustrated conferences, 17 field meetings, and also outlines five courses covering various phases of botanical activity.

The following botanists have been working at the Marine Biological Laboratory at Woods Hole during the whole or part of the past season: C. M. Derick, B. M. Duggar, L. Knudson, G. R. Lyman, G. T. Moore, W. J. V. Osterhout, and M. B. Thomas.

At the University of Utah, C. N. Jensen has been appointed professor of botany and plant pathology for 1911–1912.

We learn from the daily press of the appointment of Dr. H. H. York as assistant professor of botany at Brown University, and of Dr. Anna Starr's appointment as instructor in botany at Mount Holyoke College.

On four successive Fridays, beginning October 13, Wilhelm Ludwig Johannsen, professor of plant physiology in the University of Copenhagen, will lecture on the "Modern Principles of Heredity," in No. 305 Schermerhorn Hall, Columbia University, at 4:10 P. M. The subjects will be "The Problem of Personal Characters," "The Problem of Unit Factors," "Problems of Correlation and Sex," and "The Problems of New Biotypes." The lectures are open to the public, but the doors will be closed five minutes after the beginning of each discussion.

According to the New York *Evening Post* (October 7) the regents of the University of Wisconsin have appointed E. M. Gilbert assistant professor of botany, and W. N. Steil, E. T. Bartholemew, and Alban Stewart instructors, to fill the positions occupied by W. G. Marquette and A. B. Stout, who have come to Columbia University with Professor R. A. Harper, the recently appointed Torrey professor of botany at that institution.

From the same source we learn of the appointment of Miss Helene M. Boas as an assistant in botany at Barnard College.

Professor H. C. Cowles of the University of Chicago was one of a number of American scientists who attended the meeting of the British Association at Portsmouth.

Dr. and Mrs. N. L. Britton have returned from Europe and Dr. P. A. Rydberg has returned from a three months' collecting trip to the Rocky Mountains. Dr. Arthur Hollick left on October 15 to continue his studies on Alaskan fossil plants at the United States National Museum.

A conjugating yeast (*Schizosaccharomyces*) has been reported by W. C. Coker. It was obtained from grapes left in distilled water, and has not been noted before in America.

J. G. Lipman of Rutgers College proposes a bacteriological test for soil acidity. Tubes of bouillon are adjusted to varying acid reactions—from neutral to three per cent. After adding measured amounts of the soil to be tested (1 to 10 grams) these media are inoculated with bacteria (*e. g.*, *Bacillus subtilis*) and the amount of acid in the soils estimated by the resulting growth (heavy, slight, lacking). This method may be varied for ammonifying bacteria, for nitrogen-fixing forms, etc. Mr. Lipman expects to publish more definite results of his experiments soon.

The seedling of *Quercus virginiana* is described in the *Plant World* for May by Isaac M. Lewis. The "petiole of the cotyledons in this species serves as a 'sinker' in much the same way as is characteristic of certain monocotyledonous plants, notably *Phoenix dactylifera*. This habit, correlated with the habit of transporting the material from the acorn down to a position of greater safety in the fleshy root, would seem to be a decided advantage to the plant in establishing itself in the semi-arid situations in which it is often found."

Conjugation between two different species of *Spirogyra* (*S. crassa* and *S. communis*) is reported in the June *Bulletin of the Torrey Botanical Club* by Mr. F. M. Andrews, who is continuing his investigations hoping for interesting results connected with these hybrid forms.

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 submitting manuscript.

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Vol. II November, 1911 No. II

TORREYA

A Monthly Journal of Botanical Notes and News

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR

JOHN TORREY, 1796–1873

CONTENTS

Published for the Club
At 41 North Queen Street, Lancaster, Pa.
by The New Era Printing Company
[Entered at the Post Office at Lancaster, Pa., as second-class matter.]

THE TORREY BOTANICAL CLUB

OFFICERS FOR 1911

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TORREYA

November, 1911

Vol. 11 No. 11

THE RIVER-BANK VEGETATION OF THE LOWER APALACHICOLA, AND A NEW PRINCIPLE ILLUSTRATED THEREBY

By Roland M. Harper

Every river is unique in some respects, and the Apalachicola, which is formed by the union of the Flint and Chattahoochee at the southwestern corner of Georgia, and flows in a general southerly direction to the Gulf, dividing West Florida from Middle Florida, seems to be more so than many others of similar size. Only one other river, the Alabama, carries water from the Piedmont region to the Gulf of Mexico, and the Apalachicola differs from that in several ways. In the first place, it has no connection with the Paleozoic region or the Cretaceous "prairie" region, and is therefore presumably less calcareous. Second, it flows through a very low and flat country* for the last sixty miles or so of its course, while the Alabama has rolling hills close to it all the way to its mouth† (and even beyond, for there are bluffs nearly 100 feet high on Mobile Bay).

Botanically also the Apalachicola presents many interesting features. On its eastern bank between the Georgia line and Bristol there are several high bluffs, which have been celebrated among botanists for three quarters of a century on account of being the home of two gymnospermous trees not known anywhere

* Described as the "Middle Florida flatwoods" in Ann. Rep. Fla. Geol. Surv. 3: 221–222. 1911.

† The railroad which crosses the estuarine swamps of the Apalachicola a few miles from its mouth, where they are five miles wide, goes on trestles all the way, presumably because the nearest hills from which earth could be obtained on a level with the cars are over 40 miles away; while the one which is similarly situated with respect to the Alabama River system crosses 15 miles of swamp, on earth embankments.

[No. 10, Vol. 11, of Torreya, comprising pp. 205–224, was issued 18 October 1911.]

else in the world, and a few other rare plants, as well as being the southern limit of quite a number of shade-loving species which are more common in the mountains a few hundred miles farther north.*

For nearly a quarter of a century geologists have been attracted to the same region by the splendid sections of certain Oligocene and Miocene formations exposed in these bluffs, some of which are over 150 feet high.† But the flat country between Bristol and the coast has been almost universally regarded by geologists as devoid of interest,‡ apparently because no fossils are found there. And except in the immediate vicinity of Apalachicola, at the mouth of the river, almost no botanical work has been done along the lower Apalachicola, perhaps chiefly because the flat country is very thinly settled and there are few accommodations for travelers along that part of the river.

Notwithstanding Drummond's botanical discoveries near Apalachicola in 1835,§ Dr. A. W. Chapman's residence there from 1847 to 1899, and the visits of several other botanists to the place during that period — all of whom must have traveled on the river in going or coming, for Apalachicola had no railroad until 1907 — no one hitherto seems to have thought it worth while to describe the vegetation observable from a boat on the lower portions of the river, and thus some significant and more or less important facts have never been brought to the attention of the public.

At noon on April 25, 1910, I embarked at Apalachicola on a commodious river steamboat bound upstream, and by nightfall

* See Gray, A pilgrimage to Torreya, Scientific Papers of Asa Gray **1**: 188–196. 1889) Curtiss, Tenth Census U. S. **9**: 521. 1884; Chapman, Bot. Gaz. **10**: 251–254. 1885; Cowles, Rep. 8th Int. Geog. Cong. 599. 1905.

† See Sellards & Gunter, Ann. Rep. Fla. Geol. Surv. **2**: 261–279. 1910; and several earlier papers there referred to. (On page 261, "middle west Florida" should read "western Middle Florida," and "from Gibson to Havana" [Florida] should be "near Fowlstown, Georgia." On page 266, "St. Andrews Bay" was evidently intended for Apalachicola Bay.)

‡ See E. A Smith, Tenth Census U. S. **6**: 226, 241. 1884; W. H. Dall, Bull. U. S. Geol. Surv. **84**: 95. 1892; Dall & Stanley-Brown, Bull. Geol. Soc. Am. **5**: 150. 1894.

§ Comp. Bot. Mag. **1**: 16. 1835; Sargent, Silva N. A. **7**: 110. 1895.

had traveled about fifty miles, or some ten miles above the mouth of the Chipola River.* Notes on the river-bank vegetation were taken all the way in the usual manner, mostly from the pilot-house, about 25 feet above the water, which afforded an ample view in all directions.

Near the mouth of the river it is bordered by extensive marshes based on soft mud.† A little farther upstream strips and patches of trees begin to appear in the marshes, increasing in size and

FIG. 1. Looking down Apalachicola River near Smith's Bend, about 25 miles above Apalachicola, showing swamp vegetation extending to water's edge. A few specimens of *Pinus glabra* visible at right.

abundance until within a very few miles the marshes are reduced to narrow and more or less interrupted strips of reed-like vegetation at the water's edge, which gradually disappear entirely. The banks at the same time become firmer and higher, but in this lower portion of the river there are very few places that can be called bluffs, and the trees nearly everywhere grow right down to the water. From the boat it was difficult to form

* The Apalachicola seems never to have been carefully measured like some of the other navigable rivers of the South, so that it is impossible to give exact figures.

† See Ann. Rep. Fla. Geol. Surv. 3: 235. 1911.

any idea of the width of the swamps, there being no hills back of them.

No abrupt changes in vegetation or environmental conditions were noticed on this trip, but in order to bring out certain contrasts between the vegetation near the mouth of the river and that farther up I have divided my notes arbitrarily into two parts, selecting as the dividing point Owl Creek, which forms part of the boundary between Franklin and Liberty Counties, about thirty miles from Apalachicola by water.

In the following table the plants seen below Owl Creek and those seen above it are arranged in parallel columns, as was done with those of the Cretaceous and Eocene portions of the Warrior and Tombigbee Rivers last year.* The number prefixed to the name of each species indicates the number of times it was seen on that section of the river; those seen only once being omitted.

The country along the lower Apalachicola is so thinly settled that the effects of civilization on the river-bank vegetation, except for the removal of a good deal of *Taxodium distichum* by lumbermen, do not need to concern us at present. Almost the only works of man visible from a boat on this part of the river are lumber camps and a few apiaries, the latter being located there to take advantage of the abundance of honey furnished in spring by the two species of *Nyssa* listed below.†

The plants noted in the manner above described are as follows:

Below Owl Creek	Above Owl Creek
Trees	*Trees*
29 Taxodium distichum	42 Salix nigra
25 Salix nigra? ‡	22 Planera aquatica
18 Sabal Palmetto	22 Betula nigra
18 Nyssa uniflora	21 Liquidambar Styraciflua
17 Nyssa Ogeche	18 Taxodium distichum
8 Magnolia glauca	18 Nyssa Ogeche
8 Planera aquatica	14 Populus deltoides

* Bull. Torrey Club 37: 113–115. 1910.

† See Sargent, Silva N. A. 14: 101. 1902. Calhoun County, which forms the western bank of the river along the greater part of the route here described, is the banner honey county of Florida, producing annually about one-third of the crop of the whole state.

‡ Some of the willows seen in the first few miles may be another species which is widely distributed in Florida and passes at present for *S. longipes*.

6 Pinus Taeda
5 Pinus glabra
5 Liquidambar Styraciflua
3 Acer rubrum
3 Quercus lyrata
3 Populus deltoides
3 Betula nigra
2 Fraxinus profunda?†

Shrubs

9 Alnus rugosa
2 Sabal glabra

Herbs

22 Tillandsia usneoides
4 Zizania palustris?
4 Scirpus validus
2 Cladium effusum
2 Phragmites communis

14 Platanus occidentalis
12 Acer rubrum?*
11 Quercus nigra
8 Populus heterophylla
7 Nyssa uniflora
6 Fraxinus caroliniana?
5 Ulmus americana?
4 Quercus lyrata
4 Magnolia glauca
3 Sabal Palmetto
2 Quercus Michauxii
2 Hicoria aquatica
2 Gleditschia sp.
2 Carpinus caroliniana
2 Acer saccharinum

Shrubs and Vines

24 Arundinaria macrosperma
14 Sabal glabra
11 Vitis aestivalis?
11 Wistaria frutescens
8 Ampelopsis arborea
5 Brunnichia cirrhosa
5 Phoradendron flavescens
2 Itea virginica

Herbs

19 Tillandsia usneoides
6 Zizania palustris? ‡
3 Senecio lobatus

Before discussing the significant features of this table it will be in order to explain a few facts which the table does not show.

The two pines mentioned in the first column did not grow immediately on the banks of the river, but a short distance back, presumably on ground elevated a trifle above the swamps. The same might be said of a few of the species in the second column, such as *Quercus nigra* and *Carpinus*. *Betula nigra* and *Acer saccharinum*, here as elsewhere, seemed to be confined to the immediate banks of the stream, leaning out over the water. *Salix*

* See notes on this species in Ann. Rep. Fla. Geol. Surv. **3**: 322. 1911; also Bush, Gard. & For. **10**: 516. 1897.

† Or more likely the var. *tridens*, which seems to enjoy more alluvial habitats than the typical *A. rubrum*.

‡ Without flowers I could not be sure whether this large grass was *Zizania* or *Zizaniopsis*.

nigra, especially in the portions of the river farthest from its mouth, where the tendency to meandering is greatest, was almost confined to the inside of bends, where deposition of sediment is taking place most of the time. *Nyssa biflora*, which is very common in the estuarine swamps near the mouth of the river,* was not seen at all on the banks, perhaps because the water there is a little too swift or too muddy for it.

In dividing the notes at only one point in this way there is nothing to show the reader just where each species was first and last seen. But of the species in the first column, *Nyssa uniflora*, *Planera*, *Quercus lyrata*, *Populus deltoides*, and *Betula* have not been observed in the typical estuarine swamps, and were not seen until after passing through the railroad bridge about four miles above Apalachicola. Of those in the second column, *Nyssa Ogeche*, *Populus heterophylla*, *Magnolia glauca*, *Sabal Palmetto*, and *Zizania* are not found in the alluvial swamps above Bristol,† and perhaps do not grow on the banks of the river anywhere above the point where darkness put an end to my observations, which must be about thirty miles below Bristol.

Sabal Palmetto extends sparingly up the river to a little above the mouth of the Chipola, far enough to overlap *Platanus*, *Betula*, *Planera*, *Populus heterophylla*, *Arundinaria*, *Wistaria*, and *Brunnichia*. (There is probably no other place in the world where it associates with all these alluvial swamp plants, or even half of them.) *Magnolia glauca* as a river-swamp tree extends at least five miles above the mouth of the Chipola, but apparently not far enough to meet *Acer saccharinum*, which was not seen until about sunset. *Nyssa Ogeche* extends a little farther up, meeting *Acer saccharinum* about fifty miles from the coast, and probably nowhere else.

Planera, *Betula*, and *Populus deltoides* were first noticed about fifteen miles above Apalachicola, and *Populus heterophylla*, *Platanus*, *Quercus nigra*, *Arundinaria*, *Wistaria*, *Vitis*, *Brunnichia*, and *Ampelopsis* at about twice that distance.

Salix nigra, *Platanus occidentalis*, both species of *Populus*,

* Described in Ann. Rep. Fla. Geol. Surv. 3: 235–237. *pl. 19, 2. f. 17.* 1911.

† Ibid., 234–235. *pl. 19, 1.* 1911.

Nyssa Ogeche, *Acer saccharinum*, *Arundinaria macrosperma*, *Wistaria*, and *Brunnichia* probably extend farther south on this river than in any other part of their ranges; and several of these are not known on any other stream in Florida.*

Now for the interpretation of some of the returns shown in the table. On comparing the two lists it will be seen that herbs and evergreen trees (particularly *Sabal Palmetto* and *Magnolia glauca*) are more abundant in the lower portions of the river, and species of woody plants more numerous farther up, all of which seems to indicate that the vegetation near the mouth of the river is farther removed from the climax condition than that higher up. (Such statistics would not carry much weight if based on this one day's work alone, but I have observed similar relations on several other rivers.) Looking at the matter more closely from a floristic standpoint, *Fraxinus profunda*, *Alnus*, *Scirpus*, *Cladium*, and *Phragmites* were not seen at all after passing Owl Creek, and *Taxodium*, *Sabal Palmetto*, *Nyssa uniflora*, and *Magnolia glauca* were noticeably more abundant below there than above. On the other hand, *Platanus*, *Quercus nigra*, *Populus heterophylla*, *Ulmus americana*, *Gleditschia*, *Hicoria aquatica*, *Quercus Michauxii*, *Carpinus*, *Acer saccharinum*, *Arundinaria*, *Vitis*, *Wistaria*, *Ampelopsis*, *Brunnichia*, and *Itea* were not identified below Owl Creek, and *Salix nigra*, *Planera*, *Betula*, *Liquidambar*, *Populus deltoides*, *Fraxinus caroliniana*, *Sabal glabra*, and *Phoradendron* were seen considerably oftener in the second part of the journey than in the first, although the first was a little longer.

The explanation of all these differences between the vegetation near the mouth of the river and that a little farther up must be sought in one or more environmental or historical factors. The environmental differences between the two portions are of several kinds, among which may be enumerated the following:—

1. The upper reaches of the river, being farther north, presumably have a slightly cooler climate. But in such a short distance climatic differences due to latitude would hardly be

* *Salix nigra*, *Acer saccharinum*, both species of *Populus*, *Nyssa uniflora*, *Quercus lyrata*, *Betula*, and *Planera* are not mentioned in the most complete list of Florida plants extant, namely, that of Prof. A. S. Hitchcock in Trans. Kan. Acad. Sci. **16**: 108–157. 1899; **17**: 79–105. 1901.

perceptible, and some of the species confined to the second column (*e. g.*, *Arundinaria*, *Brunnichia*) are more "tropical" than some of those confined to the first (*e. g.*, *Alnus*, *Scirpus*, *Phragmites*).

2. The proximity of the Gulf of Mexico to the lower portions of the river might affect the climate there by making the summers more humid, or the winters milder, or both. Although this might perhaps be assumed to have something to do with the distribution of *Sabal Palmetto* or *Platanus*, it would not explain the abundance coastward of *Taxodium*, *Magnolia*, and *Alnus*, for those are equally at home much farther north and farther inland. Besides the differences due to this cause, like the first, would be very slight.

3. The water near the mouth of the river is of course a little more salty, and more affected by tides, than that farther up. But none of the plants in the first column are believed to have any particular fondness for salt, with the possible exception of *Sabal Palmetto* (whose habitat preferences are still a puzzle) and two or three of the herbs; and nearly all of them are common far inland, where there is no tide.

4. The farther one goes up the river, the higher and firmer the banks become. It may be that *Betula*, *Quercus Michauxii*, *Acer saccharinum*, and a few other trees require a solid footing, but many of the species which are abundant on the soft muck of the estuarine swamps grow just as well or even better on *terra firma* in the interior.

5. This region, like many other parts of the coastal plain, is supposed to have been submerged beneath the sea in comparatively recent times, geologically speaking, and of course the mouth of the river emerged last, which would tend to make the vegetation there more nearly of the pioneer type, if other things were equal. But we know too little as yet of the effects of geological history on vegetation, and besides, the region under consideration is so nearly level that it must have all emerged from beneath the waves almost simultaneously. If the plants along this river were not known anywhere else, then it would be difficult to separate the effects of history from those of some other factors, especially the one next to be described. But nearly all

the species in the first column are common enough at considerably higher altitudes, which have not been submerged for ages. That some of the species in the second column have not yet had time or opportunity to spread southward or coastward as far as the mouth of the river is still less likely.

6. All streams, the large muddy rivers especially, are subject to seasonal variations in volume. In times of flood every river at every point in its course must either rise (so as to increase the area of its cross-section), or flow faster, or both. But no flood can raise the level of the ocean appreciably; so the mouths of rivers are practically free from seasonal changes of level, and fluctuate only with the wind and tides. And these influences are comparatively slight at Apalachicola, which is protected by a barrier beach a few miles off shore.

The amount of seasonal fluctuation in any river of course increases upstream, to a certain point where the diminishing volume of water (or in some cases the greater slope of the channel) begins to offset it. (In the case of the Apalachicola River system the point of maximum fluctuation is far north of the portion under consideration, probably near the fall-line.) As the Florida portion of this river is navigable all the year round, it has not yet been considered necessary to measure its fluctuations, but making a rough estimate I should say that at the point where this excursion terminated the water varies in level about ten feet during the year.

There are doubtless other environmental factors concerned to some extent in the problem, but those discussed above seem to be most significant, and the last one by far the most important. All the available evidence seems to point to the conclusion that most of the swamp plants confined to the more inland portions of this and similar rivers simply require (or tolerate?) more seasonal fluctuation of water than do those of the estuarine swamps, and *vice versa*. In the last few years I have observed similar correlations between pioneer vegetation and constant water-level in so many other places, both on the coast and in bogs and non-alluvial swamps in the interior, that I am inclined to regard this principle as of universal application, at least in temperate and moderately humid climates (which are the only climates I have thus far experienced). Just how and why fluctuations of water-level affect vegetation is a problem which belongs to ecology rather than to phytogeography, and it would require too much space to discuss it here.

University, Ala.

FOSSIL FLOWERS AND FRUITS

By T. D. A. Cockerell

The Miocene shales at Florissant, Colorado, are remarkably rich in flowers and fruits, some of which have already been described. Many others have remained unpublished, because I found it extremely difficult to determine their generic relationships with any degree of certainty. Some years ago, I took a series to Cambridge University in England, where they were much admired, but eventually returned to me with the remark that no one there felt able to describe them. I have been very unwilling to publish species of "*Antholithes*," "*Carpolithes*," etc., which could not even be referred definitely to particular families; but it is possible that by ignoring these specimens we may be missing some important evidence. Tertiary plants are nearly always referred to living genera, and it is at least certain that few if any distinct genera of plants have originated since the Miocene. It is quite a different question, however, whether any have become extinct since that time, and indeed it is practically certain that many genera have disappeared during the Tertiary. We know genera like *Sequoia*, which formerly were widespread and abundant, but now are restricted to small areas. The important genus *Ginkgo* would have disappeared entirely had it not been taken into cultivation. It is therefore quite reasonable to look for extinct genera in the Miocene, and if these really exist among our fossils, it is probable that the fruits and flowers will best indicate them. For such reasons as these it may be worth while to publish descriptions of unclassified flowers and fruits, which may be introduced as "*Antholithes*" and "*Carpolithes*," and perhaps correctly classified at some later date.

To propose a new generic name for each of these organisms would only create confusion, unless the author were so skilled in botanical taxonomy that he could say positively, no such plant as this exists today. I certainly do not possess such knowledge, but it may be that the inability of any and all botanists to recognize certain types will after a time appear to justify new generic names.

1. **Carpolithes macrophyllus** n. sp.

Fruit apparently consisting of woody follicles about 2.75 mm. long, so far as can be seen like those of *Lyonothamnus*; sepals four, persistent, about 16 mm. long, 4 broad in middle, elongate-lanceolate, apparently entire, with a single strong median vein and an irregular reticulate venation of the camtodrome type. The sepals are imperfect in various degrees, but enough is visible to permit a restoration as shown in the drawing.

FIG. 1. *Carpolithes macrophyllus*. *a*, Whole fossil, the edges of the calyx-lobes restored; *b*, detail of venation; *c*, fruit.

Can this be Cunoniaceous? The follicles and persistent sepals agree, and while the hypanthium is 5-lobed in *Lyonothamnus*, it is 4 or 5-lobed in *Weinmannia* and other genera. I do not know any genus in which the sepals resemble those of the fossil, however. In connection with the Cunoniaceæ, it is to be remarked that *Lyonothamnus*, now restricted to the islands off the coast of California, must have been more widely distributed during the Tertiary. Its foliage is extraordinarily like that of the Proteaceous *Banksia*, and if it has occurred as a fossil it has probably been referred to that genus.

Among the described fossils, *C. macrophyllus* much resembles *Buettneria perplexans* Ckll., also from Florissant. *B. perplexans* has a five-lobed calyx, the lobes or sepals about 9.5 mm. long.

C. macrophyllus was found at Station 14, Florissant (*W. P. Cockerell*). The mollusc *Planorbis florissantensis* occurs on the same slab, about 25 mm. from the plant.

REVIEWS

Scott's Evolution of Plants*

This is one of the most fascinating and, at the same time, illuminating "popular" books on science that has appeared in some time; the style has a distinct literary value, and the statements have clearness and lucidity such as only a master can command. The scope of the book is much more restricted than the title indicates, for the subject of the evolution of plants is treated chiefly with reference to the fossil evidence (p. 20). The questions considered are (p. 21): (1) The evolution of the true flowering plants or angiosperms (Chapters II and III); (2) The evolution of the seed-plants generally (Chapter IV); (3) The evolution of the great groups of the higher cryptogams, *i. e.*, of those spore-plants which share with the seed-plants the possession of a vascular system (wood and bast) (Chapters V to VII).

It is of interest to note, in passing, the order of topics, as given above, which is a direct reversal of the order of evolutionary development. In view of the claim, now so frequently and emphatically urged, that any method of treatment of the subject matter of botany that departs from the supposed order of phylogeny is undesirable and "illogical," it is instructive to note the entire success of the author's inverse order of treatment. One could hardly claim, in seriousness, that the reader loses anything of either clearness or accuracy, by approaching, even for the first time, the history of development as here recorded.

Every specialist bemoans the neglect of his own corner by those who are absorbed in other corners, but it is doubtless

* Scott, Deunkinfield Henry. The Evolution of Plants pp. 1–256. *f. 1–25*. Henry Holt and Co., New York, and Williams and Norgate, London. 1911. (A volume of The Home University Library of Modern Knowledge.)

true that the very general neglect of paleobotany by botanists is most unfortunate. Lack of perspective always means distortion, and perspective in evolutionary botany is practically impossible without regarding the evidence offered only by fossil plants. The customary omission of any reference to this record in school text-books is responsible for the very common impression of students who have had only elementary courses that mosses are descended from liverworts, ferns from mosses, and gymnosperms from ferns. Many will realize for the first time, on reading this book, that the derivation of the leafy sporophyte from the sporogonium of the bryophytes is clearly not the only possible view, but that "the theory that the asexual plant of the higher Cryptogams was derived from a sporogonium is unsupported by [fossil] evidence." "The idea of the superior primitiveness and antiquity of plants of the Bryophyte type remains a pure assumption and receives no support from our knowledge of ancient vegetation" (p. 224). "On this theory, then, the sexual prothallus and the asexual plant are both alike derived from a thallus, and may once have been perfectly similar to each other; the one has gone up and the other down" (p. 226). The reviewer calls to mind more than one college text that contains not even a hint of this fossil evidence and the conclusion to which it leads.

Omissions of like kind, however, are chargeable to the book under review. In Chapter I, discussing the Darwinian theory, the mutation theory is absolutely ignored, and one reads (p. 13) with nothing short of amazement, that, "Natural Selection appears to be the only theory at present in the field, which can be said to give at all a satisfactory explanation, by means of natural causes, of the origin of adaptations." Of similar nature is the regarding of *Isoetes* as, without question, belonging to the Selaginellaceae. Again, in discussing the relation between the colors of flowers and insect visitation (pp. 41, 96–97), the recent work of Plateau and others receives no mention. Of course, in a popular book of restricted compass, one cannot go into a discussion of all the controverted questions of the specialist, but on the other hand, it hardly seems fair to the popular reader, to leave him, in such cases, with the impression that only the explanation or view given is held or tenable.

The terminology employed is about as simple and non-technical as accuracy would permit. For example, we read (p. 191) of club-mosses "with spores of one kind," where it would have been so easy to use the less-desirable technical adjective, homosporous. Especially valuable in a popular scientific work is the author's caution in inductive inference (*e. g.*, pp. 224, 228, 230, 237, and 239), emphasizing for the reader the necessity of suspending judgment in the light of insufficient data.

A genealogical tree would have added greatly to the already clear Conclusion, and two or three (at least) illustrations of fossil plants as they are found, imbedded in the rock, would have added much to the interest and value of the text, especially to the layman who is not already familiar with these in technical publications.

On page 135, we read that the old Linnean name, Cryptogams, indicated that the sexual reproduction of these plants was hidden, "which is no longer the case"! This last clause implies a sweeping morphological change which the author probably did not intend. The last sentence on page 189 reads as follows (italics mine): "On the *other* hand, nothing could be more different than the habit — tall trees on the *other* hand, and *dwarf-water* plants with a flat disc for a stem on the *other*." On page 7 evolution is defined as coextensive with organic evolution. *Tillandsia usneoides* ("old man's beard," or Florida Moss), ascribed on page 31 to "Western South America," is found from Eastern Virginia to Florida and Texas, and abundantly throughout tropical America.

In view of the fact that the book is issued by both an English and an American publisher, and therefore presumably intended for American as well as British readers, it is unfortunate that American geological formations are almost, if not quite, ignored. There is also no reference in the book to American paleobotanical contributions.

It is a pity that the publisher's work falls so far below the author's in point of merit. The book is printed on miserable paper, and either the proof-reading or the proof-correcting was not carefully done. The jumble of words composing most of the fourth and fifth lines from the bottom of page 7 is a kind of error not uncommon in books from this American publishing house. Note also *carpets* for *carpels* (p. 70), *ony* for *only* (p. 71), *rotote* for *rotate* (p. 74), *snores* for *spores* (p. 125), *formed* for *found* (p. 130).

However, the reviewer does not wish to leave a final impression of the book out of harmony with the first sentence of this review. He feels under personal obligations to the author for this concise and clear summary of the contributions of paleobotany to plant evolution, and the volume is sure to meet with a well deserved and widespread welcome.

C. Stuart Gager.

Brooklyn Botanic Garden,
September 22, 1911

A rather rare publication,* scarcely known to most botanists, contains, among a mass of ethnologic material, considerable of botanical interest. From page 179 to 204 there is a list of the vernacular names, used by the Indians for the commoner plants of their region, together with their Latin equivalents. The list is arranged according to families in alphabetical sequence, a purely botanical device quite unknown to the Indians whose sole ideas of plants seem to be confined to knowledge as to whether they are good for anything, or not. A short introductory note has this to say of the Indians' knowlege of their flora. "By far most of the species are designated as 'aze,' medicine, and are known for their medicinal properties. It might be said, in truth, that this is the keynote to the plant lore of the Navaho, since non-medicinal plants are designated as "t'ō'ch'ịl," or merely plants. On the other hand their observations of the medicinal properties have in reality accounted for the discrimination of the various species of plants, and while many of their 'medicines' are traditional only, tradition has preserved the name although the object, and often the significance of the word, is obtained with difficulty."

The foods and beverages, most of which are of plant origin

*An ethnologic dictionary of the Navaho language. Written and published by the Franciscan Fathers of the Navajo (*sic*) Indian Mission, Saint Michaels, Arizona. Pp. 1–536. [Illust.] 1910. Price $5.00.

are listed under their vernacular names (pp. 204–219). Many of the definitions in these lists contain much of interest to the ethno-botanist and mention is made here of the publication because only 200 copies were printed and very few, if any, found their way into botanical libraries.

N. T.

PROCEEDINGS OF THE CLUB

May 8, 1911

The meeting of May 8, 1911, was held at the American Museum of Natural History at 8:15 P. M., President Rusby presiding. Forty-five persons were present.

The minutes of the meeting of April 26 were read and approved. Dr. E. B. Southwick, chairman of the Field Committee, reported that the program of the field excursions had been completed and that the first two excursions in April had been attended by twelve persons, collecting 23 species of plants, 5 of which were violets.

Dr. N. L. Britton spoke of the advisability of changing the time of the regular Tuesday meeting to some other evening in order to avoid conflicting with other meetings held at the Museum on Tuesday evening.

The scientific program consisted of a lecture on "Violets" by Professor Ezra Brainerd. Numerous lantern slides were shown to illustrate the principles of Mendel's Law, and the crossing of species of violets, with the resulting hybrids. This lecture will be published in the Bulletin of the Club.

Meeting adjourned.

B. O. Dodge,
Secretary

May 31, 1911

The meeting of May 31, 1911, was held at the museum building of the New York Botanical Garden at 3:30 P. M. Vice President Barnhart presided. Ten persons were present.

The minutes of the meeting of May 8 were read and their approval deferred until the next meeting on request of the secretary. The names of the following persons who had qualified as sustaining members of the Club were then read by the secretary: Dr. J. H. Barnhart, Hon. Addison Brown, James B. Ford, John Kane and Gustave Ramsperger. Miss Caroline C. Haynes and Mr. H. A. Cassebeer, Jr., have accepted the invitation to become sustaining members.

On motion of Dr. Britton the secretary was instructed to ascertain what action was taken by the Club in fixing the day of the Wednesday meeting and to report at the next meeting the method by which the day of a regular meeting may be changed.

The scientific program consisted of a paper on "Rubber-producing Plants" by Mr. B. T. Butler. The following abstract was furnished by the speaker:

"The rubber-producing plants of the world are confined largely to the following families: Euphorbiaceae, Apocynaceae, and Moraceae. The Asclepiadaceae, although very milky plants, has few species that yield caoutchouc. The Compositae has one genus, *Parthenium*, that yields the Guayule rubber of Mexico.

"The Euphorbiaceae is the most important family from a commerical standpoint as it includes the genus *Hevea* which produces the highest grade rubber—Para. *Hevea brasiliensis* Muell. is the best known of this genus. Pure Para rubber brings the highest market price. This species is largely cultivated in all tropical countries, supplanting the well-known *Ficus elastica* in the Far East.

"The genus *Sapium* is a near realtive of the *Hevea* and produces the White Rubber of the northern South American countries. *Sapium aucuparium* Jacq. does not "bleed" freely and the caoutchouc dries or coagulates naturally beneath the bark. This can be extracted by mechanical means.

"The family Moraceae includes the Ramboug, *Ficus elastica* Roxb., which produces a low grade rubber. The *Castilla* of Central America and Mexico, which yields a fine product is much cultivated.

"The Apocynaceae contains the lianes or tropical climbers.

The Rubber Tree of South Africa, *Funtumia elastica* Stapf., is the best known rubber tree of this family. *Alstonia scholaris* R. Br. of South Asia, *Dyera castulata* Hook. of the same region, *Dyera Lowii* Hook. of Borneo (the latter two producing the resinous product called Jelutong), *Mascarenhasia* sp. of Madagascar, and several species of *Plumiera* from Mexico are also trees that produce more or less rubber.

"Another family of scientific interest is the Celastraceae. Many members of this family possess special caoutchouc cells in the stems, leaves, and fruit. These plants do not "bleed" on cutting, but the threads of caoutchouc are found scattered throughout the plant tissues of recent growths and may be separated by mechanical means.

"Several tropical genera of Loranthaceae furnish rubber known as Mistletoe Rubber. They are of no commercial importance."

Dr. Marshall A. Howe exhibited a very beautiful and instructive series of dried specimens of marine algae from Monterey Bay, California, owned by Mr. H. B. Snyder of New York City. Comments upon the rare forms were made and some comparisons were instituted between these luxuriant well-prepared specimens and those that commonly find their way into herbaria.

Dr. W. A. Murrill then exhibited a recently collected specimen of *Arcturus borealis*.

Meeting adjourned to October 10, 1911.

B. O. Dodge,
Secretary

OF INTEREST TO TEACHERS*

General Science Courses

Among other views on general biology W. L. Eikenberry's article (*School Science and Mathematics*, September, 1910) mentions two facts that are not always recognized in framing such general courses. The first is related to the three part courses now popular as a first year course.

"The present tendency toward the use of 'immediately useful' or economic materials has stimulated the attempt to organize

* Conducted by Miss Jean Broadhurst, Teachers College, Columbia University.

the old materials of general biology about human hygiene in order to give some sort of continuity to the whole. Just what real connection the teachers may in practice succeed in giving to such a course it is not the province of this paper to present; but upon the face of the printed courses and texts it would appear that the result has been to add to the old dual course a third element already familiar in the schools as human physiology. That there is actually more connection between the parts than appears on the surface is doubtless true, but such connection is dependent upon the personal equation of the teacher and exists rather in spite of the formal organization of the materials than in consequence of it. With respect to the texts, it is interesting to note that the three parts may be so wholly independent that they are issued without change, separately bound, for use in those schools in which only one of the sciences is taught. The old authors with their natural history have in many respects come closer to a solution than we with our biology."

The second shows that the unification of such courses has its difficulties and disadvantages. After showing that botany and zoölogy are divergent rather than parallel sciences, the selection of man as the unifying object is discussed, "The increasing interest in the economic phases of the sciences has stimulated the suggestion that the grouping of materials might be made about man's interest and activity, relating everything to man's use and regarding everything from the point of view of its utilization by him. This certainly has the advantage over former courses that a coherent classification is possible, and that the course can be organized as a unit. It is open to doubt, however, whether such a self-centered arrangement of the pupil's environment is desirable either scientifically or pedagogically."

Mr. Eikenberry thinks that there "is the further disability that when a science is organized with reference to man's more or less random utilization of its materials, such great gaps are left in its structure that it becomes merely a collection of unrelated fragments; it ceases to be a science. The most heterogeneous things are often brought together by man for his purpose as when a building is constructed of burnt clay, limestone, hair, pine wood, sheet iron, and a multitude of equally diverse materials. If these things be studied from the viewpoint just mentioned any knowledge of those characteristics which are not intimately connected with their availability as structural materials is merely a collection of fugitive items without relation or connection. The mind may become stored with 'a thousand wonders of land and sea' but if these facts be unrelated and unconnected its condition is after all somewhat comparable to that of a dictionary which an acquaintance of mine described as 'mighty interesting reading but powerful disconnected.'

"Unrelated facts are of course unexplained and such a mass of highly interesting information is known only in an empirical way as much of it was known long before the birth of the sciences. If a science is to be taught the gaps must be filled up in such manner that the knowledge will be, if not continuous, at least orderly. This does not necessitate the omission of the materials selected from everyday life and related to human needs but it does require a careful selection among these and the addition to the 'practical' materials thus selected of those more practical materials which are fundamental to an understanding of the field and from which most of the practical scientific knowledge has arisen."

The conservation policies as established under the Roosevelt administration have been strengthened by two recent decisions of the Supreme Court. Both cases dealt originally with grazing on national reservations. Because of the arguments brought forward, the decisions do more than protect the forest reservations in these cases; they close the State's rights refuge to the enemies of conservation; and the second does away with the squabble over delegating legislative power by Congress, affirming that there are certain powers that Congress can either exercise or delegate, and that when it does delegate these powers it does not change their character from administrative to legislative by making the violation punishable.

Seven addresses on botanical teaching were made at the Minneapolis meeting in December (A. A. A. S.; *Science*, April 28).

Professor Charles E. Bessey discussed the preparation of botanical teachers; Professor O. Caldwell, the product of our botanical teaching; Professor F. E. Clements, methods of botanical teaching; discussion by Professor John M. Coulter and Frederick C. Newcombe followed. Professor Bessey regretted the passing of the old type of field botany, and that nothing in the present courses really takes its place; he also notes the heavier requirements of botanists for the college degrees in botany, when compared with the demands in other sciences and suggests that we are "putting too high a value on what we are putting into our students, and neglecting the man himself." Professor Caldwell (these abstracts are not complete in any sense) felt that we "need more students who early in life have begun to *think botany* and to think in the scientific method." Professor Clements noted the "failure of botany to provide a definite avenue to a position such as is offered by courses in law, medicine, engineering," etc.; he also regretted the specialized tendency that permeates nearly all elementary botanical teaching, feeling that even the microscope is "far too special an instrument for the beginner."

The English government has voted $250,000 for agricultural research, including plant and animal physiology, pathology, and breeding, and agricultural zoölogy, and fruit breeding. This appropriation is accompanied by a yearly sum of $15,000 for special investigation. The scheme includes grants to various educational institutions (a separate subject to be treated by each institution receiving aid) for investigation and scientific advice to farmers.

Professor Forrest Shreve has experimented with the giant cactus (*Carnegiea gigantea*) working out the influence of low temperatures on its distribution. The paper includes curves showing the daily rise of internal temperature in the giant cactus on a cold day.

The chief factors limiting the northward range of sub-tropical species are: "the greatest number of consecutive hours during which the temperature falls below freezing; the total number of hours of frost in a single winter; the absolute minimum reached and the length of the winter, reckoned from the first frost of autumn to the last one of spring." The first and third are considered the most important; and Professor Shreve states that the "occurrence of a single day without mid-day thawing, coupled with a cloudiness that would prevent the internal temperature of the cactus from going above that of the air, would spell the destruction of *Carnegiea* and the parallel evidence of the climatological records and of the experiments which have been described appears to explain the limitation of its northward distribution."

A Cornell pamphlet by T. L. Lyon and J. A. Bizzell on a heretofore unnoted benefit from the growth of legumes states that the fact that "a legume may benefit a non-legume growing with it, by causing the non-legume to contain a larger quantity of nitrogen or protein, seems never to have been ascertained."

Alfalfa, red clover, peas, timothy, and oats were the principal plants used in the experiments described . Timothy grown *with* either alfalfa or clover showed a large increase per ton (50 pounds grown with alfalfa, 160 with clover) in protein content; oats with peas showed a gain also. These legume-bearing soils also contained more nitrates *after* the crops had been removed. Alfalfa formed nitrates much more rapidly than clover — the rate being, of course, an important factor in relation to the removal of nitrates by roots and by drainage. Alfalfa soils (five years' growth) contained more nitrates than similar timothy soils. Lime, it was demonstrated, improved the protein content of alfalfa and of non-legumes.

The United States Bureau of Education has issued a Bibliography of Science Teaching (No. 446) compiled by a committee of the American Federation of Teachers of the Mathematical and Natural Sciences. The citations have been carefully verified, and it makes a valuable contribution to science teaching.

Pennsylvania has begun a systematic campaign against the chestnut blight. Up to 1911 the Department of Agriculture estimates the country's loss at $25,000,000. In Pennsylvania there are large areas not yet invaded by the chestnut disease, and $275,000 have been appropriated for studying and combating the disease.

An anti-frost candle has been added to the protective devices (smudges, oil heaters, firepots, etc.) for fruit trees. The candles contain a slow burning substance and can be suspended near the fruit, distributing heat at the level most needed.

The state board of education of Utah has recently ruled that every high school which receives support from the maintenance fund provided for high schools must teach agriculture. Utah is probably as good a state as any in which to enforce the teaching of agriculture; not only because of the proportion of farm land, but because of the peculiar conditions attending western farming. Nevertheless, such legislation is hardly the best thing for any new subject. This is particularly true of agriculture which to be well taught demands a good biological foundation and some practical experience. Compulsory adoption of a new subject forces poorly prepared teachers into the work, and is a disadvantage which wise advocates — even the most enthusiastic — would try to avoid.

It is to be hoped that the Utah provisions are in the form of an increased appropriation for such schools as include agriculture in the curriculum, and not an enactment making it compulsory upon pain of losing the entire state appropriation.

In repeating some of Overton's plasymolysis experiments with living cells Professor W. T. V. Osterhout (*Science*, August 11) finds that the "usual methods of determining osmotic pressure by plasmolyzing in salts of Na and K is very erroneous. Salts of Ca give more nearly the true osmotic pressure."

Solutions of calcium chloride and sodium chloride — each too weak to cause plasmolysis — caused very prompt and strong plasmolysis which mixed together; this indicates that "it is unsafe to use the common method of adding a toxic to a non-toxic substance and judging the penetration of the former by the plasmolytic action of the mixture." Among other of Osterhout's conclusions is the proteid (and not lipoid) nature of the cell membrane.

W. H. Blanchard, who has described more than forty species and forms of *Rubus* during the last few years, writes in the September BULLETIN thus: "I venture to say and say with confidence, that eight species include the great bulk of our blackberries, perhaps ninety per cent. of them."

NEWS ITEMS

Dr. Bradley M. Davis, formerly of Cambridge, Mass., has been appointed assistant professor of botany at the University of Pennsylvania.

We learn from the *Evening Sun* (Oct. 19) of the resignation of Dr. M. T. Cook as plant pathologist for the State of Delaware and Delaware College, to accept a similar position with the State of New Jersey and Rutgers College.

Dr. N. L. Britton was the host at a dinner given on October 23, 1911, in honor of Professors W. L. Johannsen, R. H. Harper, W. G. Marquette and Mr. A. B. Stout. The staffs of the Columbia University, Barnard College, College of the City of New York, Normal College, New York Botanical Garden and Brooklyn Botanic Garden were present.

Dr. W. H. Brown (Hopkins '10) has gone to Manila as botanist to the Philippine Bureau of Science.

At the New York Botanical Garden Mr. A. B. Stout has been appointed director of the laboratories to succeed Mr. F. J. Seaver who has been appointed a curator. Dr. W. A. Murrill has gone to the Pacific coast to collect fleshy fungi.

Mr. C. A. Schwarze has been appointed an assistant in botany at Columbia University.

The Torrey Botanical Club

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Delegate to the Council of the New York Academy of Sciences.
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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. 37 published in 1910, contained 630 pages of text and 36 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 24–37 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. 28–37 three dollars each.

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

(2) MEMOIRS

The Memoirs, established 1889, are published at irregular intervals. Volumes 1–13 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

MR. BERNARD O. DODGE

Columbia University

New York City

Vol. 11 December, 1911 No. 12

TORREYA

A Monthly Journal of Botanical Notes and News

EDITED FOR

THE TORREY BOTANICAL CLUB

BY

NORMAN TAYLOR

JOHN TORREY, 1796–1873

CONTENTS

Published for the Club
At 41 North Queen Street, Lancaster, Pa.
by The New Era Printing Company
[Entered at the Post Office at Lancaster, Pa., as second-class matter.]

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 should be addressed to

NORMAN TAYLOR
Central Museum,
Eastern Parkway, Brooklyn, N. Y.

TORREYA

December, 1911

Vol. 11 No. 12

LIST OF PLANTS COLLECTED ON THE PEARY ARCTIC EXPEDITION OF 1905–06 AND 1908–09 WITH A GENERAL DESCRIPTION OF THE FLORA OF NORTHERN GREENLAND AND ELLESMERE LAND

By P. A. Rydberg

1. General Description of the Flora*

By the courtesy of the American Museum of Natural History, New York City, two small collections of arctic plants were turned over to the New York Botanical Garden. These collections were made on two of the Peary arctic expeditions in search of the North Pole. The first and smaller was made on the expedition of 1905–06 by Dr. L. J. Wolf; the later and larger in 1908–09 by Dr. J. W. Goodsell. The two collections number together 60 species of flowering plants and ferns. Dr. Goodsell's collection contained 95 numbers, but as he collected at five different places many of the species were represented by more than one number. Except of a few common species the duplicates were not many. Some of the most striking or most characteristic of the plants were exhibited at the American Museum of Natural History at the Peary Exposition last year. The principal set

* Most of this article was given as a paper before the Torrey Botanical Club last year. Although the writer has never visited the arctic regions, more than half of the species discussed are familiar to him from either the Scandinavian mountains or the alpine regions of the Rockies. The general description and the statistics are furthermore abstracted from two excellent works, not generally accessible, viz., Meddelelser om Groenland, found only in a few libraries in this country and printed in Danish, and the still rarer The Vascular Plants in the Flora of Ellesmere Land, by H. G. Simmons. As descriptions of the arctic regions are very rare, especially in English, it seemed advisable to print this paper in connection with the list.

[No. 11, Vol. 11, of Torreya, comprising pp. 225–248, was issued 10 November 1911.]

is preserved at the New York Botanical Garden, and smaller sets were distributed to Dr. Goodsell, the United States National Museum, the Philadelphia Academy, and the Field Museum, Chicago. As said before, Dr. Goodsell's collection was made at five different stations. Of these three are in Greenland, viz: (1) in the vicinity of North Star Bay (latitude 76° 32′), August 3–6, 1908; (2) in the vicinity of Cape Saumarey (latitude 77° 51′), August 8, 1908; (3) in the vicinity of Etah (latitude 78° 20′), August 6–18, 1908. One station was in the vicinity of Cape Sheridan, Grant Land (latitude 82° 30′), June 15 to July 17, 1909, and the last in a ravine near Battle Harbor, Labrador. All the specimens collected by Dr. Wolf were gathered on the north shore of Grant Land.

It would not be out of the way to say something about the country from which these plants came. Greenland is an island about 23° long and over 50° wide. Of course, at that latitude the degrees of longitude are very narrow. The land is very high on the eastern side. Most of the interior is completely unknown, but many mountains towering over 10,000 feet are known to exist and Petermann's Mountain is estimated at 11,000 feet. The mountains on the west side are evidently lower, the highest known about 5,400 feet. The whole interior is covered with ice or snow. The country evidently slopes somewhat from east to west as the glacier seems to bring more ice down on this side. So far as I know only three expeditions have been made across the country, one in the extreme north by Peary and two in southern Greenland. None have been undertaken in the central portion, which is much higher. A cross country ride in this portion would be a much more strenuous undertaking than Peary's trip to the pole or even Shackleton's travels in search of the South Pole.

The eastern coast, especially the part directly opposite Iceland, is practically unknown.* No vessel has been able even to get near the coast in the last two centuries. There are traditions telling of two settlements made hundreds of years ago from Ice-

* A few expeditions to this part have been undertaken recently, but the reports, if any, have not reached our libraries.

land, and Hans Egede, the first missionary among the Greenland Eskimos, has indicated on his map two churches on the east coast. If there existed any settlement here at Egede's time or not, we do not know. Egede never visited this part of Greenland. He, as well as his son Paul, spent most of his life to an old age among the western Eskimos. One expedition was made some years ago by the Danes and Norwegians along the eastern coast to the part where these old colonies were supposed to have been, but no traces of them were found. At present all the Danish colonies are on the western coast. The most northern one with regular communications, Upernavik, is situated near the 73° parallel, although there is a trading post at Tasinsak about one degree further north. The most northern Eskimo settlement is at Etah near 78° latitude.

The permanent inland ice reaches nearly to the coast and it is only a small strip of the mainland and the islands which become uncovered in the short summer, and it is only where glaciation or erosion has ground the rocks into gravel, sand, or dust, that there is any vegetation at all.

Ellesmere Land is an island situated west of North Greenland, and separated from it by Smith Sound, Kennedy Channel, and Robeson Channel. Kane Basin and Hall Basin are wider parts between the three channels. Ellesmere Land is situated between latitudes 76° and 83°. As several deep bays cut into this island both on the east and the west side, different portions of the same have received different names. The southeastern portion, the one first discovered, received the name Ellesmere Land, the middle portion Grinnell Land, and the northern portion Grant Land. The southern coast has been known as North Lincoln and the southwest end King Oscar Land. As Ellesmere Land was the first name applied to any portion of it by Europeans, it has been adopted for the whole island by the Canadian government. The oldest name is probably "Umingma nuna," the land of the muskoxen, as the Eskimos call it.

Ellesmere Land is not so high as Greenland, the highest point only a couple of thousand feet. There is no continuous inland ice as in Greenland, although smaller ice fields, snow-covered mountains, and glaciers are found. The flora would probably be much richer if the soil were not so poor and the water supply so limited. In the northern part there is a large fresh-water lake, Lake Hazen.

In the accounts of the flora of Greenland and Ellesmere Land we seldom find any references to the altitude at which the plants grow. Simmons, in his flora of the latter, accounts for this. The occurrence of higher vegetation depends wholly upon soil and moisture. He says: "even at heigths of a thousand feet or more, there would be a flourishing vegetation, if only the other conditions were favorable. In few places have I seen such tall grasses as in the plateau of the peninsula between Goose Fjord and Walrus Fjord, at a height of more than 1,000 feet, and often, when after climbing a steep slope of some hundred or a thousand feet, which was very bare except for mosses and lichens, one arrived at a ledge or plateau, one would find a vegetation, which was not any poorer than that near the sea."

West of Ellesmere Land there is another large island, Heiberg Land, perhaps half as large. The flora of this is probably the same as that of Ellesmere Land. This island is practically unknown and no collection of botanical specimens has been made there.

The Labrador coast is very rocky and barren. The inland highland is practically unknown. All botanical collections made in Labrador have been made on the coast, but as Labrador belongs to the subarctic instead of the arctic regions I shall not characterize its flora here. I may only mention that Dr. Goodsell collected here an undescribed plant, of the parsnip family. This was submitted to Dr. J. N. Rose of the United States National Museum, who has furnished a description of it. It belongs to the genus *Conioselinum*.

Greenland has only one plant that forms a tree, *Betula odorata tortuosa*, of which one specimen has been found with a trunk 10 inches in diameter and 12 feet high. It is found as a small tree only at latitude 61° and south thereof, at about the same latitude as Upsala in Sweden, where there are forests of oaks, basswood, and choke cherry. The pine and spruce forests extend to nearly the farthest point north on the Scandinavian peninsula, *i. e.*, almost to latitude 72°. This is mentioned to show the difference in temperature and climate between northern Europe and the same latitude on this side of the Atlantic. The gulf-stream ends north of Norway and the polar current skirts the east coast of Greenland.

The northern Swedish-Norwegian barley has been tried on Greenland but has failed to ripen even in the most southern part. At all the Danish colonies they have tried to grow gardens to some extent. In the Upernavik district they have failed altogether. At Umanak, near latitude 71°, they can grow green cabbage and radishes and a little lettuce, which does not form heads however. At Ritenbank, near latitude 70°, turnips and dwarf parsley are added. When the country settlers around Godthaab, latitude 64°, go to town, that is the trading post, they bring with them small bouquets of parsley as special gifts to their friends. In the most southern part peas have been grown large enough for the table although they do not ripen. Here there have also been some successful attempts to grow potatoes. But this part of Greenland is outside of the polar circle.

When the vegetable fare is so meager in the Danish colonies what would it be at Etah north of latitude 78°? Of course, none of our vegetables can be grown, and the native plants fit for food are very few. The only berries reported so far north are the crowberry, *Empetrum nigrum*, scarcely used as a food by white people, and a small blueberry, *Vaccinium uliginosum microphyllum*. The alpine blackberry, *Mairania alpina*, stops at latitude 70°, the common bearberry, *Arctostaphylos Uva-ursi* at 66° 40′, the so-called mountain cranberry, *Vaccinium Vitis-idaea* at 76°, the small cranberry, *Oxycoccus Oxycoccus microphyllus*, at 64° 30′, the blueberry, *Vaccinium uliginosum*, at 64°, the cloudberry or baked-apple-berry, *Rubus Chamaemorus*, at 64° 15′, the dwarf red dewberry, *R. saxatilis*, at 63° 30′. The only plants that can be used for food in the neighborhood of Etah and on Ellesmere Land are *Rhodiola rosea*, a species of stonecrop, of which the thick red root is eaten, mountain sorrel, *Oxyria digynia*, of which rootstock and leaves are used, and two species of scurvy-grass, *Cochlearia groenlandica* and *C. fenestrata*, of which the foliage is used. The flower spikes of a lousewort, *Pedicularis lanata*, are also eaten. Among the food plants of more southern parts of Greenland may be counted *Archangelica officinalis* and *Chamaenerium latifolium*, the latter a relative of our fireweed.

As said before, there are no trees in northern Greenland nor in Ellesmere Land. The woody flora consists of a few low bushes and undershrubs. *Betula flabellifolia* extends north to latitude 72°, the other dwarf birches are confined to southern Greenland. Two willows, *Salix groenlandica* and *S. anglorum*, are found in the whole of Greenland and in Ellesmere Land; the latter also throughout arctic America. One sterile specimen collected by Dr. Wolf on Grant Land seems to be *S. arctica*, not known from this region before. *S. herbacea* extends in Greenland north to 76° and *S. glauca ovatifolia* to 72°. The other Greenland willows are confined to the southern portion. None of them are found in Ellesmere Land.

The other undershrubs are the crowberry, *Diapensia lapponica*, and members of the heath and huckleberry families, all mentioned above except *Cassiope tetragona*. A few degrees south of Etah a few more are added, as for instance, *Phyllodoce caerulea*, *Andromeda polifolia*, *Cassiope hypnoides*, *Chamaecistus procumbens*, *Rhododendron lapponicum*, and *Ledum decumbens*. In Ellesmere Land the woody vegetation consists of the three willows mentioned above, *Diapensia lapponica*, *Vaccinium uliginosum microphyllum*, *Cassiope tetragona*, and *Empetrum nigrum*.

Nearly all of the plants of northern Greenland and Ellesmere Land are perennials. The majority are densely tufted or matted plants, some of them making large carpets. Among these can be counted many of the saxifrages and crucifers. Others have rootstocks, often thick and fleshy, as *Rhodiola rosea*, *Oxyria digyna*, several species of *Pedicularis* and *Taraxacum;* sometimes these are more slender, as the species of *Ranunculus*, the sedges, and the grasses.

Lange, in his Conspectus Florae Groenlandicae, enumerates about 400 species of flowering plants, but of course the larger number of these are confined to the southern portion. Simmons, in his Vascular Plants of Ellesmere Land, enumerates 107 phanerograms. Of these about a dozen are not found in Greenland. There are, however, perhaps a score of species found in northern Greenland not found in Ellesmere Land, and a few have been added since Simmons's publication, so that the North American flora north of latitude 72° may be estimated to about 160 species. Of these about three fifths are circumpolar plants, *i. e.*, plants common to arctic America, Spitzbergen, and Siberia. Of the remaining two fifths, at least half are plants common to arctic America, and the rest divided between truly endemic plants of this region and such as are of European origin, *i. e.*, common to Greenland and Iceland or Spitzbergen.

The families represented in the flora of Ellesmere Land and that of Greenland north of the Danish colonies (*i. e.*, north of latitude 72°) are as follows:

Gramineae	20	19	Rosaceae	5	7
Cyperaceae	15	19	Empetraceae	1	1
Juncaceae	3	6	Onagraceae	1	1
Melanthaceae	0	1	Pyrolaceae	1	1
Salicaceae	3	6	Ericaceae	1	7
Betulaceae	0	1	Vacciniaceae	1	2
Polygonaceae	2	3	Diapensiaceae	1	1
Portulacaceae	0	1	Primulaceae	1	0
Alsinaceae	7	11	Polemoniaceae	0	1
Caryophyllaceae	3	4	Plumbaginaceae	1	2
Ranunculaceae	6	8	Boraginaceae	0	1
Papaveraceae	1	1	Scrophulariaceae	4	6
Cruciferae	13	17	Campanulaceae	4	1
Crassulaceae	0	1	Compositae	4	8
Saxifragaceae	12	12	Cichoriaceae	3	2
				110	151

Of these there are 44 species reported for northern Greenland and not for Ellesmere Land, and 12 for the latter that are not found in the former. In the two together there are hence 163 species reported. The Eskimo settlements of Etah and vicinity, visited by the Peary expeditions, are situated between latitudes 76° and 78°, and no plants were collected farther south than 76°

30′ except those collected in Labrador. If 76° north latitude would be taken as the southern boundary instead of 72°, I think that the flora of the region would not comprise 100 species in all, as most of the additional Greenland species mentioned above have been recorded only a little north of 72°, and a few of the Ellesmere Land species are limited to the extreme southern portion of that island.

The grasses are all low and not very abundant. Of course, none of them could be used for hay, though they constitute an important part of the summer food for muskoxen and hares. The principal food for the former consists, however, of lichens and mosses. The grasses can be classified into two kinds: (1) The bunch grasses with very short rootstocks and sending up numerous branches from inside the lower sheaths. (2) Those with long stoloniferous rootstocks, forming sods like the Kentucky bluegrass. The former are growing in the gravel beds and among rocks, the latter in richer and moister soil around brooks and springs and below melting snowdrifts.

The sedge family is represented by two species of cotton grass, *Eriophorum*, one species each of *Kobresia* and *Elyna*, the latter genera closely related to the true sedges, *Carex*. The rest of the family consists of species of the latter genus. Most of them grow in the wetter places and have rootstocks.

The Juncaceae, the rushes, are represented by one species of *Juncus* in Ellesmere Land and two in northern Greenland, two species of *Juncoides* or *Luzula* in the former and four in the latter.

No other family of the monocotyledons is represented in Ellesmere Land, except Melanthaceae by one species, *Tofieldia palustris*, in northern Greenland.

The willow family has three representatives in Ellesmere Land and six in northern Greenland. All are low undershrubs. So also is the only representative of the birch family in northern Greenland, viz., *Betula flabellifolia*.

The representatives of the buckwheat family are *Oxyria digyna*, as stated before, one of the food plants, and *Polygonum viviparum*, a common alpine-arctic species. The third representative in northern Greenland is an introduced weed, one of the sorrels, *Rumex Acetosella*.

Montia fontana, a spring plant, *i. e.*, growing in springs, represents the purslane family in northern Greenland.

The chickweed family has seven representatives in Ellesmere Land and eleven in northern Greenland. Except the two species of *Cerastium*, they are very modest looking plants with small flowers and all forming small mats.

The pink family consists of the moss pink, *Silene acaulis*, common also on the higher mountains of this country and Europe, and three species of *Lychnis* or *Wahlbergella*.

The crowfoot family is represented by species of *Ranunculus*, all growing in wet places, especially under melting snow drifts; some of these are rather showy.

The most showy plant of the region is the arctic poppy, *Papaver radicatum*. It is rather strange that this genus, belonging principally to warmer countries, should have furnished the plant that above all gives color to the arctic flora. The common poppies of the gardens, the opium plant of India, the wild poppies of central Europe and California, are all leafy-stemmed annuals, but there is a small group of poppies of the arctic and alpine regions, which are perennials with short cespitose rootstocks, crowned by a cluster of finely dissected leaves and naked flower stalks. The stemmed poppies of warmer regions have mostly red, purple, pink, or rarely white flowers. The alpine-arctic poppies range from orange through yellow to white. *Papaver radicatum* is common through arctic Europe and America, in the Scandinavian mountains, on Iceland, and in our Rocky Mountains as far south as Colorado. Two closely related species are found in the Alps, another in the Pyrenees, another in the Caucasus, another in the Canadian Rockies and Montana, and two more in Alaska and eastern Siberia. If I do not remember incorrectly, the group is also represented in the Altai Mountains and the Himalayas.

The mustard family is represented by several species of *Draba*, two species of *Cardamine*, two of *Arabis*, two of *Cochlearia*, and one species each of the genera *Lesquerella*, *Eutrema*, *Braya*, and *Hesperis*. The species of *Cochlearia* are interesting, not only from the fact that they are used for food and as a remedy against scurvy, but more so from the fact that they are, so far as I know, the only annuals of the region.

The only representatives of the stonecrop family is *Rhodiola rosea*, the root of which is eaten. It is not found in Ellesmere Land.

All the representatives of the saxifrage family belong to the genus *Saxifraga*, in the broader sense, except *Chrysosplenium tetrandrum*, collected at one station in southern Ellesmere Land.

The rose family is represented by one species of *Dryas* in Ellesmere Land and two in Greenland. The other members of the family belong to the genus *Potentilla*, all low and tufted species.

The crowberry, *Empetrum nigrum*, is the only representative of its family. The evening primrose family is represented by *Chamaenerium latifolium*, a close relative to our fireweed, and the wintergreen family by *Pyrola grandiflora*. The heath family is represented in Ellesmere Land by a single species, *Cassiope tetragona*, but in northern Greenland by six more species of the genera *Phyllodoce*, *Andromeda*, *Cassiope*, *Chamaecistus*, *Rhododendron*, and *Ledum*.

The huckleberry family has one representative in Ellesmere Land, *Vaccinium uliginosum microphyllum*, and an additional one in northern Greenland, *V. Vitis-idaea pumilum*.

Diapensiaceae is represented by *Diapensia lapponica* in both countries, Primulaceae by *Androsace septentrionalis* in Ellesmere Land, and Polemoniaceae by *Polemonium humile* in northern Greenland.

The Plumbago family is represented by one species of *Statice* in Ellesmere Land and two in Greenland. The only representative of the borage family is *Pneumaria maritima* in North Greenland.

All the representatives of the figwort family belong to the genus *Pedicularis* in the broad sense.

The harebell family is represented by *Campanula uniflora* alone.

The sunflower family is represented in Ellesmere Land by two species of *Erigeron*, one of *Antennaria*, and one of *Arnica*.

The additional species in North Greenland are one species of *Erigeron*, two of *Gnaphalium*, and one of *Artemisia*.

All four members of the chicory family belong to the genus *Taraxacum* of which the dandelion is a member. Of these one has not been found outside of Ellesmere Land and North Greenland, two more are found only there and in arctic America, while the fourth (not found in Ellesmere Land, nor America) is common to Greenland, arctic Europe, and Asia. All four of the arctic dandelions are now represented in the herbarium of the New York Botanical Garden. A few years ago we had only one. Two more were collected by Dr. Wolf and the last one by Dr. Goodsell.

New York Botanical Garden

(*To be continued*)

NEW COMBINATIONS FROM THE GENUS EUPHORBIA

By J. C. Arthur

The rusts inhabiting the several species of the genus *Euphorbia*, as ordinarily understood, have been variously treated by mycologists. In the recent monograph of the genus *Uromyces* by Sydow, the North American forms having aecia, uredinia and telia are segregated under four species, following the authority of Tranzschel, who in turn based his studies largely upon the published results of cultures made by the writer. In the treatment of this group of rusts in a forthcoming number of the North American Flora, the writer proposes to consider the four species recognized by Sydow as representing "physiological species," or races, belonging to a single species of rust. As these races conform fairly well to the genera into which the genus *Euphorbia* has been segregated, the writer further proposes to use the names of the segregates, rather than list all the hosts, about thirty-five, under the genus *Euphorbia*. A few of these species have not yet been transferred to the segregated genera, and rather than make the transfer of phanerogamic names in a work devoted to fungi, the present method is taken to place the names on record where phanerogamic botanists may readily find them.

All the changes have the approval of Dr. Charles F. Millspaugh, who has passed upon all my material. His departure some time since upon a trip around the world made it impossible for him to publish the names, or even prepare the article. I am, therefore, assuming the responsibility, and propose the following changes:

Adenopetalum gramineum (Jacq.) Arth. *Euphorbia graminea* Jacq. Select Am. 151. 1763.

Chamaesyce arizonica (Engelm.) Arth. *Euphorbia arizonica* Engelm. in Torrey, Bot. Mex. Bound. 186. 1858.

Chamaesyce hirsuta (Torrey) Arth. *Euphorbia hypericifolia hirsuta* Torrey, Comp. 331. 1826. *E. hirsuta* Wiegand, Bot. Gaz. **24**: 50. 1897.

Chamaesyce lasiocarpa (Klotz.) Arth. *Euphorbia lasiocarpa* Klotz. Nov. Act. Nat. Cur. Suppl. **19**: 414. 1843.

Chamaesyce pilosula (Engelm.) Arth. *Euphorbia pilosula* Engelm.; Boiss. in DC. Prodr. **15**^{2}: 39. 1866.

Chamaesyce Preslii (Guss.) Arth. *Euphorbia Preslii* Guss. Fl. S c. Prodr. **1**: 539. 1827.

Chamaesyce potosina (Fernald) Arth. *Euphorbia potosina* Fernald, Proc. Am. Acad. **36**: 495. 1901.

Poinsettia strigosa (Hook. & Arn.) Arth. *Euphorbia strigosa* Hook. & Arn. Bot. Beech. Voy. 310. 1837.

Zygophyllidium biforme (S. Wats.) Arth. *Euphorbia biformis* S. Wats. Proc. Am. Acad. **18**: 151. 1883.

As the three species, *C. Preslii*, *C. hypericifolia* and *C. nutans*, are usually grouped in current literature under one name, and differential descriptions are not available, Dr. Millspaugh at my request has supplied the following key.

Inflorescence glomerate.

Leaves obtusely serrate, long-pilose at base; seeds black or blackish. *C. Preslii.*

Leaves sharply serrate, not long-pilose at base; seeds red or reddish. *C. hypericifolia.*

Inflorescence solitary. *C. nutans.*

The first two species occur throughout the United States and Canada, the last species does not occur in the United States or Canada, but is found in the West Indies and Mexico.

PURDUE UNIVERSITY,
LAFAYETTE, INDIANA

ANOTHER RESPIRATION EXPERIMENT

BY JEAN BROADHURST

For two years we have been using the following device for showing that green plants give out CO_2. Many methods have already been described; this is added only because it is so easily put up and because the contrast with the control is most marked. An air-tight joint made with water is more certain than when made with vaseline, etc.; it is also less "mussy."

A dish, *A*, is partly filled with water. In it are placed a glass vessel for lime (or barium) water, *B*, supported on any solid support, *C*, to raise it above the water in *A*. A leaf (geranium) may be placed over *B* with the petiole extending into the water

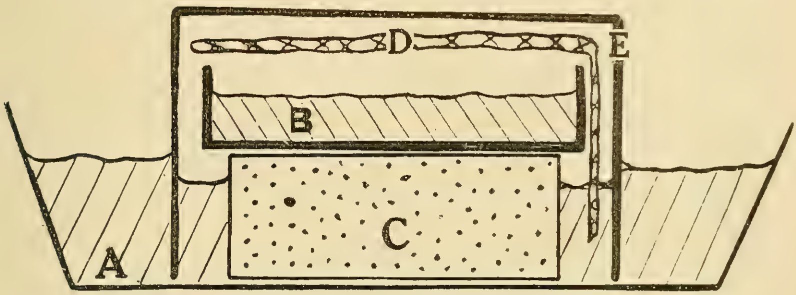

FIG. 1.—*A*, a dish or pan containing water for making an air-tight joint around *E*.
B, glass containing lime-water.
C, support.
D, a geranium leaf.
E, a glass dish enclosing *D* and *B*.

in *A*. (The petiole is, of course, not necessary, but students seem to feel that the conditions are more normal when the petiole has access to water in this way.) Over all is inverted a crystallizing dish, *E*, which should be but slightly wider in diameter than

B, making very little air enclosed in the space under *E*. An inverted vessel rarely sits firmly when inverted over water and a bent tube may be used to draw out some of the air under *E*. This will make *E* more steady, and will also make the water rise in *E* and lessen the air space. If too much air is drawn out, and the water around *B* rises too high, it will be difficult to remove *E* at the end of the experiment without the risk of causing an overflow into *B* and breaking the heavy film that forms on the surface of the lime water.

The control is exactly the same, except the leaf is omitted. The air space under *E* is so small that in the control but a partial, delicate film is formed on the lime water, contrasting strongly with the heavy one formed in 12 to 24 hours by one green leaf.

TEACHERS COLLEGE

NOTES ON RUTACEAE — VI. SPECIES OF SPATHELIA*

BY PERCY WILSON

The species of *Spathelia* L. are confined, in so far as known, to the West Indies, with a very doubtful species reported from Mexico.

Of the five recognized species of *Spathelia*, *S. simplex* and *S. glabrescens* are endemic in the island of Jamaica, while *S. cubensis* is known only from the province of Oriente, Cuba, and *S. Brittonii* from the province of Pinar del Rio. *S. vernicosa*, originally described from specimens collected in eastern Cuba, is also found on Cat Island, Bahamas.

They are slender unarmed trees one to twenty-four meters tall, with simple unbranched trunks conspicuously marked with leaf-scars, and bearing pinnate leaves, and large panicles with showy purplish or scarlet flowers at the summit. The ovary is usually 3-celled, and the fruit normally 3-winged.

It is apparent from observations made by several students of West Indian plants, that wherever species of *Spathelia* are found there are always present, in a dead or dying condition, a few speci-

* Notes on Rutaceae—V was published Bull. Torrey Club 38: 295–297. 6 Jl 1911.

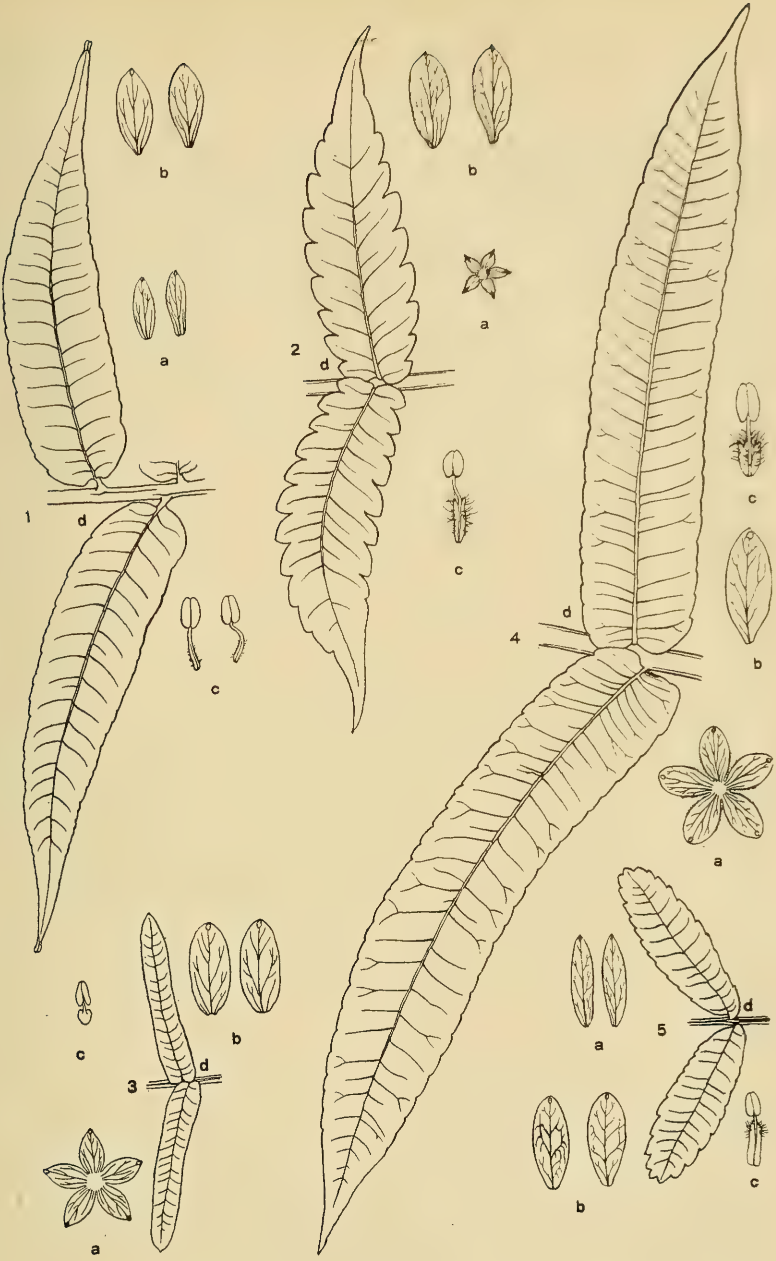

FIG. 1.

FIG. 1.—In each figure a = sepals (or calyx), $\times$ 2, b = petals, $\times$ 2, c = stamens, $\times$ 2, d = leaflets, $\times$ ½.

1. *Spathelia glabrescens* Planch.
2. *Spathelia Brittonii* P. Wilson.
3. *Spathelia cubensis* P. Wilson.
4. *Spathelia simplex* L.
5. *Spathelia vernicosa* Planch.

The figures have been made from drawings by Miss M. E. Eaton.

mens bearing old fruiting inflorescences, and in no instance do they appear to have been destroyed by disease or fire. Other observers who have had the opportunity to study them during their entire stage of reproduction, assert that the plants show signs of decay with the maturing of their fruits and soon afterward die. It would undoubtedly afford an interesting subject for investigation to ascertain the age the various species of *Spathelia* reach before producing their flowers and fruits. Definite information upon this subject appears to be lacking.

Descriptions of each of the foregoing species will be found in North American Flora **25**: 206–208. 1911.

New York Botanical Garden.

SHORTER NOTES

New Names in Ilex

Ilex kingiana n. n.; *Ilex insignis* Hook. f., Fl. Brit. Ind. *I*, 599 (1872); not *I. insignis* Heer, Fl. Foss. Alask. 37, pl. x (1869).

Ilex microphyllina n. n.; *Ilex microphylla* Newby. Proc. U. S. Nat. Mus. **5**: 510 (1883); not *I. microphylla* Hook. Ic. Pl. or Spreng. D. C. Prod. *2*: 12.

Salix fastwoodiae in the new edition of Heller's Catalogue, p. 89, is of course a misprint for *S. Eastwoodiae*, as its position in the list shows. It is *S. californica* Bebb. (not Lesq.).

T. D. A. Cockerell

REVIEWS

Alexander's Outline Key of Michigan Sunflowers*

The utter impossibility of fitting the sunflowers of southeastern Michigan into the specific limits of sunflowers as given in the manuals, has led Mr. Alexander, of Detroit, to undertake the study of these plants. As the result of six years of study, he has worked out a system of classification of the perennial sunflowers, based upon the underground parts of the plants. He recognizes two main groups which he calls the Storeatae, in which the roots and root-stocks are tangled together into a close

* Alexander, S. Outline Key of the Groups of the Genus *Helianthus* in Michigan. Report Mich. Acad. Science **13**: 191–198. *f. 1–5*. 1911.

mat; and the SPARSAE, in which there is a shorter or longer underground root-stock (which he calls the "earth-branch"). In the first group, new plants arise from buds on this matted crown; the plants, therefore, all remain in a close cluster. In the other group, the new plants are scattered at some distance from the old plants. The STOREATAE are again subdivided into those in which the roots become very fleshy and usually more or less spindle-shaped toward the end of the season. The contents of these roots are used up by the following year's growth. The other division consists of those with fine fibrous roots. Further subdivisions of these are based upon the fact that the leaves are three-nerved in some, and pinnate-nerved in others. Still further subdivisions are based upon the hairiness. The group SPARSAE is divided into sections in which the underground stems are terminated by tubers (*H. tuberosus* being an example), and those not so enlarged. The latter are again divided into those with petiolate leaves and those with practically sessile leaf-blades. Further subdivisions are based upon the presence or absence of wings upon the petioles, and on the nervation of the leaf-blades.

The author finds that by subdividing the plants in this way, he can distinguish a large number of species which have apparently never been described. It is to be hoped that botanists elsewhere, where the perennial sunflowers are abundant, will try out Mr. Alexander's key as to its workability in other localities.

EAST LANSING, MICHIGAN — ERNST A. BESSEY

NEWS ITEMS

A hurricane accompanied by rain and snow on the night of November 11, at Lafayette, Ind., did much injury to the botanical department of the Purdue Experiment Station. The windows of the offices and laboratories were blown in, but the herbarium room escaped unharmed. About half of the glass in the conservatories was broken, and as the storm was followed by severe cold, practically all the plants perished. The collection included many species gathered from all parts of the country for culture hosts in the study of rusts.

Dr. D. T. MacDougal, director of the department of Botanical Research of the Carnegie Institution, has gone to Egypt to prosecute studies on the desert vegetation of that region. Dr. W. A. Cannon recently returned from a preliminary survey of the deserts in northeastern Africa, under the auspices of the same institution.

At the American Association for the Advancement of Science meeting at Washington, D. C., during Christmas week, Dr. C. E. Bessey, of the University of Nebraska, will act as president.

We quote from the New York *Evening Post* (December 2) the following, in regard to Columbia University:

"A greenhouse and botanical laboratory is now in course of construction in East Field, the half block between Amsterdam and Morningside Avenues, which was recently acquired by the university, and on which the President's house is being erected. The greenhouse stands in the middle of the block, just back of the President's house. It is to be used by professors and advance students in the Department of Botany.

"In the conservatory, wh ch will be twenty-four by eighty feet, plants for use in all botanical work, both graduate and undergraduate, will be grown. Moreover, it will contain a laboratory and a dark room, equipped with all the modern appurtenances. . . . Advanced classes in plant physiology and experimental botany will work in the conservatory, as will the groups in experimental plant pathology."

From the New York *Evening Sun* (December 11) we learn that Sir Joseph Hooker has died. Joseph Dalton Hooker was a retired surgeon of the Royal Navy and late director of the Royal Gardens at Kew. He was born at Halesworth, Suffolk, June 30, 1817. He was educated at the High School and the University of Glasgow. He was surgeon and naturalist on his Majesty's ship Erebus in the Antarctic expedition under Sir James Ross in 1839–43. He visited as a naturalist the Himalaya Mountains, Syria and Palestine, Morocco and the Greater Atlas. He was in the Rocky Mountains and California in 1877. Sir Joseph was president of the Royal Society, 1872–77.

INDEX TO VOLUME XI

New names and the names of new genera and species are printed in **boldface type**

The Torrey Botanical Club

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OF THE

TORREY BOTANICAL CLUB

(1) BULLETIN

A monthly journal devoted to general botany, established 1870. Vol. 37 published in 1910, contained 630 pages of text and 36 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 24–37 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. 28–37 three dollars each.

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

(2) MEMOIRS

The MEMOIRS, established 1889, are published at irregular intervals. Volumes 1–13 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.

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