BULLETIN

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GENERAL INDEX.

(Illustrated articles are marked with an *.)

GENERIC INDEX.

ERRATA.

P. 266, line 22. For *Doticholus* read *Dolicholus*.
P. 446, line 12. For *pleoispora* read *pleiospora*.
P. 446, line 22. For *rediunta* read *redimita*.
P. 447, line 3. For *subplebia* read *subplebeia*.
P. 496, line 32. For ten miles read two miles.
P. 500, line 11. For *Cerataulus* read *Cocconeis*.
P. 569, line 28. For 1.5 mm. read 1.5 m.
P. 570, line 13. For 4 dm. read 15 dm.

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BULLETIN

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NATHANIEL LORD BRITTON,

AND OTHER MEMBERS OF THE CLUB.

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The Club meets regularly at Columbia University, 49th Street and Madison Avenue, New York City, on the second Tuesday and last Wednesday of each month, except June, July, August and September, at 8 o'clock, P. M. Botanists are cordially invited to attend.

MEMBERS OF THE CLUB will please remit their annual dues for 1897, now payable, to Mr. Henry Ogden, Treasurer, 11 Pine St., New York City.

BULLETIN

OF THE

TORREY BOTANICAL CLUB.

Vol. 24. Lancaster, Pa., January 28, 1897. No. 1.

Notes on Potentilla.—VI.

By P. A. Rydberg.

(Plates 287, 288.)

The *Hippianae* constitute a group somewhat related to the *Multijugae.* They are, however, as a rule stouter than the members of that group, and the leaves are more or less white or grayish hairy, generally densely silky, villous or tomentose. The group contains the following species:

Potentilla Breweri S. Wats. Proc. Am. Acad. 7: 555. 1873.

Potentilla Breweri much resembles *P. Plattensis.* It has the large stipules characteristic of that species and also essentially the the same flowers. The leaflets are, however, broader and less divided and densely silky-villous. In the typical form the cyme is rather dense and the flowers larger. It grows in California.

Potentilla Breweri expansa S. Wats. Bot. Cal. 1: 179. 1876.

Potentilla Plattensis leucophylla Greene, Erythea, 1: 4. 1893.

This resembles *P. Plattensis* still more, having the open cyme of that species. It grows also in Nevada and is apparently more common than the species.

Potentilla crinita A. Gray, Mem. Am. Acad. 1849: 41. 1849.

This is of similar habit but easily distinguished by its conduplicate, appressed-silky cuneate leaflets, which are slightly crenate at the apex. *P. crinita* grows on the dry plains of Arizona, New Mexico, southern Utah and Colorado.

Potentilla effusa Dougl.; Lehm. Stirp. Pug. **2**: 8. 1830.

The pubescence is grayish or whitish tomentose, not at all silky; the branches are rather divergent and the bractlets much smaller than the acuminate sepals. It grows on the dry plains from New Mexico to Montana, Assiniboia and Minnesota (?).

Potentilla effusa gossypina Nutt.; Torr & Gray, Fl. N. Am. **1**: 437. 1840, is still unknown. Dr. Hooker, in London Jour. Bot. **6**: 219, states that the plant collected by Geyer (no. 637) was labelled by Nuttall *P. gossypina.* These specimens Dr. Hooker identified as *P. arachnoidea* Douglas, which is *P. Pennsylvanica arachnoidea* Lehm.

Potentilla filicaulis (Nutt.).

Potentilla effusa filicaulis Nutt.; Torr. & Gray, Fl. N. Am. **1**: 437. 1840.

This is known from only two fragmentary specimens, one, the original of Nuttall, in the Torrey Herbarium at Columbia University, the other collected by Dr. J. M. Coulter, in 1872, near Fort Hale, and preserved in Dr. Porter's private collection. The stem is very slender, filiform. As the pubescence is somewhat silky, it is probably more related to the following species:*

Potentilla Hippiana Lehm. Stirp. Pug. **2**: 7. 1830.

Potentilla leucophylla Torr. Ann. Lyc. Nat. Hist. N. Y. **2**: 197. 1827. Not Pallas.

Potentilla leneophylla Eat. Man. Ed. 5, 344. 1829.

The name used by Eaton seems to have been overlooked altogether. It may be claimed that the name given was only a misprint for *P. leucophylla*, the original name, which, however, is antedated by *P. leucophylla* Pallas, a synonym of *P. nivea.* The name *P. leneophylla*, which means woolly-leaved, a very appropriate name, is not only found in the fifth edition of Eaton's Manual, but also in the sixth and seventh editions and in Eaton & Wright's North

* Since the above was written I have found a sheet of good specimens in a collection from the Iowa Agricultural College at Ames. These specimens show that the plant is more nearly related to *P. Hippiana* than to *P. effusa*, having practically the same pubescence and sepals as that species, but is much smaller. It has often subdigitate leaves, and holds about the same relation to *P. Hippiana* as *P. saximontana* and *P. minutifolia* do to *P. pulcherrima*, and may better be referred to the *Subjugae* group.

American Botany. Watson in his Bibliographical Index has no reference to any of the editions of Eaton's Manual and gives Eaton & Wright as a reference under *P. leucophylla*, which does not appear there. The Kew Index has also omitted *P. leneophylla*, which should take the place of *P. Hippiana*, being a year older, if it were not for the fact that it very likely is to be explained as a misprint. *P. Hippiana* is sometimes very hard to distinguish from *P. effusa*, and the two seem to grade into each other. *P. Hippiana* is, however, as a rule larger, silky as well as tomentose; the branches are more erect and the bractlets nearly equalling the acute sepals. The species grows on the plains and the foot hills of the Rockies, but generally in richer soil than *P. effusa*. It extends from New Mexico and Arizona to Minnesota and Saskatchewan.

POTENTILLA HIPPIANA PROPINQUA n. n.

Potentilla diffusa A. Gray, Mem. Am. Acad. **1849**: 41. 1849. Not Willd.

Potentilla Hippiana pulcherrima S. Wats. Proc. Am. Acad. 555, in part, 1873. Not *P. pulcherrima* Lehm.

The stem is more diffuse or ascending, rather low; the leaflets are more approximate and more silky, scarcely at all tomentose, often green above. In the latter case they resemble somewhat those of *P. pulcherrima*, which is a much taller plant.

POTENTILLA AMBIGENS Greene, Erythea, 1: 4. 1893.

It is strange that this very marked species should not have been described before 1893. It was collected by Hall and Harbour in 1862, Wm. A. Bell in 1867 and Geo. Vasey in 1881. The first specimens were included by Dr. Gray in *P. Hippiana*. On the label of Bell's specimens is written: "Durand suggests *P. rivularis*. Gray says no!—perhaps *P. campestris*." One of Dr. Vasey's specimens is labeled *Potentilla Thurberi*, by whom I do not know.

P. ambigens is the tallest of the group, 6–7 dm. high, rather sparingly grayish silky. The leaflets are 3–4 cm. long, coarsely serrate and more or less decurrent on the rachis. The following specimens have been examined:

Colorado: Hall & Harbour, nos. 158 and 162, 1862 (both only in part); E. L. Greene.

New Mexico: Wm. A. Bell (Ratan Mountains), 1867; G. R. Vasey (Las Vegas), 1867.

POTENTILLA LEMMONI (Wats.) Greene, Pittonia, 1: 104, 1887.

Ivesia Lemmoni Wats. Proc. Am. Acad. 20: 365. 1885.

This species should, I think, be placed as an appendix to this group. It has no relationship to any of the Ivesias, and is a true Potentilla in every respect, except as to the number of pistils, which are only half a dozen or so. Its nearest relative is, without doubt, *Potentilla crinita*, from which it differs by the longer, narrower and fewer leaflets, the sparser pubescence, the few pistils and the longer hairs on the receptacle.

Graciles. This group is the most difficult in the whole genus. It contains so many and perplexing forms, that I have not yet come to any definite conclusion as to how to treat it. Watson united all except the first (partly) and the last into one species. This is far from satisfactory. It would have been much more logical to make *P. effusa* a variety of *P. Hippiana*, *P. Breweri* one of *P. Plattensis*, or *P. emarginata* one of *P. fragiformis* than to include *P. Nuttallii* and *P. flabelliformis* in *P. gracilis*. The group contains not less than ten well marked American forms and about half a dozen less marked ones. Of these ten forms all except one have been recognized at one time or another as species or varieties, and as far as I know, all but two have received names. I shall temporarily regard these ten as species.

This view I dare to express, as I have had chance to study this group especially in the field. I have collected the following myself: *P. pulcherrima*, *Blaschkeana*, *flabelliformis*, var. *ctenophora*, *fastigiata*, *etomentosa and Nuttallii*. I have seen the following growing together: *pulcherrima* and *Nuttallii*, *Blaschkeana* and *Nuttallii*, *Blaschkeana* and *flabelliformis*, *Blaschkeana* and *ctenophora*, *flabelliformis* and *Nuttallii*. In no case have I found intermediate forms. In the herbaria that I have looked over I have found one specimen between *Blaschkeana* and *ctenophora*, a few between *Nuttallii* and *Blaschkeana* or *fastigiata*, etc., but as a rule they can be distinguished fairly well.

POTENTILLA PULCHERRIMA Lehm. Stirp. Pug. **2**: 10. 1830.

Potentilla Hippiana pulcherrima Wats. Proc. Am. Acad. **7**: 555. (in part) 1873.

As originally described, *P. pulcherrima* Lehm. has pinnate leaves with approximate leaflets. This was undoubtedly the reason why Watson united it with *P. diffusa* Gray. As far as I know, that plant is low, ascending, and rather silky and in all respects nearest related to *P. Hippiana* (see above), while *P. pulcherrima* is tall, upright, with slender erect branches and nearest related to *P. gracilis* and *P. fastigiata*. Watson, during King's expedition, observed the fact that *P. pulcherrima* had not always pinnate leaves, which, in fact, is rather seldom the case, and consequently included in *P. Hippiana pulcherrima* also a form with digitate leaves. The only character left to distinguish forms of *P. Hippiana* and those of *P. gracilis* was the number of carpels, in the former 10–30, in the latter 40. Unfortunately the number varies even in the same individual, and therefore many specimens labelled *P. gracilis* belong to *P. pulcherrima*. My own from the Black Hills, I unfortunately labeled thus. *P. pulcherrima* differs from the other members of the group by its leaflets, which are obovate or oblanceolate, mostly obtuse, crenate, silky and green above, densely white-tomentose beneath. It grows in the mountains and foot hills from New Mexico and Nevada to Saskatchewan. No specimens have been seen from the Pacific Slope.

POTENTILLLA GRACILIS Dougl.; Hook. Bot. Mag. *pl. 2984*. 1829.

The true *P. gracilis* is a very rare plant and confined to the northern Pacific Coast. What has gone under this name is either the preceding or the next following species. It differs from both in the narrow leaflets, which are oblanceolate, acute, and coarsely toothed with triangular teeth of the same form as in *P. recta*. The leaves are only slightly silky above and finely tomentose beneath, and the branches of the cyme are very slender and erect. The following specimens have been examined:

Oregon: Douglas; Tolmie, 1851; E. Hall, no. 136, 1871. *Washington:* Dr. Ruhn; Wilke's Expedition, no. 141. *Vancouver Island:* John Macoun, no. 182, 1893. *Kodiak Island:* (Collector not given).

POTENTILLA BLASCHKEANA Turcz; Lehm. in Otto, Gart. & Blumenz. 9: 506. 1853.

Potentilla gracilis most authors, not Dougl.

This differs from *P. gracilis* in stouter habit, ascending branches, larger flowers and broader leaflets, which are obovate, deeply toothed or cleft into ovate or oblong teeth, silky and green above, silky and tomentose beneath. It must be admitted that this species is near to the preceding. It was merged therein by Watson, but it is evidently not so near *P. gracilis* as is *P. pulcherrima*, which differ only in the form of the teeth.

P. Blaschkeana is common from California to Wyoming and northward as far as Kodiak, off Alaska.

✓POTENTILLA CANDIDA n. sp.

Potentilla gracilis var. Wats. King's Exp. 5: 88. 1871.

Stem low, 1–2 dm. high, densely white silky-strigose; stipules ovate, entire, nearly 1 cm. long; leaves on rather short petioles, densely silvery silky on both sides, digitate; leaflets 7–9, obovate in outline, 2–4 cm. long, rather thick, deeply incised or cleft into large oblong teeth; cyme rather dense; flowers about 1 cm. in diameter; calyx white-silky; bractlets lanceolate, much shorter than the ovate sepals; petals yellow, obcordate, a little exceeding the sepals. (Plate 287.)

It resembles most a depauperate *P. Blaschkeana*, and differs mainly in the pubescence which is very dense on both sides of the leaves, and silky; tomentum none.

Nevada: S. Watson, no. 337, 1868 (type). *Montana:* F. V. Hayden, 1860. *Wyoming:* T. C. Porter, 1873.

POTENTILLA FLABELLIFORMIS Lehm. Stirp. Pug. 2: 12. 1830.

Potentilla gracilis flabelliformis Nutt.; Torr & Gray, Fl. N. Am. 1: 440. 1840.

This stands nearest to *P. Blaschkeana*, but I think it is without doubt a good species. I have had the opportunity to watch the two in the field and found them often grow together, but never found an intermediate form, and in all the collections that have gone through my hands there are only the specimens from one locality, where I am in doubt to which species to refer them, and these may be hybrids. *P. flabelliformis* differs from the related species in the leaves, which are divided to near the base into linear segments. They are also white-tomentose beneath and densely silky above. There are two forms of this species; the one with narrow linear more or less revolute lobes and smaller flowers resembles Lehmann's figure in Hooker's Fl. Bor. Am., and is therefore taken as the type. The other somewhat approaches *P. Blaschkeana* in the general habit and the size of the flowers, and may be known under the name:

POTENTILLA FLABELLIFORMIS CTENOPHORA n. v.

Stem stout; leaflets less deeply divided into somewhat broader divisions, which are not at all revolute. Corolla over 15 mm. in diameter, petals broadly obcordate, much longer than the sepals.

Both forms are fairly common from Wyoming and California to British Columbia and Saskatchewan.

POTENTILLA FASTIGIATA Nutt.; Torr. & Gray, Fl. N. Am. 1: 440. 1840.

Potentilla gracilis fastigiata Wats. Proc. Am. Acad. 7: 557. 1873.

This perhaps comes nearest to *P. pulcherrima*, resembling it in the form of the leaflets and the size of the flower, but it is a smaller plant, less than 3 dm. high and with a rather crowded cyme. The pubescence of the leaves is also different, long, silky and with very little tomentum beneath. It is a rather rare plant, extending from Wyoming and California to British Columbia and Saskatchewan.

POTENTILLA PECTINISECTA n. sp.

Stem slender, 3–4 dm. high, ascending, finely strigose or hirsute; stipules ovate, often toothed; leaves on slender petioles, digitate, of 5–8 leaflets, apressed-silky on both sides and sometimes slightly tomentulose beneath; leaflets obovate, deeply pectinately divided into oblong or linear segments; cyme rather dense; calyx appressed-silky; bractlets linear-lanceolate, shorter than the broadly lanceolate sepals; petals yellow, obcordate, scarcely exceeding the sepals.

It has gone under the names of *P. gracilis flabelliformis* and *fastigiata*. It resembles *P. fastigiata* in general habit and pubescence, but is more slender. The form of the leaflets is most like that of *P. Blaschkeana* and *P. Nuttallii*, and sometimes that of *P.*

flabelliformis, but the plant is more delicate and the pubescence is silky and rather scant. Specimens:

Arizona: E. Palmer, no. 145, 1877. *Wyoming:* C. E. Sheldon, no. 72, 1884; Fremont, 2d exp. *Montana:* Robert Adams, 1871. *Utah:* L. F. Ward, no. 119, 1875; M. E. Jones, no. 5554d and 35544, 1894; no. 765, 1880; Mrs. Thompson, no. 195, 1873.

POTENTILLA ETOMENTOSA n. sp.

Potentilla rigida Newberry, Pac. R. R. Rep. **6**: Part 3. 72. Not Nutt.

Potentilla gracilis rigida Coville, Cont. U. S. Nat. Herb. **4**: 96. 1893.

Stem 4–5 dm. high, slightly hairy, erect, from a stout caudex; stipules ovate, lanceolate, entire; leaves on long petioles, digitate, of about 7 leaflets, glabrate above, slightly silky-strigose beneath but without any trace of tomentum; leaflets obovate, 3–5 cm. long, crenate or serrate with ovate teeth; calyx hirsute; bractlets oblong, a little shorter than the ovate pointed sepals; petals obcordate, scarcely exceeding the sepals.

This resembles mostly *P. pulcherrima* but is perfectly without tomentum and only slightly hairy. It resembles *P. Nuttallii* only in the lack of tomentum. It has the crenate, obovate leaves of *P. pulcherrima*, and if not held distinct must be regarded as a variety thereof. The distribution is quite different, *P. pulcherrima* not having been collected in California. The following are the specimens seen:

California: Fremont, no. 162, 1846 (Type); J. S. Newberry (Williamson Expedition); Munson & Hopkins, 1889; Coville & Funston, no. 1399, 1891.

POTENTILLA NUTTALLII Lehm. Ind. Sem. Hort. Bot. Hamb. **1852**: 12. 1852.

Potentilla recta Nutt. Gen. **1**: 310. 1818. Not L.

Potentilla rigida Nutt. Journ. Acad. Phila. **7**: 20. 1834. Not Wall.

Potentilla gracilis rigida Wats. Proc. Am. Acad. **7**: 557. 1873.

The general habit of this species resembles that of *P. Blaschkeana*, but the plant is green, without tomentum and coasely hirsute. The distribution is from Colorado to California, British Columbia and Saskatchewan.

POTENTILLA RECTA L. Sp. Pl. 497. 1753.

It somewhat resembles *P. Nuttallii* in pubescence and general habit, but differs in being paler and in its large pale yellow petals. It is of European origin and occurs sparingly in the Eastern States to the District of Columbia and to Ohio.

The *Argenteae* resemble in general habit the preceding group. The plants are very leafy, the leaflets generally 5 or those of the upper leaves only 3, the flowers many and small, and the petals scarcely exceed the sepals. The group is European, only *P. argentea* being also a native of North America.

POTENTILLA INTERMEDIA L. Mant. 1: 76. 1767.

This species very much resembles *P. Monspeliensis*, especially var. *Norvegica*, and has in this country been mistaken for it It differs mainly in the mostly 5-foliolate leaves, the perennial root and the style. The species is sparingly introduced in the East. Some of the specimens are:

New Jersey and *New York:* Addison Brown, 1881 and 1880.

POTENTILLA INCLINATA Vill. Hist. Pl. Delph. 3: 567. 1789.

P. canescens Besser, Prim. Fl. Galic. 1: 330. 1809.

It much resembles the preceding species, but differs in a more slender and simple stem and the grayish pubescence. The only specimens collected on this continent that I have seen are those collected in Ontario by Fowler.

POTENTILLA ARGENTEA L. Sp. Pl., 497. 1753.

P. argentea is one of the easiest to identify, by its small flowers, deeply dissected leaves, which are white-tomentose, especially beneath, and have revolute margins. It is a native of Europe and Asia, as well as of America. In this country it extends from Nova Scotia and the District of Columbia to Dakota and Kansas.

POTENTILLA COLLINA Wibel, Prim. Fl. Werth., 267. 1799.

This is another species that has been collected in the country at least once, viz., by J. M. Holzinger (no. 30) at Winona, Minn., in 1887. It differs from *P. argentea*, which it most resembles, by its prostrate or spreading habit, less white-tomentose leaves, which have broader lobes, and flat, not revolute margins.

The *Tormentillae* are a small group, characterized by the more or less spreading, prostrate or creeping stem and long-pedicelled, axillary flowers. The original *Tormentillae* have 4-merous flowers, but sometimes, however, they are 5-merous, and other species that have regularly 5-merous flowers have no other character which would warrant the division into two groups, much less into two genera. The group is mainly European, only one species being a native of North America, viz.:

Potentilla Canadensis L. Sp. Pl. 498. 1753.

It is a very variable plant, and several species have been proposed. What I take as the original *P. Canadensis* is a less luxuriant form of what has generally been known as *P. Canadensis simplex* (Michx.) T. & G. (*P. simplex* Michx.), not that small, simple, more hairy form, only a few inches high, that grows in poor dry soil, which is

Potentilla Canadensis pumila (Poir.) T. & G. Fl. N. Am. 1: 443. 1840.

Potentilla pumila Poir. in Lam. Enc. Meth. 5: 594. 1804.

P. Canadensis is common from Maine and North Carolina to Indian Territory and Minnesota. I have seen one specimen collected in Nevada, but this was undoubtedly introduced. The variety has about the same range, but is rarer.

Potentilla reptans L. Sp. Pl. 499. 1753.

This European species has been collected by Martindale in 1876 on ballast in New Jersey. It differs from *P. Canadensis* in the creeping and rooting stem, smaller leaves and large, ovate or elliptical bractlets, which exceed the sepals.

Potentilla nemoralis Nestler, Mon. Pot. 28 and 65. 1816.

Tormentilla reptans L. Sp. Pl. 500. 1753. Not *Potentilla reptans* L.

Also a European species which has been collected in Labrador. It differs from *P. Canadensis* in the 4-merous flowers and in the leaves, which are all, except the basal ones, ternate.

Haematochri. The dark purple- or dark red-flowered species of *Potentilla* constitute a very natural group, which consist of the

Mexican species: *P. Ehrenbergiana, Haematochrus, fusca*, and *comarioides*, a few Indian species, as for instance *P. Nepalensis* and *P. atrosanguinea*, and two species of the Southwestern United States, viz.:

POTENTILLA THURBERI A. Gray, Mem. Am. Acad. (II.) **5**: 318. 1854.

As described by Gray and Lehmann, *P. Thurberi* should be perfectly green and only slightly hairy. Such specimens have been collected as follows:

New Mexico: Thurber, no. 1107, 1851; Dr. Henry, 1854; Dr. Bigelow (Mex. Bound. Surv.), no. 347, 1851; E. L. Greene, 1880; E. Palmer, 1869. *Arizona:* Lemmon, 1881; C. G. Pringle, 1884; Wooton, 1895.

More than half of the specimens in our collections that are labelled *P. Thurberi* do not agree with the original description, and I take them to represent an undescribed species:

POTENTILLA ATRORUBENS.

Potentilla Thurberi Rothrock, Wheeler Surv. **4**: 113. (mainly.) 1878.

Stem 4–7 dm. high, finely pubescent and with scattered long villous spreading or reflexed hairs; stipules ovate or lanceolate, 1–2 cm. long, often toothed; basal and lower stem-leaves long-petioled, digitately 5–7-foliolate, glabrous or slightly silky above, silky and white-tomentose beneath; leaflets obovate to oblanceolate, coarsely serrate; stem-leaves sessile, 3–5-foliolate; cyme open and branched; flowers about 15 mm. in diameter; calyx silky-villous and finely pubescent, about 1 cm. in diameter; bractlets lanceolate, often equalling the lanceolate-triangular, more or less acuminate sepals; petals dark reddish purple, very broadly obcordate, exceeding the sepals; stamens 20. (Plate 288.)

This species much resembles *P. Thurberi*, from which it has not been distinguished. It differs, however, in several characters that seem to be fairly constant, viz., the tomentum on the lower surface of the leaves, the much sharper dentation, the long silky spreading or reflexed hairs of the stem and calyx, and generally more acuminate sepals. From the Mexican *P. fusca* and *P. comarioides* it differs in the leaflets, which are serrate to the very base. It seems to be more common than *P. Thurberi* and has about the same range.

Arizona: Rothrock, no. 399, 1874; C. G. Pringle, no. 305, 1881; 1884; no. 1,578, 1887; M. E. Jones, 1884; J. G. Lemmon, no. 2699, 1882; 1892; E. A. Mearns, no. 50, 1887; T. E. Wilcox. 1893. *New Mexico:* H. H. Rusby, no. 128, 1881.

The *Argentinae* are a natural group, perhaps worth generic rank. The plant is propagated by true runners as in *Fragaria.* The style is lateral as in that genus and the achene large with thick corky shell. These characters are not found in any other species of *Potentilla*, at least not in America. All the species belonging here have pinnate leaves more or less white silky, at least beneath. The species of the group are *P. anserinoides* of New Zealand and the following:

POTENTILLA ANSERINA L. Sp. Pl. 495. 1753.

This well known species is found in the colder part of the north temperate and the arctic zones of both hemispheres, extending in North America as far south as New Jersey and Nebraska, and in the mountains to New Mexico. The following varieties may be distinguished:

POTENTILLA ANSERINA GRANDIS Torr & Gray, Fl. N. Am. 1: 444. 1840.

A luxuriant form growing among grass, with larger, erect or ascending leaves, sometimes one foot long. It is common on the Pacific coast from California to Alaska, but also collected in Montana, Newfoundland and Greenland.

POTENTILLA ANSERINA CONCOLOR Ser. in DC. Prod. 2: 582. 1825.

It differs from the species in the leaves, which are silky white on both the upper and lower surfaces. In America it is confined to the Rocky Mountain Region from Mackenzie River to New Mexico, California and Alaska.

POTENTILLA EGEDII Wormsk. Fl. Dan. 9: fasc. 27. 5.

Potentilla Anserina Egedii Torr. & Gray, Fl. N. Am. 1: 444. 1840.

Potentilla Anserina Groenlandica Tratt. Ros. Mon. 4: no. 13. 1824.

I think that this is a good species, differing from *P. Anserina* in the delicate habit, the deeper and more open incisions of the leaflets and the scant pubescence. In the specimens examined by me the achenes were also different in shape. In *P. Egedii* they were decidedly lenticular, while in *P. Anserina* the upper end is thicker and rounded-triangular in cross-section.

P. Egedii is an arctic species, found from Greenland to Alaska, and extending southward on the coasts to Maine and Oregon.

The *Fruticosae* differ from the other groups of North American *Potentillae* in the following respects: The style is lateral, ovule ascending, achene hairy and the plant more or less shrubby. The American species are:

POTENTILLA FRUTICOSA L. Sp. Pl. 495. 1753.

This is a native of the north temperate zone, extending in America from Labrador to Alaska south to New Jersey and Colorado. In mountain regions the leaflets are narrower with revolute margins, and this form represents *P. floribunda* Pursh, *P. fruticosa tenuifolia* Lehm. The extreme is reached by the form collected by Watson during the King's expedition and described as *P. fruticosa parvifolia* Wats. It has nearly linear leaflets and smaller long-pedicelled flowers.

POTENTILLA TRIDENTATA Soland.; Ait. Hort. Kew. 2: 216. 1789.

P. retusa Retz. is generally cited as a synonym of *P. tridentata* and is much older, but *P. retusa* is described as having yellow flowers, and in the figure of it in Flora Danica the petals are also yellow, while in *P. tridentata*, as is well known, they are white. If made from a specimen of *P. tridentata* it is, indeed, a very poor one, as it resembles *Sibbaldia procumbens* more than *P. tridentata*. It can, however, not represent that species, as the petals exceed the sepals. What *P. retusa* was, or is, is still a secret.

P. tridentata extends from Greenland to the mountains of North Carolina and westward to Minnesota.

Biflorae. This contains only one species, placed by Lehmann with *P. fruticosa*, *P. tridentata* and their allies. The style is, however, nearly terminal, and the achenes not hairy. It resembles the *Fruticosae* in the thickish leaves, whose margins are entire, and the non-emarginate petals. The receptacle has also very long hairs.

POTENTILLA BIFLORA Willd.; Schlecht. Mag. Gesel. Nat. Fr. Berlin, 7: 297. 1813.

It is a native of northeastern Asia, Alaska and the arctic coast of North America, but a rather rare plant.

Studies in the Leguminosae.—II.

By Anna Murray Vail.

NOTES ON PAROSELA, WITH DESCRIPTIONS OF NEW SPECIES.

Parosela Arizonica n. sp.

Suffruticose, 1.5–2 dm. high, branched from the base, strongly aromatic-glandular throughout, minutely cinereous-pubescent below, glabrous above; stipules minute; basal leaves on the short, old? shoots 1 cm. long or less, grayish-green, cinereous, becoming glabrate? the leaflets 5–9, linear, strongly involute, 2–3 mm. long, obtuse, beset with scattered glands; upper leaves 2–4 cm. long, yellowish-green, glabrous or nearly so, the rhachis channeled, at length falcate, leaflets 9–21, involute, 3–6 mm. long, linear, bright yellow-green, thick and coriaceous, glandular, falcate, somewhat reflexed; peduncles terminal, 1–3 cm. long; heads subglobose, 6–10 mm. long; bracts 2–3 mm. long, broadly ovate, acute, somewhat scarious, minutely pubescent, the outer ones obtuse at the base, the inner ones unguiculate, bearded on the back of the claw; calyx slightly less than 3 mm. long, membranous, contracted at the mouth, teeth minute, acute; corolla white, very small; pod 2–5 mm. long, obliquely ovoid; seed 2 mm. long, obtuse at the hilum, pale yellow.

A species remarkable for its numerous, low, erect branches, bright green upper leaves, and very small heads of white flowers. The specimens from which this description has been drawn are preserved in Herb. Columbia University, and were sent to me by Miss Alice Eastwood, and the label reads, "Vicinity of Tucson, Arizona; collected by Herbert Brown, October, 1895."

Parosela thyrsiflora (A. Gray).

Dalea thyrsiflora A Gray, Proc. Am. Acad. 5: 177. 1861.

Dalea Dominigensis var. *paucifolia* Coulter, Contr. U. S. Nat. Herb. No. 2: 34. 1890.

Parosela Grayi.

Dalea laevigata A. Gray, Pl. Wright. 2: 38. 1853. Not *Dalea laevigata* Moç. & Sessé; in ~~Don, Gen.~~ Syst. 2: 224. 1832.

PAROSELA ELATIOR (A. Gray).

Dalea aurea var. *elatior* A. Gray, Pl. Wright. 1: 46. 1852.

Dalea rubescens S. Wats. Proc. Am. Acad. 17: 369. 1882.

Parosela rubescens A. M. Vail, Trans. N. Y. Acad. Sci. 14: 34. 1894.

Intermediate between *P. aurea* and *P. nana.* The bracts are narrower and longer than those of either of the above species, the corolla turns reddish-purple and the leaves are usually less villous.

PAROSELA WISLIZENI (A. Gray) A. M. Vail, Trans. N. Y. Acad. Sci. 14: 34. 1894.

A little-known species which shows great variation in the color of the flowers, some of them being lilac, others rose-colored and others again rose-colored with the standard ochroleucous and in the latter case closely resembling those of *Parosela lasiostachya* (Benth.), which species is glabrous throughout with somewhat fleshy leaves. *P. Wislizeni* may not be more than a pubescent form of the latter species. In Herb. Canby, preserved in Herb. N. Y. College of Pharmacy, a specimen of *P. lasiostachya* collected by Parry and Palmer, no. 15, from near San Luis Potosi shows the characteristic acute leaflets of that species, the upper ones being faintly silky villous and identical with those of some smoother forms of *P. Wislizeni.*

PAROSELA WISLIZENI SESSILIS (A. Gray).

Dalea Wislizeni var. *sessilis* A. Gray, Proc. Am. Acad. 16: 105. 1880.

A very noteworthy variation. A low shrub with spreading slender branches and short racemes of showy, rose-colored flowers sessile on the short, lateral branchlets. The general appearance of the plant is that of *Parosela formosa* (Torrey), and in several instances has been confounded with it. The leaflets are very small, greyish-green, silky-pubescent or rarely glabrate, with small dark glands on the lower surface, and are not at all fleshy. The bracts are oblong or oblong-lanceolate, caducous, the keel petals are remarkable for the two linear-oblong glands in the form of a v at the apex and the short banner is pale yellow

Parosela formosa has numerous short, divaricate branches, very small, glabrous leaflets, scarious, concave, glabrous, caducous bracts, eglandulose, bright rose-purple keel petals and a pale yellow banner.

PAROSELA JAMESII (Torr.)

Psoralea Jamesii Torr. Ann. Lyc. N. Y. 2: 175. 1828.

Jamesia obovata Rafin. Atl. Journ. 145. 1832.

Dalea Jamesii Torr. & Gray, Fl. N. Am. 1: 308. 1838.

Very close to the above species is *Parosela triphylla* (Pav.) from northern and southern Mexico. It has longer and more truly decumbent or trailing stems and somewhat narrower leaflets which are invariably glabrous on the upper surface. *P. Jamesii* may be only a northern form of the Mexican plant. Here also appears to belong *Parosela prostrata* (Orteg.), of which I have not seen any specimens.

PAROSELA WRIGHTII (A. Gray).

Dalea Wrightii A. Gray, Pl. Wright. 1: 49. 1852.

Closely resembling *P. Jamesii*, from which it differs in the apparently more erect habit, the five oblong leaflets and the rose-colored flowers. A closely allied species is *P. Luisana* (S. Wats.) from the north of Mexico (Schaffner, no. 808; Parry and Palmer, no. 164). It is very low (4–6 cm.), with short decumbent stems, slender leaflets and small capitate racemes of yellow flowers. No. 162, collected by Parry and Palmer, in the same region, appears to be a very small form of *P. Wrightii* and intermediate between it and *P. Luisana*. Further collections may prove them to be but one species.

PAROSELA FREMONTII (Torr.)

Dalea Fremontii Torr.; A. Gray, Mem. Am. Acad. 5: 316. 1855.

The type specimen of *D. Fremontii*, no. 417, collected by Fremont in the "Pah-Utah" country, southwest California, May 5th, 1844, is preserved in Herb. Columbia University, and includes many specimens since distributed as *Dalea Californica* S. Wats. Proc. Am. Acad. Sci. 11: 132, 1876, the type of which is no. 86, C. C. Parry and J. G. Lemmon, from southern California, 1876, These two species are so close as to make it doubtful that they are not the same. The leaves are identical, the greatest difference being in the calyx, which in *Parosela Californica* (S. Wats.) is smaller, more densely canescent-pubescent and more distinctly ribbed. *Parosela Fremontii* is very variable and appears to intergrade with the three following species.

Parosela Johnsoni (S. Wats.)

Dalea Johnsoni S. Wats. Bot. King's Rep. **5**: 64. 1871.

Differing from *P. Fremontii* mainly in the longer, narrowly linear leaflets which are only rarely decurrent on the rhachis.

Parosela amoena (S. Wats.).

Dalea amoena S. Wats. Am. Nat. *7*: 300. 1876.

This species was described from some rather fragmentary specimens collected by Mrs. E. P. Thompson, near Kanab, southern Utah, and now preserved in Herb. Gray. Some similar specimens were collected in Utah by Captain Bishop in 1872, and are to be seen in U. S. Nat. Herb. at Washington. The leaflets vary from very acute to rather broadly obtuse, the three terminal ones often cohering and appearing as if variously lobed. The most marked characters are the slender, linear calyx-teeth, which are as long, or nearly as long, as the tube.

Parosela Wheeleri n. sp.

Apparently a low shrub; branchlets short, beset with small, scattered, elevated, prickle-like glands; leaves 3–7-foliolate, 1–2.5 cm. long, the rhachis flattish, strigose-hirsute; petioles 3–10 mm. long; leaflets 5–10 mm. long, 2–6 mm. wide, oblong to oblong-ovate, oblong-cuneate, spatulate or ovate, strigose-hirsute on both surfaces, less so above, glands small, scattered beneath, the terminal leaflet usually petiolulate, or rarely cohering with one of the lateral ones; flowers in short (2–4 cm. (?) long), few-flowered racemes; bracts not seen; calyx 5–7 mm. long, obscurely 10-ribbed, with oblong glands between the ribs, sparingly hirsute, at length glabrous, the subulate teeth ciliate, much enlarged in fruit, about the length of the tube; corolla bluish or reddish purple; legume 1 cm. or more long, obliquely oblong, glabrous or with a few scattered hairs, beset with large glands, nearly straight on the dorsal, rounded along the ventral suture, beaked by the stout base of the style; seed oblong, acutish at the base, brown.

This description has been drawn from a few fragments belonging to what appears to be a low shrub with straw-colored bark and short, almost fascicled branchlets. I have not seen any spines but the apex of the peduncle seems to indicate a spinescent termination.

Original locality, Nevada, Wheeler expedition, 1872. Type in Herb. Columbia College and U. S. Nat. Herb.

PAROSELA THOMPSONAE n. sp.

Apparently a low shrub; branchlets short? clothed with a short, close, whitish, retrorse pubescence or tomentum and beset with scattered, somewhat elevated reddish glands, becoming glabrate with age; stipules caducous, not seen; petioles 3–5 mm. long, leaves about 1.5 cm. long, 5–7 or more foliolate; leaflets about 2 mm. long, oblong, obtuse, acutish at the base, somewhat thick, minutely strigose-hirsute on both surfaces, margins revolute, with a few dark glands beneath; racemes 3–4 cm. long, loosely-flowered, short-peduncled; bracts not seen, caducous; calyx 4 mm. long, glabrous, conspicuously 10-ribbed, with 1–3 round or oblong red glands between each rib below the sinus, the broadly triangular teeth ciliate, pubescent on the inner surface, shorter than the tube; corolla rose-purple, twice as long as the calyx, the petals with a few slender glands near the apex; legume and seeds not seen.

A species with the calyx allied to that of *Parosela maritima* (Brandegee) from Lower California, but differing in the broad, ciliate, acutish or obtuse, short calyx-teeth and the very symmetrical arrangement of the reddish glands on the ribs of the calyx-tube. The space between the two upper ribs is eglandulose, the next two spaces on either side have two glands each, one above the other, the remaining spaces having one gland each. In the very fragmentary specimens examined, this was a constant character.

Original locality, Northern Arizona.

Type collected by Mrs. Thompson, 1872.

Dalea amoena in part, in U. S. Nat. Herbarium.

Notes on some undescribed and little known Plants of the Alabama Flora.

BY CHARLES MOHR.

(PLATES 289–291).

SAGITTARIA VISCOSA n. sp.

Monoecious, scape slender, erect, over two feet long, exceeding the leaves, sparingly branched from the lowest verticil; leaves membranaceous, smooth, broadly ovate, rounded towards the slightly apiculate apex; lamina 6′–7′ wide, 12′–14′ long, deeply sagittate, the broad lobes acute, 6′ long, at first gradually, finally widely spreading; panicle slender, main branch 12′–13′ long, the branches about half its length; bracts coriaceous, papillose, rugose, viscid, free at the base, oblong-ovate, obtuse; verticils on the main stem 8–10, distant, with 2–3, rarely more flowers borne on slender, rigid, erect, spreading pedicels, about 1′ long, those of the 3–4 fertile verticils little shorter; sepals thick, and like the bracts papillose, glutinous, ovate, lanceolate; stamens numerous (20–25), $\frac{3}{16}$′ long, filament two-thirds longer than the anther, scarcely attenuate and strongly villous towards the base; immature achenes with a slender erect beak, narrowly winged; flowers large, fully ¾′ across. (Plate 289.)

Deep muddy borders of marsh on the Mobile river, May 28, 1896. On a second visit to the same locality to collect specimens with the rhizome and mature fruit the plants were destroyed by the clearing and partial drainage of the front of the marsh.

At once recognized from its allies of the same group, by the thin leaves, papillose viscid bracts and sepals. Type in herbarium of the Geological Survey of Alabama.

SAGITTARIA MOHRII J. G. Smith.

"Leaves lanceolate-linear, long attenuate to the acute apex, tapering gradually to the slender ascending petiole, 15′–20′ long by ⅜′–½′ wide; scape, with 6–8 verticils shorter than the leaves, simple, triquetrous, weak, declining and decumbent after flowering, frequently ripening the fruit under water; the inflorescence narrowly pyramidal, bracts ⅜′–½′ long, connected in the middle, fertile pedicels spreading, somewhat longer than the sterile in 3–4 verticils, ½′–⅝′ long; sepals oblong, obtuse, $\frac{1}{10}$′–⅛′ long, stamens 9–12, anthers broadly elliptical; achenes crenulately crested, broadly winged, the broad margins laterally unicostate or narrowly winged; fruiting head globose, ¼′–$\frac{5}{16}$′ in diameter. (Plate 290.)

"Partially submerged aquatic, frequently growing in tufts at the nodes of long horizontal stolons."

Muddy shallow ponds near the western suburbs of Mobile city, August 18, 1895. Type in herbarium of ths Geological Survey of Alabama.

In specimens from a partially dried up, shallow pool the leaves are very narrowly linear or the blades entirely wanting and reduced to rigid, triangular phyllodia, August, 1896.

SAGITTARIA LONGIROSTRA AUSTRALIS J. G. Smith.

Plant 2 dm. high, the scape 4 dm.; leaves ovate-elliptical, obtuse, 8–10 cm. long, the basal lobes obtuse; fertile pedicels 10–13 mm. long, exceeding the bracts; achenium 3–3½ mm. long. (Plate 291).

Collected by Dr. Charles Mohr, Cullman, Alabama, August 4, 1896. Type in Herb. Missouri Botanical Garden.

SAGITTARIA CYCLOPTERA (J. G. Smith.)

Sagittaria graminea cycloptera J. G. Smith, Ann. Rep. Mo. Bot. Gard. 6: 1894.

Lower pine region. In sandy shallow pine barren ponds. Mobile and Washington county, May–June.

SAGITTARIA CHAPMANI (J. G. Smith.)

Sagittaria graminea Chapmani J. G. Smith, l. c. 1894.

Coast plain. Muddy ditches, borders of marshes and ponds. Mobile. April and again in the fall.

By observations in the field made through the past two seasons the superficial characters of these plants, widely differing in their aspects from the type to which they were referred, have been found perfectly stable and no intermediate forms connecting them with the typical form or with each other, could be found.

SAGITTARIA MONTEVIDENSIS Cham. & Schlecht. Linnaea, 2: 156. 1827.

Deep grassy marshes and banks of Mobile river, August, 1895.

Frequent. During the season just passed this stately plant was found in the western suburbs of Mobile in deep ditches, some distance from the Mobile river. It has become naturalized and is most probably adventive from the La Plata country.

MANISURIS CORRUGATA (Bald.)

Rottboellia corrugata Baldwin, Am. Journ. Sci. 1: 355. 1819.

MANISURIS CORRUGATA AREOLATA (Hackel).

Rottboellia corrugata var. *areolata* Hackel in DC. Mon. Phan. 6: 309. 1889.

ANDROPOGON GLOMERATUS HIRSUTIOR (Hackel).

Andropogon macrourus var. *hirsutior* Hackel, l. c. 6: 488. 1889.

ANDROPOGON GLOMERATUS GLAUCOPSIS (Elliott).

Andropogon macrourus glaucopsis Ell. Sk. 1: 180. 1817.

CHRYSOPOGON ELLIOTTII.

Andropogon nutans Elliott, Sk. 1: 144. 1816. Not L.

To this species is referred the plant with the longer branches of the loose panicle more or less drooping, and the fertile glumes of a darker brown, covered with long silky hairs. It is close to *C. avenaceum*, but by the above characters clearly distinct.

CHRYSPOGON NUTANS LINNEANUS (Hackel).

Sorghum nutans Linneanum Hackel, in Mart. Fl. Bras. 2: Part 3, 276. 1883.

Readily recognized by the weak decumbent stem, contracted panicle, with the caducous spikelets scattered, and the fertile glume of deep dark brown, with a stouter and much longer awn. Confined to the coast region and preferring a closer soil.

PASPALUM RACEMULOSUM Nutt.; Chap. Fl. 571. 1860.

Paspalum racemosum Nutt. Fras. Am. Phil. Soc. 5: 145. 1837. Not Lam., fide T. H. Kearney.

Dry pine barrens, Mobile.

PASPALUM GLABRATUM (Engelm.)

Paspalum Floridanum var. *glabratum* Engelm.; Vasey, Contrib. U. S. Nat. Herb. 3: 20. 1892.

Smooth and glaucous throughout, of a lower and more slender growth, scarcely over 2½° high from a strong, horizontal, somewhat jointed rootstock, leaves shorter than the culm, 8′–12′ long by 1½″–2″ wide, long-acuminate, sheaths shorter than the joints; ligule chartaceous, obtuse; panicle of 4–6 erect, spreading, short-stalked, more or less distant spikes; spikelets smaller than in *P.*

Floridanum, mostly in two rows on the narrow, very flexuous rhachis. The essential characters are to all appearances permanent. The species is less frequent than *P. Floridanum* and prefers a wet to damp sandy soil. Mobile, Washington Co., Yellow Pine.

FIMBRISTYLIS PUBERULA (Michx.) Vahl, Enum. 2: 289. 1806.

Scirpus puberulus Michx. Fl. Bor. Am. 1: 31. 1803.

Scirpus ferrugineus Elliott, Sk. 1: 85. 1817.

Fimbristylis spadicea var. *puberula* Chap. Fl. 522. 1860.

Found under widely differing conditions of soil, in the salty marshes on the sea shore as well as in the dry pine barren of the coast region farther inland, and without the slightest deviation in its characters from those described by Michaux.

Salt marshes, Dauphin Island, Mobile Co., flat pine barrens, Fowl river, April–May.

STENOPHYLLUS CAPILLARIS (L.) Britt. Bull. Torr. Club, 21: 30. 1894. In part.

Scirpus capillaris L. Sp. Pl. 49. 1753.

Fimbristylis capillaris Gray, Man. 530. In part? 1848.

Caespitosely tufted, low; stems filiform, weak; leaves capillary, soft; sheaths bearded at the throat; spikelets scarcely more than 2 or 3 in a cluster, sessile, shorter or longer stalked; bracts very short.

Mountain region, Clay Co., Che-aw-haw mountain. Never observed in the low country. Appears to be of a more northern distribution, and southward is confined to the mountains.

STENOPHYLLUS CILIATIFOLIUS (Elliott).

Scirpus ciliatifolius Ell. Sk. 1: 82. 1816.

Isolepis ciliatifolius Torr. Ann. Lyc. N. Y. 3: 352. 1836.

A stouter plant than the above, growing in single tufts; stems rigid, almost setaceous, exceeding the leaves in length; leaves somewhat stiff, acute, sheath loosely covered with long silky hairs; spikelets in many-rayed, compound umbels, the rays little shorter than the bracts. Flowers and achenes as in *S. capillaris*, of which it might be more properly regarded as a strongly marked variety, at once distinguished by its more robust habit, the rigid stems and leaves, and by the inflorescence, and as Elliott remarks, resembling somewhat *Fimbristylis autumnalis* in appearance and size.

Coastplain, dry sandy places, common; September–October. Coast of South Carolina, Florida and Texas.

LIMODORUM MULTIFLORUM (Lindl.)

Calopogon multiflorus Lindl. Gen. & Sp. Orch. 425. 1835.

Coastplain. Flat damp pine barrens. Mobile. Rare. April.

LIMODORUM PALLIDUM (Chapm.)

Calopogon pallidus Chapm. Fl. 457. 1860.

Lower Pine Belt. Boggy Pine Barrens. Mobile. May–June.

RORIPA WALTERI (Elliott).

Sisymbrium tanacetifolium Walt. Fl. Car. 174. 1788. Not L.

Sisymbrium Walteri Elliott, Sk. 2: 146. 1824.

Nasturtium tanacetifolium Hook. & Arn. Jour. Bot. 1: 190. 1835.

Cultivated and waste ground. Mobile. February–March.

SARRACENIA FLAVA CATESBAEI (Elliott).

Sarracenia Catesbaei Elliott, Sk. 2: 11. 1824.

Near the type, differs in habit of growth and range of distribution. Leaves rarely over 12′ long, with a very narrow wing, erect hood, dark purple veined, the lamina covered with a fine silky pubescence. Apparently confined to the mountains of South Carolina and Alabama.

Alabama, De Kalb Co., Lookout Mountain, bank of Little river, about 1700 feet.

CAKILE MARITIMA GENICULATA Robinson, in Gray, Syn. Fl. N. A. 1: 132. 1895.

Cakile maritima var *aequalis* Coult. Bot. W. Tex. 22. 1891. Not Chapm.

Specimens from the seashore of Alabama and distributed as *Cakile maritima* var *aequalis* Chapm. have to be referred to this variety. The prostrate racemes are 8′–10′ long, strongly geniculate. In the Alabama specimens the second joint of the ribbed pods is acuminate and rather acute.

EUPHORBIA PILULIFERA DISCOLOR Engelm. in Torr. Bot. Mex. Bound. Surv. 188. 1859.

In our specimens the close, cymulose clusters are on peduncles ¼′–⅜′ long, with hairy involucre, and small appendages, seeds minute, acute, angled, faintly pitted.

Adventive, with ballast and during the past years widely diffused over cultivated grounds in the vicinity of Mobile, becoming a troublesome weed. Stem 8′–10′ high, erect or assurgent, the plant purplish.

ASCYRUM MULTICAULE Michx. Fl. Bor. Am. 2: 77. 1803.

Ascyrum Crux-Andreae L. Sp. Pl. 788. 1753. (?) and of most American authors.

Considering the confusion existing in the nomenclature of *Ascyrum Crux-Andreae* and *A. hypericoides*, and the obscurity surrounding the Linnaean species, Michaux's name as the next available has been taken for this species; it comprises the northern forms and those extending southward which are identical with them. Common throughout the State in various forms difficult to define.

ASCYRUM HYPERICOIDES L. Sp. Pl. ed. 2, 1108. 1764. Hemsl. Bot. Centr. Am. 1: 82. 1879–88; and also Coult.; in Bot. Gaz. 11: 80. 1886.

Ascyrum Crux-Andreae var. *angustifolium* Nutt. Gen. 2: 16. 1818.

Ascyrum Crux-Andreae of all southern authors (Coulter l. c.).

Coast plain. Damp sandy pine barrens, not infrequent.

HYPERICUM ASPALATHOIDES Willd. Sp. Pl. 3: 1451. 1803.

Hypericum fasciculatum var. *aspalathoides* Chapm. Fl. 40. 1860.

Clearly distinct by permanent characters.

Lower pine region and coast plain. Shallow, pine barren ponds, Mobile. September–October. Frequent.

XOLISMA LIGUSTRINA FOLIOSIFLORA (Michx.)

Andromeda paniculata foliosiflora Michx. Fl. Bor. Am. 1: 255. 1803.

Andromeda frondosa Pursh, Fl. Am. Sept. 295. 1814.

Andromeda ligustrina var. *pubescens* Gray, Syn. Fl. N.A. **2**: Part 1, 33. 1878.

The extreme form from the Atlantic coast and Gulf region has a decidedly different aspect from the typical form, and is distinguished by the dense panicles with stout pedicelled flowers, 3 or 4 from the same bud, and also by its pubescence. It is intimately connected with the type by intergrading forms frequently met with farther north, and can only take varietal rank.

Coast plain, damp borders of pine barren streams, Mobile. May. Frequent.

GAYLUSSACIA TOMENTOSA (Pursh.) Chapm.

Vaccinium tomentosum Pursh; Gray, Syn. Fl. N. A. **2**: Part 1, 19. 1818.

Gaylussacia frondosa var. *tomentosa* Gray, Syn. Fl. N. A. l. c.

Low, slender shrub, 1°–2° high.

Alabama, "Metamorphic Hills" and lower pine region.

Auburn, Underwood & Earle. Altitude 860 ft. Mobile, Springhill. Altitude 220 ft. April. Rare.

VACCINIUM STAMINEUM MELANOCARPUM n. var. Southern Gooseberry.

Shrub 2°–3° high, branched from near the base; leaves oblong-lanceolate, 2′–4′ long, ¾′–1′ wide, like the branchlets smoothish or pubescent; racemes elongated, 2′–2½′ long, loosely 4–8 flowered; pedicels slender, drooping from the axils of persistent ovate-oblong bracts; berries nearly double the size of the typical form, fully ⅜′ in diameter, shining black with a juicy, deep purple pulp, palatable, sweetish, with a slightly tart, pleasant flavor.

Mountain region. Rocky shaded hills. Frequent in the central and northern part of the State.

STEIRONEMA INTERMEDIUM Kearney, Bull. Torr. Bot. Club, **21**: 26. *pl. 209.* 1894.

First collected on the summit of Alpine mountain, Talladega county, growing abundantly between bare rocks of sandstone near the signal station, alt., 1800 ft. September 20, 1893, past flowering and with matured capsules. During the past season on the

Blue Ridge or Talladega mountain, Clay county, at the rocky summit of Che-aw-haw mountain, alt., 2400 ft., and in rocky woods of the Delta divide, alt., 1700 ft., in full bloom, July.

SABBATIA DODECANDRA STRICTA Gray.

Sabbatia chloroides var. *stricta* Gray, Syn. Fl. N. A. **2**: Part 1, 115. 1878.

Littoral region, Baldwin county, near Perdido Bay. Brackish swamps, July.

IPOMOEA BARBIGERA (G. Don) Sweet. Fl. Gard. *pl. 86.* 1818.

Pharbites barbigera G. Don, Gen. Syst. **4**: 262. 1838.

Matches the illustration by Sweet in every detail excepting the inflorescence. Peduncles frequently 2, rarely more than 3-flowered. This most vigorous and rapidly growing climber has been strangely overlooked by our botanists. With the fleshy stem frequently from ¼′–½′ thick, climbing over bush and tree, this plant is one of the most injurious of the bindweeds infesting the gardens and fields in the lower belt of the Carolinian and in the Louisianian zone of Alabama and Mississippi. The flowers are azure, white in the throat. June–September. Common from the mountains to the coast.

Type locality. North America.

SCUTELLARIA INCANA PUNCTATA (Chapm.)

Scutellaria canescens var. *punctata* Chapm. Fl. 323. 1860.

Mountain region to coast pine belt. Blount Co., Cullman Co., alt., 600 ft.

SOLANUM HIRSUTUM (Vahl) Dunal, Solan. 158. 1813.

Solanum nigrum var. *hirsutum* Vahl, **2**: 40. 1790–94.

Adventive from the Mediterranean countries of the old world. Common ballast plant. Naturalized on the coast. Mobile, border of swamps. June–October.

MICRANTHEMUM ORBICULATUM EMARGINATUM (Elliott).

Micranthemum emarginatum Ell. Sk. **1**: 18. 1817.

Distinct from the typical form by the habit of growth and habitat. The stem is 4–6 inches long, submersed and floating in clear brooks, singly or a few from the same root; and never found in dense patches covering muddy banks or on the miry borders of pools; leaves almost orbicular, slightly emarginate, ½′–⅜′ wide, more distant, and the flowers smaller than in the type.

Baldwin Co., Ga., Elliott; Louisiana, Hale.

VIBURNUM NITIDUM Ait. Hort. Kew. 1: 371. 1789.

Viburnum nudum var. *angustifolinm* T. & G. Fl. N. A. 2: 14. 1841.

Slender shrub 12°–15° high; differs from *V. nudum* by its weak, reclining stem and drooping branches, the smooth, oblong-lanceolate, acute or acuminate entire or obscurely crenulate leaves, the quadrangular, sparingly scurfy branches, and the slightly acute berries.

Coast region. Borders of sandy swamps, along pine barren streams. Mobile. Frequent with *V. nudum.* April.

OLDENLANDIA LITTORALIS n. sp.

Hedyotis glomerata Elliott; T. & G. Fl. N. A. 2: 42. In part. 1841.

Oldenlandia glomerata Michx.; Gray, Syn. Fl. N. A. 1: Part 2, 47. In part. 1884. Chapm. Fl. 181. In part. 1860.

Perennial from a slender, somewhat ligneous root; stem erect or slightly decumbent at the base, 8′–20′ high, simple or with a few spreading branches, smooth or slightly hirsute, terete; leaves rather stiff-lanceolate to oblong-lanceolate, sessile, glabrous, roughish on the midrib and margin, ⅛′–¼′ wide, ⅜′–⅝′ long; flowers in sessile or subsessile axillary and terminal clusters; calyx-lobes broadly triangular, as long or shorter than the smooth or hirsute capsule; corolla pale blue (pearl blue); seeds minute, roundish, strongly angulate and reticulate under a lens.

Distinct from *O. uniflora*, with which it has been confounded, and distinguished from it by the erect columnar stem, narrower, sessile leaves and less foliaceous calyx-lobes.

Coast plain. Borders fresh or brackish ponds; most abundant on the saline flats exposed to occasional overflow by the tide. Mobile, August–October.

EUPATORIUM HYSSOPIFOLIUM ANGUSTISSIMUM n. var.

Glabrate; leaves opposite, fasciculate in the axils, crowded on the short internodes, narrowly linear to filiform, rigid, scarcely $\frac{1}{16}'$ wide, acute, deeply resinous-punctate, the margins revolute; branches alternate; upper leaves reduced to subulate bracts; inflorescence, involucral bracts, and achenium as in the typical form.

Upper division of the coast pine belt. Dale Co. Dr. Eugene A. Smith. August, 1890.

KUHNIA KUHNIA (Gaertn.)

Critonia Kuhnia Gaert. Fr. & Sem. **2**: 411. 1788–91.

Kuhnia Critonia Willd. Sp. Pl. **3**: 1773. 1804.

Kuhnia paniculata Cass. Dict. **24**: 516. 1821.

Kuhnia eupatorioides var. *gracilis* T. & G. Fl. N. A. **2**: 78. 1841.

Dry pine barrens. Springhill. September–October. Frequent.

CHONDROPHORA VIRGATA (Nutt.)

Chrysocoma virgata Nutt. Gen. **2**: 137. 1818.

Bigelovia nudata var *virgata* T. & G. Fl. N. A. **2**: 232. 1841.

Chondrophora nudata virgata Britt. Mem. Torr. Bot. Club, **5**: 317. 1894.

Allied to *C. nudata* by the inflorescence and other floral characters, but widely differing in the habit of growth, habitat, distribution and foliage.

The stout sprouts of the multicipitate rootstock are covered with the soft, filiform leaves, forming dense tufts; leaves of the flowering stalk filiform, $1'$–$1\frac{1}{2}'$ long, more or less distant. In the specimens from Alabama and others from western Louisiana no tendency towards the development of a wider leaf blade could be observed; on a specimen from western Texas a few linear-spatulate leaves were found, scarcely $\frac{1}{8}'$ wide.

Mountain region. Rocky banks of Little River on Lookout Mountain, DeKalb Co. altitude 1,600 ft. September. Texas, western Louisiana.

New Species of Fungi imperfecti from Alabama.

BY F. S. EARLE.

During the past year Dr. Underwood and I have been preparing a preliminary list of the fungi of Alabama, which it is hoped to publish at an early day, as a bulletin of the Alabama Experiment Station. During the course of the work a number of species have been found that seem to be undescribed. As the Experiment Station Bulletins do not have a sufficiently wide circulation among botanists to justify their use as a medium for publishing new species, I give below descriptions of some Fungi Imperfecti which appear to be new. Type specimens* are deposited in the herbaria of the Alabama Polytechnic Institute, the Agricultural Department at Washington, Harvard University, Columbia University and in the private herbarium of the writer. A number of other seemingly new species have been detected, but publication is withheld for the present for lack of sufficient material, or for further study.

Colletotrichum Jussiaeae n. sp.

On orbicular, yellowish-white, arid, purple-bordered spots, 2–10 mm. in diameter; acervuli scattered, not erumpent, small, about 100 μ; setae few, brown, transparent, occasionally septate, obtuse, mostly straight, from a somewhat enlarged base, about 70–100x6–8 μ.

On living leaves of *Jussiaea decurrens*, Auburn, Ala., August 27, 1891. G. F. Atkinson.

Cylindrosporium Celtidis n. sp.

Spots small, yellowish, indefinite and indistinct; acervuli hypophyllous, scattered, often only one on a spot, yellowish brown; spores cylindric or clavate, guttate, at length obscurely several septate, 20–25x3 μ.

On living leaves of *Celtis Mississippiensis*, Montgomery, Ala. November 10, 1891. G. F. Atkinson.

This somewhat closely resembles *Cylindrosporium ulmicolum* E. & E., on *Ulmus*, but the spores are only half as long.

Diplodia macrospora n. sp.

Perithecia scattered, large, carbonaceous, buried, ostiole erumpent, elevating and rupturing the epidermis; spores very long, dark fuliginous, irregularly clavate, on short slender hyaline ba-

*It seems useless among the fungi to attempt to distinguish between types and duplicate types. The descriptions have always been drawn from an examination of all the available material and this has been divided into as many "type specimens" as the quantity justified.

sidia, unequally uniseptate, scarcely constricted, each cell often biguttate, oozing out and blackening the epidermis, 70–80x6–8 μ.

On old weathered cornstalks (*Zea Mays*). Auburn, Ala. Spring of 1896. Underwood & Earle.

This is a very striking species. The long dark spores can be distinctly seen with a hand magnifier scattered over the epidermis. The gross appearance is much like that of *Diplodia Zeae* Lev., but it is easily distinguished by the much larger spores.

HETEROSPORIUM SAMBUCI n. sp.

Effused, covering considerable areas with a black velvety tomentum; hyphae long, 100–200 μ, dark fuscous, erect, often fascicled, branching, septate, nodular, bearing spores pleurogenously at the enlarged nodes; spores oblong, dark fuscous, 3-septate, surface conspicuously roughened by minute tubercles, about 20–30x5 μ.

On dead and weathered stems of *Sambucus*, Auburn, Ala., March 13, 1896. Underwood & Earle.

ISARIOPSIS PILOSA n. sp.

Fascicles, scattered, black, opake, large, 400–600x150–200 μ clothed with numerous short fuscous hairs 4–12 μ long; spores very numerous, acrogenous, crowning the fascicles with a penicillate bundle, light fuscous, transparent, somewhat curved, 12 or more septate, about 75x3 μ.

On the bark of dead twigs of peach, Auburn, Ala., May 25, 1896. L. M. Underwood.

MACROPHOMA DIOSPYRI n. sp.

Thickly scattered over large indeterminate areas; perithecia buried, elevating the epidermis in prominent pustules, at length partially erumpent, surrounded by the ruptured epidermis, large, opening by a distinct ostiolum, dark brown, of soft cellular structure, reaching 200 μ; spores cylindric, sometimes slightly curved, ends abruptly pointed, faintly tinged with olive when seen in mass, contents homogeneous, not guttate nor granular, about 20x3 μ; basidia thread-like, shorter than the spores, forming an agglutinated nebulous central mass.

On half-grown fallen fruits of *Diospyros Virginiana*, Auburn, Ala., July, 1896. Underwood & Earle.

PESTALOZZIA FLAGELLATA n sp.

Epiphyllous on large orbicular or irregular brown spots, bordered by a narrow darker brown line; acervuli confined to a definitely limited central pallid area, usually elongate, seeming to follow the smaller veins, rimosely dehiscent; spores blackening the epidermis, fusoid, 4-septate, not constricted, 3 central cells dark fuscous, end cells hyaline, about 16x6 μ; stipe straight, slender, about equalling the spore, the single seta or flagellum bent at an abrupt angle, and prolonged nearly twice the length of the spore, reaching 28 μ.

On living leaves of *Quercus* sp. (*rubra ?*), Auburn, Ala., August and September, 1891. B. M. Duggar.

PHYLLOSTICTA VACCINII n. sp.

Epiphyllous on brown irregular indeterminate spots, 1 cm. or more in diameter; perithecia scattered, erumpent, of soft texture, ostiole large, 8–10 μ, size variable, 80–12 μ; spores large, usually ovate, with a large (4 μ) spherical gutta near the broader end, about 12x6 μ.

On living leaves of *Vaccinium arboreum*, Auburn, Ala., April 25, 1896. Underwood & Earle.

PROSTHEMIUM PALMATUM n. sp.

Perithecia scattered over large whitened areas, elongate, hysteroid, black, carbonaceous, buried, at length partially erumpent, rupturing irregularly, or becoming discoid by the breaking away of upper portion; spores cylindric, light fuliginous, 1–3 septate, about 12–15x4 μ, united at base into bundles of 3 to 6, not stellate, but palmate or fascicled; basidia obsolete.

On rotten wood, Auburn, Ala., March 28, 1896. Underwood & Earle.

This genus does not seem to have been reported before from this country. The three known European species agree in the stellate arrangement of the spores in which they differ widely from our species.

SEPTORIA NEGLECTA n. sp.

On irregular determinate angular brownish arid spots, from 1 mm.–2 cm. or more, usually with a darker border; perithecia epiphyllous, or amphigenous, prominently erumpent, irregularly scattered, 106–120 μ or more; spores thread-like, continuous, faintly guttate, 30–40x1–1½ μ.

On persistent living leaves of *Quercus Phellos* growing as an undershrub, quite common, Auburn, Ala., February, March and April, 1896. Underwood & Earle.

Sporonema Camelliae n. sp.

Epiphyllous on large white brown-bordered spots or areas, 2–5 cm. in diameter; perithecia thickly scattered, buried, elevating the epidermis, orbicular or somewhat elongate, usually rimosely dehiscent, occasionally stellate-laciniate, becoming discoid, of firm cellular texture, about 200 μ; spores cylindric, ends obtusely rounded, sometimes curved, usually bi-guttate, 12–18 x 4–5 μ; basidia short and thick, about equalling the spore, usually simple.

On living leaves of *Camellia Japonica*, Auburn, Ala., March and April, 1896. J. S. Burton.

The spots resemble very closely those caused by *Pestalozzia Guepini* Desm.

Sporonema Ilicis n. sp.

Epiphyllous on large deadened and whitened areas, usually involving the apical portion of the leaf; perithecia often somewhat concentrically arranged, or thickly scattered, large, brown, membranous, buried in the epidermis and coming off with it, usually somewhat elongate, elevating the epidermis and at length cracking it longitudinally or stellately; spores continuous, elliptic, hyaline, on short simple hyaline basidia about 12–15 x 4–6 μ.

On languishing leaves of *Ilex opaca*, Auburn, Ala., December, 1895; January, February and March, 1896. Underwood & Earle.

From a fourth to a half of the leaf is usually dead and conspicuously whitened. The living portion is usually bounded by a broad intermediate dark purplish border. The gross appearance is much like *Phyllosticta opaca* E. & E., N. A. F. 3443, but the spores are entirely different.

Alabama Polytechnic Institute, Auburn, Ala.

Reinke's Discussions of Lichenology.

By Albert Schneider.

III.

Preliminary Considerations of a Phylogenetic Morphology of Lichens.*

Acharius,† the father of lichenology, classified lichens as a distinct order of plants. This method was not followed by later

* Reinke, J. Einige Voraussetzungen einer phylogenetischen Morphologie der Flechten. Pringsheim's Jahrbücher, 28: 39–69. 1895.

† Acharius, E. Lichenographia Universalis, Göttingen, 1810.

botanists who included these plants sometimes with algae and sometimes with fungi. Nägeli* placed them with the algae under the family Lichenaceae, stating that they agree in vegetative habit with the Stilophoreae and Fucaceae. So-called modern botany persists in placing lichens with fungi, a procedure which the author has always considered unnatural and unscientific, because morphologically lichens resemble green assimilating plants (algae, etc.) and not fungi. Morphological conformation and habit is in all cases the expression of the organization of plants as they develop in obedience to the requirements of biological existence.

Sometimes plants that are widely separate as to their habits show a great similarity of form. Nothing would however be farther from the truth than to assume that these similarities of gross appearance were due to identical or similar causes. As an illustration is cited *Clavaria flava* and *Cladonia uncialis.* In both the anatomical conformations secure a maximum of surface-expansion. In the former plant this is for the special purpose of furthering reproduction, in the latter for the special purpose of furthering assimilation. A few similar illustrations are given, which emphasize the necessity of giving correct physiological interpretations to the structural conformations.

The author now enters upon a highly theoretical discussion of classification. A system may be either practical and artificial or theoretical and natural. Furthermore, the modern natural system is supposed to be built upon the basis of phylogenesis. The author has purposely refrained from designating the natural system as scientific, since the artificial system is likewise scientific.

There is no sound basis upon which to build a phylogenetic system. Paleontology fails us in the consideration of the most important questions; this is particularly true in the phylogeny of the thallophytes. Here we are almost entirely dependent upon evidence deduced from a study of the comparative morphology of existing plants. But what scientific right have we to formulate conclusions from such comparisons? What evidence have we of the genetic relationship of plant-types? The emphatic statement that ontogeny represents phylogenetic development is nothing

* Nägeli, K. Die neuen Algensysteme, und Versuch zur Begründung eines eignen Systems der Algen und Florideen, Zürich, 1847.

more nor less than a mere thesis which is worshipped by those whom scruples and doubt do not enthrall, and who, in their sanguinism, accept that as truth which in their estimation is desirable. The phylogenetic method of procedure has some scientific value. as is evidenced from the paleontologic data of general evolution. It is necessary in all cases to add to these phylogenetic constructions certain hypothetical assumptions so as to form a rationally appearing chain of evidence. To exclude hypothetical assumptions from the domains of science is impossible; they are necessary in botany as well as in physics and chemistry. It is the object of science to point out what constitutes positive facts and what is only relatively true or hypothetical. If we ignore this distinction we become unscientific. As an illustration, may be mentioned the premature fruit of hyper-Darwinism, which has such a deleterious influence in the realms of natural science.

The parts of a plant stand to each other in the relation of a morphological equilibrium. This equilibrium is more or less labile, but it may acquire a high degree of stability. In a given individual the greatest morphological lability exists in the embryo. It tends toward continual change. Among the higher plants (ex., a tree), there are as many points of labile equilibrium as there are meristematic areas. A mature leaf has reached the state of stable equilibrium; it changes neither in size or form. Neoformations may however be induced by special stimuli, producing a state of temporary lability.

All species are in a state of morphological lability as long as they are variable. Struggle for existence and other causes finally produced stability of form.

At this point the author's arguments become peculiarly weak and antiquated. He assumes that the majority of plants and animals now living have reached a state of morphological stability. Many stable forms have gone out of existence because they could not adapt themselves to the changes in environment. As evidence for the existence of such stability the author states that our most common plants of cultivation have not undergone any appreciable change within thousands of years. Man is cited to illustrate stability in the animal kingdom. Homer is compared with moderns to prove that the psychological peculiarities have not undergone any changes within 4,000 years. He concludes that if man were a labile organism he would have undergone some appreciable change within that period. Temporary lability may occur, but there is a continual tendency toward the stable forms, or an optimum of adaptability. This peculiarly dogmatic argument has about it a certain cadaveric odor. It is in sharp contrast to the author's usually scientifically rational arguments.

The discussion of the lichen-thallus is next taken up. Sachs * maintains that the flatness of the lichen-thallus (foliose) is due to the direct influence of sunlight (photomorphosis). Reinke points out that this can not be the cause, since there are numerous lichens with fruticose thalli. Wherever or in what form the lichen-thallus occurs, it indicates a special morphological adaptation to favor the function of assimilation. If light and chlorophyll were the only factors concerned, then all assimilating organs would have the same structure, since constant factors must produce constant results.

Since lichens undoubtedly have a polyphyletic origin we have a striking illustration of the fact that identical morphological adaptations may be produced in phylogenetically distinct series. It demonstrates that a plant which is most suitably adapted to its environment constitutes a stable form, toward which the less perfect forms of the series tend. The author concludes that sexuality is the cause of variation; therefore, lichens which are propagated by soredia alone must have reached the highest degree of stability. The phylogenetic development in lichens must have been the result of reproduction from spores and gonidia. If a lichen in the course of its phylogenetic development becomes associated with a new alga it is changed from a stable form to a labile form. It may also be possible that one and the same fungus may unite with different algae (forms of *Cora*, *Sticta*, *Stictina*, and *Solarina*). This subject, however, requires further study. Change of algae has already been observed by Forssell. † According to Bonnier, ‡

* Sachs, J. Physiologische Notizen, VIII. Mechanomorphose und Phylogenie. Flora, 78: 215–243. 1894.

† Forssell, K. B. J. Lichenologische Untersuchungen. Flora, 64: 1–8, 33–46. 1884.

‡ Bonnier, G. Germination des Lichens sur les protonémas des Mousses. Rev. Gen. de Bot. 1: 165–169. 1889.

lichens may also utilize the protonemas of various mosses. There is no doubt that many of the lower lichens will develop to some extent (in artificial media) without the algae,* but no lichen-fungus will develop to maturity in nature. From this we may conclude that all fungi which have entered into the formation of lichens no longer exist.

Phylogenetic morphology is intimately related to classification. It supplies science with the necessary building material for the natural system of the future. Conversely systematists in their various and varied attempts at classification have unconsciously added to our knowledge of phylogenetic morphology.

In a natural system the oldest morphological characters serve to limit the main divisions; the next oldest limit the families. The more recently acquired characters serve to define the genera and species. It is often difficult to determine what are in reality the old and new characters. In this difficulty lichens prove very interesting because it is to a certain degree possible to determine the relative ages of the phylogenetically acquired characters. The more recent characters occur in the thallus; the oldest in the apothecium and related structures, since these are as old as the lichen plus the age of the fungal ancestor. Accordingly the main divisions of the lichen-system should be based upon the characters of the apothecia, and not upon the thallus-characters. This, however, does not imply that the apothecia have undergone no variation; the variation is even considerable, as becomes evident upon comparing the lecanorine type with the lecideine. The same may be said of the spores. In general, however, the variations in the thallus are much more considerable and represent the direct characters of adaptation.

The future system of lichens will also consider the relation of these plants to their probable fungal ancestors. In the limitation of the genera it will be necessary to determine whether or not a given character was transmitted from the fungal ancestor or whether it was newly acquired.

The following is a brief summary of this paper:

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* Möller. Ueber die Kultur flechtenbildender Ascomyceten ohne Algen. Münster. 1887.

1. Morphological similarities may be induced by wholly distinct causes and may serve wholly different ends.

2. The majority of species (both vegetable and animal) are stable. Temporary lability may be induced artificially or otherwise. All subsequent changes again tend toward the stable form.

3. The form of the lichen-thallus indicates a special morphological adaptation to favor the function of assimilation.

4. The phylogenetic morphological characters of lichens are of great significance in the formation of a natural system as well as in the consideration of phylogenesis in general.

5. The more recently acquired characters of lichens are to be found in the thallus; the oldest in the apothecial structures.

6. The entire lichen-structure has undergone considerable change since its phylogenetic history.

New or Noteworthy American Grasses.—V.

By Geo. V. Nash.

Erianthus Tracyi n. sp.

Culms stout, erect, 2–4 m. high, smooth and glabrous, the nodes upwardly barbed with deciduous silky hairs, about 1 cm. long; sheaths closely embracing the culm, shorter than the internodes, smooth, glabrous, except at the apex, where they are pubescent with deciduous, long, silky, appressed hairs; ligule rounded, about 5 mm. long; leaves 5 dm. long or more, 1.5–3 cm. broad, narrowed toward the base, long-acuminate toward the apex, strongly scabrous on both surfaces, pilose on the upper side toward the base; panicle oblong, 3–5 dm. long, 8–12 cm. wide, cream-white, dense, the main axis and branches pubescent with long appressed silky hairs, the branches usually in 2's, much divided, ascending or nearly erect, 15 cm. long or less; spikelets lanceolate, 5–6 mm. long, about one-half again as long as the internodes, yellowish brown, usually marked with red, less than one-half the length of the involucral hairs; first and second scales firm-membranous, the former a little the longer, both pubescent with silky hairs, twice the length of the scales, the first acuminate, faintly 7-nerved at the base, 2-toothed and prominently 2-nerved at the apex, the two nerves scabrous, the second scale acute, the nerves hardly discernible; third and fourth scales hyaline, shorter than the first and second ones, ciliate on the margins, the third acute, 1-nerved, the fourth narrower, acuminate, 2-toothed, conspicuously 1-nerved, the nerve excurrent as a straight or slightly twisted (not spiral) awn, 1.5–2 cm. long.

Type collected at Starkville, Miss., on October 1, 1896, by Prof. S. M. Tracy, in whose honor I take pleasure in naming it. C. L. Pollard's no. 1,341, collected at the same locality, in August of the past year, is the same. Mr. Pollard informs me that it grows on moist open slopes.

The larger and denser panicle, the longer hairs both on the outer scales and at the base of the spikelet, and the longer awn, which is straight or nearly so (not coiled), readily separate it from *E. alopecuroides* L. The base of the awn in *E. Tracyi*, that portion included in the outer scales, is loosely twisted, while the same portion in *E. alopecuroides* is closely coiled.

At the present time I only have specimens from Mississippi, and would be exceedingly glad to receive more material from other localities.

PASPALUM BLODGETII Chapman.

It would seem best to maintain the above name, although perhaps not the oldest, for the plants that have been referred to *P. caespitosum* Fluegge. Chapman's type is preserved in the Herbarium of Columbia University, so that the positive identification of that species is possible. One of the forms which has been placed here is very different and surely worthy of specific rank. I have taken it out and described it below as new. Its differences from the plants here under consideration are there pointed out.

The reason which seems to make it desirable to maintain Chapman's name instead of Fluegge's is the inability to make the plants in my possession, which have been referred to *P. caespitosum*, agree with the description of Fluegge. He says, among his differentiating characters, that the scales are 5-nerved and the rachis as broad as the spikelets. In all the specimens at my disposal the scales are only 3-nerved and the rachis but one-half to two-thirds as wide as the spikelets. If this should be found to be true in all the specimens that have been referred to this species it would throw considerable doubt upon the validity of past determinations. As no certainty is possible in the matter of Fluegge's name until his type can be seen, it would seem preferable to adopt, for the present at least, Chapman's name, about which there can be no doubt, as above stated. The *P. caespitosum longifolium* of Dr. Vasey would seem to me hardly worthy of the rank of a variety, as both long and short leaves occur on the same plant.

Paspalum Simpsoni n. sp.

Culms, upper sheaths, and surfaces of the leaves smooth and glabrous. Culms erect, slender, 2–8 dm. tall; sheaths loosely embracing the culm, the basal ones short and appressed-villuos, the remainder longer and usually much exceeded by the internodes of the mature culms, the uppermost one elongated; ligule very short and truncate; leaves erect or ascending, lanceolate, or linear-lanceolate, 2.5–14 cm. long, 2–10 mm. wide, rounded or slightly cordate at the base, acuminate at the apex, ciliate, glaucescent above; inflorescence 8–16 cm. long, the first internode of the main axis 3.5–5 cm. in length, the remainder gradually becoming shorter; spikes usually strict, 3–5, spreading or ascending, 2.5–7.5 cm. long, pubescent and pilose at the base, the rachis flat, winged, one-half to two-thirds as broad as the spikelets, narrower and more or less flexuous toward the apex, minutely scabrous on the margins; spikelets in 4 rows, in pairs on flattened minutely scabrous shorter pedicels, obicular-obovate, 1.5 mm. long, the two outer scales membranous, 3-nerved, the first one concave, pubescent with short spreading glandular-tipped hairs, the second flat, glabrous, or sparingly pubescent at the very base, the third scale chartaceous, concave, smooth and shining, yellowish, enclosing a palet of equal length and similar texture.

Collected by J. H. Simpson on No Name Key, Florida, in May, 1891, no. 184. I take pleasure in naming this grass in honor of Mr. Simpson, whose extensive collections in southern peninsular Florida, have added much to the knowledge of the flora of that most interesting region. The *Paspalum* in question has been confounded with *P. caespitosum* Fluegge, a discussion of which species occurs above under *P. Blodgettii*, and Mr. Simpson's plant, referred to previously, was distributed under the former name. Curtiss' no. 5440, collected at the same locality on June 26, 1895, is this same plant and was also distributed as *P. caespitosum*.

This grass is readily distinguished from *P. Blodgettii*, to which it is related, by its smaller and differently shaped spikelets, the pubescence of which is short, spreading and glandular-tipped, and by the broader and manifestly ciliate leaves. The spikelets in

P. Blodgettii are elliptic or elliptic-obovate, about one-half longer, and the pubescence scantier and composed of much longer hairs, which are appressed and not glandular-tipped; the leaves, moreover, are sparingly, if at all, ciliate.

PASPALUM VILLOSISSIMUM n. sp.

Whole plant, except the culm and spikelets, densely vilous, particularly the lower sheaths. Culms erect, smooth and glabrous, 5–10 dm. tall, from a thick and more or less branching rootstock, extending, when mature, much beyond the uppermost sheath, branching at the highest node, the usually single branch exserted but little beyond the sheath; nodes purple; sheaths loosely embracing the culm, those at the base short and overlapping, the remainder elongated, the uppermost sometimes without a leaf blade; ligule truncate, less than .5 mm. long; leaves erect, linear-lanceolate to lanceolate, 3–20 cm. long, 3–10 mm. wide, truncate or slightly rounded at the base, long-acuminate toward the apex, a ring of long hairs at the very base immediately above the ligule; spike single, rarely with an additional one below, slender, usually strict, or the longer a little arcuate, 7–11 cm. long, the rachis flat, about two-thirds as wide as the spikelets, wing-margined, somewhat flexuous, the margins serrulate; spikelets orbicular-obovate, .8–.9 mm. long, .75 mm. wide, by pairs, in four rows, on hispidulous pedicels about one-half their length; first and second scales membranous, strongly pubescent with short spreading glandular-tipped hairs, the former concave and 3-nerved, the latter flat with inrolled margins, 2-nerved; third scale similar in shape to the first, greenish white, chartaceous or coriaceous, enclosing a palet of equal length and similar texture.

Type collected by the writer at Eustis, Lake County, Florida, early in June, 1894, no. 946, and distributed as *P. setaceum*, from which it seems clearly distinct, the shorter and broader leaves and the pubescent spikelets readily separating it from that species. It resembles *P. dasyphyllum* Ell. in its pubescence, but its slender long-exserted culms and the slender spikes, usually single, serve well to distinguish it. In *P. dasyphyllum* the culm is much stouter, and the thicker spikes 2–4 in number, rarely 1.

Nos. 2019, collected at the same place, and 2416a at Tampa, both in 1895, belong here.

PANICUM ALBO-MARGINATUM n. sp.

Whole plant, with the exception of the spikelets and the lowermost sheaths, smooth and glabrous. Culms erect, slender, 1.5–4.5 dm. tall, somewhat branched toward the base; sheaths short, often sparingly ciliate on the margins, those on the culm one-third the length of the internodes or less, 1.5–2.5 cm. long, those on the branches shorter and overlapping, 1 cm. long or less; ligule a ring of short hairs about .25 mm. long; leaves thick, erect, lanceolate, 1.5–4.5 cm. long, 2–8 mm. wide, acuminate, somewhat narrowed and rounded at the base, with a prominent thick, white, cartilaginous, serrulate margin about .25 mm. wide; panicle ovate in outline, the primary ones long-exserted, 2.5–4 cm. long, the branches ascending; the panicles on the branches smaller, shorter than the uppermost leaf; spikelets 1.5 mm. long, broadly obovate, obtuse, diverging from the branches; first scale orbicular, glabrous, one-fourth to one-third as long as the spikelet; second and third scales membranous, 7-nerved, strongly pubescent with short spreading hairs, the latter enclosing a hyaline palet about one-half its length; fourth scale chartaceous, oval, obtuse, 1.25 cm. long, about .8 mm. wide, enclosing a palet of equal length and similar texture.

Collected by the writer in the low pine land at Eustis, Lake County, Florida, early in June, 1894, no. 925. In habit it is much like *P. sphaerocarpon* Ell. It is probably the *P. nitidum* of Elliott.

PANICUM LATIFOLIUM L.

It may be of interest to call attention to a remark of Trinius in relation to this species, although the evidence as to what plant Linnaeus had in mind is so strong that it would hardly seem worth while to allude to it further. Trinius (Mem. Acad. St. Petersb., VI., 3: Pt. 2, 262, 1834), in the latter part of his description of this species, makes the following statement in parenthesis:

"Ob quam notam et ob Sloanei iconem optimam de Linnaei planta dubium nullum."

PANICUM LEUCOTHRIX n. sp.

Culms caespitose, 1–4.5 dm. tall, erect or ascending, somewhat branched, sparingly pubescent with ascending hairs, the nodes glabrous. Sheaths less than one-half as long as the internodes, 2 cm. long or less, usually purplish, pubescent with ascending or nearly appressed long white hairs, those at the base of the sheath more dense and spreading; ligule a ring of long white, erect hairs; leaves erect or nearly so, lanceolate, 2–6 cm. long, 3–7 mm. wide, acuminate at the apex, truncate or rounded at the partly clasping base, 7–9-nerved, rough and glabrous above or with a few minute scattered hairs, pubescent below with short appressed hairs; panicle ovate or oval, 2.5–6 cm. long, 2–4 cm. broad, its branches spreading or ascending, 2.5 cm. long or less; spikelets obovate, about .65 mm. long, .4 mm. wide; first scale membranous, one-quarter to one-third as long as the spikelet, orbicular-ovate, obtuse, 1-nerved; second and third scales membranous, equal in length, 7-nerved, strongly pubescent with short spreading hairs; fourth scale chartaceous, elliptic, yellowish-white, enclosing a palet of equal length and similar texture.

Type collected by the writer in the low pine land at Eustis, Lake County, Florida, in the latter part of July, 1894, no. 1338. Nos. 334 and 467, of the same collection, also belong here.

PANICUM MANATENSE n. sp.

Whole plant, with the few exceptions described below, smooth and glabrous. Culms 2–4 dm. long, strongly striate-grooved, decumbent, much branched, the lower and longer internodes arcuate; nodes often yellowish on one side; sheaths loose, ciliate along the margins, at least when young, the lower ones much shorter than the internodes, those at and toward the extremities of the branches crowded and overlapping; ligule truncate, very short; leaves erect or nearly so; lanceolate 3.5–9 cm. long, 7–15 mm. wide, acuminate at the apex, rounded at the sparsely ciliate base, 9–13-nerved; panicle ovate in outline, 4–6 cm. long, its branches single and divided almost to the base, 1.5–3 cm. long, ascending; spikelets on ascending pedicels usually longer than themselves, elliptic about 3.5 mm. long, 1.3 mm wide, very acute; first scale membranous, slightly exceeding one-third the length of the spikelet, ovate, acute, 1–3-nerved; second and third scales 7–9-nerved, membranous, acute, strongly pubescent with spreading hairs, the latter with a hyaline palet about one-third its length; fourth scale chartaceous, elliptic 2.5 mm. long, strongly apiculate, enclosing a palet of similar texture as long as itself.

Collected by the writer on August 21, 1895, near a sulphur well in a wet hammock northeast of Palmetto, Manatee County, Florida, no. 2428a. Approaching *P. commutatum* Schult. in habit and general appearance, but the large and very acute spikelets readily distinguish it from that species.

AGROSTIS IDAHOENSIS n. sp.

Culms caespitose, slender, 2–4 dm. tall, erect, bearing usually two distant leaves below the middle; sheaths loosely embracing the culm, the lower ones short, the uppermost one elongated 4.5–9 cm. long; ligule membranous 3–4 mm. long, obtuse, cut-toothed at the apex, minutely pubescent on the outside; leaves narrowly linear, erect, 4–9 cm. long, 1–2 mm. wide, acuminate at the apex, rough, particularly on the margins; panicle oblong, 6–12 cm. long, 2.5–4.5 cm. wide, the axis smooth below, slightly scabrous above as are the branches and pedicels; branches of the panicle ascending 5.5 cm. long or less, usually in 5's, the secondary branches more or less spreading; spikelets lanceolate and acuminate when closed, 2 mm. long, generally about equaling the pedicels, which are decidedly thickened at the apex and usually more or less spreading; empty scales acuminate, purplish, scabrous on the keels, the first longer than the second; flowering scale about three-fifths as long as the first scale; palet wanting.

Collected by A. A. and E. Gertrude Heller, at Forest, Nez Perces County, Idaho, on July 16, 1896, at an altitude of 3,500 feet, no. 3431. A very delicate and beautiful member of the genus and perfectly distinct from any species of that region with which I am acquainted.

DANTHONIA GLABRA n. sp.

Whole plant, with the few exceptions noted below, glabrous. Culms 4–7 dm. tall, erect, simple, striate, slightly rough just below the panicle, and puberulent for some distance below the brown nodes; sheaths smooth, only those at the base of the culm exceeding the internodes, the remainder much shorter than their internodes; ligule densely ciliate with silky hairs 1–2 mm. long; leaves smooth excepting at the apex, 1.5–3 mm. wide, erect, those on the sterile shoots 1.5 dm. long or more, those on the culm 5–10 cm. long, the basal ones shorter than the rest; panicle 5–8 cm. long, its axis, together with the erect or occasionally spreading branches, hispidulous; spikelets, including awns, 1.7–2 cm. long, 5–8-flowered, on hispidulous appressed pedicels, 2.5–7 mm. long; empty scales acuminate, the first 3-nerved, 1.3–1.7 cm. long, equalling or slightly shorter than the 5-nerved second; flowering scales 5–6 mm. long to base of the teeth, pubescent on the lower half of the margins, and occasionally sparingly so on the mid-nerve near the base, with erect silky hairs about 2 mm. long, teeth including awns 1.5–3 mm. long, one of the awns usually shorter than the other, the central awn 9–12 mm. long, more or less spreading, yellowish brown at the base, strongly hispidulous toward the green apex, about once twisted; palet about reaching to the base of the awn or nearly so, strongly ciliate on the two nerves.

Type specimens collected by Dr. John K. Small, on Little Stone Mountain, DeKalb County, Georgia, on July 5, 1895. In this the flowering scales are entirely glabrous on the back. In another form from New Jersey the flowering scales are sparingly pilose on the back near the base. This latter form was secured by Dr. John Torrey, at Quaker Bridge, in May, 1830; also by a party of the Torrey Botanical Club at Forked river, on May 30, 1896.

This is abundantly distinct from *D. sericea* Nutt., to which it is allied. In that species the sheaths are densely villous, and the marginal hairs of the appressed-pubescent flowering scales are about 3 mm. long, instead of 2 mm. as in *D. glabra*.

An apparently undescribed Species of Prunus from Connecticut.

By John K. Small.

(Plate 292.)

To venture to describe a new species of *Prunus* from the long explored territory of the State of Connecticut may seem to some to be questionable, but so clear a case has recently come to my notice that to do otherwise would be unjust to nature.

The plant in question is a low slender branching shrub, reaching a maximum height of about twelve decimeters. The main stem is clothed with a dark rough bark and, like the principal branches, is leafless, the ascending twigs and branchlets only producing leaves. The small white flowers are confined to the branchlets just below the leaf-producing parts. The small globose drupe is deep purple or almost black, covered with an abundant light blue bloom. To the taste the fruit is bitter and astringent.

The species occurs on a cross-shaped area, on a low gravelly ridge near Long Island Sound, at Groton, Connecticut, and is related to *Prunus maritima*, which grows in the immediate neighborhood and under precisely the same conditions, thus affording an excellent opportunity for a comparison of characters:

1. The new species is lower, more slender and delicate in habit than *Prunus maritima*, maturing both its leaves and fruit earlier in the season.

2. The small suborbicular type of leaf, as against the larger elongated type characteristic of the beach plum. This character is very apparent from the time the buds begin to unfold.

3. The smaller flowers with the suborbicular petals, which are about 5 mm. in diameter and abruptly narrowed at the base, as compared with the larger broadly obovate petals of *Prunus maritima*, which are gradually narrowed at the base.

4. The smaller always globose short-pedicelled drupe, in place of the longer often elongated and long-pedicelled fruit of the beach plum.

5. A small and very turgid stone (nearly as thick as broad), which is pointed only at the base. The stone of *Prunus maritima* is flatter and usually pointed at both ends.

6. Sprouts arising from the ground never produce flowers, as they frequently do in the case of *Prunus maritima*.

This plum was discovered by Dr. Charles B. Graves, of New London, Connecticut, to whom I am indebted for specimens and much of the substance of this paper, and whose name I wish to associate with the plant as

PRUNUS GRAVESII n. sp.

A low, unarmed shrub; stems erect or ascending, reaching a maximum height of 12 dm., much branched, clothed with a dark rough bark, leafless like the ascending branches; twigs and branchlets less leafy, usually puberulent; leaves orbicular or oval-orbicular, varying towards orbicular-obovate, 2–4 cm. long, rounded or retuse and apiculate at the apex, sharply serrate or those of the shoots crenate-serrate, abruptly narrowed, rounded or truncate at the base, sparingly pubescent or glabrate above, more pubescent beneath, especially on the nerves; flowers pure white, 1–3 cm. broad, solitary or 2–3 together, scattered on the twigs near the top of the shrub; pedicels stiff, stout, 6–10 mm. long, pubescent; calyx pubescent like the pedicels, the tube campanulate, the segments oblong, as long as the tube; petals sub-orbicular, about 5 mm. in diameter, abruptly narrowed at the base; drupe globose, solitary, 10–15 mm. in diameter, usually 12.5–13 mm. in diameter, deep purple or almost black with an abundant light blue bloom, bitter and slightly astringent; stone broadly oval, broadly crested, 7.5–9 mm. long, 7–8 mm. broad and 6–6.5 mm. thick, very turgid on one side, acute at the base, rounded at the apex.

In the year 1895 the species flowered during the last week of May and matured its fruit the first week of September.

A new Polygonum from Bolivia.

By John K. Small.

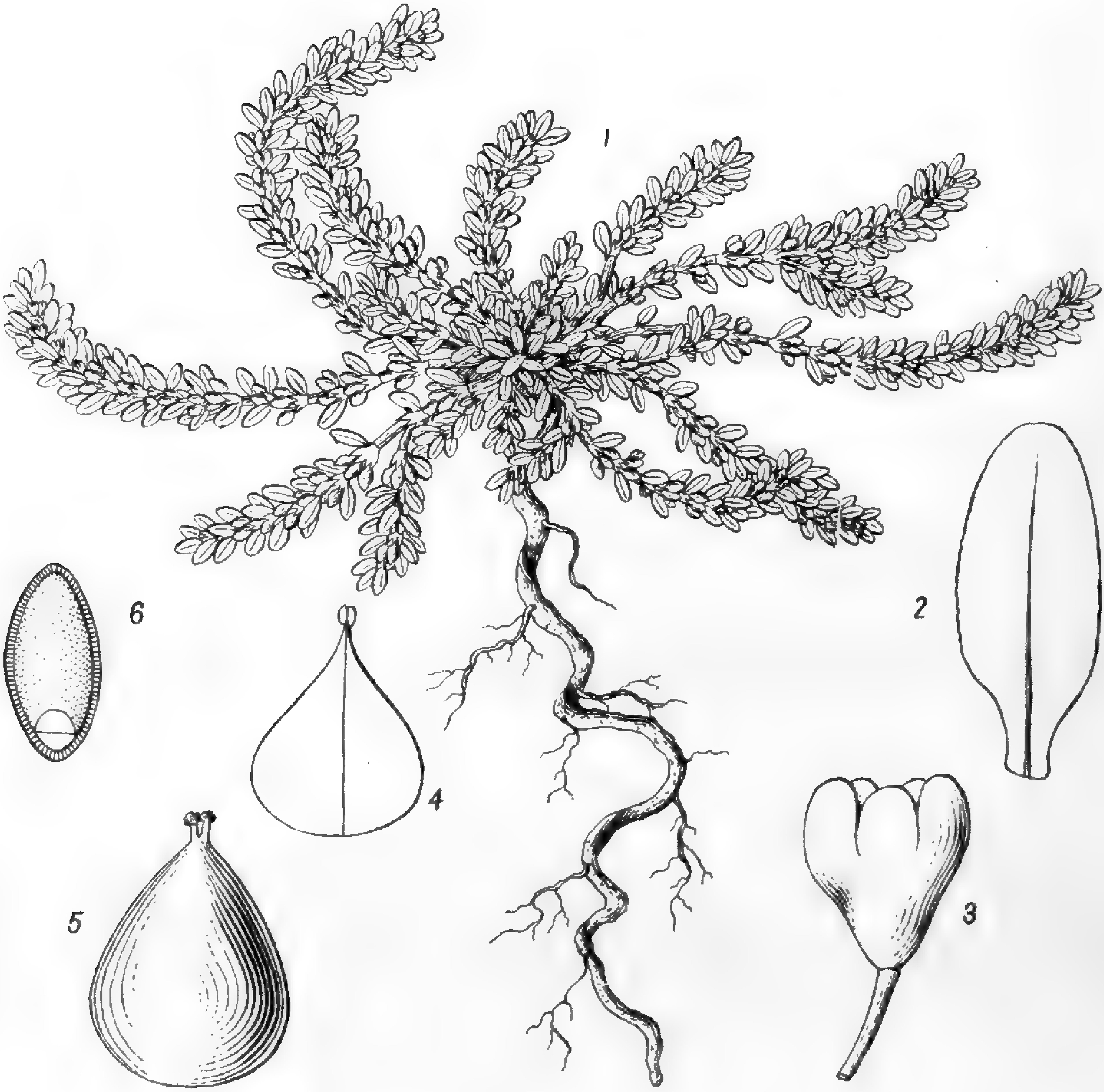
(Plate 293.)

Polygonum fallax n. sp.

Annual or perennial by a long somewhat spiral root, low, dull green. Stem more or less densely and caespitosely branched near the top of the root, the branches spreading or prostrate and ascending, 2–12 cm. long, very leafy except at the base; leaves varying from ovate-oblong to obovate-oblong, 3–5 mm. long, obtuse, somewhat revolute and crisped, narrowed at the base, wrinkled above, slightly nerved beneath, the mid-nerve keeled beneath, especially near the base, obliquely articulated at the base of the ocreae; ocreae funnelform, 4 mm. long, imbricated, especially toward the ends of the branches, at length lacerate to a little below the middle; flowers numerous and often crowded; calyx 2.5 mm. long, 5-parted, 4 segments green, with whitish margins, 1 wholly included and hyaline, all rounded at the apex, stamens usually 5 or 6; filaments dilated their whole length into a broadly ovate hyaline petal-like organ; style two-parted, .4 mm. long; achene lenticular, ovoid, 2.5 mm. long, reddish, nearly smooth, shining, its faces convex, its angles rounded, sometimes faintly margined.

A species of especial interest collected in Bolivia by Mr. Bang and communicated to me by Dr. Rusby. Although it belongs to the subgenus *Avicularia*, its fruit possesses characters heretofore unknown in that subgenus. The several natural groups of *Polygonum* bear two kinds of achenes, some lenticular, others triquetrous, while in a few cases both forms appear. *Avicularia* has been known to produce only the triquetrous achenes developed from a three-angled ovary with a more or less three-branched style, but in *Polygonum fallax* we are confronted with a species of subgenus *Avicularia* bearing only lenticular achenes developed from lenticular ovaries with two-branched styles.

A second peculiarity is exhibited in the pericarp which most closely resembles that of the different members of the subgenus *Duravia*, both in texture and color, but the styles are not those of that group. Another interesting point is found in the androecium; the filaments are dilated into broad petal-like organs, which form a cup around the ovary. I know no other case like this in the



POLYGONUM FALLAX SMALL.

genus. Notwithstanding these exceptions, the species for the present must be referred to *Avicularia* and forms the first exception to its normal morphology as far as I have observed, and an interesting one.

Explanation of Plate 293.

1. Whole plant, natural size.
2. Leaf, enlarged.
3. Flower, enlarged.
4. A stamen, enlarged.
5. Achene, enlarged.
6. Cross-section of achene, enlarged.

The Relation between the Genera Thysanella and Polygenella as shown by a hitherto unobserved Character.

By John K. Small.

The genus *Thysanella* has generally, and apparently without good reason, been included in *Polygonum*.

In a former paper * I stated that *Thysanella* was a perfectly distinct genus, related to *Polygonella* and not to *Polygonum*.

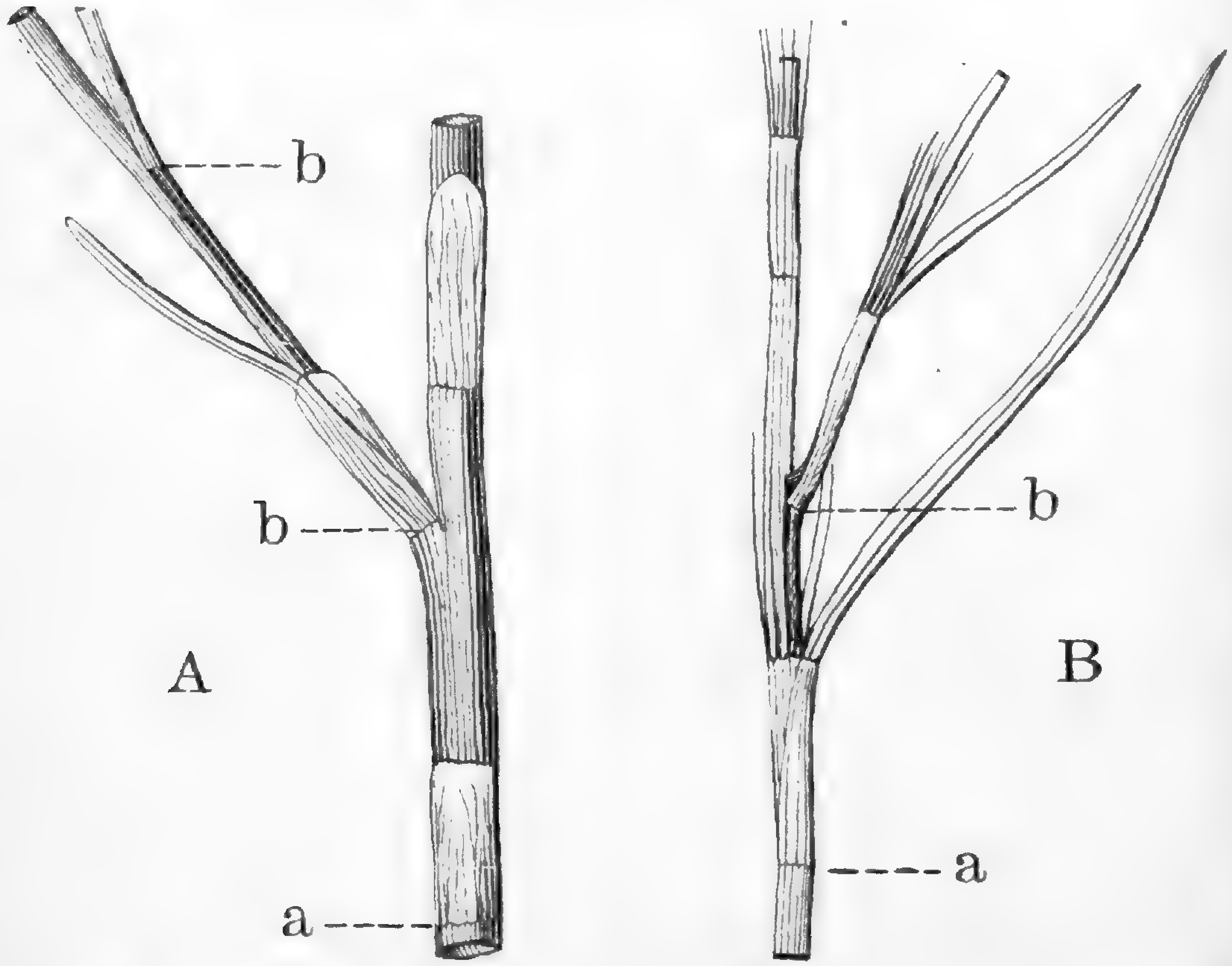
A glance at *Thysanella fimbriata* and any member of the genus *Polygonella* ought to be sufficient to convince any one of the strong relationship between the two genera. The habits of the two are almost identical, while the vegetative organs of *Thysanella* much more closely resemble those of *Polygonella* than they do any member of *Polygonum*.

Coming to special morphological characters let us first consider the flower. Here we find the special development in the inner series of sepals; likewise in *Polygonella* it is the inner sepals that develop special organs. In *Polygonum* the outer sepals are specialized if any development at all takes place, the inner series being practically unmodified.

Besides the foregoing considerations I have lately noticed a character in both the genera *Thysanella* and *Polygonella* which is possessed by no other member of the family *Polygonaceae*. In the

* Mem. Dept. Bot. Col. Coll. 1: 9.

one species of *Thysanella* and in all the species of *Polygonella* the branching is not nodal, but internodal.



The internodal branching is brought about by the adnation of a secondary axis to a primary axis for a greater or less distance above a secondary node, usually about one-half the distance from node to node. The true condition is more plainly shown in *Thysanella*, where the union of the two axes is not as complete as in *Polygonella*, a shallow but usually distinct groove showing the place of union.

Explanation of the Figure.

A. *Polygonella Americana* (F. & M.) Small.
B. *Thysanella fimbriata* (Ell.) A. Gray.
a. Nodes.
b. Point where the adnate axis diverges.

A Plant Catapult.

In the process of enlarging the College seed collection a quart or so of the pods of the Chinese Wistaria were recently brought into the laboratory for their seeds. Some of the pods, that might be easily mistaken for the fingers of a soiled buckskin mitten, were placed upon a radiator to dry while others were deposited upon a table near by. Some were hung in my son's sleeping room to note the effect upon a young person unversed in the methods of plant dissemination. Upon the third day the pods upon the laboratory radiator began their bombardment. The first shot provoked surprised in a person in a adjoining room, the report being in volume not unlike that made by a Fourth of July toy pistol. In a few minutes the first shot was followed by a second and the pieces of the horny pod were seen to rise for several inches, while the large seeds hit the high ceiling with considerable force. A third pod was taken to the middle of the room and watched for an explosion. Within five minutes the efforts were rewarded by first a low snap, followed quickly by a high somersault of the pod and the expulsion of the seeds to a vertical and lateral distance of ten feet. Of the four seeds only two were recovered, the others being lost among papers and books not far away. In another instance the seed was flung from a pod with such force as to strike the window, producing a sharp sound as if a small stone had been thrown against the pane. If the window had been open the seed would have reached the side of a neighboring building fifteen feet away.

It is an easy matter to cause the dry Wistaria pods to explode by holding by the stem end and bringing them down with a sharp tap upon one of the two edges. The pods open uniformly by the ventral suture, and if the pod is struck by this edge the seeds do not fly out so readily, but by reversing the edges they are flung upward, and may rise to the height of many feet.

One of the pods "popped" in my boy's room just as the lad was awaking in the morning, and drew from him the remark that he was "scared awful." He also said that "if those things were made to hold seeds they were not of much use."

These statements are repeated here to enforce the fact that the noise made by the Wistaria seed-pods may be positively alarming in the quiet of the early dawn to an unsuspecting child. Older persons, still earlier in the morning, might experience a surprise should one of these spring traps fly open with its attendant sharp cracking sound.

The pods average from four to six inches long, bearing two, three and four seeds, which are flat upon one side and convex upon the other and a half-inch in diameter. The wall of the pod is quite thick and develops in drying a remarkable degree of tension. Other members of the Leguminosae are noted for their casting of the seeds; but the undersigned has observed nothing that will compare in volume of sound or of projection distance with the Wistaria. BYRON D. HALSTED.

DECEMBER 9, 1896.

Notes upon Maine Plants.

BY F. L. HARVEY.

The following Maine plants were detected during the past season. Several are not recorded in Fernald's Catalogue or Supplement. Some are added for locality.

Anemone cylindrica Gray. Pastures, E. Auburn, Me., une, 1896. E. D. Merrill.

Cardamine Pennsylvanica Muhl. Rocky hillsides at the base of a shaded cliff. Abundant. Growing as though native, E. Auburn, June to Oct., 1896. E. D. Merrill.

Silene nivea Otth. Bank of the Stillwater River near Orono, Me., on a north hillside. The patch was nearly a rod square. July, 1896. F. L. Harvey.

Koellia flexuosa (Walt.) MacM. (*Pycnanthemum linifolium* Pursh). Field, Brownfield, Me., August, 1896. E. D. Merrill.

Stachys palustris L. This was excluded from the Maine Flora by Mr. Fernald, as no station was known. Growing abundantly on the islands of Penobscot Bay. Two Bush Island, F. L. Harvey; Pond Island, O. W. Knight, August, 1896.

Polygonum lapathifolium nodosum (Pers.) Small. Waste places, E. Auburn, E. D. Merrill. We also found this at Jackman last season.

Polygonum littorale Link. Waste places, Orono, Me., 1896. O. W. Knight.

Galinsoga parviflora Cav. A single robust specimen growing near a garden in E. Auburn. E. D. Merrill.

Senecio viscosus L. Quite abundant on Western Sister Island, near Mt. Desert, Long Island, Penobscot Bay, August, 1896. F. L. Harvey. Growing with *Solanum nigrum.*

Panicum agrostidiforme Lam. (*Panicum agrostoides* Muhl.). Along roadsides, Brownfield, Me., August, 1896. For locality. E. D. Merrill.

Panicum lanuginosum Ell. A form with long soft hairs was referred to Prof. Scribner, who named it as above doubtfully. Our Panicums need careful study. E. Auburn, July, 1896. E. D. Merrill.

Lolium temulentum L. A few specimens found near the Stillwater river, Orono, Me., July, 1896. F. L. Harvey. Probably introduced.

Agrostis Novae-Angliae Tuck. Low ground. Grasslands, E. Auburn, July, 1896. E. D. Merrill.

An undescribed Species of Gilia.

GILIA LAXIFLORA (Coulter).

Gilia Macombii laxiflora Coulter, Cont. U. S. Nat. Herb. 1: 44. 1890.

This *Gilia* is undoubtedly worthy of specific rank, and its relationship seems to be with *Gilia longiflora* Don, rather than with the species of which it was made a variety. It may be characterized as follows:

Annual, about 3 dm. high, erect, branching, glabrous except the calyx, pedicels and growing stem, which are minutely glandus lar; leaves pinnate with slender divisions, mucronate-tipped, the upper few-lobed or entire; inflorescence scattering, with flowers on slender pedicels 1–2 cm. long, the corolla white or bluish tinted, slender, 10–15 mm., the lobes ovate, pointed, 4–5 mm. long, the filaments included, unequally inserted; tube of the calyx 5 mm. long, with subulate teeth 1½–2 mm. long; capsule 10 mm. long, having 6 seeds in each cell, which develop mucilaginous threads when wetted.

It is found on the plains about New Windsor, Colo., and has quite an extensive range. It blossoms from June to September. The flowers are smaller and are not showy as are those of *Gilia longiflora*. I intended to describe this *Gilia* under another name, but Mr. P. A. Rydberg compared it with type specimens in the

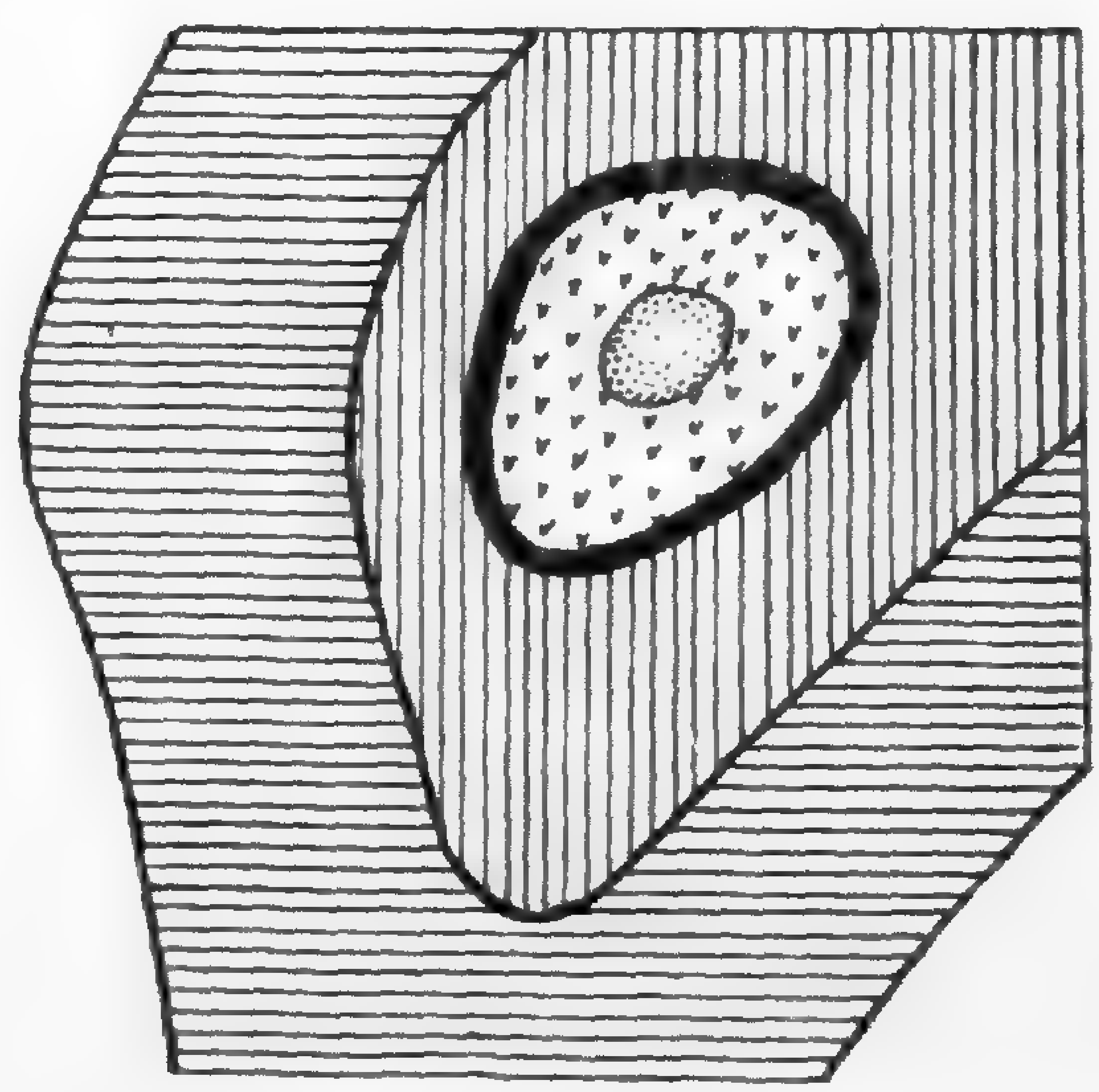
Harvard herbarium and identified it with *Gilia Macombi* var. *laxiflora* Coulter. To Mr. Rydberg I am also indebted for the citation of former collections: *Colorado:* James (Long expedition), Dr. G. W. Hulse, 1870, O. A. Farwell, no. 1068; *Texas:* Bigelow (Whipple expedition), 1853, Reverchon, 1882, G. C. Neally, 1889; *Southeastern Utah:* Alice Eastwood, no. 77, 1895.

GEO. E. OSTERHOUT.

NEW WINDSOR, COLORADO.

Botanical Notes.

On the Formation of Circular Muskeag in Tamarack Swamps—A Correction. In Professor MacMillan's paper published in the December Bulletin, 1896, the description of the figure printed on page 502 was accidently reversed; it should read as follows:



Central *Sphagnum* and *Utricularia.*

Zone of *Ledum* and *Eriophorum.*

Zone of *Picea Mariana.*

Zone of *Larix laricina.*

Ridges with *Pinus divaricata.*

It is requested that this correction be indicated at the place noted. [ED.]

Cymbalaria Cymbalaria (L.) Wetts. in eastern Pennsylvania. For some years I have observed and collected the above-named plant at several places along roadsides between Lancaster and Safe Harbor. During the past summer I found it established in the extreme southern part of Lancaster County, near Pleasant Grove.
J. K. SMALL.

CRATAEGUS VAILIAE n. sp. A shrub, 3°–6° high, the branches stout, light gray; thorns about 1′ long; leaves oval, 1′–3′ long, short-petioled, pubescent on both sides, but becoming glabrate and slightly shining above, acute at both ends, or some of them obtuse at the apex, sharply serrate nearly all around, sometimes slightly 3-lobed, those of young shoots sometimes nearly orbicular, the petioles sparingly glandular, or glandless; stipules narrow, very glandular; corymbs 2–6-flowered; pedicels and calyx densely pubescent; calyx-lobes lanceolate, 4″–6″ long, deeply incised, glandular, nearly as long as the petals, reflexed in fruit; pome globose, yellowish green, 4″–5″ in diameter.

Collected by Miss Anna Murray Vail, on the bank of the Roanoke River, Roanoke, Va., May, 1890, and by Dr. John K. Small, at the Falls of the Yadkin River, N. C., August, 1892. It is nearest to *C. uniflora* Muench.
N. L. BRITTON.

Proceedings of the Club.

ANNUAL MEETING, TUESDAY EVENING, JANUARY 12, 1897.

The President occupied the chair and there were 33 persons present.

The following persons were elected active members: Miss Edith K. Joyce, Mr. A. J. Grout, Mr. W. N. Clute, Mr. M. A. Howe, Dr. H. N. Richards, Dr. H. B. Ferguson.

The following were elected corresponding members: Mr. E. M. Holmes, Curator, Museum Phar. Soc. of Great Britain; Mr. J. H. Hart, Director Royal Botanic Garden, Port of Spain, Trinidad, West Indies.

The Committee on the death of Mr. Rudkin presented the following report:

Resolved, That in the death, on the 13th of November, last, of Mr. William H. Rudkin, one of the early members of the Torrey Botanical Club, we have lost a most valued friend, a long and faithful member, officer and coadjutor, and an endeared companion in all the work, the excursions, and the enjoyments of our organization.

ADDISON BROWN,
N. L. BRITTON,
HENRY OGDEN,
Committee.

It was unanimously resolved that the report be published in the BULLETIN, and that the Secretary forward a copy thereof to Mr. Rudkin's surviving brother.

Miss Ingersoll, Curator, reported a large amount of work performed upon the herbarium during the year, and that the latter was progressing rapidly toward a very satisfactory condition. In accordance with a recommendation contained in this report, it was unanimously resolved that the Curator and the Editor be appointed a committee to prepare and print a list of the Club's desiderata for the local herbarium, and to distribute the same to the members.

The Treasurer, Mr. Ogden, reported a cash balance of $56.89 in the general fund and $514.14 in the Buchanan fund.

The Recording Secretary, Dr. Rusby, reported an average attendance of 31 persons at the 15 meetings held during the year, 2 deaths, a net gain in active membership of 28, a present active membership of 219, corresponding membership 150, honorary membership 4, scientific papers presented 37, of which 22 had been published. Several hundred new species and a number of new genera had been communicated, and there had been a marked increase in attention given to anatomical and cryptogamic subjects. It was recommended that provision be made in the new constitution and by-laws for a standing committee on scientific programme and an order of business for the annual meeting. The recommendations were approved.

The Editor reported that Vol. 23 of the BULLETIN had aggregated 548 pages and 34 full-page plates, and that two numbers of the *Memoirs*, aggregating 206 pages, had been issued. There was a cash balance from publications of $48.09 in addition to the balance already reported by the Treasurer. The Editor also presented a special report referring to the special sale of publications to secure funds for reprinting certain exhausted numbers of the BULLETIN. About $105 additional would be required, thus enabling the sale of $424 worth of BULLETIN sets. It was recommended that this sum be appropriated from the treasury for the purpose. After discussion this recommendation was adopted. The discussion developed the fact that the BULLETIN had more than supported itself financially.

Officers for 1897 were elected as follows: President, Addison Brown; Vice-Presidents, T. F. Allen, H. H. Rusby; Treasurer, Henry Ogden; Recording Secretary, Edward S. Burgess; Corresponding Secretary, John K. Small; Editor, N. L. Britton; Associate Editors, Emily L. Gregory, Arthur Hollick, Anna M. Vail, B. D. Halsted, Lucien M. Underwood; Curator, Helen M. Ingersoll; Librarian, William E. Wheelock.

A communication was presented from the *American Naturalist*, requesting that abstracts of the proceedings of the Club be regularly furnished for publication in that journal. The request was granted.

The scientific programme of the evening was then taken up as follows:

By Mr. A. J. Grout, "Notes on some American *Brachythecia*."

By Dr. N. L. Britton, "*Linum Virginianum* and its Relatives."

Index to recent Literature relating to American Botany.

Allen, T. F. A new Species of *Nitella*, belonging to the *N. flexilis* Series, with a Review of the allied Species. Bull. Torr. Bot. Club, **23**: 533. *pl. 284.* 28 D. 1896.
N. laxa n. sp. from Japan.

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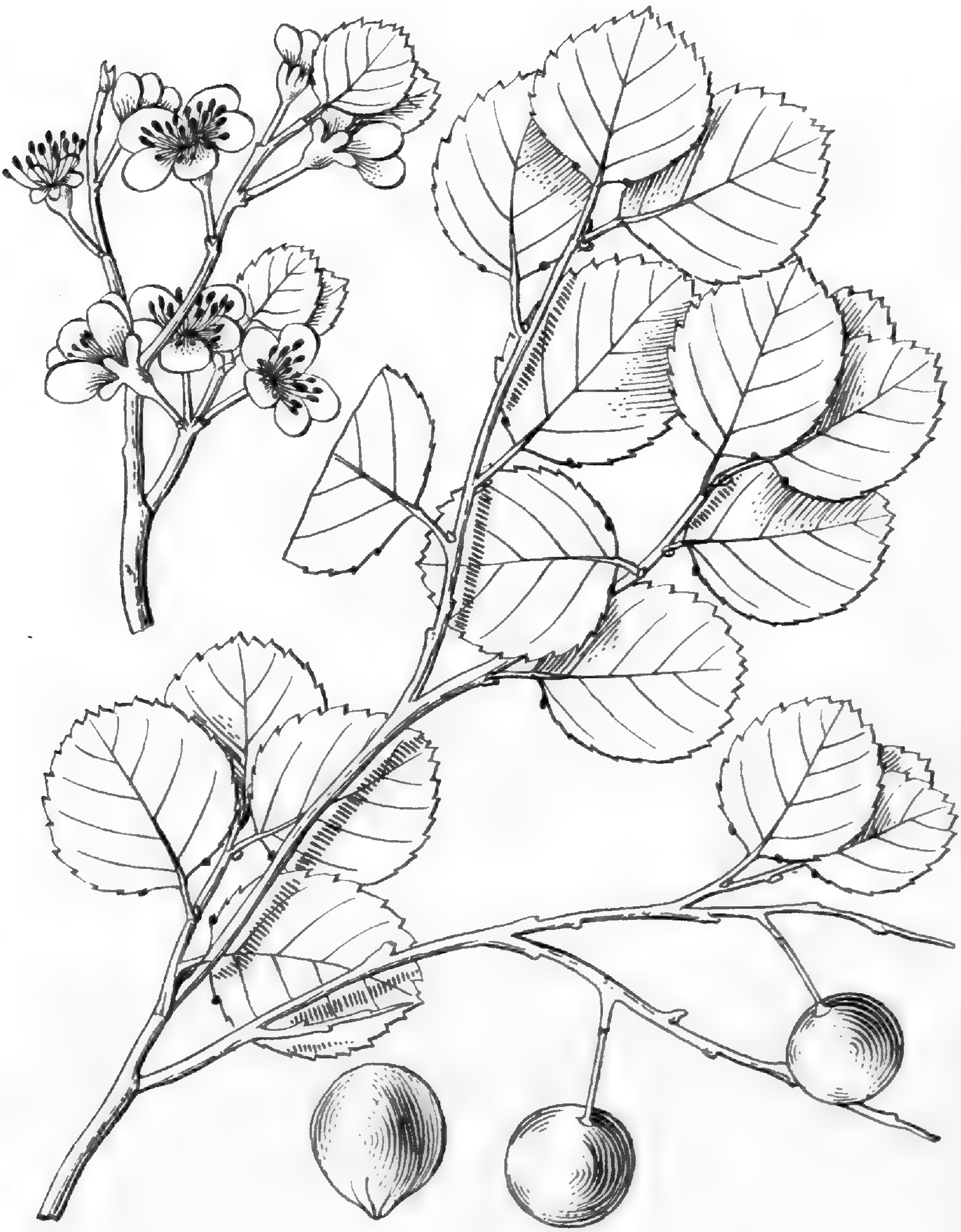

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AND OTHER MEMBERS OF THE CLUB.

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BULLETIN

OF THE

TORREY BOTANICAL CLUB.

Vol. 24. Lancaster, Pa., February 28, 1897. No. 2.

Shrubs and Trees of the Southern States.—I.

By John K. Small.

Tsuga Caroliniana Engelm. Coult. Bot. Gaz. **6**: 223. 1881.

I have already reported this rare hemlock from Georgia* and can now record a second station, at Tallulah Falls, several miles below the first one. At the second station the trees grow in a more accessible position and reach a better development, there being plenty of soil. The station is towards the lower end of the cañon, on the south side, where the bank slopes at an angle of 45° or more, and about 1000 feet above the river. Owing to a drenching rain which prevailed during my stay at Tallulah I could not ascertain the extent of this grove.

Pinus pungens Michx. f. Hist. Arb. Am. **1**: 61. *pl. 5.* 1810.

I can now report this most locally distributed of our mountain-inhabiting pines for the flora of Georgia, having encountered it in the lower part of the cañon at Tallulah Falls. For the same reason given in the foregoing paragraph, I am unable to tell the size of the grove, but it is extensive and the trees are larger than I have seen them elsewhere in the southern mountains.

Salix Wardii Bebb, Gard. & For. **8**: 363. 1895.

At the Falls of the Yadkin river in North Carolina both *Salix nigra* and *Salix Wardii* are plentiful, the black willow growing along the water's edge on the south side of the river, while *Salix*

* Bull. Torr. Club, **22**: 45.

Wardii occurs on the opposite shore hardly two hundred yards distant, the two species being respectively confined to the north and south sides of the river. The form of *Salix Wardii* occurring there is peculiar; the bushes are smaller than any heretofore observed, diffusely branched and the branches decumbent or almost prostrate, spreading radially and forming large, tangled mats, seldom rising more than six inches above the ground.

QUERCUS NANA (Marsh.) Sarg. Gard. & Forest, **8**: 93. 1895.

I was much surprised to find quantities of this scrub oak on the summit of King's and Crowder's Mountains near the southern boundary of North Carolina in the summer of 1894. The locality is within several miles of South Carolina and about one hundred miles east of the Blue Ridge.

QUERCUS RUBRA L. Sp. Pl. 996. 1753.

The existence of the red oak in Georgia was unknown to botanists before 1893. In that year I discovered a few trees just south of the North Carolina boundary, on the summit of the Thomas Bald, at an altitude of 5200 feet. The trees were stunted and irregular, as is characteristic at high altitudes. Last year, however, I found a remarkable development of the species in the northwestern corner of Georgia, in Catoosa county. The species abounds in the limestone "bottoms;" trees three feet or more in diameter are not uncommon, their trunks, naked often for seventy-five feet from the ground, are so straight that it is impossible to tell which way they will fall when cut off at the base. The thick bark is more or less mottled, whence the local name "Leopard Oak."

CELTIS MISSISSIPPIENSIS Bosc, Encycl. Agric. 7: 577. 1822.

Although extending over most of the western part of Georgia, this species of hackberry reaches its greatest development in the rich limestone "bottoms" in the region east of Lookout Mountain. Gigantic trunks, three or four feet in diameter, are very common, and are covered with innumerable corky warts, which range from one to two or even three inches in height.

DARBYA UMBELLULATA A. Gray, Am. Journ. Sci. (II.) **1**: 388. 1846.

I have lately discovered a new station for this rare plant. It grows in limited quantities on the south banks of the Yellow River, near McGuire's Mill, Gwinnett county, Georgia. I found it in company with its near relative, *Comandra umbellata.*

MAGNOLIA TRIPETALA L. Sp. Pl. Ed. 2, 756. 1763.

Another species new to the flora of Georgia, apparently never found so far southeast of the Blue Ridge. I first encountered some trees at the northern base of Stone Mountain, and later at several localities near the mountain. The trees are small and slender, and the species does not thrive as it does farther north.

CRATAEGUS ELLIPTICA Ait. Hort. Kew. 2: 168. 1787.

On several occasions, while collecting between Tallulah Falls and Toccoa Falls and in the Nacoochee Valley in northern Georgia I have observed numerous groves of *Crataegus elliptica* growing on the barren slopes of low hills, usually above streams, at altitudes varying from 1000–1500 feet. After several seasons' study of this form in the field I can see no reason for uniting it with *Crataegus flava* as a variety, as has lately been done.* Besides characters in the habit, the leaves, the fruit and seeds, which serve to separate it specifically from *Crataegus flava,* I find an apparent trustworthy distinction in the bark of the trunk. The bark of *Crataegus flava* is black and in high narrow ridges, while that of *Crataegus elliptica* is a light brown and in thin broad scales.

CRATAEGUS ROTUNDIFOLIA (Ehrh.) Borck. in Roem. Arch 1: Pt. 3, 87. 1798.

This species of *Crataegus* is very common in the southern Alleghanies and extends southward almost to the Gulf of Mexico. In 1895 I found it throughout the southern part of Georgia, where its favorite situation is the low ridges in the pine barrens, where the different species of hardwoods abound.

CLIFTONIA MONOPHYLLA (Lam.) Britton, Bull. Torr. Club, 16: 310. 1889.

This curious and local plant forms remarkably dense thickets in the swamps and districts bordering streams in the vicinity of the Altamaha river, especially north of Jesup, Georgia. The

* Silva of N. A. 4: 114.

stems there range from one-half of an inch to one foot in diameter, and the thickets they form remind one of those made by the growth of *Kalmia latifolia* and *Rhododendron maximum* on the higher mountains of North Carolina.

ACER LEUCODERME Small, Bull. Torr. Club, 22: 367. 1895.

When first described, this species was thought to be confined to the middle country of the Southern States, but my extensive journeys in Georgia last season brought to light two new stations in the foothills of the Blue Ridge and the Alleghanies; one is the deep cañon just below the precipice of Toccoa Falls, the other a shallow cañon along the Little Chickamauga creek near Ringgold. Both stations are similar to the original, and at both the tree holds all its characters.

ACER FLORIDANUM (Chapm.) Pax, Engler's Bot. Jahrb. 7: 243. 1886.

This characteristic maple is apparently very common in the river swamps of the Flint River in southwestern Georgia. Last summer I encountered a remarkable growth just below Albany. It probably follows the river to its mouth, for I again met it in the vicinity of Bainbridge. The trees are conspicuous on account of their close white bark and very dark foliage. Although said to be a small tree I measured many trunks that were three feet in diameter.

VACCINIUM HIRSUTUM Buckl. Am. Journ. Sci. 45: 175. 1844.

In April, 1893, I discovered this local and little-known huckleberry on the southern cliffs of the cañon at Tallulah Falls, Georgia. This apparently is the first collection since the original discovery by Buckley in Cherokee County, North Carolina. In 1894 Prof. A. Ruth found the shrub on the Cade's Cove Mountains in eastern Tennessee, thus adding the third station and the third State in which the species is known to exist.

Contribution to the Myxogasters of Maine.—II.

By F. L. Harvey.

The excessive rainfall in Maine during the season of 1896 made the conditions most favorable for the growth of all kinds of fungi. We have never before seen such magnificent specimens of fleshy fungi, nor such fine myxogasters. The favorable season, together with more careful research, made by Mr. E. D. Merrill, a member of the Junior Class at the Maine State College, and myself, has brought to light nearly thirty species not before reported from the State. Quite a number of these are rare in the United States and a few new to this country. They are recorded below. Appended is a list of new localities by numbers, which refer to a former list (Bulletin, Aug., 1896) and to the numbers of this. Our specimens have been carefully determined with the compound microscope and the results confirmed by Mr. A. P. Morgan, who has kindly examined all the species offering any difficulties. Notes upon some of the species reported in a former list will be found in their proper places in the text. Some there mentioned will have to be combined as synonyms, while some included doubtfully have been confirmed. Mr. Merrill's specimens were collected on the shores of Lake Auburn, where, in a week, he obtained over forty species.

Ord. Physaraceae.

87. *Cytidium globuliferum* Bull. Orono, Aug., 1896. On fallen trunks. (Harvey.) E. Auburn, Nov., 1896. (E. D. Merrill.) On fallen hemlock. The sporanges of Mr. Merrill's specimens were rather small for the species, but otherwise characteristic.

88. *Cytidium rufipes* A. & S. Orono, Oct., 1896. (Harvey.) Nov., 1896, E. Auburn. (Merrill.) Specimens scanty on fallen, decaying leaves. The above includes *P. aurantium rufipes* A. &. S.

89. *Craterium minutum* Leers. = *C. pedunculatum* Trentepohl. On decaying leaves. Orono, Sept., 1896. (Merrill.) Oct., 1896. (Harvey.) E. Auburn. Nov., 1896. (Merrill.)

90. *Physarum cupripes* B. & R. Orono, Sept., 1896. (Harvey.) Mr. Morgan says of our specimens. "Fine! Capillitium with much lime."

91. *P. connexum* Link. Greenfield, Sept., 1896. (Harvey.) Abundant on dead wood and bark. Included by Lister in *P. compressum* Alb. & Schw. Our specimens answer to *P. affine* Rost. nearly.

92. *P. imitans* Racib. Orono, Oct., 1896. (Harvey.) On moss associated with *Arcyria* and *Diderma*, scanty. A small species with sporanges .5 mm. diameter and liable to be overlooked. Mr. Morgan says of a specimen sent him "its large sharp pointed nodules are apparent even under a ¾-in. objective."

93. *P. ornatum* Peck. Greenfield, Sept., 1896. (Harvey.) On dead wood. Morgan says "this is a fine species and yours is an elegant specimen."

94. *Physarum diderma* Rost. Orono, Oct., 1896. (Harvey.) Mr. Morgan made the following note on a specimen sent him: "This is exactly like my specimens, which I refer to *P. diderma* Rost. I have found it only twice and distributed it to Rex, McBride and Sturgis who agree with me. I do not regard it as *P. diderma* Lister." This is a rare species heretofore only collected by Mr. Morgan and only twice by him. To find it in Maine is interesting.

95. *P. striatum* Fr. Western Sisters' Is., Penobscot Bay, Aug., 1896. (Harvey.) We sent Mr. Morgan a specimen and he says "It is referable to the above species. I have the yellow form also, which is *P. aurantium* Pers. From what little material I have, I am inclined to think the two may stand for a good species." Both have disappeared from Rostafinski's monograph and from Lister's work.

96. *Fuligo candida* Pers. Head of Pamedomcook Lake, Oct., 1895. (Harvey.) Two specimens taken, which were referred to Mr. Morgan who makes the following note: "I never saw anything like it. It is not *Fuligo cinera* Schw. The spores are oval to oblong, minutely warted, 10–11 x 9–10 mic. and the lime nodules are different. The specimens are good ripe ones showing the internal structure nicely. We will call it *F. candida* Pers. The cortex is whitish, fragile, and soon breaking into small patches. This form is included under *Fuligo septica* Link (Gruel) by Saccardo, but is very different. Persoon's species should be restored.

96a. *Fuligo muscorum* A. & S. Eastport. Prof. W. G. Farlow. Omitted from our former list.

97. *Badhamia verna* Rost. Orono. Me. Oct., 1896. (Harvey.) This is an exceeding rare species. It = *Physarum vernum* Sommerfeldt sent by him to Fries in litt. (See Fries S. M. 3: 146.) Rostafinski cites but one other specimen, found at Freiberg by De Bary. To find it in this country is remarkable. Lister merges it with *B. panicea* Rost., but wherever placed the species is new to this country. The sessile sporanges are hard to detect on the mossy logs where it grows. We have never found it but once, and then in very small quantity. Mr. Morgan, to whom a specimen was sent, thinks "it is just as near as can be to the specimen described by Fries."

98. *Badhamia capsulifera* Bull. Orono, Oct., 1896. (O. W. Knight.) Lister puts this under *B. hyalina* Berk. He says that the spores are like those of *B. hyalina* Berk. The plasmodium from which our specimens come was very large and at one end the sporanges were finely obovate and at the other end globose and some of the sporanges were lobed. Some were long stalked and others sessile. The large plasmodium would suggest *B. utricularis* Berk. if that is a distinction between *B. hyalina* Berk. and *B. utricularis* Berk. Our specimens were regarded as the above species by Mr. Morgan, who includes in his description (M. M. V., p. 106) *B. hyalina* Rost. We incline to Massee's view *a polymorphous species* for the above and *B. utricularis* Bull.

99. *Scyphium rubiginosum* Chev. Orono, Oct., 1896. (Merrill.) Nov., 1895. (Harvey.) Mr. Merrill's specimens were found on moss, sticks and on the base of alders near a brook. My specimens were found on the base of a fir tree in deep woods. Not abundant.

Ord. Didymiaceae.

100. *Lepidoderma tigrinum* Schr. Orono, Oct., 1896. (Harvey.) Only a few scattered sporanges found amongst moss on the underside of a declining trunk, two feet from the ground. *A rare species.* Mr. Morgan says it is scanty in Ohio.

101. *Diderma radiatum* Morgan = *Chondrioderma radiatum* Rost. Orono, Oct., 1896. (Harvey.) Scanty specimens were found amongst lichens on hemlock bark. Mr. Merrill found this species much more abundant at E. Auburn, showing finely the radiate structure

of the ruptured sporanges and the columella. The outer peridium breaks up in patches and the sporanges were hard to detect, resembling the scaly growth of a young *Parmelia*. This is a rare species in this country but promises to be abundant in Maine.

102. *D. spumarioides* Fr. E. Auburn, Nov., 1896. (Merrill.) A single plasmodium found on decaying leaves. A species with small subglobose sessile contiguous sporanges, whitened by a coating of lime. Rare in Maine.

103. *Spumaria alba* Bull. Head of Pamedomcook Lake, October, 1895. (Harvey.) Growing on moss. Two specimens taken, Orono, October, 1896, and E. Auburn, Nov., 1896. (Merrill.) On sticks and grass. Specimens taken by Mr. Merrill at Orono were infested by the rare fungus *Hypomyces candicans* Plow., which has never before been recorded from this country, and by nobody abroad except Plowright. He found it on a Myxogaster, but did not know the species. Our specimens have well developed asci. The form described by Mr. Ellis as *Nectria Rexiana* (Ell.), and found by Dr. Rex on *Chondrioderma spumarioides*, is the young of the same thing. We sent Mr. Ellis a specimen and he said it was the same as his *Nectria Rexiana* Ell.

104. *Didymium lobatum* Nees, Greenfield, Oct., 1896. (Harvey). This form is included by Rostafinski under *D. farinaceum* Schrad. It may be distinct.

Ord. Stemonitaceae.

Remarks: Comatriche crypta Schw. Greenfield, Aug., 1896. (Harvey.) Nov., 1896. E. Auburn. (Merrill.) Mr. Morgan said of our Greenville specimens that they were well grown and typical. The form which Dr. Rex described as *C. irregularis*, and which Lister makes a variety of Peck's *C. longa* is only a ragged, poorly developed state of *C. crypta*. We find this and the type in the same plasmodium. Abundant in Maine, forming plasmodia several inches across. This is no. 38 of a former list.

Comatriche nigra Pers. Greenfield, Aug., 1896. (Harvey). A few scattered sporanges on decaying wood. Reported in a previous list (no. 57) as *C. obtusata* Preuss. Lister includes the above, together with another form which we find at Orono that was described as *C. Suksdorfii* by Ellis in his *C. obtusata* Preuss. The latter may prove a distinct species.

105. *Lamproderma scintillans* B. & Br. E. Auburn, Nov., 1896 (Merrill.) A small cluster of sporanges on decaying wood.

106. *Clastoderma DeBaryanum*, Blytt. Orono, Oct., 1896. (Harvey.) A few scattered sporanges on rotten wood. A small species easily overlooked.

Ord. Reticulariaceae.

107. *Reticularia splendens* Morgan. Oldtown, Greenfield, Orono. (Harvey.) E. Auburn. (Merrill.) This was reported as *Enteridium Rozeanum*. (No. 53 of former list.) We have sent specimens to Mr. Morgan, who pronounces them his *R. splendens*. He insists that his species is distinct from European specimens called *E. Rozeanum*.

108. *R. umbrina* Fr. = *R. Lycoperdon* Bull. Oldtown, Greenfield, Orono. (Harvey.) E. Auburn. (Merrill.)

Mr. Morgan thinks *R. atra* Fr. (No. 43 of former list) = *R. umbrina* Fr.

Ord. Liceaceae.

Remarks: Licea minima Fr., Orono, Oct., 1896. (Harvey.) This species was reported in a previous list (No. 50) from crushed specimens in the Blake Herb. collected by Blake. The rediscovery establishes this form as a Maine species. It is rare. Mr. Morgan wrote us he had never seen the species before, but that it agreed exactly with Fries' description. The spores are 11–13 μ. *Licea fragiformis* (Bull.) Nees. Orono. Oct., 1896. (Harvey.) This may prove to be distinct from *Tubulina cylindrica* Bull., with which it is merged by Lister.

109. *Lycogala flavofuscum* Ehr. Brunswick, 1896. (Kate Furbish.) A single specimen among some fungi sent for determination. Habitat not known.

Ord. Trichiaceae.

110. *Trichia fragilis* Sow. E. Auburn., Nov., 1896. (Merrill.) This was growing with *Hemiarcyria rubiformis* Pers., which it resembles somewhat in color.

Remarks: Morgan puts *T. Jackii* and *T. affinis* DeB. (Nos. 58 and 65) of our former list together. He says of our specimens: "They are genuine *T. Jackii* Rost., if you want to take spore sculpture for species."

Regarding specimens of *Hemiarcyria* sent Mr. Morgan he says "your specimen is genuine *H. clavata* Pers. and the only one I ever saw." This species seems to be common in Maine.

ORD. ARCYRIACEAE.

111. *Heterotrichia Gabriellae* Massee. E. Auburn, Nov., 1896 (Merrill). Growing on wood. The only specimens before reported are from South Carolina. Morgan says of our specimens that they are all right both for genus and species and that it is a remarkable species. We are unable to see how Lister can unite this to *Arcyria ferruginea*, which is a common species in Maine and very unlike the above in habit and structure.

112. *Arcyria pomiformis* Rost. = *A. ochroleuca* Fr. = *A. lutea* Schw. Orono, 1890. (Harvey.) Mr. Morgan says "this is a good species, wholly distinct from *A. cinerea* Pers., with which Lister merges it. I always get it in like your sample with only a few sporangia to the specimen. I have had it only from S. Carolina before. It is a minute species and is certainly extremely rare in America." It is not common in Maine.

Remarks: Of a specimen of *Arcyria* we sent Mr. Morgan he says "it is exactly *A. aurantiaca* Raunkier. I have his work with this species elaborately illustrated and it agrees exactly. The calyculus of your specimen is minutely warted, not reticulate. The sculpture of the thread is finer than in *A. ferruginea.*"

113. *Lachnobolus incarnatus* A. & S. Orono and Greenfield. (Harvey.) Our specimens agree with what Prof. McBride described as the above species. Lister merges it with *L. circinans* Fr. Our form is probably a distinct American species, deserving a new name.

ORD. PERICHAENIACEAE.

114. *Perichaena microcarpa* Schroeter. Orono, Oct., 1896. (Harvey.) Only a single specimen found which was sent to Mr. Morgan, who says it puzzles him exceedingly, but he thinks it nearest to the above. He makes the following notes: "Spores 14–17 mic., strongly spinose, but the color is yellow-brown; threads not yellow, but hyaline. I cannot discover lime anywhere; the wall is yellow, or when more thickened, yellow-brown. Evidently rare and new to the country."

115. *P. marginata* Schw., Orono, etc. (Harvey.) E. Auburn, Nov., 1896. (Merrill.) The specimens a little weathered, but the internal characters all right. Not abundant. We have seen this at several localities, but thought it the young of some other Myxogaster until this season.

New Localities for Maine Myxogasters.

The numbers refer to a previous list (Bulletin, Aug., 1896), and to the numbers of this article.

Eastport: Prof. W. G. Farlow, Bull. Bussey Ins. 1876, p. 430. Nos. 40, 47, 96a.

Brunswick: Kate Furbish, No. 109.

Western Sisters' Island, Penobscot Bay, near Mt. Desert, Long Island: F. L. Harvey, Nos. 19, 26, 34, 35, 76, 81, 95.

Head of Pamedomcook Lake: F. L. Harvey, 96, 103.

Orono: O. W. Knight, No. 98; E. D. Merrill, Nos. 48, 89, 99, 102, 103; F. L. Harvey, Nos. 50, 87, 88, 89, 90, 92, 94, 97, 99, 100, 101, 106, 107, 108, 112, 113, 114.

Greenfield: F. L. Harvey, Nos. 37, 38, 91, 93, 108, 113.

E. Auburn: E. D. Merrill, Nos. 1, 10, 13, 14, 17, 18, 19, 26, 32, 34, 38, 42, 47, 52, 54, 55, 57, 58, 59, 61, 62, 65, 68, 69, 73, 75, 81, 82, 86, 87, 88, 89, 99, 101, 102, 103, 105, 107, 108, 110, 111, 115.

Contribution to the Gasteromycetes of Maine.

By F. L. Harvey.

This list embraces all the gasteromycetes known by the writer to have been collected in Maine.

It includes all the species referred to in the literature at hand, besides the species found in the collections of the Portland Society of Natural History and the Blake Herbarium of the Maine State College. The species detected by the writer and his pupils are also included. No special efforts have been made to do exhaustive collecting, and the list may be regarded as preliminary. Correspondence with parties interested in Maine Cryptogams is solicited, and additional references to Maine species of the above order will be gratefully received and credited.

We are under obligations to Mr. A. P. Morgan and Prof. Trelease for the examination of specimens.

We have followed Saccordo in most cases in the arrangement of the genera.

GASTEROMYCETES.

I. Ord. Phalloideae.

1. *Phallus daemonum* Rumphius = *Dictyophora daemonum* Lev. Growing at base of a pine stump in a pasture. Not abundant. Orono, Sept., 1894. Three specimens taken. (Harvey.) Odor offensive.

2. *Phallus impudicus* Linn. = *Ithyphallus impudicus* (L.) Fr. Growing in a meadow near the woods. Two fine characteristic specimens taken. Sept., 1896. (Harvey.) Offensive.

3. *Mutinus brevis* B & C. = *M. Ravenelii* (Berk. & Curt.). Found in abundance for several seasons on the ground about the roots of a clump of lilac bushes; also seen in several other places. The most common *phalloid* in Maine. Found about sink holes sometimes. Offensive. Orono, Me. (Harvey.)

Fam. II. Nidulariaceae.

4. *Nidularia pulvinata* (Schwein.) Fr. Rotten logs. Orono. (Harvey.)

5. *Cyathus striatus* (Huds.) Hoffm. Sacc. Syll. 7:33. On the ground and upon railroad ties. Orono, Me. (Harvey.)

6. *C. vernicosus* (Bull.) DC. Sacc. Syll. 7 : 38. Orono, Me. (Bartle, Harvey.)

7. *C. stercoreus* Schw. Ground. Orono. (Harvey.)

8. *Crucibulum vulgare* Tul. Sacc. Syll. 7 : 43. P. S. N. H. Coll. No. 28. (Fuller), Portland (Bolles), Blake Herb. Cumberland (Blake), Orono (Harvey). Common on decaying twigs, logs and boards.

9. *Sphaerobolus stellatus* Tod. Sacc. Syll. 7 : 46. Abundant upon decaying wood and on the ground. Orono. (Harvey.) The peridium of this species opens with a stellate border. The inner wall protrudes until it is obovate in form and finally bursts with force, throwing the sporangium several inches. We put some of these plants into a cigar box once, and in a few hours many sporangia were found fastened to the sides of the box.

10. *S. tubulosus* Fr. Rather common about Orono on decaying boards. Orono, Sept., 1896. (Harvey.)

II. Ord. Lycoperdaceæ.

11. *Geaster hygrometricus* Pers. Port. Soc. Nat. Hist. No. 36. Old Orchard (Fuller), Blake Herb. Maine State College; Wells (Blake), Cape Elizabeth (Fernald), Belfast (Upton), Western Maine (Miss Furbush). On the ground.

12. *Calvatia cyathiforme* Bosc. Several specimens found in pasture near Orono last of Aug., 1896. Some specimens about 6 inches in diameter. A large handsome species. (Harvey.)

13. *Bovista plumbea* Pers. Sacc. 7:96. Common in pastures, Orono. (Harvey.)

14. *B. circumscissa* Berk. et Curtis. Sacc. 7:104. Cumberland. (Blake.)

15. *B. pila* Berk. et Curtis. Sacc. 7:104. Common in pastures. Orono & Jackman. (Harvey.)

16. *Lycoperdon gemmatum* Batsch. Sacc. 7: 106. Harrison (Blake), Orono, Greenville, Norcross (Harvey), Brunswick (Furbish). Most common species. On decaying logs and stumps, also on the ground. Quite variable as to form and coating of spines. Aug.–Sept.

17. *L. gemmatum molle* Pers. Sacc. 7:107 = *L. molle* Peck = *L. muscorum* Morgan.

18. *L. bovista* L. Sacc. 7:109. There is a specimen of this species in the Bost. Soc. Nat. Hist. collections as *Lycoperdon giganteum* Batsch. We have not detected this species in Maine.

19. *L. furfuraceum* Schaeff. Sacc. 7:110 = *L. pusillum* Batsch. Cumberland (Blake), Orono (Harvey). Pastures and roadsides.

20. *L. Wrightii* B. & C. Sacc. 7:111. On the ground in pastures, etc. Orono and vicinity. (Harvey.) Variable as to spines.

21. *L. pyriforme* Schaeff. Cumberland (Blake), Orono, Jackman, Norcross (Harvey), E. Auburn (Merrill), Brunswick (Kate Furbish).

22. *Lycoperdon asterospermum* D. & M. Orono. (Harvey.)

23. *L. glabellum* Peck. Orono, 1896. (Harvey.) On ground in woods. Not abundant.

24. *L. Turneri* E. & E. Ground pastures and open woods. Orono, Greenfield, Sept. and Oct. (Harvey.)

25. L. *subincarnatum* Peck. Growing in clusters on decaying wood, Greenville. Orono and Norcross. (Harvey.) August.

26. *L. Curtisii* Beck. In pastures. Orono. (Harvey.)

27. *L. separans* Peck. Ground in pastures, Orono, Me. Very abundant in October. (Harvey.)

28. *L. pedicellatum* Peck. Ground and on rotton wood. Orono, Me. (Harvey.)

29. *Scleroderma vulgare* Hornem. Western Me. (Blake.) Orono, under fir trees and at Pea Cove on decaying logs. (Harvey), Belfast (Uptom) E. Auburn (E. D. Merrill).

Further Considerations of the Biological Status of Lichens.

BY ALBERT SCHNEIDER.

In a previous number of the BULLETIN I have given a brief statement of the biological status of lichens. The paper was essentially a restatement of Reinke's views on the subject. The present object is to continue the discussion and to present different phases and other details. Limited space will not permit entering into lengthy discussions, nor is this called for, since the details here touched upon have already been fully discussed elsewhere. The intended function of this paper is primarily educational, pointing out the best method by which the conscientious student may arrive at a rational conclusion relative to the nature of lichens. This seems necessary since many botanists (in verbal communication) are most persistent in designating and classifying lichens as fungi (in agreement with Schwendener). And this is not all; some so-called lichenologists are just beginning to take notice of Schwendener's theory and wonder "whether there is anything in it," while others have not even heard of this theory or ignore it entirely.

The stubborn resistance offered to the recognition of lichens as a distinct class (in the sense of Reinke, not Tuckerman, Acharius and others), may be said to have a beneficial influence upon the general progress of lichenology. Controversy and difference of opinion is to science what the governor is to the engine, it insures a more steady progress by urging more thorough study and greater care and consistency in formulating conclusions. It is, however, a fact which cannot be denied that (with a few exceptions) the most vehement objectors to Reinke's theory are those who have little scientific perspective and who have done little or no scientific work in lichenology. Among the more scientific class of botanists the principal cause of the difference of opinion lies in the difference of the point of view. The Schwendenerians are essentially morphologists (histologists) of the older school who consider structure and not function of prime importance. The followers of Reinke are the product of the modern school of biological investigation which teaches that the morpho-physiological method is the true one. That is, it should be the investigator's purpose to give a proper physiological interpretation to the morphological conformation. Peculiarly enough Schwendener is quite universally recognized as the founder of this school. It should also be borne in mind that at the present time Schwendener raises no serious objection to Reinke's views.

Until recent years the pure systematists held full sway. Morphological studies were resorted to simply as an aid to classification; hence those structures which proved most useful in forming or perfecting a system received first attention. In the various systems of fungi the characters of the spore-bearing tissue was found most useful. On comparing the apothecia of lichens with the reproductive organs of fungi, certain morphological similarities were noted and at once the conclusion was reached that lichens must be fungi. No efforts were made to demonstrate whether or not the spores of lichens were functionally the same as those of the fungi. The study of the thallus was neglected because it was not clear what practical use could be made of it in classifying lichens as fungi. Schwendener himself, as well as many investigators before and after him, made careful morphological investigations of the various lichen-thalli. Schwendener indeed demonstrated that the gonidia in the majority of lichens were true algae, but he did not give a true explanation of the relationship existing between the fungus and the enclosed algae (gonidia). Reasoning from the standpoint of morphology he concluded that lichens were the result of the parasitism of fungi with algae, a conclusion without any physiological basis, as later investigators have demonstrated.

Eminent investigators, after years of careful study attempting to give a corresponding physiological interpretation to the morphological specializations as they occur in the lichen-thallus, have concluded that it cannot be compared to any fungal structure.

The recent progress in the study of the phenomena of mutualistic symbiosis has a very important bearing upon the recognition of the true nature of lichens. There are botanists who are scientifically so unprogressive as to recognize no other form of symbiosis * than "parasitism" (antagonistic symbiosis). Such will, of course, persist in maintaining the "parasitic" nature of lichens. There are all gradations between mutual antagonistic symbiosis (mutual parasitism) and complete individualism.† Upon a recognition of these phenomena depends the proper consideration and treatment of lichens. Furthermore, the phenomena of symbiosis have an important bearing upon the modern conception of the cell, some problems in evolution, and upon the interdependence of plants and animals. It is intended to define and discuss these phenomena in some future paper.

Symbiosis has also a direct bearing upon the consideration of what constitutes a morphological unit. When a form of symbiosis has reached the stage of complete individualism there can be no doubt that the resulting structure constitutes a morphological unit in the true sense of the word. The important question at this phase of the subject is whether or not the form of symbiosis as it occurs in lichens is sufficiently specialized that the resulting structure may be recognized as being autonomous. In attempting to solve this problem it is necessary to consider the following: 1. Is the lichen-structure morphologically and physiologically distinct from the symbionts? 2. Have the symbionts wholly or partially lost the power of independent existence?

* The term is here used in its broader meaning. It includes all forms of contiguous associations of two or more morphologically distinct organisms accompanied by a loss or acquisition of assimilated food-substances.

† Complete individualism is a form of mutualistic symbiosis in which *none* of the symbionts can exist independently (examples: some of the higher lichens, the cell). Semi-individualism is a form of mutualistic symbiosis in which at least *one* of the symbiants cannot exist independently (the Collemas and other lichens).

The first question has already been answered in the affirmative by Reinke, Bonnier, Bornet and others. The second will receive some further consideration. As far as lichens are concerned investigators are quite generally agreed that the fungal symbiont can no longer lead an independent existence. It is absolutely dependent upon its symbiotic association with the algae. It is also generally believed that the algae (gonidia) can exist independently. At least, many of the lichen-algae have been cultivated in artificial media. Some recent experiments in this line would lead me to conclude that the algae of some of the higher lichens can not exist independently for any considerable period of time. It became apparent at once that related single-celled algae occurring free in nature develop more readily than the lichen-algae when placed in or on artificicial media. Repeated attempts to cultivate the algae (*Cystococcus humicola* Näg.) of *Cladonia* have only partially succeeded. The algae would soon acquire an impoverished appearance; changing from bright green to yellowish green and finally to a pale straw color. Cell-division occurred only rarely and at long intervals during the beginning of the experiment. Soon cell-division and growth ceased altogether. In some of the experiments a species of natural algae (*Protococcus viridis* and another species) accidentally introduced developed rapidly, soon forming a green layer over the substratum (schistose rock, sandstone, limestone). These natural algae frequently occur upon the surface of the lichen-thallus and are apt to gain access to the culture media. They can, however, readily be gotten rid of by the isolation method. Culture attempts with algae (*Cystococcus humicola* Näg.) from several species of *Parmelia* gave similar results. In no case was it possible to develop a colony of any considerable size nor could the growth of the culture be maintaned for any considerable period of time. From these experiments the conclusion seems justifiable that the algae of some of the higher lichens are no longer capable of leading a continued independent existence. Fungus and alga, during their association as lichen, have become mutually adapted so that they are complimentary in their relationship as a morphological whole. It is safe to conclude that at least some of the lichens form absolute individualism. Even the most prejudiced, therefore, cannot hesitate in recognizing such lichens as morphological units. In regard to the lower lichens and some of the higher (Nostoc-bearing) there seems to be evident semi-individualism, though further carefully conducted experiments are necessary to settle this point.

Without entering into details I shall briefly summarize the essential differences between lichens and the ascomycetous fungi. This summary is deduced from the results obtained by the most scientific lichenologists during the past forty or fifty years. These statements are especially intended for those who are continually forgetting that there is a difference between fungi and lichens.

1. The morphological adaptions of the vegetative portion of lichens is primarily for the furtherance of the function of *chlorophyll-assimilation*; in fungi it is for the furtherance of the function of *reproduction* (distribution of spores, etc.).

2. Fungi are essentially parasitic and saprophytic. Lichens have partially or wholly lost the saprophytic or parasitic function and have phylogenetically acquired the power of converting inorganic substances into organic compounds by a process of photosynthesis. Morphologically and physiologically lichens resemble other chlorophyll-bearing plants; fungi do not.

3. In lichens the mechanical tissues * are specially adapted to support and protect the assimilation tissue; in fungi the mechanical tissue is specially adapted to support and protect the sporogenous tissue.

4. The soredia of lichens are special phylogenetically-derived propagative organs and have no homologues among the fungi. The cyphellae and cephalodia are also phylogenetically derived lichen-structures.

5. The spores of fungi can develop into mature fungi; the spores of lichens cannot develop into mature lichens. In other words fungi may develop from spores, lichens cannot.

6. Lichens are better adapted to resist extremes of temperature and dryness. Fungi are better adapted to dark moist places.

7. In general lichens are long-lived while fungi are short-lived. Some of the higher as well as the lower lichens (*Cladonia, Par-*

* More fully described by Zukal and in my Text-book of General Lichenology now in press. In this book the citations of the more important literature on lichenology will be given.

melia, Sticta, Lecidea, Biatora) have an indeterminate existence. The life-period does not terminate with the maturation of the spores, as with the majority of fungi.

8. The spore-bearing tissue of lichens is of little functional value, hence it degenerates or becomes converted into a chlorophyll-bearing assimilating tissue (sterile *Parmelias* and *Cladonias*; podetia of *Cladonia*, thalloid exciple). Among the fungi the sporogenous tissue becomes functionally more and more specialized.

9. Lichens contain chemical compounds (lichenin, acids, etc.) which do not occur among fungi.

10. Morphological similarities (in the vegetative tissues of lichens and fungi they rarely occur) do not indicate similarity in function. (See 1.)

Finally I will again urge the necessity of conducting modern biological research from the standpoint of morpho-physiology. It will be productive of reliable and harmonious conclusions.

The Affinities of Dendrobangia Rusby.*

By H. H. Rusby.

(Plate 294.)

The family Olacineae, as treated by Bentham and Hooker (Gen. Plant, 1: 342 and 995) comprises four tribes. Olaceae has the ovary normally 3–5-celled, occasionally 1-celled by suppression, with two pendulous ovules in each cell. Opilieae has the ovary 1-celled, with one erect ovule. Icacineae has the ovary normally 1-celled with two, rarely one by abortion, unilaterally dendulous ovules. Phytocraneae has characters very similar to those last mentioned.

Dr. Engler (Pflanzenfamilien, 3: Abt. 5, 233) separates the two tribes last mentioned, under the family Icacinaceae, grouping them with the Aceraceae, Celastraceae and Anacardiaceae, referring the Euphorbiaceae, also to this group. The two tribes first mentioned he retains in the family Olacinaceae and groups them with the Aristolochiaceae, Loranthaceae and Urticaceae.

* Mem. Torr. Bot. Club, 6: 19.

The affinities of *Dendrobangia* are clearly with the Icacinaceae. Of this Dr. Engler makes three sub-families, to one of which, the Icacinoideae, with 1-celled ovary, *Dendrobangia* pertains. Of the four tribes of this sub-family, three comprise only climbing plants and their floral characters exclude the genus under consideration, which is clearly a member of the tribe Icacineae. In this tribe Dr. Engler recognizes 26 genera, all but 7 of them having the calyx gamosepalous, thus excluding *Dendrobangia*, the sepals of which are barely coherent at the base. Of these 7 genera, *Villaresia* is the only one known to have representatives in America. *Villaresia* has the petals imbricate, while in *Dendrobangia* they are perfectly valvate. From the six foreign genera the plant is distinguished as follows: *Cassinopsis*, of Africa, has the stamens opposite the petals. *Leptaulus*, of Africa, has a slender infundibular corolla. *Alsodeiopsis*, of Africa, has the filaments free from the corolla-tube. *Platea*, of Polynesia, is polygamous, and has the stamens free. *Sarcanthidion*, of New Caledonia, has the petals imbricate, like *Villaresia*. It may be said that, in addition to the characters given, none of the above have apical appendages to the petals, while this is a most important character of *Dendrobangia*. Although the remaining genus, *Chariessa*, of New South Wales, has such appendages, they are very different from those of *Dendrobangia*. The petals of *Chariessa*, moreover, are distinct, except at the very base, and its stamens are free. The characters of filament and anther and the absence of a style would also certainly exclude *Dendrobangia* from that genus. It appears, therefore, that the plant is strikingly distinct from any other genus, and that it combines in a remarkable manner the characters of the associated genera. It agrees with *Villaresia* in the general ovary-characters, with *Alsodeiopsis* and *Leptaulus* in the partially gamopetalous corolla, with *Leptaulus* in the adnate filaments, with *Platea* in the sessile stigma, and with *Chariessa* in having apical petal-appendages.

In the description of the plant already published, a number of points were misinterpreted or overlooked, and that description should be amended as follows: The sepals are barely coherent at the base, which fact, taken in connection with its general characters, must place it in the first section, described as having a chorisepalous calyx. The term "corolla-lobes" and not "petals," should be used, as the corolla is gamopetalous nearly to the middle. The corolla-appendages are lacerate-toothed rather than "bearded." The mature stamens are more than "half the length of the corolla exclusive of its appendages." The appendages of the petals appear to elongate considerably during the opening of the bud, and they are widely explanate when the flower is expanded, becoming early detached. They appear to act as pollen-holders. Their mode of origin is peculiar. They are not continuous with the tips of the petals, but originate from the inner face of the latter.

Explanation of Plate 294.

Fig. 1. Flowering branch, slightly reduced.

Fig. 2. A bud.

Fig. 3. Longitudinal section of bud, showing concave lateral face of theca.

Fig. 4. Anther, showing attachment of connective.

Fig. 5. A petal with its appendage.

Some new Fungi, chiefly from Alabama.

By Lucien Marcus Underwood.

In certain favorable seasons the Southern States offer fine opportunities for field work in mycology. It is fortunate that we are beginning to have intelligent field workers that are resident instead of transient collectors, for it is only by persistent resident work that anything like a clear understanding of the flora can be obtained. While much is still to be desired in many of the Southern States, it can safely be said that the States of Alabama and Mississippi, at least, are now fairly well equipped with local workers, as compared with neighboring States, if one or two workers for an area of 50,000 square miles can be regarded as a fair equipment. Many species are comparatively ephemeral, and only the local observer who is at hand at the favorable moment is able to gather the harvest. The fall season of 1895 was specially unfavorable for field work, on account of excessive drought, and this condition prevailed more or less throughout the spring season. In fact, not until July, 1896, were the rains sufficient to bring out the normal hymenomycetous flora. Since that time, and particularly during the months of October, November and December, 1896, Professor Earle reports a very prolific growth of fleshy species, and among them he sent a very interesting series of the central and lateral stemmed forms of the genera *Polyporus*. These, together with a few others collected by myself in the same region, and one or two from elsewhere, are described below. For convenience the genera and species are arranged alphabetically.

Hydnum chrysocomum n. sp.

Resupinate, forming areas 2–6 cm. each way; mycelial strands wide-creeping, more or less branched, bright orange-yellow, expanding here and there to form a membranous subiculum bearing the bright orange-yellow spines; subiculum thin, whitish fimbriate at the margin, yellowish within and later bright orange-yellow; spines crowded, 1 mm. or more long, often confluent so as to appear flattened, terete when single, concolorous, rather obtuse.

Growing under much decayed sticks, New Dorp, Staten Island, New York, October 17, 1896. Smaller and imperfect specimens had been previously found in Indiana and Alabama, with well-developed mycelium and scanty spines. A well-marked species and easily recognized by its brilliant mycelial strands and the color of its spines.

Lepiota mammaeformis n. sp.

Pileus thin, white, with a dull brownish strongly umbonate disc, 5-8 cm. in diameter, mealy squamulose, the margin strongly sulcate-striate, somewhat incurved; gills rather narrow, moderately close; stem 12-18 cm. long, flexuous, hollow, tapering upward from an elongate thickened base, over 1 cm. at its greatest thickness, the narrow distant annulus often finally deciduous.

Growing caespitosely from near the base of a decaying *Broussinetia* on the streets of Auburn, Alabama, July 1896. The gills turn darker in drying and the umbo becomes strikingly prominent.

Leptoglossum Alabamense n. sp.

Black throughout, gregarious, 2–3 cm. high. Ascoma about 1 cm. long, flattened, in the dry condition about 2 mm. wide and 0.5 mm. thick, blunt or rounded, horny, yellowish within; stem roughened, somewhat enlarged at base; spores hyaline, straight or slightly more or less curved, biseriate in the asci, becoming 4-septate, $18–20 \times 4 \mu$; paraphyses abundant, thickened and darker colored at the tip.

On the ground, Auburn, Alabama. July.

Peronospora Plantaginis n. sp.

Mycelium parasitic in well-defined yellow areas of the leaf, occupying the entire width and a length of 1–3 cm.; conidiophores usually solitary, long exserted, irregularly 5–6 times dichotomous; ultimate ramulae short, unequal, recurved, 4–12 μ long; conidia narrowly oval or lemon-shaped, pointed at each end, dark, almost black by reflected light, brownish violet by transmitted light, 40–44 x 16–18 μ. Oöspore unknown.

On leaves of *Plantago aristata*, Auburn, Alabama, May, 1896. F. S. Earle.

Peronospora Seymourii Burrill n. sp.

Sparse, forming white patches or lines on leaves and stems; oöspores on floral organs. Mycelium large, distorted, haustoria knob-like; conidiophores slender, seven or eight times dichotomous, branches flexuous, spreading, tips short or of moderate length, subulate; conidia subglobose to elliptical, variable, 12–18 μ by 14–27 μ, brownish; oögonia with firm, rather thick brownish walls, reaching 70 μ in diameter; oöspores dark brown, opaque, thick-walled, rough, 27–45 μ.

On *Houstonia* sp. Union and Jackson counties, Illinois, April 11–28, 1882. (A. B. Seymour.)

The above description was furnished me by Professor T. J. Burrill. Having found what appeared to be an undescribed species of *Peronospora* on *Houstonia patens*, in Auburn, Alabama, I learned by accident that a species had been found on the same host many years ago and that its description written at the time by Mr. Seymour had laid in manuscript until now. The Alabama specimens appear to be the same species, but no oöspores were found. In the Alabama specimens the conidiophores were about 400 μ long, with a diameter of about 6 μ; the branching was alternate, the main branches being 70–90 μ long and the ultimate branches or sterigmata 6–10 μ; the conidia were more often ovate, 21 by 11–14 μ.

Polyporus decurrens n. sp.

Mesopous; terrestrial; pileus nearly circular, 5 cm. in diameter, plane or slightly depressed at the centre, brown or bay-colored, covered with a thin crust which is glabrous except where it is raised at certain points to simulate, when dried, an imbricated surface; pores nearly white, forming a layer about 2 mm. deep, decurrent on the stem and vanishing in faint reticulations just above the base, slightly angular, 0.5 mm. in diameter; dissepiments thin, entire; context white, probably fleshy when fresh, compact, homogeneous, about 7 mm. thick at the centre, gradually becoming thinner; margins thin, slightly involute when dry; stem somewhat bulbous at base, 3 cm. or more long, tapering above, 1 cm. in diameter at the apex, 1.5 cm. below, somewhat darker than the pores.

Growing in soil on the side of a cañon near the Soldier's Home, near Los Angeles, California. Feburary, 1896. Dr. H. E. Hasse. (Communicated by A. J. McClatchie.)

A very characteristic species; the pileus in drying presents a very irregular surface, certain points which have the appearance of slight imbrications remaining more elevated, while the intermediate spaces become deeply depressed; it is hoped that more material can be secured of this interesting plant and that its characters may be noted in the field. The measurements were made from the dry specimen and are naturally somewhat less than in the fresh condition.

POLYPORUS EARLEI n. sp.

Mesopous; terrestrial; stem 4–5 cm. long, 1–1.5 cm. or more thick, colored like the pileus; pileus 7–12 cm. each way, cinereous, slightly darker towards the centre; margin very thin, much incurved in drying; context soft-fleshy, grayish, drying to a thin layer; pores 1–2 mm. deep, somewhat whitish-stuffed when young, cinereous gray, paler when young and, towards the margin, small (less than 0.5 mm.), the dissepiments rather firm, entire.

Pine woods, Auburn, Alabama, Nov., 1896. Prof. F. S. Earle.

The plant is cinereous throughout and retains this color when dry. It gives me great pleasure to associate with this plant, the name of my former genial co-laborer and companion in many "fungus forays," who is contributing largely to our knowledge of mycology in a much neglected section of the Union.

POLYPORUS FLAVO-SQUAMOSUS n. sp.

Pleuropous; terrestrial; stem 7–8 cm. long, 4–5 cm. thick, slightly flattened, irregularly roughened, colored like the pileus; pileus 15 cm. each way, yellowish, with a slight tinge of greenish; covered with rather small floccose imbricate scales, which form a very thin fragile crust, channeled behind where the edges nearly meet; margin rather acute, more or less incurved in drying; context white or slightly yellowish, fleshy, firm, becoming almost woody when dry; pores 5 mm. deep, rather large (about 1 mm.), irregular, angular, with thin dissepiments, slightly decurrent, white, changing to greenish where wounded, yellowish when dry; spores oval or ovoid, 9 x 6 μ, with a single large highly refractive gutta.

Growing in clayey soil, Auburn, Alabama, 23 Nov., 1896. Mrs. F. S. Earle.

POLYPORUS IRREGULARIS n. sp.

Pileus irregular, more or less branching, brownish, paler towards the margin, uneven, subtomentose, with a thin imperfect crust, the under layer of which is darker colored, forming a delicate brown line in section; 4–6 cm. long, 3–4 cm. wide, the margin usually thin; context white, floccose-felty pores white, 5 mm. or more deep, irregular, more or less angular, small (0.25 mm.), the dissepiments rather thin, firm, even.

Growing irregularly underneath a pine log, Auburn, Alabama, Feb., 1896.

The older portions are ferruginous brown above, and the free margins, when developed, are thin and distinctly paler brown for a space of about 1 cm. The extreme margin is sterile, and the pores which are normally even, become irregular and oblique as the margin tends to become erect.

POLYPORUS MELIAE n. sp.

Pileus convex, dirty white, subtomentose, anoderm, 5–8 cm. in diameter, occasionally coalescing; margin obtuse, sometimes extending nearly or quite around the pores; cortex floccose-corky, whitish; pores cream white, becoming darker with age, more or less rimose, 5–6 mm. deep, minute (about 0.2 mm.), the dissepiments firm, slightly uneven, usually with obtuse edges; spores narrowly oblong, 6x3, hyaline.

On branches of *Melia Azederach*, Auburn, Alabama, Oct., 1895.

In very old specimens the layer of pores becomes cracked in all directions and very much discolored.

POLYPORUS RETIPES n. sp.

Terrestrial; stem excentric, 4–6 cm. long, 2 cm or more thick, yellowish-white towards the base; pileus 6–15 cm. each way, brown, appressed tomentose, finely areolate-rimose so as to appear finely mottled; context fleshy, rather thick (2 cm. or more) becoming quite thin in drying, whitish; margin acute; pores decurrent half the length of the stem, shallow, whitish, large (1.5 mm. or more), mostly hexagonal, the dissepiments thin and finely lacerate.

The young pores are very shallow and the stem appears reticulate-veined nearly to the base. As the pores become older they deepen and those nearest the base of the stem become more or less obscured.

In pine woods, Auburn, Alabama, Dec., 1896. Mrs. F. S. Earle.

PUCCINIA POLYSORA n. sp.

II., III. Amphigenous; sori very small, short, very numerous but irregularly scattered, remaining long enclosed in the tough epidermis of the host, at length rupturing by a narrow slit; uredospores large, broadly oval, $35 \times 30\ \mu$, scarcely echinulate, the epispore of medium thickness, pale rusty brown; teleutospores variable, usually short, irregularly oblong, often somewhat constricted at the septum, averaging $25 \times 40\ \mu$, the cells often irregularly angled, the upper usually broader than long, blunt or rounded above; apex not thickened; pedicel usually short.

On *Tripsacum dactyloides*, Auburn, Alabama, August and October, 1891, B. M. Duggar.

USTILAGO SPARSA n. sp.

Parasite infesting occasional ovaries and transforming them into somewhat sphaerical olivaceous pustules covered by the changed and roughened seed coat, 1–3 mm. in diameter, the remainder of the inflorescence unchanged; spores regularly oval, distinctly echinulate, about 7–9 μ in length.

Related to *U. neglecta* Niessl. and *U. spermophora* B. & C., but distinguished from them by its larger pustules and smaller spores. It has nothing in common with *U. Dactyloctaenii* P. Henn. Die Pflanzenwelt Ost-Afrika, 5: 48 which occurs on the same host, has dark violet horn-shaped sori and smooth spores, 10–14 μ.

In scattered ovaries of *Dactyloctenium Aegyptium*, Auburn, Alabama, November, 1895, and October, 1896. Underwood & Earle.

February 8, 1897.

An undescribed Lechea from Maine.

BY EUGENE P. BICKNELL.

One of the most characteristic plants of York Harbor, Maine, is a species of *Lechea* which abounds in dry open places, especially over the weedy downs near the sea. Upon visiting York Harbor some years ago my attention was at once arrested by this plant, which was obviously neither *Lechea intermedia* nor *Lechea maritima*, the only eastern pinweeds which could be considered at all in connection with it. Subsequent investigation discovered that the plant, though it had never been discussed in print, had not been overlooked by botanists, but had been a long-standing puzzle variously solved, it appeared, in terms of one or the other of the species named above. Material from different collectors which had formed part of Mr. Leggett's collection and bore his penciled memoranda showed that the plant had perplexed that careful student of the genus, who had at different times referred it doubtfully both to *Lechea intermedia* and to *Lechea maritima* and had at least entertained the idea that it might be referable to the more western *Lechea stricta*. It may be said here that Mr. Leggett's material was not fairly representative of the plant and was quite insufficient to form a basis for any safe conclusions. For this reason the same material was passed over by Dr. Britton in his revision of the genus (Bull. Torr. Club, **21**: 244–253, 1894), which therefore affords no help in the present case. In Dr. Robinson's recent critical treatment of the genus (Syn. Fl. **1**: Part 1, 192–194, 1895) we find the first published notice of the Maine plant. It is there mentioned under *Lechea stricta* as being nearly related to that species, but as probably to be referred to *Lechea intermedia*. The case, therefore, stands to-day just as it was left by Mr. Leggett over fifteen years ago.

During several visits to York Harbor in August this pinweed has claimed my particular attention, and I have realized in the field that the problem it presented was indeed a perplexing one. The main facts in the case seem to be these: The plant has much the aspect of *Lechea stricta*, and is hence frankly distinguished in appearance from *Lechea intermedia;* nevertheless, though closely allied to the former it is not that species, but is a more or less immediate derivative of the latter, as is shown by the occurrence of forms not satisfactorily referable to either plant.

Technically, therefore, on the evidence, the plant is a variety of *intermedia*—an incompletely detached derivative of that species. Actually it has reached a degree of differentiation which, measured by the slight differences separating species in this group of plants, is certainly remarkable, and may fairly be taken as of species value despite the apparently intergrading forms. Indeed, so distinct from *intermedia* does the typical plant appear that it may well be questioned whether intergradation between the two is not, after all, more apparent than real. When we recall instances of perfectly distinct species exhibiting an apparent identity up to the time of full maturity of flower or fruit we find ourselves less ready to assign doubtful specimens to the category of intergrades. It may be readily conceived that between certain individuals of nearly related plants an inherent distinctness may be completely disguised to the eye as a result of retarded development or other cause. Be this as it may, I am sufficiently satisfied of the expediency of recognizing as a species the *Lechea* here discussed. To refer it to either of its near allies would be to evade a difficulty through a makeshift, and as for varietal rank the grade *variety* has been misused out of all definite meaning. Species are necessarily of different values. Closely similar but trenchantly distinct plants range side by side with species far more divergent from each other, yet inter-related through medial forms. The relegation of such well-characterized plants to the vague rank of *variety* surely involves a disregard of the facts of nature not to be excused by an appeal to the supposed requirements of a system of nomenclature necessarily more or less artificial.

For the new plant I propose the name *Lechea juniperina* in allusion to the appearance of its densly leafy narrow panicle, which is often suggestive of a spiry red cedar (*Juniperus Virginiana*) in miniature.

LECHEA JUNIPERINA n. sp.

Tufted from a descending and branched woody root, 2–5 dm. high. Stems erect, often from an outcurved or ascending base, mostly purplish and naked below the middle at flowering-time, branched above the middle to form a dense narrow panicle; branches short, numerous, closely ascending, mostly 2–5 cm. long (1–9 cm.); pubescence consisting of fine white hairs, at first densely appressed, becoming loosely substrigose-hoary or even subtomentose-canescent; leaves numerous, crowded, ascending or appressed, thickish, slightly revolute in drying, only the midvein evident, glabrous above, below with the midrib finely strigose-pubescent, and with some loose marginal hairs, the petioles 1–2.5 mm. long, appressed white-pubescent on the under side; stem-leaves linear to oblong-linear and oblanceolate, mostly tapering towards the base and more abruptly narrowed at the apex, acute or subacute, 1–2.2 cm. long, 2–4 mm. wide, those of the branches much smaller, narrowly linear, acute; inflorescence forming a dense and leafy narrow panicle, 10–20 cm. long (in reduced plants much smaller and more or less terminal), the numerous short-pedicelled flowers crowded in short axillary racemes and clustered at the ends of the branches; fruiting calyx ovoid-ellipsoid, 1.5–2 mm. long; pedicels 1–3 mm. long, often very short in the clustered terminal flowers; inner sepals elliptic, subacute, nerveless or faintly 3-nerved, reddish-purple, at least on the margins, the shorter outer sepals usually bright green in marked contrast; capsule ovoid-subglobose, 1.5–2 mm. long; petals reddish-purple, oblong-linear, with only a mid-vein, about 2 mm. long by 1 mm. wide; leaves of basal shoots narrowly elliptic, acute at each end, somewhat pilose-hairy on the midrib and margins or nearly glabrate. The plant blooms in August. The basal shoots do not begin to develop until September.

In reduced states the plant is only 1–3 dm. high and linear in general outline, the more persistent leaves appressed, the shortened panicle more or less terminal and sometimes only 1 cm. wide.

A form which grows in the shade of copses or park-like woods is more slender and less leafy than the typical plant of neighboring open ground, the leaves looser and often spreading, the more open panicle much less floriferous and more racemose-paniculate.

Specimens have been examined from various localities along and near the Maine coast from York Harbor to Mt. Desert.

Lechea intermedia Leggett differs from *L. juniperina* in less tufted habit and often larger size, becoming 7 dm. tall. The pubescence is somewhat coarser and more strigose, and composed of shorter, less whitened hairs, never becoming tomentose or canescent. The stem is usually greener, with the more persistent leaves less crowded and appressed and with more verticillate tendency. The leaves are often larger and longer, becoming 2.8 cm. long and 5 mm. wide, and are rarely if ever distinctly oblanceolate. The panicle is more or less loose and open with fewer and larger, more globose, longer-pedicelled flowers, which are mostly loosely racemose and never glomerate-clustered. The broader usually orbicular sepals are green or only with the slightest purplish tinge and strongly nerved, the nerves often five in number and branched;

the petals are larger and broader and mostly 3-nerved, the stigmas twice as large, the outer sepals commonly shorter and closer. The leaves of the basal shoots are often larger and relatively narrower and usually more hairy.

Lechea stricta Leggett, as compared with *L. juniperina*, is a paler, more silky-canescent plant, especially when young, the narrower acute leaves more pubescent, even pubescent over the lower surface and sparsely hairy above, the branches longer and massed above to form a broader panicle, the rather smaller and more globose longer-pedicelled flowers not at all glomerate, but distinctly racemose-paniculate and showing little or no purple.

L. juniperina appears to occupy a somewhat intermediate position between *L. intermedia* and *L. maritima* Leggett, although it need never be confused with the latter. *L. maritima* is, in fact, very distinct from all our species and is strongly characterized by its rigidly bushy-branched habit, dense tomentose-canescence and the oblong densely-pubescent leaves of the basal shoots.

Notes on two western Plants.

By P. A. Rydberg.

Lonicera glaucescens.

Lonicera parviflora var.? Torr. & Gr. Fl. N. Am. **2**: 7 (partly). 1840.

Lonicera Douglasii Hook. Fl. Bor. Am. **1**: 282. 1833. Not *Caprifolium Douglasii* Lindl. Trans. Hort. Soc. London, **7**: 244. 1830.

Lonicera hirsuta glaucescens Rydb. Cont. U. S. Nat. Herb. **3**: 503. 1896.

After seeing more material I have become perfectly convinced that this is just as good a species as any in the genus. The same conclusion has been reached independently by Dr. J. K. Small, who intended to describe it as new, not noticing my description cited above. He has also informed me of some of the localities given below. To the characters given in my description in the Cont. U. S. Nat. Herb. l. c., I can add a feature which then escaped my observation and which distinguishes *L. glaucescens* from all forms of *L. hirsuta.* The leaves of the former always have a chartaceous margin which is also common in *L. dioica,* but never occurs in *L. hirsuta.*

The following localities are to be added to those given in the Contributions. These localities are based upon specimens in the herbaria of the Ohio State University, Oberlin College, Lafayette College and Columbia University:

Pennsylvania: S. W. Knipe, 1868; 1871; Guttenberg, 1879; C. E. Smith, 1864; McMinn.

Ohio: F. B. Mason; Andrew Auten, 1896; Mr. Krebs, 1891; W. A. Kellerman, 1895.

Michigan: Dr. Pitcher, 1829; F. E. Boyce, 1883.

Isle Royale: T. C. Porter, 1865.

Ontario: Dr. and Mrs. Britton and Miss M. Timmerman, 1889; T. J. W. Burgess, 1881.

Saskatchewan: E. Bourgeau (Palliser Exp.), 1858.

South Dakota (Black Hills): W. S. Rusby, 1887.

Geum (Sieversia) turbinatum.

Potentilla nivalis Torr. Am. Lyc. N. Y. 1: 32. 1827. Not Lapeyr, 1782.

Geum Rossii Torr. & Gr. Fl. N. Am. 1: 424. In part. 1840. Not *Sieversia Rossii* R. Br.

This has gone under the name of *Geum Rossii* (R. Br.) DC. without any question ever since Torrey and Gray's Flora was published in 1840. *Sieversia Rossii* was described from specimens collected on the Melville Island by Lieutenant Ross during Captain Parry's first voyage. *Geum Rossii* is a distinctly arctic species, ranging from the Baffin Bay Islands to Alaska. *Geum turbinatum* is found in the higher Rockies of Colorado, New Mexico, Arizona, Utah, Nevada and Southern Wyoming. It is not found in the mountains of British North America, and I have no record of its having been collected in Montana or Idaho. The two species are therefore separated by a distance of almost 2,000 miles. The arctic plant has much larger flowers, from 2 to 2½ cm. wide, while in the Rocky Mountain plant the flower scarcely exceeds 1½ cm. In the latter the bractlets are narrowly lanceolate and much shorter than the tube of the calyx, which is decidedly turbinate, especially in fruit. In the true *G. Rossii* the bractlets are usually broadly ovate and about the length of the tube. It has, as a rule, a more hairy calyx and upper part of the pedicels. In *G. tubinatum* the leaves, as a rule, are much deeper cleft and with narrower segments. The pedicels are also much more slender and longer. The upper stem-leaves and bracts are much reduced, entire, or with linear segments, while in *G. Rossii* the segments, as well as the stipules, are broad and large.

G. humilis (R. Br.) Steud., (*Sieversia humilis* R. Br.), is not found in the United States. The *G. Rossii humile* of Torrey and Gray's Flora and Watson's Report of the Botany of King's Expedition has nothing to do with *Sieversia humilis* R. Br. from Unalaska. It is simply a more hairy *G. turbinatum*, not worthy of varietal rank. Of the true *G. humile*, I have seen only one specimen, collected by John Chapman, in 1893, also on Unalaska. It resembles *G. Rossii*, but is more coarsely hairy and the leaflets are broader and incised rather than divided. Whether it should be regarded as a variety of *G. Rossii* or a distinct species I cannot decide from the insufficient material seen.

Two undescribed eastern Species.

By N. L. Britton.

Viola Atlantica.

Glabrous, or with a few scattered hairs, acaulescent; rootstock thick, erect. Flowering scapes very slender, 4′–8′ high, mostly longer than the leaves; petioles much longer than the blades; blades broadly ovate to reniform in outline, 1′–3′ wide when mature, deeply subpedately parted into linear or oblanceolate, acute or acutish lobes, the lobes with a few low distant teeth, or entire, the middle one somewhat the broadest; sepals linear-lanceolate, long-acuminate, 4″–5″ long; petals blue, longer than the sepals, at least the lateral ones bearded; capsule oval-oblong, nearly 6″ long, glabrous.

Eastern Massachusetts to southern New Jersey, in sandy soil along the coast. Simulates *V. delphinifolia*. May–June.

Geranium Bicknellii.

Similar to *G. Carolinianum* but taller, the stems usually more slender, loosely pubescent. Leaves slender-petioled, somewhat angulate in outline, the segments oblong or linear-oblong, mostly narrower; peduncles slender, 2-flowered, the inflorescence loose; sepals lanceolate, awn-pointed; ovary-lobes pubescent; persistent filaments longer than the carpels; beak about 1′ long, long-pointed, its tip 2″–3″ long; seeds reticulated.

Nova Scotia (?) Maine to Western Ontario and southern New York.

A new Ribes from Idaho.

RIBES LEUCODERME.

A shrub, four to six feet high, freely branching above, the branches inclined to droop; main stem rather stout, covered with thin light gray epidermis, which peels off in shreds; branches, especially the younger ones, pubescent with very short and thick white tomentum, the growing ends furnished with long-stalked yellow glands; infrastipular spines solitary, or sometimes in pairs on young branches, nearly an inch long when mature, slender and very sharp, from a stout base, slightly curved downward, yellow-brown; leaves broadly ovate, or almost orbicular in outline, the largest two inches in diameter, deeply three-lobed, the lateral lobes sometimes cut, so as to give the leaf the appearance of being five-lobed, the lobes all coarsely crenate-serrate, pubescent on both sides with short white hairs, and usually resinous-dotted, ciliate; petioles slender, pubescent, usually as long as the blade; flowering rachis an inch in length, or less, furnished with stalked glands, two-flowered; flowers approximate, on short, glabrous pedicels; bracts very small, shorter than the pedicels, almost orbicular, fringed with stalked glands; calyx tubular, nearly a half-inch in length, glabrous on the outside, hairy within in the throat, greenish white, or sometimes tinged with purple, the lobes narrowly oblong; petals narrow, obovate, little more than half the length of the calyx-lobes, white; anthers on glabrous filaments; style pubescent; fruit spherical, four lines in diameter, unarmed, purplish when fully ripe.

Collected at Lake Waha, in the Craig mountains, Nez Perces county, Idaho, by Mrs. Heller and the writer, June 2, 1896. Type, number 3175, in flower. It was also collected in fruit at Forest, Nez Perces county, by Mr. H. E. Brown, in August, no. 17. It is common on the Craig mountains, growing on the edge of the forest, and in moist copses, at elevations of 2,000 to 3,500 feet. It is the plant called *Ribes oxyacanthoides*, by Holzinger, in Contr.

U. S. Nat. Herb. 3 : 225. It is apparently common in northern Idaho and adjacent Washington and, although found in various collections, has always been referred to the very different *R. oxyacanthoides*, which seems to be confined to the eastern part of the continent.

A. A. HELLER.

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Reviews.

*Flora of the Amboy Clays.** After many vexatious delays the Flora of the Amboy Clays has appeared. It makes a handsome quarto volume, uniform with other U. S. Geological Survey Monographs, of 260 pages and 58 plates. Its distinguished author was one of the fathers of American paleobotany and it is much to be regretted that he could not have lived to see the publication of his valuable material. But it was not to be, and it is fortunate, indeed, that so able an editor was found to carry on the book to its completion. It will stand as a monument to the painstaking discrimination and acumen of the one and the careful judgment of the other.

The so-called Amboy Clays take their name from Perth Amboy and South Amboy, in New Jersey, and embrace some 350 feet of clays, usually of much commercial importance, that are there best exposed. As a formation, however, the Amboy Clays extend from northeastern Maryland diagonally across the State of New Jersey, the southern portion of Staten Island and the north shore of Long Island to the southern counties of Massachusetts. These clays have furnished the rich flora, which is the subject of the present monograph.

Biologically speaking the Amboy Clay flora is of much interest. It consists of 156 species, of which just 100 are described as new to science, besides a number of more or less doubtful fragments. The most striking feature of the flora is the great

* *Flora of the Amboy Clays.* By John Strong Newberry. A posthumous work, edited by Arthur Hollick. Monographs U. S. Geol. Surv. Vol. 26: Wash., Government Printing Office, 1895 (1896). pp. 260. *pl. 58.*

preponderance of phanerogams, there being only 10 species not belonging to this class. This approaches somewhat closely to the proportions existing in the present between the higher cryptogams and the dominant types, and suggests at once the comparative modernness of the Amboy flora.

Of the 10 cryptogams enumerated, one is regarded as an alga, one as an hepatic, and the remainder are ferns, one of the most interesting being an undoubted *Ophioglossum*. The Cycadaceae are represented by 3 genera and 5 species, and the Coniferae by 15 genera and 19 species. No monocotyledons were obtained. The angiospermous dicotyledons are represented as follows: Juglandaceae, 1 genus and species; Myricaceae, 1 genus and 7 species; Salicaceae, 2 genera and 5 species; Fagaceae, 1 genus and species; Ulmaceae, 1 genus and species; Moraceae, 1 genus and 3 species; Proteaceae, 2 genera and 3 species; Magnoliaceae 3 genera, 11 species, of which the remarkable *Liriodendropsis* is described as new; Menispermaceae, 1 genus, 2 species; Lauraceae, 4 genera, 8 species; Rosaceae, 1 genus and species; Leguminosae, 7 genera and 10 species; Aquifoliaceae, 1 genus and species; Celastraceae, 2 genera, 11 species; Aceraceae, 1 genus and species; Rhamnaceae, 2 genera and 2 species; Vitaceae, 1 genus, 2 species; Tiliaceae and Passifloraceae each with 1 genus and species; Myrtaceae, 1 genus, 5 species; Araliaceae, 3 genera, 12 species; Cornaceae, 1 genus and species; Ericaceae, 1 genus, 4 species; Myrsinaceae, 1 genus, 3 species; Sapotaceae, Ebenaceae, Asclepiadaceae and Caprifoliaceae each with a single genus and species; uncertain affinities, 8 genera and 19 species.

This brief enumeration brings out clearly the great diversity of the flora, for there are not less than 30 well marked modern families represented, and often with a goodly number of species. It seems unreasonable to suppose that this complex dicotyledonous flora should be anywhere near the actual beginning of this great class of plants, as has recently been suggested. It must have had a long period of development before such diversity could have been attained.

From the geological side this work furnishes a valuable and timely contribution to the controversy regarding the presence of Jurassic strata along the Atlantic border. The Amboy Clays are shown to be higher than the Potomac of Virginia, and to have strong affinities with the Dakota group, the Atam and Patoot beds of Greenland, the Cretaceous clays of Aachen, Germany, and the upper Cretaceous rocks of Bohemia. The geological position and the abundant angiospermous flora furnish a complete refutation of the contention that the Amboy Clays can belong to the Jurassic.

The task of editing a posthumous work is always a delicate one, since the editor is in constant fear of not correctly interpreting the author. In this respect Mr. Hollick seems to have been very judicious, and has made only such changes in the original manuscript as were necessary on account of discoveries made or publications issued subsequent to the time when the author ceased active work. These changes are presented in the form of footnotes over the editor's initials; the work, therefore, is essentially Dr. Newberry's.

The plates, in point of mechanical finish, are unquestionably the best that have thus far been made of this class of objects by the Geological Survey. The printing is also of good quality, but it is unfortunate that the book should be marred by an incorrect date of issue. It appears from the letter of transmittal that it was submitted in March, 1894. It bears on the title page the date of 1895, whereas it was only issued in the last days of 1896.

F. H. K.

Spermatozoids in Phanerogams. The leading articles in recent numbers* of the *Botanisches Centralblatt* are contributed by two Japanese botanists, Prof. S. Ikeno, of the University at Tokio, and Dr. S. Hirase, of the same institution. In these two rather brief papers is announced a discovery of great interest to the botanical world—that of spermatozoids in *Ginko biloba* and *Cycas revoluta.* If confirmed, this will prove one of the most significant additions to the comparative morphology of the higher plants that has been made since the time of Hofmeister.

While more details are promised in papers that are to follow, enough is given in these preliminary contributions to inspire a good degree of confidence. In *Ginko biloba*, according to Dr. Hirase, a

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**Botanisches Centralblatt*, 69: 1–3; 33–35. 1897.

pollen-tube is formed, which penetrates the ovule, but does not come in contact with the archegonium. The nucleus of the pollen-tube divides, parallel to the long axis of the tube, into two daughter nuclei, one of which continues to grow and divides again into two in a similar way. The latter two daughter-cells become the ciliated motile male gametes. These spermatozoids are described as exhibiting a nucleus completely surrounded by cytoplasm. They are of an ovoid form, 82 μ long by 49 μ broad; the head consists of three spiral turns, these bearing numerous cilia, and a pointed tail is also present. As soon as the spermatozoids escape from the pollen-tube into a fluid which by this time has accumulated in the nucleus, they swim quite actively about with whirling movements.

The writer does not state that he has traced out the course of events from this time on. Prof. Ikeno has found in *Cycas revoluta* spermatozoids similar in structure and development to those of *Ginko*, but has not seen them in motion, as his observations were confined to material collected at a distance and treated with various fixing reagents. MARSHALL A. HOWE.

Contributions towards a Monograph of the Laboulbeniaceae. By Roland Thaxter. Memoirs Am. Acad. **12**: 187–429. *pl. 1–26.* D. 1896.

This is one of the most elaborate works that has yet appeared on American mycology and has set a pace that it will be difficult for many to follow. The author has been peculiarly fortunate in having before him an almost open field, since, of the 158 species known, 130 are American and with one or two exceptions have been described by the author himself; he has, moreover, described several of the exotic species. It is a privilege that few can enjoy to enter a field so free from the necessity, to borrow an expression from a colleague, "of first clearing the Augean stable of synonymy." The limits of species and genera have thus been a new problem and the group is fortunate in thus having its outlines marked by a skilled investigator. Besides the careful diagnoses of genera and species, there are twenty-six plates that are as nearly perfect as the art both of the author and of the engraver can make them; these illustrate all the species described. The author also gives some general discussion of the group and brings out more fully than in his former papers the two most important features of the group: (1) that they are true ascomycetes, and (2) that they possess a sexual method of reproduction. The group is an obscure one, its members living parasitic on insects and having a simple structure and microscopic size, but inconspicuous as the group is, it is likely to throw much light on the origin and relations of some of the higher fungi, and is certain, at least, to throw doubt on the Brefeldian conclusions regarding the origin of the ascomycetes. American botany is indebted to the author for his laborious work on this unknown group of fungi and for his elaborate monograph. L. M. U.

Ferns and Fern Allies of New England. By Raynal Dodge. Pp. 52. Binghamton, N. Y., Willard N. Clute & Co. 1896.

This little handbook, which can be slipped into the pocket, will be a convenient companion for fern-hunters in the region which it covers. It also indicates a renewal of interest in the popular study of these plants which, in the past twenty years, has been of much service in bringing to light the fuller knowledge of their distribution and variation. Two species of *Isoetes* are described, and a series of field notes on these plants is included; these are timely, since this obscure group, more than any other, is in need (1) of careful and extended observation in the field, and (2) careful study under variation of water supply with special reference to its influence on the development of structures that have been used hitherto in classification, and (3) of comparative study in anatomical structures and their illustration. To none who have made greater or less contributions to the knowledge of this group in America has this possibility of the study of fresh material been possible, and there is much to be gained by those to whom the opportunity is open to study habits as well as comparative structures. If this booklet succeeds in stimulating this sort of observation it will have done a good work. L. M. U.

Proceedings of the Club.

WEDNESDAY EVENING, JANUARY 27, 1897.

In the absence of the President, Vice-President Rusby occupied the chair. There were twenty-one persons present.

Dr. H. Zahlbrückner, Natur-historische Hof-Museum, Vienna, Austria, was elected a corresponding member.

The scientific program of the evening was as follows :

By Dr. H. H. Rusby, "Remarks on some Solanaceae."

By Mr. A. A. Tyler, "The Nature and Origin of Stipules."

By Dr. J. K. Small, "*Aster gracilis* Nuttall."

By Mr. Geo. V. Nash, "New and Noteworthy American Grasses."

Dr. Rusby exhibited a number of Solanaceous plants and remarked upon their relationships. It was pointed out that the general appearance and chemical and physiological characteristics of these plants frequently fail to indicate their structural affinities. *Cestrum* and *Sessea*, *Atropa* and *Datura* were cited as illustrations of the separation of otherwise naturally related groups through their possession respectively of baccate and capsular fruits. *Nicotiana* was referred to as connecting those tribes having a radial symmetry, with the tribe Salpiglossidae, having a bilateral symmetry and thus connecting the family with the Labiales. The Androcera and Andropeda sections of the genus *Solanum* were instances of the appearance of this bilateral symmetry in a widely separated part of the family where radial symmetry is otherwise the rule.

Dr. Britton discussed the subject and remarked upon this instance of development of two divisions of a group along different lines, in this case through baccate and capsular fruits. He cited similar parallelisms in other families tending to produce different resulting characters, as in Capparidaceae; and remarked that an indication of the lines along which these genera have been derived may be indicated by these characters.

The second paper by Mr. A. A. Tyler on "The Nature and Origin of Stipules," presented conclusions derived from studies extending through several years. The subject was treated at length in the light of geological, morphological, anatomical and developmental evidence. Discussing Mr. Tyler's paper, which will shortly be published in full, Dr. Britton remarked that the outcome of this very important paper is most interesting; it emphasizes the significance of basal scales and those of buds and rootstocks; and it is the more convincing from the nicety with which it accords with the seemingly haphazard distribution of stipules widely but irregularly here and there through the vegetable kingdom.

Of the remaining papers, that by Mr. Nash was read by title; it is printed in the January BULLETIN; that by Mr. Small was, on account of the lateness of the hour, deferred until the next meeting.

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Native of New Granada.

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Chromatin-reduction and Tetrad-formation in Pteridophytes.

By Gary N. Calkins.

(Plates 295, 296.)

From the time when Van Beneden, in 1883, found that mature reproductive cells have only half as many chromosomes as the ordinary somatic cells, until the present time, cytologists have endeavored to explain the meaning of this reduction and to show how it takes place. These efforts have not as yet been attended with complete success.

One of the most widely known theories as to the meaning of reduction is that of Weismann who accepted the earlier conception of Roux (1883) as to the significance of mitosis and built upon it an elaborate theory of development. In this he predicted that a form of mitosis would be found in the maturation of the reproductive elements "in which the primary equatorial loops are not split longitudinally" (p. 371) and "by means of which each daughter nucleus receives only half the number of ancestral germ-plasms possessed by the mother nucleus" (p. 375).

Weismann's prediction has been confirmed by recent observations on the copepod crustacea, and it is now known that in this group of animals at least, the chromosomes of a maturing cell undergo a transverse division, giving reduction in the Weismann sense. This process of reduction, wherever definitely made out, is invariably preceded by an arrangement of the chromatin into four-parted chromosomes, to which the name "*Vierergruppen*" or "tetrads" has been given. These tetrads are always half as numerous as the chromosomes of the somatic cells and often differ widely from them both in shape and size.

The entire question of reduction rests upon the manner of tetrad-formation, but unfortunately, observers are diametrically opposed in their descriptions of the process. On the one hand it has been shown beyond question, that in some cases (the copepod crustacea) two of the four parts of the tetrad are formed by longitudinal division of the spireme-segment, while the other two arise by transverse division. In such cases two successive mitoses divide the tetrads, first into two dyads and second into single elements. By these two divisions the resultant reproductive cell receives one-fourth of each of the original tetrads. On the other hand, in another case, *Ascaris megalocephala*, where the facts also seem to be beyond contradiction, Brauer has shown that the tetrads arise by double longitudinal division of the spireme-segments and that no transverse division takes place. In this case reduction is purely quantitative and not qualitative.

The botanists Guignard (1891) and Strasburger (1888) have maintained that in plants also, a reduction in the Weismann sense does not take place. Neither Guignard nor Strasburger found tetrads. They described the spireme as breaking up into half the normal number of chromosomes which undergo simple longitudinal division at each successive mitosis.

It would be remarkable if a process so general in animal cells as the formation of tetrads should not be found in plant cells, and with the hope of finding some evidence of this in plants I undertook the study of reduction in the group of Pteridophytes, the results of which are given in the following section.

I. Observations.

Guignard and Strasburger found that in *Lilium* and in *Allium* the pollen-grain after reduction, undergoes subsequent mitoses, in each of which the same reduced number of chromosomes is retained. This led Overton (1892) to suggest that reduction in the higher cryptogams, where sexual and asexual generations alternate, might take place as far back as the formation of the spore. . He also suggested that all of the cells of the sexual generation might have the reduced number of chromosomes, and in 1893 he strengthened his position by showing that the cells of the endosperm in the Gymnosperm *Ceratozamia*, divide with the reduced number. But it was Strasburger (1894) who proved it, beyond doubt, by showing that in the fern *Osmunda* all the cells of the prothallus have the reduced number of chromosomes; in other words that all cells derived from the spore have half as many chromosomes as the cells of the asexual generation. Reduction in ferns, therefore, takes place during the formation of the spore and here, if anywhere, we must look for the tetrads.

A. Material and Fixation.—Two fern species (*Pteris tremula* and *Adiantum cuneatum*) were selected, which were found in a fernery in October, to be in various stages of spore-formation. The pinnae were removed and cut into small pieces before fixation. The fixing agents used were 1, Herman's platino-aceto-osmic mixture; 2, Von Rath's fluid; 3, corrosive sublimate; 4, sublimate-acetic; and 5, picro-acetic. The best results were obtained with 1, 3 and 4. The pieces were imbedded in paraffine and cut horizontally in sections about 4 to 5 μ thick. The stains used were Heidenhain's haematoxylin, either alone or with orange G or Congo red as counter stains in the majority of preparations, although Flemming's triple stain gave good results.

B. Terminology.—In animals three periods are recognized in the development of the reproductive cells (O. Hertwig). 1. A "division period," during which the primordial germ cells ("oögonia" and "spermatogonia") increase by ordinary mitoses; 2, a "growth-period," during which the primordial germ cells enlarge and during which tetrads are formed. These cells are known as "primary oöcytes" and "primary spermatocytes," and 3, the "maturation-period," during which the nuclei with tetrads are divided by mitosis into nuclei with dyads ("secondary oöcytes" and "secondary spermatocytes"). These are again divided to form eggs or spermatids.

As regards the periods of maturation it can now be shown that both male and female cells in many animals, and reproductive cells in some plants (Pteridophytes), conform to the same type. It is well known that in spore formation of *Pteris*, the single primordial cell ultimately gives rise to sixty-four spores. It is also known that there are sixteen so-called "spore-mother-cells" in each sporangium, and that from these sixteen cells the final spores are formed. The stage between the first spore cell and the sixteen cells is directly comparable with the "division-period" in animal maturation. The sixteen-cell stage (see next page) is the stage of enlargement and of tetrad-formation and corresponds with the "growth-period." Finally the "maturation-period" is recognized by the two consecutive divisions of the sixteen cells to form the sixty-four spores.

As the maturation phenomena are so closely parallel in plants and animals, it would be of advantage to have the corresponding cells designated by analogous names. In some cases the present botanical names are unwieldy and inappropriate. The "spore-mother-cell" as a designation for the cells of the sixteen-cell stage is incorrect as well as clumsy; for, if we consider the nuclei alone, these cells do not give rise to the spores, but to the "mother-cells" of the spores, and are therefore the "grandmother-cells" of the spores. I propose, therefore, to use the term "primary sporocyte" for the cells of the sixteen-cell stage, and "secondary sporocyte" for cells of the thirty-two-cell stage. These terms are directly analogous to "primary" and "secondary" "oöcyte," and "spermatocyte" in animal cells. The term "sporogonium," which in this connection would be analogous to the term "oögonium" or "spermatogonium" is, unfortunately, already used in a different sense in botanical nomenclature and I shall therefore designate the first eight cells in spore formation as "archesporial cells" in accordance with botanical usage.

C. Observations.

It is beyond the scope of this paper to describe in detail the formation of the sporangium, with its annulus and tapetum, or to describe the degeneration of the tapetal cells. Nor is it necessary to give aminute account of the mitoses leading up to the formation of the sixteen sporocytes. They all agree with the division of the "archesporium" and the number of the chromosomes apparently remains the same, although they are so numerous that it is impossible to give the absolute number. From careful counting in several cases, I estimate the number to be between one hundred and twenty and one hundred and thirty.

The unicellular archesporium, which is destined to give rise to all the spores of the sporangium, can be readily distinguished from the surrounding somatic cells. It is larger, and the chromatin of the nucleus stains much more deeply than that of the other cells. The chromosomes are large and distinctly looped, and in the metaphase of karyokinesis they are split by a longitudinal division (Fig. 17). After each division the daughter-nuclei pass into the resting stage, during which the cell-walls are completely formed and each daughter-cell becomes completely separated. The resting stages are comparatively long and the division stages short.

1. *The growth-period.*

After the sixteen primary sporocytes are formed the nuclei pass as usual into the resting stage (Fig. 1). The nuclei are at first comparatively small (10.3 μ in diameter), the chromatin-reticulum does not stain intensely, and there are usually from one to three or more nucleoli in each. Meantime the tapetal cells degenerate, giving room for growth of the reproductive elements. This growth must begin very soon for the cells in the resting stage (Fig. 1) are not frequently found. When fully grown, the nuclei measure about 14.5 μ in diameter, an increase of nearly 50 per cent. During this enlargement the chromatin reticulum is converted into a delicate moniliform spireme. This is a single thread of chromatin, very much coiled and interwoven and at first distributed evenly throughout the nucleus (Fig. 2). From this condition of extreme delicacy and expansion the chromatin soon passes into a stage of greater localization and the spireme becomes thicker. Evidence of the beginning of concentration can be seen in Fig. 2 an early stage, where the nucleolus has not disappeared. In a later stage, to which Farmer has given the name "Synapsis," the meshes are drawn towards one side of the nucleus into a much more compact chromatin mass (Fig. 3). This mass next becomes loosened and the filaments more or less isolated. In exceptionally favorable preparations the spireme in this stage is seen to be double (Fig. 3 x).

The concentration of the chromatin at the same time with the thickening of the spireme seems to indicate a coalescence and union of the formerly distinct granules of chromatin in the delicate moniliform spireme.

2. *Period of tetrad formation; pseudo-reduction.*

In the case of animals when the spireme thread breaks up into segments destined to form tetrads, the number of these segments is, in general, half the number of chromosomes in the somatic cells. There is a reduction in number of chromatin masses, but the nucleus still contains all the chromatin it held at first, so that actual reduction has not yet taken place. Rückert (1894) has accordingly proposed the expressive term "pseudo-reduction" for this preliminary halving of the number of chromosomes.

Pteris forms no exception to this rule. The double spireme breaks up into short and well defined chromatin segments (Fig. 5 a) each of which gives rise to a tetrad. The number of these segments is difficult to determine; in several cases I counted about sixty. This is about half of the number in somatic cells where, as nearly as I can make out, there are between one hundred and twenty and one hundred and thirty chromosomes. It is an interesting fact that the process of tetrad formation is subject to some variation and does not, apparently, conform exclusively to any one type. This conclusion is based upon the following facts. The spireme segments are, from the beginning, invariably double (Fig. 5 a). The same nuclei contain various modifications of the double segment. Some of them are split in the center while the ends remain connected, giving rise to ring forms (Figs. 4, 5, 19 c). In some there is no separation at all, in others the ends separate, giving rise to "cross" forms (Fig. 6 l and Fig. 19 a) and in still others one half the segment may slide along on the other half till the ends are no longer contiguous (Fig. 6 d and e). There may be still further modifications of the double segment in the same nucleus (Fig. 5 x). In none of the nuclei which I have examined does any of these types predominate; and from their various and diverse shapes it is impossible to regard them as developmental stages of a single type. I am forced, therefore, to the conclusion that, in these ferns, tetrads may be formed in a variety of ways. The various methods can be grouped into three types, which I will describe separately as (a) the "ring type;" (b) the "rod type;" and (c) the "cross type."

a. The "ring type." Almost every primary sporocyte contains from one to several (8 or 9) ring forms in different stages. In some cases the chromatin portion is thin and the opening comparatively large (Fig. 4 c, 5 c, 19 c). In no case is the ring thin and delicate as in *Heterocope robusta* (Rückert, 1893, Fig. 23). The ring stage begins with a lateral bulging of the two halves of the spireme segment (Fig. 6 i); this is followed by the appearance of a furrow at the center. This furrow enlarges until it forms a circular space, and, the ends of the segment remaining attached, the chromatin forms a closed ring (Fig. 19 c). The chromatin then begins to accumulate in four parts, each half of the originally double spireme forming two (Figs. 6 J, 19 c and 20 c). These parts become more and more distinct and individualized; more compact and tightly packed together, until finally the tetrad is completed (Fig. 7). The tetrad is, therefore, derived first, by a longitudinal splitting of the spireme segment, and second, by the transverse splitting of the two halves.

b. The "rod type." The tetrad begins as before with the short and somewhat thickened double spireme-segment, but here no separation of the two parts of the segment takes place (Fig. 5 a). The chromatin segregates at the two ends in four swellings (Fig. 6 b). These swellings enlarge, become more definite and the segments become shorter by the gradual drawing together of the ends. The ends finally round out and tetrads are formed by what would seem to be the simplest method possible.

There are some modifications of this type. In some cases the two halves of the spireme segment slide along on each other until, in an extreme case, the opposite ends may become contiguous (Fig. 6 d, e). The resultant tetrad does not differ essentially from one formed in the simpler manner. There is the same segregation of chromatin at the four ends, the same shortening of the segment and finally the same end result, although at first the tetrad is somewhat distorted. In the rod type, therefore, the tetrad originates first by a longitudinal division of the spireme, and second, by transverse division of the halves and is equivalent in all respects to the tetrad of the "ring type."

c. The "cross type." In this type the halves of the double spireme segment, instead of separating in the centre as in the "ring type," or of remaining parallel to each other as in the "rod type," become separate at the two ends but remain attached to each other in the centre. (Fig. 6 a, l., etc.) These ends separate farther and farther until each half segment forms a loop which lies in contact with the other half segment only at the center of the convex side (Fig. 6 c). It is the opposite of the ring type. In some cases the segregation of the chromatin begins at an early period (Fig. 6 a), and, as separation continues, the segregation becomes more marked, until finally there are four distinct swellings lying at right angles to each other (Fig. 6 c, 19 a). The loops meantime become shorter and shorter, until finally the four parts of the chromosome are brought together, and a tetrad is formed similar in all respects to those of the "ring" and "rod" types (Fig. 6 k).

Like the "rod type," the "cross type" shows some modifications. After the ends have begun to diverge as in the normal cross type, one of the loops may swing around through an angle of 90 degrees on the point of attachment as a pivot (Fig. 6 f). It thus comes to lie in a plane at right angles to its original position. Segregation of the chromatin gives rise to the four parts of the chromosome as before. Various other modifications of this type are found (Fig. 5 x), but in all of them the result is the same. Here, therefore, as in the other types the tetrad originates first by a longitudinal division of the spireme-segment and second by transverse division of the halves.

3. *Period of Reduction.*

It is in this period of spore development that reduction of the chromosomes actually takes place. It begins with the arrangement of the mature tetrads into the nuclear plate of the primary sporocyte spindle. Before this arrangement the tetrads are distributed throughout the nucleus (Fig. 7). The nuclear membrane disappears, and after this, for the first time, it can be clearly seen that the nuclear space is filled with almost parallel spindle fibres (Fig. 8). The latter at this stage could not be traced to definite points at the poles. The tetrads lie in various positions on the spindle fibres (Fig. 9), but they gradually collect at the equator of the spindle. The migration towards the equator of the spindle is clearly shown in Fig. 10 for *Pteris* and Fig. 20 for *Adiantum*, while Fig. 11 shows the completion of the spindle in *Pteris* and the definite formation of the nuclear plate. In this stage the tetrads are closely packed, and are so numerous that counting is impossible. In the early stages, however (Figs. 8 and 10), it can be seen that the number is about sixty.

The compact arrangement of the tetrads in the nuclear plate leaves no chance for orientation. It is impossible, therefore, to tell from this division whether the tetrad divides through the line of original cleavage, or through the secondarily acquired transverse cleavage. In other words, it is impossible to tell whether the division of the primary sporocyte is a reducing or an equation division. There is, however, good reason to regard this as an equation division, and the division of the secondary sporocyte as transverse, and, therefore, as a reducing division. The second mitosis follows closely on the first, but in the short interval the two parts of each dyad, which at first appear like two small balls closely pressed together (Figs. 12 and 21), now become drawn out in the direction of their common axis, which is probably the original longitudinal axis of the spireme-segment (Figs. 13 and 14). It is immaterial in the final spore cells whether the first or the second division is a reducing division in the Weismann sense. That one of them must be is shown by the method of tetrad formation; but, from the manner in which the dyads elongate, the probability is certainly strong that reduction is effected by the second mitosis. The change in shape of the chromosomes in the secondary sporocyte-spindle makes the general appearance of the nuclear plate conform more nearly with that of the somatic cells (cf. Figs. 13 and 18), although they are fundamentally different.

4. *The spore.*

The cylindrical shape of the daughter chromosomes as they come from the division of the dyads in the secondary sporocytes is retained until late in the anaphase (Fig. 14). The resulting four daughter-nuclei lie freely in a single cell which, until the cell-plates are formed, is a syncytium. In the division of multinuclear cells it has been frequently noted that the nuclei are connected by spindle fibres. This occurs in ferns, and long after division, and even as late as the telophase after the cell-plates are formed and the nuclei have gone into the resting stage, fibres can still be seen connecting each nucleus with all the others (Figs. 14 and 15). While the cell-plates are forming, the chromosomes gradually disintegrate and pass into the reticulum although their outlines can be dimly made out even after the reticulum is well formed and the nucleoli have reappeared (Fig. 16).

5. *The centrosome.*

It is extremely difficult to stain, and correspondingly hard to find the centrosomes in this material; even at the spindle-poles its identification is not easy. I was able, however, to make it out in two different stages (Figs. 11, 12 and 13). One of these was in the mitosis of the primary sporocyte, the other in that of the secondary sporocyte. In the first of these the centrosome at the spindle-poles was double (Figs. 11 and 12), in the second it was single (Fig. 13).

II. Tetrad-formation.

In cases where reduction in the Weismann sense is actually known to take place, there have been wide variations in the accounts of the process. It was first described by a former pupil of Weismann's, Ishikawa, who did not find tetrads and who held that reduction in the copepod *Diaptomus* is accomplished by the separation of entire chromosomes. This result is entirely contradictory to the more recent results obtained by the subsequent study of *Diaptomus* and other copepods.

Vom Rath, apparently the first to correctly interpret the formation of tetrads, gave a different account of reduction in the insect *Gryllotalpa*. He found that the spireme is double before it breaks up and that there are half as many of the double segments as there are chromosomes in the somatic cells. The halves of the double segment separate, except at the ends, and a ring is formed. Later the tetrads arise by concentration of the chromatin at four points of the ring, a method by which the four parts of the tetrad originate by longitudinal division represented by the original division of the spireme, and by a transverse division.

Häcker gave still another description of tetrad-formation in *Cyclops strenuus*. His details have been denied by Rückert, who, however, accepted the general results and agreed with him that the tetrad is formed as in *Gryllotalpa* by a longitudinal and a transverse division of the original spireme segments. Rückert (1893 and 1894) has found two modes of tetrad formation, each giving, however, the same results, viz.: the formation of tetrads by a primary longitudinal and a secondary transverse division of the spireme. The first method (*Cyclops*, *Canthocamptus*) agrees almost exactly with what I have here described as the "rod type." The spireme is divided longitudinally before segmentation into half the normal number of chromosomes. The chromatin then begins to collect into a much thicker double rod; the rod then divides transversely and the tetrad is formed by longitudinal and transverse division. The other method described by Rückert takes place in *Heterocope* and *Diaptomus* and agrees very closely with what I have described as the "ring type." The double spireme breaks as before, but the double segment, instead of remaining contiguous throughout, becomes separated in the middle, while the ends alone remain in contact. A ring is thus formed and tetrads arise later by two divisions, one through the diameter of original cleavage, the other at right angles to this line.

Enough has been given in this account to show that certain methods tetrad-formation are characteristic of certain species of animals. Up to the present time it has always been found that the tetrads in a single nucleus are formed by one method, either by the "rod type" or by the "ring type" alone. My observations on the fern, however, show that tetrads in the same nucleus may be formed by both methods or even by a third. From these facts the conclusion seems inevitable that all the types of tetrad-formation mentioned above are merely modifications of the same process and have no significance in themselves so long as a common result is obtained.

It seems remarkable that such obvious structures as tetrads should have been hitherto overlooked in the plant reproductive cells. Many observers have noticed that the mitosis in the sporocyte differs from that of all other cells, whether somatic or archesporial. This difference was early recognized by Guignard and Strasburger. Overton and Belajeff also were struck by the peculiar shape and appearance of the chromosomes in this mitosis; the latter especially described them as agreeing in all particulars with Flemming's account of heterotypical mitosis. Finally Farmer (1895), in speaking of the pollen-mother-cell of *Lilium Martagon*, refers to structures which can be explained only as early stages in tetrad formation: "Die Form der Chromosomen ist sehr unregelmässig, zuweilen erscheinen sie als Bänder, oft als Ringe mit einer oder zwei Protuberanzen, letzteres tritt namentlich in etwas späteren Stadien auf. Ich habe viele Zeit geopfert, mit dem Versuch zu einer festen Entscheidung darüber zu kommen, ob die Ringähnliche Form wirklich primitiv vorhanden oder einer inneren Spaltung zuzuschreiben ist, die das Chromosom noch nicht vollständig getheilt hat. Ich neige stark zu letzterer Annahme und betrachte desshald die Ringform, wo sie verkommt als ein frühes Anzeichen der Langstheilung des Chromosoms" (p. 58). Again he says: "Es braucht kaum bemerkt zu werden, dass diese heterotype Form der Mitose auf die Pollenmutterzellentheilungen sich beschränkt und sich weder in den vegetativen, noch in den früheren Archesporialen Theilungen derselben Pflanze findet" (p. 64). And finally: "Was die zweite Kerntheilung in Pollenmutterkorn betrifft, so zeigt sie gar nichts von den eigenthümlichen (heterotypischen) Vorgänge, welche die erste Mitose characterisiren, sie weicht nur durch die behaltene reducirte Chromosomenzahl von einer vegetativen oder eine frühen Archesporialen Kerntheilung ab. Es ist daher wahrscheinlich, dass die der ersten Theilung besonderen eigenthumlichkeiten mit der plötzlichen Chromosomenzahlveränderung in einer directen und causalen Beziehung stehen" (p. 67).

The still later work of Miss Sargant ('95), on the chromosome of the pollen-mother-cell of *Lilium Martagon*, shows that a transverse division of the chromosomes probably takes place. She does not mention the formation of rings which were described by Farmer as preceding the nuclear plate stage, nor does she mention tetrads. But as Wilson first pointed out ('96 p. 197), her description of the dividing chromosomes give strong reason to believe that these structures are to be interpreted as tetrads.

The fact that so many observers have described phases which suggest more or less clearly the formation of tetrads in different groups of plants, together with my own observations on the ferns, render it probable that further study will show the reduction of chromosomes through tetrad formation to be a phenomenon of as wide occurrence among plants as it is already known to be among animals.

SUMMARY.

1. The spore maturation in Pteridophytes agrees step by step with the maturation of sexual cells in animals.

2. As in animal maturation, the process of spore-formation can be divided into three periods of division, growth and maturation. The *division-period* is the interval between the archesporium and the sixteen-cell stage of the sporangium. The *growth-period* is the interval during which the sixteen cells enlarge and tetrads are formed. The *maturation-period* includes the two successive divisions of the nuclei in the sixteen-cell stage, and the formation of the spores.

3. Different terms are used to designate the cells in the different stages of maturation. Those of the "division-period" are known as the "*archesporial cells*." Those of the "growth-period" have hitherto been known as the "spore-mother-cells." The term "spore-mother-cell" is, however, inaccurate and clumsy, and I suggest the term *primary sporocyte* in its place, also *secondary sporocyte* for the daughter-cells of the primary sporocyte. These are the mother-cells of the spores and by their subsequent division the sixty-four spores are formed.

4. The "growth-period" is the most important stage in maturation. It begins with a distinct enlargement of the cell. The chromatin then forms a delicate moniliform spireme before the nucleolus has disappeared. A much thicker spireme is subsequently formed from the moniliform thread. The thickened spireme then splits longitudinally. It next breaks up into half as many double spireme-segments as there are chromosomes in the somatic cells; each of these double elements forms a tetrad.

5. Three types of tetrad-formation are found in each nucleus. These may be called the "rod type," the "ring type" and the "cross type." In the first type the halves of the double spireme segment are completely separated; in the second, the halves become separated in the center but remain connected at the ends; in the third type the halves become separated at the ends but remain connected at the centre.

6. In all three types the tetrads are finally formed by a transverse division of the halves of the double spireme-segment, giving reduction in the Weismann sense.

7. These methods of tetrad-formation have no significance in themselves so long as a common result is obtained. They may be considered as modifications of the same process.

COLUMBIA UNIVERSITY, DEPARTMENT OF BOTANY,
February 8, 1897.

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Description of Plates 295, 296.

Figures 1–18 are stages in *Pteris*; figures 19–21 are *Adiantum*; all figures are drawn with a Zeiss Camera lucida.

Fig. 1. Early sporocytes in the resting stage subsequent to the last division of the archesporial cells. × 1800.

Fig. 2. Primary sporocyte after growth. Chromatin arranged in a delicate, single, moniliform spireme, nucleolus persistent. × 1800.

Fig. 3. Primary sporocyte with thickened and concentrated spireme. The end (x) is double. × 1800.

Fig. 4. Primary sporocyte showing different stages in tetrad formation. C-ring forms. × 1800.

Fig. 5. Primary sporocyte; portion of nucleus showing stages in tetrad formation. A-double spireme segment; C-ring forms; X-divergent forms. × 2300.

Fig. 6. Various types of tetrad formation; A, B, C, F, G, H, K, L, show the "cross type," D and E the "rod type," I and J the "ring type." × 3600.

Fig. 7. Primary sporocyte with finished tetrads. × 1800.

Fig. 8. Primary sporocyte showing spindle fibres, loss of nuclear membrane, and distribution of the tetrads. × 2300.

Fig. 9. Primary sporocyte section showing fewer tetrads and the arrangement on the spindle fibres. × 2300.

Fig. 10. Primary sporocyte, a prophase showing concentration of the tetrads into the nuclear plate. × 2300.

Fig. 11. Primary sporocyte; metaphase showing completed spindle. C-centrosome. × 2300.

Fig. 12. Primary sporocyte, anaphase showing division of tetrads into dyads. D-dyads. C-centrosome. × 1800.

Fig. 13. Secondary sporocyte; metaphase showing arrangement of elongate dyads in the nuclear plate. C-centrosome. × 1800.

Fig. 14. Late anaphase of the division of the secondary sporocyte showing the four nuclei free in the cell, with connecting spindle fibres. × 2300.

Fig. 15. Early spores. The cell plates have formed; remnants of the spindle fibres can still be seen. × 1800.

Fig. 16. Young spore. Nucleoli have reappeared. × 1800.

Fig. 17. Primary archesporium; a few of the chromosomes during the early stage of division. They are distinctly double. × 2300.

Fig. 18. Somatic cell from a young fern plant, in division. × 2300.

Fig. 19. Primary sporocyte (*Adiantum*) showing formation of tetrads. C-ring form. A-cross form. × 2300.

Fig. 20. Primary sporocyte showing division of tetrads into the nuclear plate. C-ring forms. × 2300.

Fig. 21. Primary sporocyte showing division of the tetrads to form dyads. (D). × 2300.

Notes on the Influence of Light on certain dorsiventral Organs.

By Katharine Cleveland Burnett.

(Plate 297.)

The influence of light on morphology and anatomy of dorsi-ventral organs comprises a most important part of plant physiology. It is necessary therefore to explain that the work set forth in this paper is of a very limited character, owing to the short time available in a laboratory course, so that the subject should be limited to the study of the influence of light on the morphology and anatomy of dorsi-ventral organs of two plants studied during the months of March, April and May.

The influence of light on a plant may be negatively studied by watching its behavior when deprived of light. The results of this deprivation are morphological, anatomical and physiological, and are known as the phenomena of etiolation.

Some of these results are well known and prominent, many are exceptional and disputed.

As a general thing, we notice morphologically the lengthening of the internodes and the smallness of dorsi-ventral leaves; also, that the leaves make a very small angle with the stem.

Studied from an anatomical point of view, the vascular and thick-walled tissues are found to be much less developed in the internodes, and no differentiation of palisade and spongy tissue is found in the leaves; this is almost a physiological point, being connected with the non-formation of green chlorophyll pigment. A green plant deprived of light forms no green chlorophyll pigment and even loses that which it already has formed.

It has been stated by various authorities that a dorsi-ventral leaf owes its differentiation of palisade and spongy tissue entirely to the influence of light, and *that* for a distinct purpose. According to Vines,* "palisade layers occur always beneath the epidermis of those surfaces which are directly exposed to the sun's rays. If a plant be grown in the shade the palisade layers are imperfectly differentiated even if they can be detected at all. Development of palisade layers is clearly a peculiarity of leaves which are exposed to sunlight. Bright light promotes assimilation and oxida-

* Vines. A Students' Text-Book of Botany, 686–687.

tion and decomposition of chlorophyll. Palisade tissue affords protection from the latter effect. When there is diffuse daylight the chlorophyll corpuscles are arranged horizontally along the upper surface of the cells. In direct sunlight they are vertical. The elongated form of the palisade tissue facilitates this withdrawal. The spongy tissue is especially adapted to transpiration, so in submerged water plants we find no palisade nor spongy tissue. First, the light is not intense. Second, they do not transpire."

Furthermore, MacDougal, in his *Experimental Plant Physiology*,* says that if young leaves of beech be turned so that the morphological under surface becomes the upper, the palisade will be found on what was originally the under surface.

The following investigations were made for the purpose of verifying these statements, and, furthermore, to see if the tissues of the leaf could be changed after the anatomical differentiation had taken place, that is, after the palisade tissue had formed could the leaf then be turned and palisade tissue be formed on the side now exposed to light.

The plant experimented with was the *Salix alba*. Young twigs were obtained April 17th with buds ½ cm. long, slightly swollen but still covered with scales, the leaves, therefore, were not exposed directly to the influence of sunlight (a).

On cross-sectioning a bud the tissue of the leaves showed regularly arranged parenchymatic tissue with no differentiation of palisade or spongy (b).

The twigs were put in water, some in the dark and some exposed to light, to see whether the willow showed any exceptions to the ordinary facts of the etiolation. Ten days later, April 27th, the willow grown in darkness showed well marked etiolation. The terminal bud had grown 3½ cm., being now 4 cm. long, the the lateral buds only from 1–2 cm. The internodes varied in length from ¼ cm. to 1 cm. The leaves were small, from ½ to ¾ cm. in length; they made a small angle with the stem and had no green chlorophyll pigment.

On cross-sectioning, the anatomy had changed but little from that of the bud studied ten days earlier. There was a very slight

* Pp. 73–74.

lengthening, vertically, of the first layer of cells under the epidermis of the upper surface, but no further differentiation, merely a growth in size and number of cells.

The bud grown in light had developed in six days (April 23) as follows: (c) The entire bud had lengthened, being now 1 1/4 cm.; all but one scale had fallen off. The outer, lower leaf was 3/4 cm. long and of a delicate green color, the leaves showed no sign of hyponasty, but were closely folded around the stem. The bud was then cross sectioned to see the anatomical changes, if such had occurred. The outer lower leaf showed a slight indication of palisade tissue by the lengthening of the first row of cells under the upper epidermis (d.) This surface had not been exposed to direct rays of light, the under surface directly exposed to light showed no sign of palisade tissue. These facts indicate that the formation of palisade tissue is the result of an inherent quality of the leaf, only assisted and not induced by light.

An inner, upper leaf of the bud, still enclosed by the outer leaves on the cross section, showed no differentiation of palisade and spongy tissue.

On April 27th, on examining the bud grown in light, we find a different morphology and far greater anatomical changes than in the etiolated bud grown the same length of time. The bud is 1 1/2 cm. long, the outer lower leaf 1 cm. long, large leaf and short internodes as opposed to small leaves and long internodes of the etiolated bud examined. This outer leaf forms a small angle with its stem for 3/4 of its length when its upper surface has grown very rapidly, so that the remaining 1/4 of the blade makes an angle of 90° with the stem, so that this part of the surface receives direct rays from the sun. This leaf is bright green. On examination by cross sectioning we see decided development; a well formed layer of palisade tissue under upper epidermis, spongy tissues on under surface, many stomata and large air spaces.

On April 30th, after two weeks' growth, the leaves are opening still further. The outer lower leaf, corresponding to the leaf studied, April 27th, makes an angle of 45°, half its length from the base and the rest of the way an angle of 90°. The second leaf just above is at an angle of 45° throughout its entire length. The other leaves are still folded about the stem. The anatomical differences are slight. The lower leaf shows no change. The one above it (f) just showing hyponasty is forming palisade and spongy tissues, and corresponds in its anatomy to the outer leaf studied April 27th. The next leaf, still folded on the bud, (g) shows a layer of palisade tissue and a slight formation of spongy tissue.

To sum up: in all these cases examined, the leaves, whose upper surfaces were appressed against the stem and so had in no case been directly exposed to light, showed beginning of formation of palisade tissue. The under surface being at this same time exposed to direct rays of sunlight, formed no palisade tissue whatever. Therefore, the results of these observations show that the general statements made regarding change in form of tissues in young leaf do not always hold true, as the palisade tissue is already formed on morphological upper surface before it has been exposed to direct sunlight and before the leaf can be turned.

There remains now the second consideration, namely, to see if, after the leaf has been turned, the tissues can be changed.

Two methods for experimenting were adopted. In the first the bud was tied April 30th, so that the leaf could not turn its upper surface to the light (h). On May 6th, six days later, on cross sectioning this leaf, the upper surface showed two well formed layers of palisade tissue (i). On the morphological under surface exposed to light, two rows of palisade tissue were formed, but not directly under the epidermis, the layer immediately under the epidermis being ordinarily formed cells with intercellular spaces. Another leaf, grown normally, was examined the same day, May 6th, and was found to be typical, that is with two rows of palisade tissue on upper surface and very loose spongy tissue on under surface.

The second method adopted was to turn the leaf over on its petiole so that the morphological under surface becomes the upper, and fasten the leaf with a split match. Owing to the leaf having been disturbed at various times, the result was not very successful. On examination the morphological upper surface turned away from the light still showed two rows of palisade tissue, but the cells have intercellular spaces as though taking on the nature of spongy tissue. The under surface now exposed to light shows tissue with less indication of intercellular spaces, but the cells are not lengthening in palisade form. This latter was not a fair test, as the plant had not been properly cared for. The results obtained in the tied leaf were more satisfactory, indicating that palisade tissue already formed could not be changed, but that the parenchymatic tissue of the under surface, if exposed to light for a long time, would take on the palisade characteristics for the protection of the leaf from too intense light.

The *Lunularia*, being a plant whose dorsi-ventrality is marked by its structural peculiarities, was next investigated.

It may be well to speak briefly of its normal structure.* Campbell describes it thus: "The thallus is made up largely of parenchyma. The dorsal part occupied by a single layer of definite air chambers opening at the surface by a single pore, seen from the surface they form a network. The thallus is fastened by unicellular rhizoids from the dorsal surface. One of the methods of asexual reproduction is by the so-called gemmae. These gemmae are produced in special receptacles upon the *dorsal* side of the thallus, and are crescent-shaped in *Lunularia*. These cups are specially developed air chambers, which open. The gemmae arise from the bottom as papillate hairs; one papilla projects, and a wall is formed, separating this projection from the surface of the cup; this outer cell is again divided by horizontal walls until four are formed. Each of these four primary cells is divided by a vertical wall, the young thallus being but one layer in thickness (k, l, m, n, o.), but later walls appear in the central cells parallel to the surface, so it is lenticular. As it grows older, two growing points are established and lie in a depression so the older gemma is fiddle-shaped. The gemma is vertical, therefore has no distinction of dorsum and ventrum. The further development depends upon light. Whichever side touches the ground develops rhizoids; as soon as it becomes fastened to the ground the dorsiventrality is established."† Sachs says: "Certain cells on both convex sides are destined, according to circumstances, to grow out into root hairs; if both surfaces are equally illuminated, those grow which are able to follow influence of gravity. Zimmerman says influence of light is stronger, as if lower surface is illuminated

* Mosses and Ferns, 45–46.

† Physiology of Plants, 526.

the roots of shaded side develop." Pfeffer suggested it was partly due to action of gravity and effect of contact with substratum, but chiefly to influence of light.

The *Lunularia* (k, l, m, n, o.) in the laboratory had well developed gemmae cups 1/4 cm. in the long diameter, in which were gemmae in all stages of development, from four-celled up to detached gemmae of plates of several layers. These last were the characteristic fiddle shape and were .45 to .5 mm. in size. Several dozens of these tiny gemmae were planted in moist earth March 2d. Three days later (March 5th), tiny rhizoids .1 mm. long had grown on surface touching the earth, the gemmae had grown to .97 by 0.5 mm. in length and breadth.

Several were then *turned* so that the upper side now became the side touching the earth, and allowed to grow four days, from March 5th to 9th. On examination long rhizoids 1 to 1.05 mm. in length had grown on what had been the upper surface, so we had the curious phenomenon of a gemmae with rhizoids on both surfaces. (p.a. q.b.)

We next tried to find at what stage of development the anatomical characteristics become permanent, so that no change can be induced by change in position.

Gemmae grown six days and having formed long rhizoids from 1 to 2 mm., on being turned, did not develop rhizoids on the dorsal surface.

Full grown thallus, with tips turned, produced no result, so that the conclusion here is that, though dorsi-ventrality can be induced by light and other accessory assistants, yet, after a certain development of the thallus, and that early in its history, the dorsi-ventrality becomes permanent and turning produces no change.

Explanation of Plate 297.

a. Young twig of willow, buds still covered with scales, × 3/4.

b. Cross section of a leaf from one of the buds, × 90.

c. Bud with leaves still folded, × 1 1/2.

d. Section of outside leaf showing first indication of palisade tissue, circa × 190.

e. Bud unfolding showing leaves 1, 2, 3, × 1 1/2.

f. Cross section of leaf 2, showing palisade tissue, circa × 190.

g. Cross section of leaf 3, showing palisade tissue, circa × 190.

h. Leaf tied so under surface is exposed to light, × 1 1/2.

i. Cross section showing palisade tissue on both under and upper surfaces, circa × 190.

k. Thallus of *Lunularia* with gemmae cups, $\times 2\frac{1}{4}$.

l, m, n, o. Stages in development of gemmae, circa $\times 50$.

p. a.
q. b. Gemmae with rhizoids aa. bb. grown on both ends, circa $\times 30$.

A new fossil Grass from Staten Island.

BY ARTHUR HOLLICK.

(PLATE 298.)

PHRAGMITES AQUEHONGENSIS n. sp.

Culms round, narrowly striate longitudinally, articulate, occasionally dotted with one or more circular scars immediately above the articulations; internodes short; rhizomes tuberous, branching, consisting of irregularly rounded, articulated parts, which are longer than broad, with knots or scars either at the joints or between them; leaves wanting.

Locality: Clifton, Staten Island, N. Y.

The first discovery of specimens representing this species was made in 1894, but these merely consisted of a few fragments of jointed stems and I referred them at the time to *Equisetum*.*

Subsequently better specimens were obtained, consisting not only of jointed stems, but also of tuberous rhizomes, and their affinity with the monocotyledons was then satisfactorily established.†

The generic name *Phragmites* has been finally adopted largely for the reason that similar fossil fragmentary remains have been described and figured under that genus, and not necessarily because our specimens are supposed to belong in it without question, although they certainly represent some grass. The specific name is coined from "Aquehonga," the Indian name for Staten Island.

The specimens figured are fairly representative of the material collected. They consist of fragments of culms and rhizomes, preserved in a conglomerate of yellow gravel, cemented with limonite.

This conglomerate is not in place where found, but forms part of the drift material, beneath the bowlder till, on the extreme southern edge of the terminal moraine. It was uncovered by reason of an excavation having been made there for building sand

* Proc. Nat. Sci. Assn. Staten Isld. 4: 37.

† Ibid. 6: 12.

and is associated with "kaolin" and white plastic clay, presumably of Cretaceous age; yellow gravel and sand, representing probably a recent Tertiary horizon and water-worn fragments of serpentine rock. These materials form a sort of hummock, beneath and distinct from the typical red bowlder till on top and afford every evidence of having been carried forward by the advancing glacier of the Ice Age, which, upon melting, deposited on top the debris which we call the bowlder till.*

The conglomerate, with its included fragments of vegetation, is, therefore, certainly pre-glacial in age. The direction of glacial movement on Staten Island was from the northwest, and as a line from the locality in question towards this point of the compass would cross the serpentine and limonite area of the Island we would naturally infer that it was from there that the conglomerate was derived. Throughout this area there are numerous deposits of limonite, associated with yellow gravel under favorable conditions, occupying basin-like depressions in the serpentine and evidently representing old swamps, around or in which a semi-aquatic vegetation flourished, prior to the advent of the Ice Age. Furthermore, as no such combination of yellow gravel, limonite and serpentine is known to occur elsewhere on the line of glacial movement, towards the locality where the conglomerate was found, we are justified in inferring that our specimens are native to Staten Island.

The problem of the exact geologic age of the yellow gravel conglomerate and, therefore, of the vegetation contained in it, has not been completely solved. Upon stratigraphic grounds Professor R. D. Salisbury decided it to belong to his Beacon Hill formation, which he classes as Miocene Tertiary in age.† It is, therefore, of interest to ascertain how the evidence afforded by fossil plants compares with this conclusion.

Grasses, as fossils are comparatively rare, and are not definitely known prior to the Tertiary period, although monocotyledons under the generic names of *Poacites*, *Bambusium*, *Culmites*, *Arundo* and

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*For the geological features of the locality see description in Proc. Nat. Sci. Anss. Staten Isld. 2: 8; 3: 8; 3: 45-47, and Trans. N. Y. Acad. Sci. 11: 104; 14: 15, *fig.* 4.

† Ann. Rept. State Geol., N. J., 1894, 100; 1895, 3.

Phragmites, have been described from Cretaceous and even older horizons, but fossils which can be unquestionably referred to the grasses can hardly be said to date back beyond the Eocene Tertiary.*

The figures with which ours may be most closely compared are of species from either Eocene or Miocene strata in the Old World or Greenland, included under the genera *Phragmites* † and *Arundo*.‡ I do not know of any having been heretofore described from the eastern United States, although broad grass-like leaves, which I am inclined to refer to *Phragmites*, occur in the yellow gravel sandstone at Bridgeton, N. J., as previously noted by me.§

The flora of the Bridgeton sandstone is almost certainly Miocene or early Pliocene in age, and we may safely refer our species to about the same horizon. It is greatly to be desired that leaves should be found in connection with the Staten Island specimens and that culms and rhizomes be found at Bridgeton. Should such discoveries be made, a more exact comparison between the two floras would be possible.

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*For a general discussion of this subject see "Fossil Grasses," J. Starkie Gardner, Proc. Geologists Assn. 9: No. 6, in which copious references may be found.

†*P. Oeningensis* Al. Braun.

Heer. Fl. Tert. Helvet. 1: 64. *pl. 22, figs. 5a–e; 24; 27, fig. 2b; 29, fig. 8e.*

Ludwig, Palæontog. 8: 80. *pl. 16, figs. 1–1c; 18, figs. 2–2i; 24, fig. 7.*

Ettingsh. Fl. Bilin, 97 [21] *pl. 4. figs. 6–10.*

‡*A.* (*Donax*) *Goepperti* (Münst.) Heer, Fl. Tert. Helvet. 1: 62. *pl. 22. figs. 3a, b; 23.*

Ettingsh. Fl. Bilin, 95 [19] *pl 4. figs. 1–4.*

Ludwig, Palæontog. 8: 80. *pl. 17.*

A. anomala (Brong.) Heer, Fl. Tert. Helvet. 1: 63. *pl. 22, fig. 4.*

§Bull. Torrey Bot. Club, 19: 330–333.

New Species of Fungi from various Localities.

By J. B. Ellis and B. M. Everhart.

HYMENOMYCETES.

Polystictus obesus E. & E.

On the ground, in contact with, and partly attached to decaying pine limbs partly buried in the soil, Newfield, N. J., and Fairmount Park, Philadelphia, Pa.

Stipitate. Stipe central, spongy, velutinous, dark cinnamon, 4–6 cm. high, ½–1½ cm. thick above, enlarged below to 1–3 cm.; pileus convex then depressed in the center, obconical at first with the margin obtuse, then spreading out with margin acute, color lighter than that of the stipe, yellowish-cinnamon, surface uneven, velutinous, sub-colliculose, not zonate, 4–6 cm. across; pores irregular, short (1 mm.), at first round with margins thick, finally irregular and subsinuous, ½–1 mm. across, margins acute; spores elliptical, ferruginous, $7–8 \times 4–5\mu$.

This might, perhaps, be considered a thick-fleshed form of *Polystictus perennis* (L.). The tomentose-velutinous covering of the pileus and stipe is the same as that of *Mucronoporus tomentosus* (Fr.), but the hymenium is unarmed.

Corticium portentosum crystallophorum E. & E.

On bark of dead trees or logs, St. Martinville, La., December, 1895. (Langlois, no. 2438.)

Closely adnate, roughened by the inequalities of the bark, cream-color, about ½ mm. thick, in parts, stratose, tough, coriaceous, margin determinate, texture of densely and closely interwoven fibrils, enclosing abundant coarse amorphous crystals, confluent for 10 cm. or more, and 4–6 cm. wide; margin here and there obscurely and briefly subfimbriate. Has the general appearance of *C. leve* Pers.

Differs from the type in the abundant amorphous crystals.

Cyathus rufipes E. & E.

Underside of old sods, in a plowed field, Rooks Co., Kansas, July, 1893 (E. Bartholomew).

Peridium slender-obconical, about 1 cm. high and 4 mm. wide, thin, dark lead color and smooth inside (not striate above, covered outside with a coarse tow-colored strigose-tomentose coat, and with a tuft of reddish-brown tomentum at the base, margin connivent, uneven; sporangiola discoid, 1 ¼ mm. in diameter, becoming dark, concave and wrinkled when dry, the surface overrun with slender (3 μ thick) brown interwoven threads. Spores globose or elliptical, 20–27 × 15–20μ.

Growing (sec. Mr. B.) "head downward." Distinguished by its slender growth, large spores, and the tuft of reddish-brown tomentum at the base.

Meliola acervata E & E.

On leaves of *Physalis Peruviana*, Kaui (S. I.). 1895. (A. A. Heller, no. 2773.)

Epiphyllous. Perithecia globose, 150–200 in diameter, of coarse cellular structure and like the mycelium unarmed, collected in little heaps or dense clusters 1 mm. in diameter or less, and fringed with abundant brown branching mycelium of the usual type; capitate hyphopodia alternate, obovate, 12–14 × 8–10 μ; mucronate hyphopodia less abundant, smaller, ovate, opposite, with a slender straight beak 6–8 μ long; asci oval, short-stipitate, 40 × 20 μ, 2–4-spored; sporidia oblong-cylindrical, obtuse, 4-septate, scarcely constricted, 30–35 × 12 μ.

Asterina sphaerelloides E. & E.

On leaves of *Clematis persicaefolia*, Sandwich Islands, 1895. (Heller, no. 2394.)

Mycelium reticulated, brown, forming small black suborbicular spots (1 mm. diameter), often subconfluent; perithecia seated on the mycelium, black, ovate-globose, papillate, 80–90 μ in diameter; asci oblong, sessile, aparaphysate, 30–35 × 10–12 μ; sporidia irregularly biseriate, pyriform, uniseptate, brown, not constricted, 10–12 × 3–3½ μ.

There was also an immature *Meliola* on the same leaves.

Rosellinia confertissima E. & E.

On rotten wood, Ohio. (Morgan, no. 1173.)

Perithecia superficial, densely gregarious, globose, 350–500 μ in diameter, thin-walled and brittle, farinose-pubescent, becoming nearly glabrous; ostiolum prominent, mammiform; sporidia elliptical, 8–10 × 4 μ, continuous, brown.

Rosellinia macra E. &. E.

On leaves of some monocotyledonous plant, Florida. (Morgan no. 1134.)

Perithecia gregarious, superficial, convex-flattened, $\frac{1}{4}$–$\frac{1}{3}$ mm. in diameter, not polished, ostiolum papilliform, minute; asci (in the specimens examined) not seen; sporidia oblong-elliptical, brown, subacute, 20–30 × 10–12 μ, some of them with a paler streak across the middle but not truly septate.

Differs from *R. sublimata* Dur. & Mont. in its much smaller thinner perithecia, and from *R. hemispherica* Sacc. & Paol. and *R. amblistoma* Berl. & Sacc. in its much smaller spores. Perithecia almost as in *Microthyrium.*

Ceratostoma biparasiticum E. & E.

On the stipe of *Isaria farinosa* (Dicks.) Fr. Ohio (Lloyd).

Perithecia ovate, 80–100 μ in diameter, enveloped in a white mucedinous subiculum of loosely interwoven hyaline threads about 3 μ thick, enveloping the lower part of the *Isaria* stipe, and bearing subglobose hyaline conidia 2 × 1$\frac{1}{2}$ μ; asci clavate-lanceolate, p. sp. 20 × 6 μ, short-stipitate (paraphysate?); sporidia fasciculate, 8 in an ascus, oblong-cylindrical, olivaceous, 6–2 × 1$\frac{1}{2}$ μ. The beak of the perithecium is of a grayish-brown, of fibrous structure and about 1 mm. long × 35–40 μ thick.

Teichospora Nepetae E. & E.

On dead stems of *Nepeta Cataria*, Granton, Ontario, Canada, August, 1895. (J. Dearness, no. 2351.)

Perithecia scattered, superficial, depressed, 220–250 μ in diameter, collapsing; ostiolum papilliform, distinct; asci clavate-cylindrical, nearly sessile, gradually narrowed downward, 70–80 × 12–15 μ; paraphyses linear, stout, 2–2$\frac{1}{2}$ μ thick; sporidia biseriate, clavate-oblong, slightly curved, 5–7-(mostly 6-)septate, sometimes strongly constricted in the middle, 20–22 × 6–7 μ (exceptionally reaching 25 × 10 μ), yellow-brown, one or two cells divided by a longitudinal septum.

Closely allied to *Teichospora vitalbae* De Not. but that (sec. Berlese) has perithecia 300–350 μ in diameter, and asci cylindrical, 120–130 × 11–13 μ. *T. clavispora* E. & E. has rather larger (250–300 μ) perithecia, not collapsing, and longer 8–10-septate sporidia.

Cucurbitaria Astragali E. & E.

On dead stems of *Astragalus* sp., Rooks county, Kansas. August, 1895. (E. Bartholomew, no. 1894.)

Perithecia gregarious or crowded, erumpent-superficial, globose-hemispherical, minutely roughened, 500–650 μ in diameter, finally collapsing above; ostiolum black, conic-papilliform; asci clavate-cylindrical, stipitate, paraphysate, $85–100 \times 9–10 \mu$; sporidia overlapping, uniseriate, oblong-fusoid, sub-acute below, obtuse above, 3-septate, slightly constricted at the middle septum, hyaline at first, then pale yellow, generally with one cell (sometimes two cells) divided by a longitudinal septum, $15–20 \times 6–8 \mu$; stylospores in similar perithecia, oblong-elliptical, uniseptate, scarcely constricted, nearly hyaline, $6–8 \times 3–3\frac{1}{2} \mu$.

Melanomma cupulata E. & E.

On decorticated *Salix*, Mt. Paddo, Wash., alt. 7000 ft. (Suksdorf, no. 484.)

Perithecia scattered or gregarious, superficial, brownish-black, membranous, clothed with short ($20–40 \times 2 \mu$) continuous spreading subundulate brown hairs, finally collapsing to cup-shaped, with a papilliform ostiolum. Where the perithecia stand close together the surface of the wood is often covered with a felt-like olive-black subiculum, formed of branching brown closely septate hyphae; asci clavate-cylindrical, $45–60 \times 8 \mu$, with indistinct paraphyses; sporidia biseriate, oblong-fusoid, pale brown, 3-septate, not constricted, $10–12 \times 3\frac{1}{2}–4 \mu$.

Closely allied to *C. pilosella* Karst., but perithecia collapsing and asci and sporidia somewhat smaller.

Lophiotrema Fraxini E. & E.

On decorticated *Fraxinus viridis*, Rooks Co., Kansas, March 30, 1896. (Bartholomew, no. 2101.)

Perithecia scattered or gregarious, semi-emergent, depressed-spherical, brown, 400–500 μ in diameter; ostiolum variable, papilliform, compressed-conical, or extending $\frac{1}{3}$ across the perithecium; asci clavate-cylindrical, $85–90 \times 10 \mu$; sporidia biseriate, fusoid, acuminate, hyaline, 5- or more nucleate, becoming 3- or more septate, scarcely constricted, $35–42 \times 4\frac{1}{2}–6 \mu$, mostly about 5 μ thick.

L. Fontanesiae Pass. and *L. Coryli* H. Fabre have sporidia about the same as this, but differ otherwise.

Lophiotrema Oenotherae E. & E.

On dead stems of *Oenothera biennis*, Newfield, N. J., Aug., 1895.

Perithecia subgregarious or scattered, erumpent-superficial, minute (about $\frac{1}{4}$ mm.), ovate-globose, with a narrow, but prominent, compressed ostiolum; asci clavate, 45–55 × 7 μ, paraphysate; sporidia biseriate or oblique, oblong-fusoid, 4-nucleate, becoming faintly 3-septate and slightly constricted in the middle, hyaline subobtuse, straight or slightly curved, 12–13 × 3–3½ μ.

LOPHIDIUM TRIFIDUM E. & E.

On decorticated *Salix*, Mt. Paddo, Wash., alt. 7000 ft. (Suksdorf, no. 483.)

Perithecia gregarious, ovate-conic, about 1 mm. in diameter the broad base lightly sunk in the wood, mostly with an acutely elliptical depression at the top, in the center of which is the narrow, inconspicuous ostiolum. When old and empty, the perithecia open above with three broad laciniae; asci cylindrical, 130–150 × 12 μ, including the short stipe; sporidia uniseriate, oblong-elliptical, 5-septate, with one or more cells divided by a longitudinal septum, slightly constricted in the middle, 20–23 × 12 μ.

Comes near *C. Populi* H. Fabre.

LOPHIDIUM RUDE E. & E.

On weather-beaten cottonwood shingle, Smith Co., Kansas, April, 1896. (Bartholomew, no. 2102.)

Perithecia scattered or gregarious, semi-emergent, subglobose, brown, not polished, ½–¾ mm. in diameter; ostiolum short-cylindrical, only slightly compressed; asci cylindrical, 8-spored, paraphysate, p. sp. 75–80 × 12–14 μ; sporidia uniseriate, oblong-elliptical or oblong-cylindrical, brown, 4–8-septate, not constricted, obtuse, with a longitudinal septum, more or less distinct, running through two or more of the cells, 22–35 × 8–12 μ.

Many of the sporidia show no longitudinal septum.

LAESTADIA RUBICOLA E. & E.

On dead stems of *Rubus strigosus*, Granton, Ontario, Canada, Aug., 1895. (J. Dearness, no. 2353.)

Perithecia thickly scattered, subcuticular, depressed-hemispherical, collapsing, and by the falling away of the papilliform ostiolum, broadly perforated above; asci clavate-cylindrical, stipitate, 60 × 7–8 μ, (p. sp.), narrowed and acute above and below; paraphyses obscure, shorter than the asci; sporidia biseriate, oblong-elliptical, hyaline, 2-nucleate, ends obtusely rounded, 12–14 × 5–6 μ.

LAESTADIA SCROPHULARIA E. & E.

On dead stems of *Scrophularia*, London, Canada, August, 1895. (J. Dearness, no. 2342.)

Perithecia scattered, subcuticular, 100–130 μ in diameter, visible through the epidermis which is slightly raised; asci clavate-cylindrical, 35–40 (p. sp. 25–30) × 6–7 μ; sporidia biseriate, oblong, obtuse, nucleate, continuous, hyaline, 9–12 × 3 = 3–3½ μ.

In *L. Epilobii* Wallr., the perithecia collapse and the sporidia are larger (13–17 × 3–4 μ).

DIDYMOSPHAERIA MAJOR E. & E.

On decorticated wood of *Rhus glabra*, Rooks Co., Kansas, September, 1895. (Bartholomew, no. 1934.)

Gregarious, covered by the blackened surface of the wood which is raised into pustules pierced by the papilliform ostiola; perithecia buried in the unchanged substance of the wood, about 300 μ in diameter; asci cylindrical, 90–105 × 10–12 μ, short-stipitate, paraphysate, 8-spored; sporidia uniseriate, mostly oblique, oblong-elliptical, uniseptate, slightly or not at all constricted, pale brown, obtuse, 12–18 × 7–8 μ.

Differs from *D. rhoina* E. & E. on the same host, in its larger asci and sporidia.

DIDYMOSPHAERIA RHOINA E & E.

On weather-beaten, decorticated limbs of *Rhus glabra*, Rooks Co., Kansas, September, 1895. (Bartholomew, no. 1935.)

Perithecia gregarious, covered, ovate-globose, 350–450 μ in diameter, with a conic-papilliform erumpent ostiolum; asci cylindrical, short-stipitate, paraphysate, 60–70 × 6 μ; sporidia uniseriate, elliptical, pale brown, scarcely constricted, 7–8 × 4–5 μ.

Differs from *D. conoidea* Nessl. in its rather smaller elliptical sporidia, and its rather smaller permanently covered perithecia.

PHYSALOSPORA SUBERUMPENS E. & E.

On bark of dead *Eucalyptus globulus*, California (McClatchie).

Perithecia gregarious, at first covered by the pustuliform-elevated epidermis, then semi-erumpent, white inside, ¼–⅓ mm. in diameter, the erumpent apex conic-hemispherical, crowned with the strongly papilliform or conic-papilliform ostiolum; asci broad, clavate-cylindrical, 80–100 × 18–20 μ; sporidia irregularly crowded, elliptical or ovate-elliptical, hyaline, 18–21 × 9–11 μ.

Accompanied by a *Sphaeropsis* in similar but rather larger perithecia, with oblong-elliptical brown sporules, 18–22 × 10–12 μ.

AMPHISPHAERIA SEPARANS E. & E.

On old cottonwood shingle, Smith Co., Kansas, April, 1896. (Bartholomew, no. 2104.)

Perithecia subgregarious, ovate-conical, grayish-brown, about ½ mm. in diameter, 1 mm. high, base slightly sunk in the wood; ostiolum stout, short-cylindrical, black, rough, obtuse; asci cylindrical, $110 \times 12\ \mu$, paraphysate, 8-spored; sporidia elliptical, narrowed at the ends, but obtuse, brown, uniseptate, deeply constricted and easily separating at the septum, $20–23 \times 9–11\ \mu$.

LEPTOSPHAERIA RHOINA E. & E.

On decorticated wood of *Rhus glabra*, Rooks Co., Kansas, Sept., 1895. (Bartholomew, no. 1933.)

Perithecia gregarious, buried in the surface of the weather-beaten wood which is raised into small pustules over them, globose or short-elliptical, $200–250\ \mu$ in diameter; ostiolum papilliform, erumpent; asci clavate-cylindrical, $60–70 \times 8–10\ \mu$, short-stipitate, paraphysate; sporidia biseriate, fusoid, slightly curved, 3–5- (mostly 5-) septate, constricted at the septa, yellow-brown, 16–22 (mostly 20) $\times$ 5–6½ μ.

Closely allied to *L. Baggei* (Awd. and Niessl.), which has rather larger perithecia, broader asci ($70–90 \times 16–20\ \mu$) and longer sporidia.

PLEOSPORA CRANDALLII E. & E.

On dead stems of *Androsace Chamaejasne*, above the timber line, Cameron Pass, Colo., alt. 12000 feet, July 6, 1894. (Prof. C. S. Crandall, no. 237.)

Perithecia scattered, semi-erumpent, obtusely conical, $200\ \mu$ in diameter, with a papilliform ostiolum; asci oblong, subsessile, with very short nodular stipe, $75–80 \times 20–22\ \mu$, with indistinct paraphyses; sporidia crowded, biseriate, oblong or slightly obovate-oblong, 5-septate, scarcely constricted, 2 or more of the cells divided by a longitudinal septum, $20–22 \times 10–12\ \mu$, ends obtusely rounded.

Differs from *P. media* Niessl. in its smaller conical perithecia not collapsing.

DILOPHIA MAGNOLIAE E. & E.

On dead limbs of *Magnolia Fraseri*, Nuttallberg, West Va., May 12, 1896. (L. W. Nuttall, no. 849.)

Perithecia in circinate clusters of 3–6, seated on the inner bark, ovate-globose, membranous, ½–¾ mm. in diameter, with the short cylindrical, subsulcate-cleft or smooth ostiola slightly erumpent in a rather loose fascicle; asci clavate-cylindrical, short-stipitate, $90–110 \times 8–10\ \mu$; paraphyses inconspicuous or none; sporidia biseriate, oblong-fusoid, hyaline, becoming 1-

(3-?) septate, 20–23 × 5–6 μ, slightly curved, with a slender hyaline bristle-like appendage 15–30 μ long at each end; stylospores in ovate-conical scattered erumpent perithecia, with sporules shaped like the ascospores, only smaller (14–16 × 4–5 μ) and lacking the bristle-like appendage. When the outer bark is stripped off, the perithecia either adhere to it or remain attached to the surface of the inner bark.

Diaporthe aorista E. & E.

On dead stems of *Solidago* sp., Newfield, N. J., July, 1896. (N. A. F. 3432.)

Perithecia scattered or gregarious, often 2–3 subconfluent, sometimes subseriately arranged, slightly sunk in the unaltered substance of the stem without any black circumscribing line, slightly raising the epidermis which is not discolored, or at most only slightly blackened where the perithecia stand close together, globose, small (300–350 μ); ostiola exserted, stout, roughish, conic-cylindrical, short; asci oblong-cylindrical, p. sp. 35–45 × 8 μ; sporidia biseriate, oblong, uniseptate, slightly constricted, 2–4-nucleate, obtuse, hyaline, 11–13 × 4–4½ μ.

Differs from *D. orthoceras* (Fr.) in its rather smaller, only slightly buried perithecia and broader sporidia. *D. exercitalis* Pk. also has narrower sporidia and distinctly seriate perithecia.

Diaporthe ligustrina E. & E.

On dead *Andromeda ligustrina*, Newfield, N. J., April, 1896.

Perithecia thickly scattered, buried in the unaltered substance of the bark, about ⅓ mm. in diameter; ostiola subconical, tuberculiform or subglobose, often seriate in longitudinal cracks in the bark, distinctly erumpent so as to appear like superficial perithecia; asci clavate-oblong, 50–60 × 8–10 μ; sporidia subbiseriate, fusoid at first but when mature obtusely rounded at the ends and constricted in the middle, about 10 × 4 μ or 9–11 × 3½–4½ μ.

Valsa socialis E & E.

On dead limbs of *Salix cordata*, Rooks Co., Kansas. (E. Bartholomew, no. 2099.)

Stromata circinate or gregarious, cortical, not circumscribed, small (1–2 mm.), raising the epidermis into small pustules often arranged in a circle around a central one; perithecia buried in the unaltered substance of the bark, ½ mm. in diameter, abruptly contracted into slender necks with the minute black ostiola at first covered by a pale white disk, but finally erumpent though not exserted; asci subcylindrical, about 60 × 6 μ (p. sp.); sporidia subbiseriate, allantoid, obtuse, moderately curved, hyaline, 12–16 × ½–3 μ; each of the small stromata contains 1–6 perithecia.

Valsa Celtidis E. & E.

On dead limbs of *Celtis occidentalis*, Rooks county, Kansas, March, 1896. (E. Bartholomew, no. 2082.)

Stroma cortical; perithecia circinate, immersed in the unaltered substance of the inner bark, ovate, with coarsely cellular membranous wall, about ½ mm. in diameter, with necks convergent and obscure ostiola united in an erumpent black disk; asci oblong-lanceolate, 40–50 × 13–15 μ; sporidia biseriate, oblong or oblong-elliptical, very slightly curved, 14–18 × 5–6 μ, ends rounded and obtuse; the perithecia occur in subconfluent groups of 12–20 and are often laterally collapsed; the young stromata are multicellular, orbicular and depressed, the cells filled with allantoid, hyaline spermatia, 5–6 × 1¼ μ, exuding in nearly black thick wax-like cirrhi.

Valsa Amorphae E. & E.

On dead limbs of *Amorpha fruticosa*, Rooks Co., Kansas, Feb., 1896. (E. Bartholomew, no. 2048.)

Perithecia circinate, 6–10 or more together, buried in the unchanged substance of the inner bark, ovate-globose, 300–350 μ in diameter, with coarsely cellular walls, often collapsing below when the bark is loosened; necks stout, cylindrical, convergent, their obtusely conical smooth black ostiola piercing the epidermis, and rising slightly above it, sometimes at first united in a black disk, which is soon obliterated; asci clavate-cylindrical, 75–80 × 10–12 μ, obscurely parayhysate, 8-spored, stipitate; sporidia subbiseriate, allantoid (often elliptical at first), hyaline, 10–18 × 3½–4½.

Possibly this might be considered a dwarf form of *Valsa dissepta* Fr., but all the specimens of that species in the different exsiccati have the perithecia and sporidia larger. This must not be confounded with *Eutypella Amorphae* E. & E. which is very distinct.

Eutypella Fici E. & E.

On dead limbs of *Ficus*, St. Martinville, La., March, 1896. (Langlois, no. 3443.)

Perithecia in subcircinate clusters of 4–6, depressed-globose, ¼–⅓ mm. in diameter, buried in the unaltered substance of the inner bark which is uniformly blackened on the surface, not penetrating to the wood or surrounded by any circumscribing line; ostiola short-cylindrical, 4-sulcate at the subacute tips, rising together in a close fascicle which pierces the epidermis, but rises only slightly above it; asci (p. sp.) clavate, 15–20 × 3½–4 μ; sporidia subbiseriate, yellowish, allantoid, curved, 3–3½ × 1 μ.

This might, perhaps, be considered a variety of *E. capillata* E. & E., but the habit is different and the perithecia smaller.

Calosphaeria acerina E. & E.

On dead limbs of maple, London, Canada, Sept., 1895. (Dearness, no. 2361.)

Perithecia subcuticular, circinate, 4–12, depressed-globose, thinly clothed with a gray villosity, black and shining inside, the inner substance of the wall white when cut through, inner cavity about 200 μ in diameter. Ostiola convergent and united in a minute disk which raises and finally perforates the epidermis, but projects but slightly above; asci clavate, p. sp. 35–40 × 6 μ; paraphyses 2–3 times as long as the asci; sporidia biseriate, allantoid, a little narrower at one end, only slightly curved, hyaline, 8–12 × 2–2½ μ. The ostiola are scarcely exserted.

Diatrype linearis E. & E.

On *Eucalyptus globulus*, California. (McClatchie.)

Stroma narrow, 2–6 mm. long, 1 mm. wide, sunk in the weather-beaten surface of the wood, erumpent but only slightly projecting, nearly flat above and bordered on each side by the raised fibers of the wood, acute at the ends and bearing considerable resemblance to *Glonium lineare*; perithecia 6–15, sunk in the stroma, globose, with rather thick coriaceous walls, 400–500 μ in diameter, dull white inside, roughened above by the slightly projecting papilliform or subconical ostiola; asci (p. sp.) about 60 × 7 μ or, including the filiform stipe, 120 μ long, paraphysate, 8-spored, sporidia subbiseriate above, allantoid, brownish, slightly curved, 7–10 × 2–2½ μ, mostly about 8 × 2½ μ.

Differing from *D. hochelagae* E. & E. in its narrower sunken stroma.

Melogramma horridum E. & E.

On dead beech, London, Canada. (Dearness, no. 2369.)

Stromata elongated, ½ cm. high, 2–3 mm. broad, densely caespitose-crowded and subconfluent, the surface colliculose, and roughened by the quadrisulcate stout spine-like ostiola like those of *Eutypa spinosa*, to which this bears outwardly a striking resemblance; perithecia ovate-globose, ⅓–½ mm. in diameter, with rather thin coriaceous walls, black and shining inside, sunk in the surface of the wood-colored stroma; asci cylindrical, 100–

110 × 10 μ (p. sp. 80–85 × 10 μ); sporidia uniseriate, elliptical, hyaline, 3-septate, each cell with 2 nuclei, hardly constricted, 14–16 × 7–8 μ, possibly becoming muriform.

NUMMULARIA ALBOSTICTA Ell. & Morgan.

On decaying hickory wood, Preston, Ohio. (Morgan, no. 1178.)

Stroma effused, thin, 1 mm. thick or a little over, 3–4 × 1 cm., mostly with a thin erect margin, slaty black, smooth, but dotted with the minute dirty-white punctiform ostiola; perithecia oblong, 1 × ¼–⅓ mm., crowded, asci cylindrical, 130 × 8–9 μ, stipitate, paraphysate; sporidia uniseriate, oblong-elliptical, subacute, pale at first, finally dark brown, 14–16 × 7–8 μ.

HOMOSTEGIA DIPLOCARPA E. & E.

On *Distichlis maritima*, Rooks Co., Kansas, Sept., 1895. (Bartholomew, no. 1923.)

Stroma subcuticular, black, convex, subelliptical, 1–2 mm. in diameter; ascigerous cells minute, subseriate, producing two kinds of stylospores: minute suballantoid hyaline 5–7 × 1½ μ; and cylindrical nucleate spores, becoming 3-septate, 14–23 × 4–4½ μ, hyaline, becoming subolivaceous.

CURREYA SANDICENSIS E. & E.

On living leaves of *Alphitonia ponderosa*, Sandwich Islands (Kaui), 1895. (A. A. Heller, no. 2758.)

Stromata hypophyllous, globose, 1–1¾ mm. in diameter, erumpent, grayish-black; ascigerous cells minute, globose, peripherical or subpolystichous, buried in the stroma which is dotted with the minute black punctiform erumpent ostiola; asci oblong-obovate, abruptly contracted below into a short stipe, 8-spored; sporidia irregularly crowded, cylindric-oblong, 3–5-septate, with one or two cells divided by a longitudinal septum, yellowish, 19–22 × 6–8 μ, not constricted.

The upper surface of the leaf opposite the strome is marked by a small, dark colored depression.

DISCOMYCETES.

PHIALEA AMPLA E. & E.

On decaying wood of *Salix*, Mt. Paddo, Wash. (Suksdorf, no. 493.)

Gregarious, stipitate, obconic, or clavate at first, at length expanding, 3–4 mm. in diameter, and shallow cup-shaped; disk lemon-yellow, outside paler, farinose-pubescent or minutely striate, margin involute and entire; stipe stout, 1–2 mm. long, generally, in the mature plant, less than the diameter of the cup; asci clavate cylindrical, $110 \times 6\mu$; paraphyses filiform; sporidia uniseriate, overlapping, narrow, obovate, hyaline, $11–12 \times 3\frac{1}{2}–4\mu$.

Differs from *Helotium citrinum*, in its involute margin and larger size.

CENANGIUM ALBOATRUM E. & E.

On a decorticated decaying chestnut log, Nuttallburg, West Virginia, Jan., 1896. (L. W. Nuttall, no. 788.)

Gregarious, obconical, short-stipitate, closed at first, then discoid-plane, $\frac{3}{4}$–1 mm. in diameter, hymenium slate-color with a narrow white margin, finally dark throughout; asci clavate, short-stipitate, $35–45 \times 6\mu$; paraphyses linear; sporidia subuniseriate, ovate-elliptical, hyaline, continuous, $3–4 \times 2–2\frac{1}{2}\mu$.

Differs from the usual type of *Cenangium* in its scattered growth.

CENANGIUM TRYBLIDIOIDES E. & E.

On decorticated *Salix*, Mt. Paddo, Washington., alt. 7000 feet. (Suksdorf, no. 482.)

Gregarious, sessile, black, glabrous, of fibrous texture, laterally compressed, about 1 mm. long, lips incurved, margin whitish or faintly transversely rugulose; hymenium pallid; asci clavate-cylindrical, stipitate, $55–60 \times 8\mu$, paraphysate, 8-spored; sporidia oblong or oblong-elliptical, hyaline, continuous, $6–10 \times 2\frac{1}{2}–3\mu$, slightly curved, suballantoid.

LASIOBELONIUM SUBFLAVIDUM E. & E.

On wood of *Salix*, Mt. Paddo, Wash. alt. 7000 ft. (W. N., Suksdorf, no. 489.)

Scattered, short-stipitate, between light yellow and brick color, closed and clavate and light yellow at first, then open, shallow cupshaped, 1–1$\frac{1}{2}$ mm. across, of fibrous texture, clothed with appressed hairs and margin fimbriate with brown sparingly septate hairs $2–2\frac{1}{2}\mu$ thick; asci slender, clavate-cylindrical, $85–95 \times 6\mu$; paraphyses filiform; sporidia fusoid, hyaline, slightly curved, not constricted, $15–20 \times 2–2\frac{1}{2}\mu$.

SCHIZOXYLON MICROSTOMUM E. & E.

On dead stems of *Andromeda ligustrina*, Newfield, N. J., April, 20, 1896.

Ascomata scattered or gregarious, conic-papilliform, orbicular or subelliptical, 1–1$\frac{1}{4}$ mm. in diameter, at first covered by the pustuliform-elevated epidermis, then suberumpent exposing the small (½ mm.) black circular disk with a slightly raised paler margin; asci cylindrical, $250 \times 12–14\,\mu$, abruptly contracted at base into a short stipe and surrounded by abundant filiform branching paraphyses; sporidia cylindrical, hyaline, fasciculate, nearly as long as the asci, readily separating into cylindrical 3–6-septate segments, 10–20 (exceptionally 30) $\times$ 3½ μ, more or less constricted at the septa.

This has the general appearance of *Didymosphaeria grumata* Cke.

New Species of Fungi.

By Chas H. Peck.

Amanita candida.

Pileus thin, broadly convex or nearly plane, verrucose with numerous small erect angular or pyramidal easily separable warts, often becoming smooth with age, white, even on the margin, flesh white; lamellae rather narrow, close, reaching to the stem, white; stem solid, bulbous, floccose-squamose, white, the annulus attached to the top of the stem, becoming pendent and often disappearing with age, floccose-squamose on the lower surface, striate on the upper, the bulb rather large, ovate, squamose, not margined, tapering above into the stem and rounded or merely abruptly pointed below; spores elliptical, .0004 to .0005 in. long, .0003 in. broad. Pileus 3 to 6 in. broad; stem 2.5 to 5 in. long, 5 to 8 lines thick, the bulb 1 to 1.5 in. thick in the dried specimens.

Woods. Auburn, Alabama. October. L. M. Underwood and F. S. Earle.

This is a fine large species related to *A. solitaria*, but differing from it in the character of its bulb and of its annulus. The bulb is not marginate nor imbricately squamose. Its scales are small and numerous. Nor is it clearly radicating, though sometimes it has a slight abrupt point or mycelioid-agglomerated mass of soil at its base. The veil or annulus is large and well developed, but it is apt to fall away and disappear with age. Its attachment at the very top of the stem brings it closely in contact with the lamellae of the young plant and the striations of its upper surface appear to be due to the pressure of the edges of these upon it. It separates readily from the margin of the pileus and is not lacerated. In the mature plant the warts have generally disappeared from the pileus and sometimes its margin is curved upward.

Amanita abrupta.

Pileus thin, broadly convex or nearly plane, verrucose with small angular or pyramidal erect somewhat evanescent warts, white, slightly striate on the margin, flesh white; lamellae moderately close, reaching the stem and sometimes terminating in slightly decurrent lines upon it, white; stem slender, glabrous, solid, bulbous, white, the bulb abrupt, subglobose, often coated below by the white persistent mycelium, the annulus membranous, persistent; spores broadly elliptical or subglobose, .0003–.0004 in. long, .00025–.0003 broad. Pileus 2–4 in. broad; stem 2.5–4 in. long, 3–4 lines thick.

Woods. Auburn, Alabama. July. Underwood.

The chief distinguishing mark of this species is its abrupt nearly globose bulbous base of the stem. This is somewhat flattened above and is sometimes longitudinally split on the sides. The small warts of the pileus are easily separable, and in mature specimens they have often wholly or partly disappeared. The remains of the volva are not present on the bulb in mature dried specimens, which indicates that the species should be placed in the same group with *A. rubescens*, *A. spissa*, etc. The latter species has the bulb of the stem similar to that of our plant, but the color of the pileus and other characters easily separate it.

Amanita prairiicola.

Pileus thin, convex, slightly verrucose, white, more or less tinged with yellow, even on the margin, flesh white; lamellae rather broad, subdistant, reaching the stem, white; stem equal or slightly tapering upward, somewhat squamose toward the base, white or whitish, the annulus persistent; spores large, broadly elliptical, .0005–.00055 in. long, .0003–.00035 broad. Pileus 1.5–3 in. broad; stem 2–2.5 in. long, 2–4 lines thick.

Bare ground on open prairies. Kansas. September. E. Bartholomew.

This species belongs to the same tribe as the preceding one. The only evidence of the presence of a volva shown by the dried specimens is found in a few inconspicuous, but separable warts on the pileus. There is no well marked bulb to the stem and no evident remains of a volva at its base.

Lepiota sublilacea.

Pileus thin, convex, obtuse or umbonate, dry, floccose-squamulose, brownish tinged with lilac, flesh white; lamellae rather broad, free, subdistant, whitish; stem short, solid, colored like the pileus, but paler at the top, the annulus slight, evanescent; spores elliptical, .0004 in. long, .0002 broad, commonly containing a single large shining nucleus. Pileus 6–12 lines broad; stem 6–12 lines long, 1–2 lines thick.

Bare ground in pastures. Kansas. September. Bartholomew.

This plant appears to have some points of resemblance to *L. lilacea*, from which it may be separated by its solid stem and larger spores.

Tricholoma acre.

Pileus fleshy, but rather thin, broadly convex, nearly plane or even slightly depressed in the center, often wavy on the margin, dry, innately fibrillose, whitish or pale gray, flesh white or whitish, taste acrid; lamellae close, adnexed, subventricose, white; stem equal or slightly tapering downward, short, slightly fibrillose, stuffed or hollow, white; spores subglobose, .0002–.00025 in. long, .00016–.0002 broad. Pileus 1.5–2.5 in. broad; stem 1–2 in. long, 3–5 lines thick.

Thin woods of deciduous trees. Worcester, Massachusetts. October. Dr. G. E. Francis.

The species is closely related to the European *T. impolitum*, from which it appears to differ in its paler pileus not becoming rimose-squamose, and in its stem, which is not at all squamose and which is stuffed or hollow rather than solid. Besides, its taste is only hot or peppery and not at all salty as in that species.

Tricholoma pallidum.

Pileus fleshy on the disk, thin towards the margin, convex or nearly plane, obtuse, glabrous, sometimes obscurely spotted on the disk with thin appressed brownish squamules, somewhat shining, whitish tinged with yellow or brownish-yellow, flesh white, sometimes slowly assuming a faint pinkish hue where cut or broken, taste mild; lamellae broad, subdistant, rounded behind or adnexed, often eroded on the edge, white; stem equal or slightly thickened at the base, glabrous, white; spores elliptical, .0002–.00025 in. long, .00016 broad. Pileus 1–2.5 in. broad; stem 1–2 in. long, 3–6 lines thick.

Thin wood of deciduous trees. Worcester, Massachusetts. October. Francis.

Armillaria appendiculata.

Pileus broadly convex, glabrous, whitish, often tinged with ferruginous or brownish-ferruginous on the disk, flesh white or whitish; lamellae close, rounded behind, whitish; stem equal or slightly tapering upward, solid, bulbous, whitish, the veil either membranous or webby, white, commonly adhering in fragments to the margin of the pileus; spores subelliptical, .0003 in. long, .0002 broad. Pileus 2–4 in. broad; stem 1.5–3.5 in. long; 5–10 lines thick.

Auburn, Alabama. October. C. F. Baker.

The general appearance of this species is suggestive of *Tricholoma album*, but the presence of a veil separates it from that fungus and places it in the genus *Armillaria*. The veil, however, is often slight lacerated or webby and adherent to the margin of the pileus.

Clitocybe tarda.

Pileus fleshy but rather thin, easily splitting when old, but firm when young and fresh, convex becoming nearly plane or somewhat centrally depressed, sometimes slightly umbonate, glabrous, hygrophanous, brown when moist, grayish or grayish-brown when dry, the margin at first deflexed or incurved, flesh white, inodorous; lamellae subhorizontal, moderately close, rather fragile, adnate or slightly decurrent, often eroded on the edge, at first with a pale violaceous tint, becoming whitish; stem short, equal or tapering downwards, solid, fibrillose, colored like the pileus; spores elliptical, .0003 in. long, .00016 broad. Pileus 1–3 in. broad; stem about 1 in. long, 1–3 lines thick.

Ground in greenhouses. Lynn, Massachusetts. December. Mrs. A. P. Doughty.

The species is referable to the second section of the tribe Orbiformes. The stem, when viewed by the aid of a lens, appears to be longitudinally and interruptedly rimulous from the separation of the fibrils. These are somewhat reticulately connected as in the stem of *C. cyathiformis*. The lamellae easily split transversely, and sometimes separate from the pileus at their inner extremity.

There are two forms. The darker colored one may be taken as the typical form. It is firmer, more regular, and under a lens sometimes appears to be minutely innately fibrillose. The other may be designated as

Clitocybe tarda pallidior.

Pileus paler, more fragile and irregular, more apt to be centrally depressed, somewhat striate on the margin when dry, sometimes eccentric; lamellae of the young plant with a flesh-colored tint.

The species is separated from *C. diatreta* by its darker and differently colored pileus and by its solid stem.

Hygrophrous cuspidatus.

Pileus thin, subcampanulate, glabrous, cuspidate, bright red; lamellae broad, ventricose, yellow; stem slender, equal, glabrous, hollow; spores elliptical, .00045–.0006 in. long, .00025–0003 broad. Pileus 6–10 lines broad; stem 1–2 in. long, about 1 line thick.

Ottawa, Canada. September. J. Macoun.

This fungus is closely allied to *H. conicus*, of which it might easily be taken to be a variety, but its more slender habit, its strongly cuspidate pileus and its longer and comparatively more narrow spores lead me to separate it. As in that species the plants are apt to turn more or less black in drying.

Collybia luxurians

Pileus thin, convex or subcampanulate, often irregular from its mode of growth, obtuse or umbonate, glabrous, moist, brown; lamellae narrow, close, whitish; stems caespitose, equal, flexuous, hollow, brown, thinly clothed above with a minute grayish pulverulent villosity which is often more dense and tomentose toward the base; spores elliptical, .00025–.0003 in. long, .00016 broad. Pileus 2–4 in. broad; stem 3–4 in. long, 2–3 lines thick.

Under brush heaps. Auburn, Alabama. July. Underwood.

This is a large caespitose and luxuriant appearing species, but as the specimens were not accompanied by notes of the characters of the fresh plant it can only be imperfectly described. The pileus was said to be very moist when fresh and it was probably hygrophanous. In the dried state it is a dull, reddish brown, closely approaching Mars' brown. Its margin is more or less wavy, lobed and striate. The species is apparently related to *C. confluens*, but it is a much larger plant with a darker colored pileus. Its place is probably among the Confertipedes.

Omphalia pubescentipes.

Pileus thin, convex, umbilicate, glabrous, reddish-tawny, sometimes paler on the margin; lamellae moderately close, decurrent, whitish; stem slender, pubescent, tawny with a tawny mycelioid tomentum at the base; spores elliptical, .00025 in. long, .00016 broad. Pileus 2–4 lines broad; stem about 1 in. long, .5 line thick.

Decaying wood and vegetable mold. Alabama. December. Earle.

The downy or pubescent stem is the distinguishing character of this species.

Marasmius plicatulus.

Pileus submembranous, convex or subcampanulate, glabrous, even when moist, commonly sulcate or striate when dry, dark vinous red inclining to bay brown; lamellae subdistant, narrowed behind, adnexed, whitish; stem slender, hollow, glabrous above, shining, blackish-brown, red at the top, radicating and clothed at the base with a copious dense whitish villosity or tomentum; spores subelliptical, apiculate at one end, somewhat narrowed toward the other, .0004–.0005 in. long, .0002–.00025 broad. Pileus 6–12 lines broad; stem 2.5–5 in. long, about 1 line thick.

Among fallen leaves and other decomposing vegetable matter. Common in Southern California. A. J. McClatchie.

The colors of this plant are very similar to those of *Marasmius pulcherripes*, but it is a much larger plant and differs in the attachment of its lamellae and in the character of the base of the stem. In the dried specimens the stem is striate and the pileus has a velvety appearance, but it is glabrous.

I find that the name *Marasmius badius*, Bull. Torr. Club, **22**: 487, 1895, was preoccupied and I would substitute for it Marasminus badiceps.

Flammula edulis.

Pileus fleshy, convex, obtuse, glabrous, moist, brown, grayish-brown or alutaceous-brown, sometimes rimose, flesh whitish; lamellae rather broad, close, decurrent, bright tan color, becoming brownish-ferruginous; stems caespitose, equal, stuffed or hollow, brown; spores subelliptical, .0005 in. long, .0002–.00025 broad. Pileus 2–3 in. broad; stem 2–3 in. long, 3–6 lines thick.

Grassy ground, along pavements, in gutters and by the side of wooden frames of hotbeds. Haddonfield, New Jersey. October. C. McIlvaine.

The collector of this species informs me that the flavor of the fresh plant is slightly bitter, but that this disappears in cooking and the fungus furnishes a very good and tender article of food. Successive crops continued to appear for a month. In the dried specimens the stem is striate.

Galera angusticeps.

Pileus thin, narrowly and irregularly conical or subcylindrical, obtuse acute or abruptly acuminate at the apex, even, glabrous, viscid and dark ochraceous when young and moist, nearly white when old and dry, the margin somewhat incurved and appressed to the stem; lamellae close, narrow, adnate, somewhat white-margined, more or less anastomosing, brownish-ferruginous when mature; stem slender, glabrous, hollow, equal or slightly thickened at the base, whitish or tinged with yellow, shining when dry; spores elliptical, .0004–.0005 in. long, .0003 broad. Pileus 8–15 lines long, 4–6 lines wide; stem 1.5–3 in. long, 1–1.5 lines thick.

Grassy ground in streets and pastures. Pasadena, Los Angeles and Compton, California. McClatchie.

This species is closely allied to *G. lateritia* and *G. semilanceata*, from both of which I have separated it because of its viscid pileus the absence of striations and the darker color of its mature lamellae. The pileus also scarcely expands, so far as shown by the specimens seen, and the notes of the collector say that the margin is "permanently incurved."

Galera alba.

Pileus submembranous, campanulate, very fragile, moist, striate, splitting on the margin, white; lamellae narrow, close, white, becoming brownish-ferruginous; stem fragile, hollow, glabrous, white; spores elliptical, .0005–.0006 in. long, .0003–.0004 broad, commonly containing one to three nuclei. Pileus 8–12 lines broad; stem 1.5–2.5 in. long, 1–2 lines thick.

Rich ground in the shade of weeds. Brookings, South Dakota. Summer. T. A. Williams.

It occurs after rains in warm weather. It is more fragile when fresh than when dried.

Galera versicolor.

Pileus thin, fragile, convex or subcampanulate, moist or slightly viscid, glabrous, striate on the margin, whitish pale-yellow or brownish tan color; lamellae close, white or pale yellow, becoming reddish-ferruginous; stem equal, fragile, hollow, slightly mealy or pruinose, often tomentose at the base, white; spores very unequal in size, .0005–.0008 in. long, .0003–.0005 broad, generally containing one to three nuclei. Pileus 1–2.5 in. broad; stem 2–4 in. long, 1–2 lines thick.

Manure and other decaying vegetable matter. Brookings, South Dakota. Spring and early summer. Williams.

The species is remarkable for the variability in the color of the pileus and in the size of the spores. These vary in the same individual. The prevailing color of the pileus is pale yellow.

Galera fragilis.

Pileus submembranous, very fragile, broadly campanulate, glabrous, dull flesh color; lamellae ascending, adnate, subdistant, dark yellow or subochraceous, becoming ferruginous; stem slender, flexuous, hollow; spores elliptical, .0004 in. long, .0002 broad. Pileus 3–5 lines broad; stem 10–15 lines long, .5 line thick.

Among short grasses in pasture. Kansas. Bartholomew.

A very small and very fragile plant.

Psilocybe sabulosa.

Pileus convex, subumbonate, glabrous, yellow; lamellae broad, subdistant, ventricose, adnate, becoming purplish-brown, whitish on the edge; stem equal, hollow, pallid or straw-color; spores elliptical, .0005–.0006 in. long, .0003 broad. Pileus 8–12 lines broad; stem 1–1.5 in. long, about 1 line thick.

Sandy soil in pastures. Kansas. August. Bartholomew.

The pileus in the dried specimens has a somewhat shining appearance. The umbo in some specimens is quite prominent, in others it is wholly wanting. The species is quite distinct from *P. arenulina*, which is hygrophanous and has smaller spores.

Psilocybe obscura.

Pileus thin, convex, hygrophanous, striate, more or less flecked or scurfy with a white floccose tomentum, brown or reddish-brown; lamellae broad, subdistant, adnate, brown, becoming almost black, white flocculent on the edge; stem slender, hollow, a little paler than the pileus, whitish tomentose at the base; spores elliptical, .0004–.0005 in. long, .00025–.0003 broad. Pileus 4–9 lines broad; stem 1–1.5 in. long, about 1 line thick.

Rich leaf mold in woods. Kansas. August. Bartholomew.

Boletus fistulosus.

Pileus convex, viscid, glabrous, yellow, the margin at first incurved or involute, flesh yellow; tubes plane or subventricose, medium size, round with thin walls, adnate or sometimes depressed around the stem, yellow; stem rather slender, subequal, viscid, glabrous, hollow, yellow, with a white mycelioid tomentum a the base; s res elliptical, .0005 in. long, .00025 broad. Pileus about 1 in. b ad; stem 2–4 in. long, about 3 lines thick.

Grassy woods. Auburn, Alabama. July. Underwood.

A small but pretty species of a yellow color throughout. It is remarkable for its hollow stem, which is suggestive of the specific name. It is referable to the tribe Viscipelles.

Boletus fraternus.

Pileus convex, becoming plane or depressed, slightly tomentose, deep red when young, becoming dull red with age, flesh yellow, slowly changing to greenish-blue where wounded; tubes rather long, becoming ventricose, slightly depressed about the stem, their walls sometimes slightly decurrent, the mouths large, angular or irregular, sometimes compound, bright yellow, quickly changing to blue where wounded; stem short, caespitose, often irregular, solid, subtomentose, slightly velvety at the base, pale reddish yellow, paler above and below, yellow within, quickly changing to dark green where wounded; spores .0005 in. long, .00025 broad. Pileus 1–1.5 in. broad; stem 1–1.5 in. long, 3–6 lines thick.

Shaded streets. Auburn, Alabama July. Underwood.

The species is apparently allied to *R. rubeus*, but is very distinct by its small size, caespitose habit, color of the flesh of the stem and by the peculiar hues assumed where wounded. When the pileus cracks the chinks become yellow as in *B. subtomentosus*. The species belongs to the tribe Subtomentosi.

Boletus Underwoodii.

Pileus rather thin, convex, becoming nearly plane, slightly velvety, bright brownish-red, becoming paler with age, flesh yellow, changing to greenish-blue where wounded; tubes adnate or slightly decurrent, greenish-yellow, becoming bluish where wounded, their mouths very small, round, cinnabar red, becoming brownish orange; stem equal or slightly tapering upward, somewhat irregular, solid, yellow without and within; spores .0004–.0005 in. long, .0002 broad. Pileus 2–3 in. broad; stem 3–4 in. long, 4–6 lines thick.

Grassy woods. Auburn, Alabama. July. Underwood.

The species is remarkable for its adnate or subdecurrent tubes in which it departs from the character of the tribe to which it belongs according to the colors of the tubes.

Boletus parvus.

Pileus convex, becoming plane, often slightly umbonate, subtomentose, reddish, flesh yellowish white, slowly changing to pinkish where wounded; tubes nearly plane, adnate, their mouths rather large, angular, at first bright red, becoming reddish-brown; stem equal or slightly thickened below, red; spores oblong, .0005 in. long, .00016 broad. Pileus 1–2 in. broad; stem 1–2 in. long, 2–3 lines thick.

Grassy woods. Auburn, Alabama. July. Underwood.

This is one of the smallest species of the tribe. It is referable to the tribe Luridi.

Boletus frustulosus.

Pileus thick, convex or nearly plane, subglabrous, rimosely areolate, white or whitish, flesh whitish; tubes equal to or a little longer than the thickness of the flesh of the pileus, depressed about the stem, whitish, becoming pale brown; stem equal, solid, whitish, reticulated above; spores .0006–.0007 in. long, .0002–.00025 broad. Pileus 3–5 in. broad; stem 1–2 in. long, 6–10 lines thick.

Open ground and clay banks. Ocean Springs, Mississippi and Akron, Alabama. May and June. Underwood.

The deeply cracked surface of the pileus is the most notable feature of this species. This sometimes is seen even in quite young plants. The areolae are quite unequal in size. The deep chinks with sloping sides cause them to appear like frustra of polygonal pyramids. In some specimens the reticulations of the stem extend nearly or quite to its base, and make the place of the species ambiguous between the Calopodes and Edules.

Boletus isabellinus.

Pileus convex, firm, minutely tomentose, whitish, becoming darker and smoother with age, flesh isabelline; tubes adnate, minute, sometimes larger near the stem, nearly round, whitish; stem nearly equal, subglabrous, hollow, whitish; spores subelliptical, .0003–.00035 in. long, .0002–.00025 broad. Pileus 2–3 in. broad; stem 1–2 in. long, 4–6 lines thick.

Woods. Ocean Springs, Mississippi. June. Underwood.

The species belongs to the Cariosi.

Polyporus Burtii.

Pileus dimidiate, 1–2 in. broad, tough, sessile or effuso-reflexed, minutely tomentose, smoky whitish or pallid, flesh 1–2 lines thick, pallid; pores .5–1 line long, unequal, angular, extending to the margin, smoky black, their dissepiments thin.

Yellow birch, *Betula lutea*. Middleburg, Vermont. December. E. A. Burt.

This fungus is closely allied to *Polyporus adustus*, of which it might easily be considered a mere variety, but from which it differs as *P. fragrans* does from *P. fumosus*. Its unequal angular pores with thin dissepiments and the absence of a sterile margin to the pileus separate it from *P. adustus*. Its colors are nearly the same as in that species.

CRYPTOPHALLUS *gen. nov.*

Receptacle consisting of a stem and pileus bearing the gleba on its external surface but covered by the persistent remains of the upper part of the volva.

A genus of Phalleae differing from *Ithyphallus* simply in having a volva which ruptures in a somewhat circumscissile manner, the upper part of it being carried up and remaining on the pileus and persistently concealing the stratum of spores.

It is with some hesitation that I have given generic value to this plant, it seemed at first so probable that the persistency of the remains of the volva on the pileus was an accidental circumstance. But having received two specimens of the same kind, one collected in Kansas and the other in Canada, the probability of its being a mere accident seemed greatly lessened and I have concluded to recognize the fact in a formal manner. The sporiferous stratum is sandwiched between the surface of the pileus and the continuous covering formed by the remains of the volva. What purpose in nature is subserved by this arrangement is not clear, except that perhaps the spores are less exposed to the rapid and sudden washing of heavy rains and are better reserved for dissemination and dispersion by the agency of insects.

Cryptophallus albiceps.

Pileus subcampanulate, about one inch high and nearly as broad, obtuse or rounded at the apex, covered by the whitish remains of the ruptured volva whose surface is minutely tomentose; stem cylindrical, hollow, 2½–4 in. long, 5–8 lines thick, whitish or pallid, inserted at the base in the cup-like remains of the lower part of the volva; veil none; spores narrowly elliptical, .00016–.0002 in. long, about .0001 broad.

In a cornfield. Kansas. June. Bartholomew. At the base of a stump. Canada. J. Macoun.

The species is similar to *Ithyphallus impudicus*, except in the covering of the pileus.

Studies in the Flora of the Central Gulf Region.—I.

By Charles Louis Pollard.

The Central Gulf Region, comprising the States of Alabama and Mississippi, has been neglected by collectors to an extent that is surprising in view of the interest attaching to its flora; a condition of affairs, doubtless due to the fact that Professor S. M. Tracy and Dr. Charles Mohr, both zealous field workers, have been most generous in supplying material for investigation. In the course of several months' study of Mississippi and Alabama *Cassias*, I had observed that in these southern specimens, as well as in Florida material, there was apt to be uniform variation from northern types as I understand them. With the object, therefore, of supplementing herbarium work by field observations, I spent a month in Mississippi during the past summer, for the most part exploring the Gulf coast, although some time was put in at Waynesboro, near the northern limit of the pine belt and at the Agricultural College, on the northeastern quarter of the State. During this visit over four hundred plants were collected, and I have since been afforded the opportunity of examining the collections made later in the summer, throughout substantially the same area, by Mr. T. H. Kearney, of the Department of Agriculture, to whom I am greatly indebted. Mr. Charles Schuchert, of the National Museum, made a collection of plants late in the fall, in the neighborhood of Meridian and Waynesboro, Mississippi, and in adjacent portions of Alabama; these specimens, which are of great interest as containing a number of the characteristic fall composites, Mr. Schuchert kindly turned over to me, and they will be reported upon in a subsequent paper. Professor S. M. Tracy, of the Mississippi Agricultural Experiment Station, also placed in my hands a large number of specimens obtained in every quarter of the State, and for these, as well as for his many kindnesses and cordial hospitality, I would return sincerest gratitude. I have thus been enabled to examine a large portion of the known flora of Mississippi and to verify, by actual observations in the field, a number of conclusions previously drawn.

Probably the most conspicuous, and certainly the most interesting feature of this flora, is the extension of types from the

Florida peninsula westward along the Gulf coast. It is a common experience to find in southern Mississippi, for example, a plant which, according to Dr. Chapman's work, is an exclusive inhabitant of south Florida; and it is quite as often that species actually assigned to Mississippi do not match the characters given for them in the book. These circumstances serve to emphasize the necessity for much critical field work in this area, and a careful study of southern species in the light of modern taxonomic principles.

The following notes are based on my own collections, the first set of which is deposited in the United States National Herbarium, the remainder having been already distributed. The determinations of the Gramineae were made by Professor Tracy, and of the Cyperaceae by Dr. N. L. Britton, to whom I would extend thanks, as also to Dr. J. K. Small, Mr. Frederick V. Coville, Dr. J. N. Rose, Professor L. M. Underwood, Mr. P. A. Rydberg, Mr. G. B. Sudworth, and Dr. G. N. Best, for their courtesy in naming certain groups.

Adiantum Capillus-Veneris L.

This beautiful fern was found for the first time in Mississippi, as far as I have been able to ascertain, at Waynesboro, Wayne County, near the Alabama line. On my arrival at the village I at once observed it growing in pots and hanging baskets about the veranda of the hotel, and supposed it had been brought from some distance; but inquiry elicited the fact that the locality was only a few miles away, and the son of my good landlady, a young man whose knowledge of local plant-names is very extensive, readily volunteered his services as guide. The fern grew on the steep banks of the creek, in rather damp soil, the fronds for the most part pendent, and growing so dense that other vegetation was entirely excluded.

Stipulicida setacea Michx.

A single specimen was obtained on Deer Island, in Biloxi Bay, and others were observed; the range is thus extended consideraby westward.

Asimina parviflora (Michx.) Dunal.

One specimen, with nearly ripe fruit, was collected at Waynesboro, but Prof. Tracy kindly furnished me with additional material obtained by him in the previous spring at Columbus, in the northern part of the State.

CASSIA MULTIPINNATA Pollard, Bull. Torr. Club, **22**: 515. 1895.

This species, together with the low, diffuse *C. multipinnata Nashii*, is the only small-flowered *Cassia* in the coast region, as it is in Florida. I visited the type locality for *C. Mississippiensis** near Ocean Springs, but the extremely abundant form mistaken by Prof. Tracy for this species proved to be beyond question *multipinnata*. The distinguishing feature of the latter is found in its very numerous and exceedingly narrow leaflets. In travelling northward through the state, we find that the *multipinnata* belt overlaps the belt of the true *nictitans*, and occasionally specimens of evident hybrids may be collected. In the mountains of northern Alabama, Dr. Mohr has found typical *nictitans*, but it barely enters Mississippi.

The late-blooming feature of *multipinnata* was again observed. At the time of my departure from the State on August 20, no trace of a flower could be detected on any of the plants examined, although here in Washington at the same time the seed-pods of *nictitans* were rapidly maturing. Prof. Tracy supplied flowering specimens of *multipinnata* from Starkville on September 1, and from Biloxi on September 15. (Nos. 1349 and 1422.)

CASSIA DEPRESSA Pollard, Bull. Torr. Club, **22**: 515. 1895.

This occurs in some abundance along the coast, blooming in September. (No. 1423.) *C. Chamaecrista* is not common until the interior is reached, but abounds everywhere northward, being at its prime in August.

CASSIA ROBUSTA Pollard.

Cassia Chamaecrista robusta Pollard, Bull. Torr. Club, **21**: 219. 1894.

The type of this species is a specimen in the herbarium of Columbia University, collected by Dr. C. W. Short in the mountains of Kentucky. It is without fruit, and I did not at the time feel warranted in giving it more than varietal rank. Last year a plant similar in appearance was sent me by Professor Tracy, bear-

* Bull. Torr. Club, **21**: 219. 1894.

ing mature pods which at once attracted attention by their recurved position. I cultivated garden specimens from seeds of this plant, and when in Mississippi visited the locality whence it was originally obtained. Not having access to my former type, and appreciating its distinctness from *Chamaecrista* I gave a partial diagnosis of it as a new species in a note presented before Section G at the Buffalo meeting of the Association. The plant must, of course, assume the varietal name originally assigned to it. (No. 1276.)

CASSIA ASPERA MOHRII Pollard, n. var.

Aspect of *C. aspera:* hispid pubescence and leaflets as in that species, except that both surfaces of the leaflets are hoary with stiff white hairs; petiolar gland depressed-cupuliform, substipitate.

Type in the herbarium of the U. S. Geol. Surv. of Alabama, collected in Mobile in 1878 by Dr. Mohr, to whom the variety is dedicated.

PHASEOLUS SINUATUS Nutt. T. & G. Fl. N. Am., 1: 279. 1838.

Specimens of this were obtained, not yet in flower, near Ocean Springs. (No. 1017.) I have not been able to find a previous record of its appearance west of Florida.

DAUBENTONIA LONGIFOLIA (Cav.) DC. Mem. Legum. 285. 1825.

The discovery of a plant on the coast of Mississippi (No. 1001) hitherto known only from Texas and Mexico, and as a ballast immigrant at Pensacola, Florida, is of interest as illustrating the tendency of the western gulf flora to move eastward, just as the Florida peninsula flora in so many cases exhibits a northwestward extension. While undoubtedly originally introduced, this showy plant now figures prominently along the sea-beach at Biloxi and other coast towns, and with its large, bright yellow flowers and four-winged, many-seeded pods, ought never to be mistaken for the nearly-related *Glottidium Floridanum*, which grows in the same region. The characters of the legume separate *Daubentonia* and *Glottidium* from *Sesbania* fully as clearly as similar characters distinguish any Mimosaceous genera. In *Sesbania* we have a pod which is narrow, elongated, tetragonal, and many-seeded, usually torulose. *Glottidium* has a short compressed pod, two-seeded, with a thick, coriaceous epicarp splitting away at maturity from the membranous endocarp, which remains investing the seeds. *Daubentonia* has a several-seeded, compressed and often torulose legume, the central portion of the winged valves becoming indurated over the seeds, and hence never dehiscent.* A more striking contrast of characters in a group of nearly related genera it would be hard to find elsewhere in the Leguminosae.

The bibliography of the species is involved in some obscurity, owing to the fact that all copies in this country of one of the works concerned, Ortega's Hortus Matritensis, are apparently incomplete, and to the resultant fact that the synonymy has been thrown into confusion by later writers. The genus *Daubentonia* was based by De Candolle upon *AEschynomene longifolia* Cav., and *Piscidia punicea* Cav. Reference to the latter's work shows the plate of *A. longifolia* to be an excellent and unmistakable reproduction of our Texano-Mexican plant.

In addition to the two species of *Daubentonia*, De Candolle describes in Prodromus 2 : 265 a species of *Sesbania* under the name of *S. longifolia*, for which he cites as a synonym Ortega's *AEschynomene longifolia*, referring to the plate of the latter in the ninth decade of the Hortus. In his characterization of the species he uses the words " leguminibus linearibus torulosis acutis," which cannot apply to anything but a true *Sesbania*. It is thus evident that De Candolle understood with great clearness the fact that Ortega and Cavanilles had described two different plants under the same binomial appellation (*AEschynomene longifolia*), the former of which he transferred to *Sesbania*, and the latter he raised to generic rank; by this means he preserved the same specific for each. It is due to the efforts of later botanists to combine both forms under *Sesbania* that most of the trouble has originated. Among British authorities, especially, there has been a surprising tendency to jump at conclusions, and, as it would seem, to avoid the proper verifications of references, since a very superficial examination of the pages above cited would have afforded a solution.

The genus *Daubentonia* is taken up by Torrey and Gray, and the citations are correctly given.† On the other hand, Hemsley,

* For a good figure of this type of legume, see Fig. 117, Engl. & Prantl. Nat. Pflanzenf. Theil 3 : 279, 1894, under *Sesbania punicea*.

† Torr. & Gray, Fl. N. Am. 1 : 294. 1838.

in Vol. I, p. 263, of the Biologia Centrali-Americana, enumerates *Sesbania longifolia* DC., with its synonym *AEschynomene longifolia* Ortega, but refers, for an example, to Parry and Palmer's No. 209, from Central Mexico, which is beyond question *Daubentonia*. No mention whatever is made of Cavanilles' plate, and we are forced to conclude that Mr. Hemsley imagined the two species to be identical. Dr. Watson appreciated this error, and remarks * "*Sesbania Cavanillesii* Watson, *Daubentonia longifolia* DC., * * * No. 209, Parry and Palmer belongs to this species, not to *S. longifolia* DC., which, according to the description is very different." The Index Kewensis makes matters worse, as follows:

AEschynomene longifolia Cav. Icon. 4: 8. *t. 316.*=*Piscidia longifolia.*

AEschynomene longifolia Orteg. Hort. Mat. Dec. 9: 70.=*Sesbania Cavanillesii.*

This is most remarkable when we recollect the fact that both the synonyms cited belong exclusively to the *AEschynomene* of Cavanilles, not to that of Ortega, which should, of course, have been referred to *Sesbania longifolia* DC., a name admitted by the Index in another place, as that of a valid pecies.

In Coulter's Botany of Texas† appears a very good diagnosis of our plant under Watson's name, *Sesbania Cavanillesii*. It is there quoted as "abundant on the lower Rio Grande and also near San Antonio." Specimens in the National Hebarium are as follows: Texas, Dr. Schlottman; Schott, 1853, Bravo del Norte; J. F. Joor, 1875, Harrisburg; Berlandier, no. 3132; Palmer, San Antonio, 1880, no. 278; Harvard, 1884; Nealley, 1889, no. 76; Florida, Pensacola, Curtiss, no. 590.

Specimens of *Sesbania longifolia* DC., are represented as follows: Guadalajara, Jalisco, Mexico, Palmer, no. 237, 1886; Pringle, no. 4738, 1894. These specimens are instantly recognizable as true *Sesbanias*, having linear torulose legumes and ovate-lanceolate leaflets.

It is, therefore, quite evident that whether these two species are regarded as congeneric or are separated, one of them must take a name other than *longifolia*, which belongs, by right of pri-

* Proc. Am. Acad. 17: 342. 1882.

† Contr. Nat. Herb. 2: 281. 1891. 581

ority to the plant of Cavanilles.* The Mexican plant must, therefore, take a new designation, and the synonymy and citation of the two species will then stand as follows:

SESBANIA MEXICANA nom. nov.

AEschynomene longifolia Orteg. Hort. Matr. Dec. 9: 70. 1800. Not Cav.

Sesbania longifolia DC. Prodr. 2: 265. 1825.

Mexico, state of Jalisco.

DAUBENTONIA LONGIFOLIA (Cav.) DC. Mem. Legum. 285. 1825.

AEschynomene longifolia Cav. Icon. 4: 8. *pl. 316*. 1797. Not Orteg. 315

Piscidia longifolia Willd. Sp. Pl. 3: 920. 1800.

Sesbania Cavanillesii S. Wats. Proc. Am. Acad. 17: 342. 1882.

Mexico and southern Texas along the Gulf coast to western Florida.

CLIFTONIA NITIDA Banks; Gaertn f. Fruct 3: 246. *pl. 225*. 1805.

Mylocaryum ligustrinum Willd. Enum. Hort. Berol. 454. 1809.

Cliftonia ligustrina Sims; Spreng. Syst. 2: 316. 1825.

A rare plant in many localities, but in Mississippi not uncommon on the coast. (No. 1040.)

KOSTELETZKYA VIRGINICA SMILACIFOLIA Chapm. Fl. S. States 57. 1860.

It is with some hesitation that I refer no. 1164 to this variety. The hastate leaves agree entirely with Dr. Chapman's description, but the flowers in my specimens are pure white. This plant, as well as typical *K. Virginica*, was obtained in the vicinity of Biloxi.

AMMANNIA COCCINEA Rottb. Pl. Hort. Havn. Descr. 7. 1773.

Specimens of unusual size were collected at the Agricultural College (No. 1309), and distributed erroneously as a new species of *Rotala*. The status of our American *Ammannias* is somewhat uncertain, owing to the ambiguity of the Linnaean *A. latifolia*. Dr. Koehne † has very properly distinguished two species, one with long style and capsule and fugacious petals, for which he adopts the

* The ninth decade of Ortega's work did not appear before 1800, as stated by De Candolle, whose reference I have not at hand.

† Engler's Bot. Jahrb. 1: 249–251. 1880.

name *coccinea* of Rottboell, and another of more southerly range with very short style and no petals, for which the name *latifolia* is taken up. The question yet in doubt, it seems to me, is whether the type of Linnaeus' species was really a short-styled plant. The only figure cited is from Hans Sloane's History of Jamaica, a work which I have been unable to examine. Dr. Britton has described still a third species.* *A. Koehnei*, which apparently combines the characters of the other two in having the petals of *coccinea* and the short style of *latifolia;* but it is by no means certain that this floral character is constant.

RHEXIA FLORIDANA Nash, Bull. Torr. Club, 2: 150. 1895.

Another illustration of the northwestward extension of the Florida flora. Typical specimens of this *Rhexia* were collected at Biloxi on July 29 (No. 1096), and were easily distinguishable by their narrowly linear leaves and the dark olive-green hue of the whole plant from the abundance of *R. Mariana* growing in the immediate vicinity.

RHEXIA LANCEOLATA Walt. Fl. Car. 129. 1788.

A species accepted by Torrey and Gray, but reduced by Cogniaux in his Monograph† to *R. Mariana.* The totally different color of the flowers, a feature of importance in this genus, as well as the glabrous calyx of *R. lanceolata*, points to its specific validity. Specimens were obtained at Ocean Springs (No. 1077).

HYDROCOTYLE BONARIENSIS Lam. Encycl. 3: 153. 1788.

Mr. J. N. Rose furnishes me with the following note on this rare species: "The collection of *Hydrocotyle Bonariensis*, a southern Mexican and South American species, in Mississippii is of interest. This species is entirely new to the United States, except that the variety *Texana* occurs in a single locality in southern Texas. It belongs, of course, near *H. umbellata*, and may sometimes be mistaken for that species. The inflorescence, however, is different, as *H. umbellata* usually has a simple umbel, while *H. Bonariensis* has numerous elongated rays with a number of interrupted whorls of flowers."

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* Bull. Torr. Club, 18: 271. 1891.

† Cogn. in DC. Mon. Phan. 7: 388. 1891.

Sabbatia brachiata Ell. Bot. S. C. & Ga. 1: 284. 1817.

It is quite possible that Michaux had this plant in mind as the type of his *Chironia angularis* var. *angustifolia*;* the description of the latter is too meagre, however, to warrant a change in the name without further research.

Nerium Oleander L. Sp. Pl. 209. 1753.

Abundant on the beaches along the coast as an escape from gardens and in many places apparently spontaneous.

Asclepias verticillata linearis (Scheele).

Asclepias linearis Scheele, Linn. 21: 758. 1848.

Asclepias verticillata var. *subverticillata* A. Gray, Proc. Am. Acad. 12: 71. 1876.

Only two specimens of this variety were obtained (no. 1006, Ocean Springs). It is distinguishable from the type by the opposite rather than verticillate leaves.

Asclepias amplexicaulis Michx.

Abundant in the sand on Deer Island, off the coast of Biloxi. (No. 1186). Walter's characterization of his *A. humistrata* as "floribus rubris" leads me to doubt the propriety of taking up his name for the species.

Leonotis nepetaefolia R. Br.

A tropical African plant sparingly adventive throughout the South, but in the coast region of Mississippi a common weed.

Mesosphaerum rugosum (L.).

Clinopodium rugosum L. Sp. Pl. 588. 1753.

Hyptis radiata Willd. Sp. Pl. 3: 84. 1800.

This labiate is common in southern Mississippi. The genus *Mesosphaerum*, founded by Patrick Browne in 1756, has thirty years' priority over *Hyptis* of Jacquin.

Teucrium Nashii Kearney, Bull. Torr. Club, 21: 484. 1894.

My specimens of this handsome *Teucrium*, collected on Prof. Tracy's grounds near Biloxi (no. 1075), exactly match Mr. Kearney's type from Florida.

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* Fl. Bor. Am. 1: 146. 1803.

GRATIOLA HISPIDA (Benth.).

Sophronanthe hispida Benth.; Lindl. Intr. Nat. Syst. Ed. 2, 445. 1836.

Gratiola subulata Baldw.; Benth. DC. Prodr. **10**: 405. 1846.

This little plant, which bears when growing an aspect similar to that of a small *Phlox*, was found in abundance on Deer Island (No. 1187). I am by no means convinced that a comparative study of the species of *Gratiola* will not justify Bentham's original segregation of *G. hispida* as a distinct genus.

RUELLIA HUMILIS Nutt. Trans. Am. Phil. Soc. (II.) **5**: 182. 1833–7.

Ruellia ciliosa var. *longiflora* A. Gray, Syn. Fl. **2**: Part 1, 326. 1878.

This species was found by Nuttall on the low, scarcely caulescent plant of which my number 1221, collected at Waynesboro, is representative. Specimens are in the National Herbarium obtained by Curtiss in Florida (no. 149), and also by Nash (no. 183) in the same State. Dr. Gray afterwards included it in his variety *longiflora* of *R. ciliosa* Pursh. The original description gives no warrant for applying the name *humilis* to the tall leafy plants that are known everywhere as typical *ciliosa*; and even in cases where the stem is more than usually elongated, the obovate obtuse leaves are always so distinguishable from the ovate more or less acute leaves of the latter species.

CARDUUS LECONTEI (T. & G.).

Cirsium Lecontei T. & G. Fl. N. Am. **2**: 456. 1841.

Cnicus Virginianus Hook. Comp. Bot. Mag. **1**: 48. 1835. Not Pursh.

A single specimen of this handsome species was collected in a moist pine barren near Ocean Springs.

CARDUUS NUTTALLII (DC.).

Cirsium Nuttallii DC. Prodr. **6**: 651. 1837.

Cnicus glaber Ell. Bot. S. C. & Ga. **2**: 270. 1824. Not *Carduus glaber* Nutt. Gen. **2**: 129, 1818, nor Steud. Nom. Ed. 1, 152. 1821.

This species being exclusively southern in its range, it is probable that Nuttall's *Carduus glaber*, referred in his description to New Jersey, is a form of *C. muticus*.

STOKESIA LAEVIS (Hill) Greene, Eryth. **1**: 3. 1893.

Carthamus laevis Hill, Hort. Kew. 57. *pl. 5.* 1769.

Stokesia cyanea L'Her. Sert. Angl. 27. 1788.

Cartesia centauroides Cass. Bull. Philom. **1816**: 198. 1816.

This beautiful plant, usually considered the rarest of the Compositae, is extremely abundant along the whole length of the Mississippi coast, growing in dry or moist pine-barrens, and bearing a striking resemblance to a large *Aster*.

ERIANTHUS TRACYI Nash, Bull. Torr. Club, **24**: 37, 1897.

A fine new species of *Erianthus*, collected only in a single locality in the vicinity of the Agricultural College, near Starkville. (No. 1341.)

Proceedings of the Club.

TUESDAY EVENING, FEBRUARY 9, 1897.

The President occupied the chair and there were about 200 persons present.

The minutes of the last meeting were read and approved.

The President reported the following appointments of Committees:

Committee on Finance: J. I. Kane, Wm. E. Wheelock, M.D.

Committee on Admissions: Cornelius Van Brunt, Jeannette B. Greene, M.D.

Library and Herbarium Committee: Eugene P. Bicknell, Helen M. Ingersoll, Wm. E. Wheelock, M.D., Marie L. Sanial.

Committee on Local Flora.—Phanerogamia: Prof. Thos. C. Porter, N. L. Britton, Ph.D., H. H. Rusby, M.D. Cryptogamia: Prof. L. M. Underwood, Maria O. Le Brun, Smith Ely Jelliffe, M.D.

Committee on Mosses: Mrs. Elizabeth G. Britton.

The regular program was then taken up, being a lecture by Henry A. Siebrecht, entitled "Orchids, their Habitat, Manner of Collecting and Cultivation."

The paper was handsomely illustrated with lantern slides by Mr. Cornelius Van Brunt, colored by Mrs. Van Brunt.

Mr. Siebrecht in his paper referred to the hardships undergone by the orchid-collector, and paid a tribute to the energy displayed by three friends of the speaker, Carmiole, an Italian, who had come to New York when the speaker was a boy; Föstermann, who died about two years ago, the victim, like most collectors, of disease contracted in that enterprise; and Thieme, who had made three trips for Mr. Siebrecht, and who went last to Brazil in search of the *Cattleya autumnalis*, but was never heard from.

Mr. Siebrecht referred also to three trips of his own in quest of orchids, to the West Indies, Venezuela, Brazil and Central America. He then exhibited the lantern views, which were of remarkable beauty and evoked frequent applause. They included numerous representatives of the chief tropical genera cultivated, also with views of interiors showing a house of *Cattleyas* in full blossom, etc. Slides showing numerous species native to the eastern United States followed.

Mr. Siebrecht then described the culture of orchids and classed their diseases, as chiefly because too wet, when the "spot" closes the stomata, or too dry when they collect insects. He referred to their insect enemies at home, the "Jack Spaniard," which eats the marrow from the bulb, and the cattleya-fly, now introduced into English houses. He mentioned the ravages of *Cladosporium*, and the great difficulty with which orchids of the genus *Phalaenopsis* are preserved from fungal diseases.

The subject was further discussed by the President, Dr. Britton, Mr. Samuel Henshaw and Mr. Livingston, the latter referring to his recent experience as an orchid collector. A slide was exhibited, made from a photograph taken by Mr. Livingston, showing his orchids packed upon oxen and so carried down from the mountains to Magdalena.

Mr. Henshaw spoke of his visit to Mr. Siebrecht's nursery in Trinidad, and of the growth made there by *Crotons*, as much in one year as here in four or five. In those gardens they divide their plants by rows and edges of *Crotons* which are sheared off as we would trim a privet-hedge. Mr. Henshaw also paid a deserved tribute to Mrs. Van Brunt for the wonderful success of her coloring of the orchid slides.

WEDNESDAY EVENING, FEBRUARY 24, 1897.

In the absence of the President, Vice-President V. P. Allen presided. There were 28 persons present.

The scientific program was as follows:

1. By Mr. Arthur Hollick, "A fossil *Phragmites* from Staten Island." (Published in this issue of the BULLETIN.)

2. By Mr. E. O. Wooton, "Remarks on some of the rarer Plants of New Mexico."

Mr. Wooton sketched briefly the botanical regions of New Mexico, dividing the territory by differences in the flora into (a) the river valleys, (b) the table-lands or *mesas*, (c) the dry, rocky and narrow mountain ranges, and (d) those areas which are of uniformly high altitude and have numerous mountain ranges closely associated and more or less timbered. He also traced upon a map the routes traversed by most of the botanical collectors who have visited New Mexico, beginning with Pike and including Long, Gregg, Wislizenus in 1846, Emory, Marcy, Sitgreaves and Woodhouse, with the work of the Mexican Boundary and other surveys, 1849 and after. Mr. Wooton was himself practically the first to make collections in the southeast section of the territory, a very interesting botanical region, with high mountains, some of which were illustrated by photographs. Specimens of Mr. Wooton's collecting were then shown, exhibiting about 35 flowering plants and ferns, and including among those familiar in the East: *Pellaea atropurpurea*, *Cystopteris fragilis*, *Pteris aquilina* and *Cheilanthes tomentosa*.

Discussing Mr. Wooton's presentation, Dr. Rusby spoke of his own former travels in New Mexico, and of various incidents of that journey, as of the discovery of *Primula Parryi* on the top of Gray's Peak (central Arizona), blooming on July 3d under three or four inches of snow which had just fallen.

Mr. Rydberg compared some of the features presented by the sand region of Central Nebraska, referring to *Muhlenbergia pungens* and other so-called "blow-out grasses" of the sand-hills, and describing the formation of the characteristic "blow-outs," or hollows, originating in spots where the grasses had died out, and deepening rapidly, sometimes to 300 feet, producing a country where the hills are moving every year, and where he, when camp-ing, could find no fuel except roots of sand cherries exposed along fresh "blow-outs."

Discussion by Dr. Allen, Mr. Wooton and Dr. Rusby followed relative to the loco-weed poison. Mr. Wooton said that *Spiesia Lamberti* is the chief *loco-weed* about Flagstaff, Arizona, that cattle men claim that the well-fed animal will not touch it, but that those which have formed the taste will not eat anything else. Reasons were urged by the speakers for the belief that the results of the *loco-weed* are due simply to mal-nutrition, or to effect of seeds alone, or to a poison (as extracted by Sheldon) diffused in very minute quantities throughout the plant.

3. By Dr. H. M. Richards "On some of the Reactions of Plants toward Injury."

Dr. Richards spoke on certain effects of wounding upon the functions of various plant organs as shown by his own experiments in Germany last summer. Diagrams illustrating the effect of injury upon both respiration and temperature were shown. In the former case it was seen that the respiration is greatly increased by wounding, attaining its maximum about 24 hours after the injury was inflicted, this increase depending both on the stimulus of the wound itself and upon the access of atmospheric oxygen to the tissues. The occurrence of a corresponding rise in temperature of a local nature, was also briefly referred to, the temperature curve corresponding closely to that described by the increased respiratory activity. The thermoelectric apparatus used was described, its delicacy is such as to indicate a difference of $\frac{1}{400}$ of a degree, the result with potatoes showing a maximum rise of temperature of a little over $\frac{2}{10}$ of a degree at the end of the second day, falling to the end of the fifth day. A remarkable temperature rise in the onion of nearly $3\frac{1}{2}$ degrees was explained by the fact that here the rise was not local, but affected the whole onion in accordance with its morphological structure, and with the fact that metabolism is carried on very fast in the onion.

The paper was discussed by Dr. Jelliffe and by Dr. Britton, especially with regard to the sudden escape of CO_2 after wounding, Dr. Richards considering it to be due largely to contents of intercellular spaces, but partly to solution within the cells; potatoes contain a very considerable amount of enclosed CO_2, a quart of it being obtained from a pound of potatoes. Dr. Richards distinguished carefully the coincident but independent escape of a slight amount of CO_2 always given off, even in pure hydrogen; to be called "intermolecular respiration."

4. The next paper was a contribution read by title, from Dr. Alexander Zahlbrückner, of Vienna, a corresponding member of the Club, entitled, "Revisio Lobeliacearum Boliviensium hucusque cognitarum." The paper, which is in Latin, enumerates all the species, giving synonomy and references to the literature, and cites collectors and their numbers. There are 39 species, as follows: 9 in *Centropogon*, 2 new; 20 in *Siphocampylos*, 7 new; 1 in *Laurentia;* 2 in *Rhizocephalum;* 3 in *Hypsela;* 4 in *Lobelia.* The paper will be printed in the BULLETIN.

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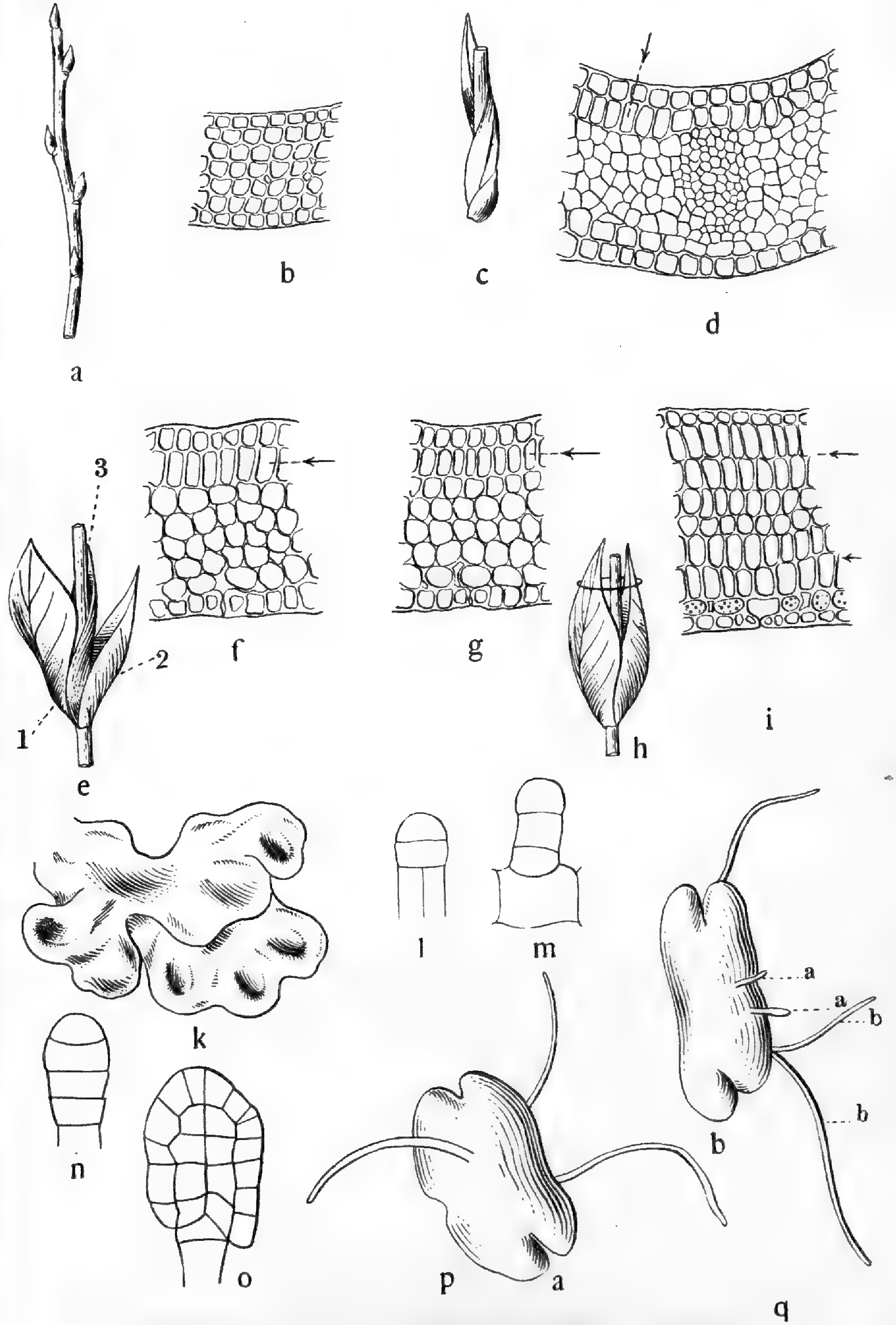

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BULLETIN

OF THE

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Vol. 24. Lancaster, Pa., April 24, 1897. No. 4.

Studies in the Botany of the Southeastern United States.—IX.

By John K. Small.

1. THE SESSILE-FLOWERED TRILLIA OF THE SOUTHERN STATES.*

In the spring of 1896, Professor Underwood and the writer independently became interested in a species of *Trillium* native in the southern Atlantic and the Gulf States.† Professor Underwood collected his material in Alabama, while I received specimens collected in western North Carolina, by my friend Mr. A. M. Huger.

The plant in question, judging both from descriptions and specimens preserved in our larger herbaria, has without exception been included in *Trillium sessile.* As I shall show, this is an error, and was committed by Linnaeus himself and both general botanists, and monographers of this group have apparently followed his disposition of the plants to the present time.

Without doubt the original *Trillium sessile* of Linnaeus‡ was a composite species, for after his description, "Trillium flora sessile erecto," he quotes descriptions from the three authors, Gronovius, Plukenet and Catesby, as follows:

* This study has been furthered by the loan of material from the herbaria of Harvard University and the United States Department of Agriculture.

† After extensive field observations during the spring and summer, Professor Underwood read a paper on the sessile *Trillia* before Section G of the American Association for the Advancement of Science at its last meeting. He expected to finish and publish the results of the study, but, being pressed for time, requested the writer to complete the work already well advanced.

‡ Species Plantarum, 340.

"Paris foliis ternatis, flore sessile erecto. Gron. virg. 44. Solanum virginianum triphyllum, flore tripetalo atropurpureo in foliorum sinu, absque pediculo, sessile. Pluk. alm. 352. t. 111. f. 6. Solanum triphyllum, flore hexapetalo: tribus petalis purpureis, caeteris viridibus reflexis. Catesb. car. 1. p. 50. t. 50."

The habitat given is "Virginia, Carolina." The first of these three descriptions throws little or no light on the subject, but the second and third quotations each refer to a plate. A comparison of these two plates indicates a great discrepancy, the figure of Plukenet representing a small plant with oval leaves, while the Catesby drawing illustrates a large robust plant with ovate-lanceolate leaves. If only these two plates had to be considered, there would be no doubt not only as to there being two distinct species involved, but we should have no trouble in deciding to which plant the name *Trillium sessile* must be applied. The first quoted description being wholly indefinite, left this important question in doubt. In order to settle this point definitely, Dr. Britton sent specimens of both the small and large plants to Mr. Edmund G. Baker, at the British Museum, and I can not do better than print his reply: " * * * * We have the Gronovian plant and also a plant in the Plukenet Herbarium, written up by Plukenet, but not the one apparently the figure was done from, as you will see from the tracing I enclose. The Gronovian and Plukenet plants are fairly similar and more like no. 2 (the small plant with oval leaves) than the much larger no. 1 (the large plant with ovate-lanceolate leaves). Neither of the specimens are particularly good ones, but I have tried to make tracings of them, such as they are, these will show the outline of the leaf if they do nothing else. You may like to have exact measurements of the Plukenet plant: Leaves broadly oval, 2 in. long, breadth $1\frac{7}{12}$ in., sepals $\frac{5}{6}$ in., petals $\frac{11}{12}$ in. * * * * ."

Thus we see that the first and second quoted descriptions in the Species Plantarum are represented by specimens which agree with each other in all essential particulars, while the third quotation is founded wholly on a plate, which represents a species totally distinct from that on which the first and second descriptions were founded. Therefore the name *Trillium sessile* must be associated with the small oval-leaved plant, and the large plant must receive a name, which will appear in the appended synopsis. The solution of this ong-standing error naturally excited my interest in this whole group of *Trillium*, and a study of the different species leads me to print the following key and specific descriptions which, I hope, will lead to a better understanding of these interesting plants.

As far as I can see, this group of *Trillium* has always been very unfairly treated; most authors seem to have taken it for granted that the number of species was very limited and that that number could not be naturally increased. If an author did put his convictions in print, described a new species, pointed out excellent characters for a species and distributed specimens, that species was almost certain to find itself in synonymy or reduced to varieta, rank of another species at an early date. This state of affairs continued and reached a climax in Dr. Watson's treatment of the group in his revision of the North American Liliaceae,* where only two forms are given specific rank, while the rest are included in the synonymy or varietal ranks under a much distorted nomenclature, for example, *Trillium viride* Beck appears as a synonym of *Trillium sessile* L., *Trillium discolor* Wray appears as a variety of *Trillium sessile* under the new name *Wrayi*, *Trillium viridescens* Nutt. (*T. viride* Beck) also appears as a variety of the Linnaean species under the new name *Nuttallii* and *Trillium lanceolatum* Boykin mss. is set down as a variety of *Trillium recurvatum*, which is fortunate enough to have retained specific standing.

Key to the Species.

Petals sessile, of one color throughout.

Sepals oblong or oblong lanceolate; petals broadly spatulate. 1. *T. discolor.*

Sepals lanceolate; petals lanceolate, elliptic or oblanceolate.

Leaves oval or suborbicular, 4–8 cm. long; anthers 3–4 times longer than the filaments; styles elongated, nearly straight. 2. *T. sessile.*

Leaves ovate-lanceolate to ovate-orbicular, 8–18 cm. long; anthers subsessile; styles almost wanting, stigmas recurved. 3. *T. Underwoodii.*

Petals clawed, the blade and claw often of different colors.

Leaves sessile; blades of the petals linear or linear-oblong.

Stems rough pubescent at least above; leaves ovate or oblong; sepals 2.5–5 cm. long; filaments—$\frac{1}{4}$–$\frac{1}{3}$ shorter than the anthers. 4. *T. viride.*

Stems smooth; leaves lanceolate or elliptic; sepals 2–2.5 cm. long; filaments about as long as the anthers. 5. *T. lanceolatum.*

Leaves petioled; blades of the petals ovate, elliptic or obovate. 6. *T. recurvatum.*

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* Proc. Am. Acad. 14: 213–303.

1. Trillium discolor Wray; Hook. Bot. Mag. *pl. 3097.* 1831.*

Trillium sessile var. *Wrayi* S. Wats. Proc. Am. Acad. 14: 273. 1879.

Perennial by a rootstock, bright green, glabrous. Stems erect, 1–2 dm. tall, smooth; leaves oval, 6–7 cm. long, obtuse, or short-acuminate, 3–5-nerved, mottled, rounded at the base, sessile; flowers sessile; sepals oblong or oblong-lanceolate, 2 cm. long, obtuse or acute, spreading; petals broadly spatulate, about ⅓ longer than the sepals, greenish, sessile, rounded and one prominently apiculate at the apex; stamens less than ½ as long as the petals, the filaments nearly wanting; berry not seen.

Georgia.

Apparently a rare species and not lately collected, but very distinct, differing from all its relatives in the peculiar broadly spatulate petals, one of which is distinctly apiculate.

2. Trillium sessile L. Sp. Pl. 340. 1753.

Perennial by an erect or ascending corm-like rootstock, deep green, glabrous. Stems solitary or clustered, erect, 1–2 dm. tall, slender; leaves oval or suborbicular, 4–8 cm. long, obtuse or acute, rounded at the base, sessile, 3–5 nerved, not mottled; flowers sessile; sepals lanceolate, 2–3 cm. long, acute or acutish; petals narrowly elliptic, slightly shorter than or longer than the sepals, sessile, acutish, purple; stamens about ½ as long as the petals; filaments dilated at the base, ⅓–¼ shorter than the anthers; styles elongated, nearly straight, berry not seen.

In woods, Pennsylvania to Minnesota, south to Florida and Mississippi. April and May.

3. Trillium Underwoodii n. sp.

Perennial by a horizontal rootstock, bright green, glabrous. Stems solitary or clustered, 1–3 dm. tall, stout; leaves varying from ovate-lanceolate to ovate-orbicular, 8–18 cm., long, acute or short-acuminate, undulate, sometimes crisped, with a velvety lustre, mottled with 3 shades of green, rounded or subcordate at the base, sessile; flowers sessile, musk-scented; sepals lanceolate, 4.5–5.5 cm. long, obtuse or acute, erect or spreading, green or purplish-green; petals lanceolate, elliptic or oblanceolate, 5.5–8.5 cm. long, sessile, acute or obtuse, erect, purple; stamens 3–4 times shorter than the petals, filaments very short, anthers 1.5–2 cm. long, subsessile; styles almost wanting; stigmas recurved; berry ovoid.

* I am indebted to Dr. B. L. Robinson for a tracing of the original plate of *Trillium discolor*.

In woods and fields, North Carolina to Tennessee, south to Florida and Alabama. April and May. Ascends to 950 metres in North Carolina. *Trillium sessile* and *Trillium Underwoodii* are remarkably constant in comparative size. The two species can readily be segregated on size and habit alone and of course comparative measurements of organs would serve as an excellent basis of separation. But this is not necessary since we have such good specific characters as exist in the flower, especially as respects the stamens and styles.

4. TRILLIUM VIRIDE Beck, Am. Jour. Sci. **11**: 178. 1826.

Trillium viridescens Nutt. Trans. Am. Philos. Soc. (II.) **5**: 155. 1837.

Trillium sessile var. *Nuttallii* S. Wats. Proc. Am. Acad. **14**: 273. 1879.

Perennial by a short corm-like rootstock, bright green, more or less pubescent. Stems solitary, or several together, 1–4 dm. tall, purple, rough-pubescent at least near the top; leaves oblong, ovate, or broadly ovate, 5–11 cm. long, acute or obtusish, 3–5-nerved, usually blotched, more or less pubescent on the nerves beneath, abruptly short-attenuate at the base; flowers sessile; sepals linear or linear-lanceolate, 2.5–5 cm. long, bright green, acute or obtuse, erect or spreading; petals clawed, the blades linear or nearly so, 2.5–6 cm. long, surpassing the sepals, light green or purplish green, acute or obtuse, on brown or purple claws; stamens about $\frac{1}{3}$ as long as the petals; filaments flattened, $\frac{1}{4}$–$\frac{1}{5}$ shorter than the anthers; berry not seen.

In woods and glades, Missouri to Tennessee, south to Mississippi and Arkansas. April and May.

Prof. Beck published a good description of this species in the year 1826. Mr. Nuttall described an apparently extreme form of the same species eleven years later. With these two full descriptions and the original specimens of Mr. Nuttall extant, it seems strange that *Trillium viride* Beck, and *Trillium viridescens* Nutt., being one and the same species, should, on the one hand, be made a synonym and on the other a variety of a species to which it is only distantly related; the clawed petals, among many other characters, primarily prevent it being associated with *Trillium sessile.* Its true relationship is with *Trillium recurvatum.*

Mr. Nuttall collected the original specimens of *Trillium viri-*

descens in Arkansas, and of this collection there are good specimens preserved. Prof. Beck's plants came from St. Louis and, although I have not seen his original specimens, we have a specimen from the same place collected by Riehl in 1841, and, in addition to this, Mr. Henry Eggert has sent me excellent material from the vicinity of St. Louis collected during the past few years. All these plants, as well as those from the extremities of the known geographic range cited above, agree with each other in essential specific characters.

5. Trillium lanceolatum Boykin; S. Wats. Proc. Am. Acad. 14: 274. As synonym. 1879.

Trillium recuratum var. (?) *lanceolatum* S. Wats. Proc. Am. Acad. 14: 273. 1879.

Perennial by a rootstock, bright green, glabrous. Stems erect, 1–4 cm. long, slender, purplish, smooth; leaves lanceolate or elliptic, 7–9 cm. long, acute or acutish, more or less constricted at the base, sessile; flowers sessile; sepals linear or linear-lanceolate, 2–2.5 cm. long, acute, green, spreading; petals clawed, 3–3.5 cm. long, the blades linear or linear-oblong, acute, the claws about ½ ~~twice~~ as long as blades; stamens about ⅓ as long as the petals; filaments about as long as the more or less incurved anthers; berry not seen.

mottled?

In moist woodlands and river bottoms, Georgia to Alabama, and Louisiana. (?) April and May.

The following label accompanying Dr. Boykins' original specimen may be of interest: "*Trillium lanceolatum.* This is certainly a new species of sessile *Trillium.* It grows universally in stiff clayey river bottoms. Flowers March and April. The fruit is more bellied than S. Trillium, and deep grooving formed by the stamina, rendering it hexagonal. Stamina incurved."

6. Trillium recurvatum Beck, Am. Journ. Sci. 11: 178. 1826.

Trillium unguiculatum Nutt. Trans. Am. Philos. Soc. (II.) 5: 154. 1837.

Perennial by a short horizontal rootstock, light green, glabrous. Stems solitary, or several together, 1–4 dm. tall, smooth, usually slender; leaves petioled, the blades ovate-lanceolate, oval or suborbicular, obtuse or acute, 5–9 cm. long, rounded or sub-cordate at the base or rarely attenuate, often mottled; petioles winged, several times shorter than the blades; flowers sessile, purple; sepals lanceolate, 2–3 cm. long, acute, finally deflexed; petals clawed, the blades ovate, obovate or elliptic, usually acute, about twice longer than the claws; stamens hardly ½ as long as the petals; filaments about ½ or ⅓ as long as the more or less incurved anthers; berry not seen.

In woods, Ohio to Minnesota, south to Mississippi and Arkansas. April and May.

2. NOTES ON CRITICAL SPECIES.

Iris verna L. Sp. Pl. 39. 1753.

I have seen two collections of the spring Iris during the past season, both from North Carolina; the one was made by Mr. A. M. Huger in the mountains and the other by myself in the central part of the State. I find that two of its striking features have not been recorded: first, the remarkable elongation of the leaves, which often reach a length of 3–4 decimeters, and second, the odor of the flowers, which almost exactly imitates the fragrance of sweet violets.

Anemone trifolia L. Sp. Pl. 540. 1753.

While walking along a small stream just west of the Falls of the Yadkin river, last spring I was astonished to find fine plants of *Anemone trifolia.* The species has only been known to exist in America on the higher parts of the Alleghanies, chiefly in the Southern States, but here, in the central part of North Carolina at an elevation of only 200–300 feet above the level of the sea, the species appears as typical as anywhere.

Cardamine parviflora L. Sp. Pl. Ed. 2, 914. 1763.

Virginia seems to have been the southern recorded limit for this species but now Mr. A. M. Huger sends us good specimens from the mountains of Polk County, North Carolina.

Diamorpha pusilla Nutt. Gen. 1: 293. 1818.

The geographic range of this curious plant is gradually expanding. I have recently found the species at various points in northern Georgia and in 1894 and 1895 met with it on Dunn's Mountain in Rowan County, North Carolina. The outlying stations of its distribution as we have it represented by specimens are:

Cumberland Mountains, Tennessee, Prof. Kirby Smith.
Mountains of North Carolina, Mr. G. R. Vasey.
Habersham County, Georgia, Mr. Buckley.
Warren County, Georgia, Dr. Chapman.
Stone Mountain and vicinity, Georgia, various collectors.

WALDSTEINIA FRAGARIOIDES (Michx.) Tratt. Ros. Mon. 3: 107. 1823.

Like *Anemone trifolia* this is normally an Alleghanian species, but I have found quantities of it in the central part of North Carolina growing in dark ravines which branch from the cañon at the Falls of the Yadkin. The altitude of the locality is little over 150 feet.

OXALIS RECURVA Ell. Bot. S. C. & Ga. 1: 526. 1821.

During the summer of 1895 I collected a few specimens of this beautiful and strongly characterized *Oxalis* at Stone Mountain and in the vicinity of Augusta, Georgia.

MONOTROPSIS ODORATA Ell. Bot. S. C. & Ga. 1: 479. 1817.

This rare plant has lately been rediscovered by Mr. A. M. Huger on the mountains of Polk County, North Carolina.

SCUTELLARIA CAMPESTRIS Britton, Mem. Torr. Club. 5: 283. 1894.

In former papers of this series I have reported a number of typically prairie plants which occur east of the Appalachian mountain system; *Scutellaria campestris* must now be added to the increasing list. In April, 1896, I found several patches above the bluffs at the Falls of the Yadkin River, North Carolina. The latest record of its distribution is given by Drs. Watson and Coulter* as southern Illinois and Kansas. Both Prof. Bain and Mr. Bicknell have collected specimens in Tennessee. It is an excellent species and doubtless has a considerably wider range than our present material indicates.

3. NOTES ON EPILOBIACEAE.

The genus *Ludwigia* as it is now generally interpreted has always seemed to me to contain too many distinct generic types.

* A. Gray, Man. Ed. 6. 418.

I think Linnaeus' idea of holding *Isnardia palustris* generically separate from *Ludwigia alternifolia* is the proper way of disposing of these widely divergent species and their respective relatives. There are three clear generic lines in *Ludwigia* as it is limited by most authors and I think it is much more satisfactory to treat these groups as separate genera than to associate them as subgenera in a composite genus.

I append a synopsis which will serve to emphasize the diagnostic characters:

Leaves opposite; stems prostrate or decumbent, creeping or floating.
- Flowers sessile; petals wanting or very small; leaves petioled; capsules short, sessile, straight, with a flat or depressed top. 1. *Isnardia.*
- Flowers long-stalked; petals large and conspicuous; leaves sessile; capsules elongated, long-stalked, curved, with a prominent 4-lobed stylopodium. 2. *Ludwigantha.*

Leaves alternate; stems erect or ascending. 3. *Ludwigia.*

1. ISNARDIA L. Sp. Pl. 120. 1753.

Key to the Species.

Petals usually none; capsules 2.5–4 mm. long.
- Pubescent; capsules 2.5–3 mm. long. 1. *I. spathulata.*
- Glabrous; capsules 3–4 mm. long. 2. *I. palutris.*

Petals usually present; capsules 6–7 mm. long. 3. *I. natans.*

1. Isnardia spathulata (T. & G.).

Ludwigia spathulata T. & G. Fl. N. A. 1: 526. 1840.
Around pine barren ponds, middle Florida.

2. Isnardia palustris L. Sp. Pl. 120. 1753.

Ludwigia apetala Walt. Fl. Car. 89. 1788.
Ludwigia nitida Michx. Fl. Bor. Am. 1: 57. 1803.
Ludwigia palustris Ell. Bot. S.C. & Ga. 1: 211. 1817.
Isnardia palustris var. *Americana* DC. Prodr. 3: 61. 1828.
Isnardia ascendens Hall; Eaton & Wr. N. A. Bot. 285. 1840.
Ditches, streams and ponds, throughout eastern North America.

3. Isnardia natans (Ell.).

Ludwigia natans Ell. Bot. S. C. & Ga. 1: 518. 1817.
Streams and marshes, North Carolina to Florida and Mexico.

2. LUDWIGIANTHA.

[*Ludwigia*, section *Ludwigiantha* T. & G. Fl. N. A. 1: 526. 1840.]

1. LUDWIGIANTHA ARCUATA (Walt.).

Ludwigia arcuata Walt. Fl. Car. 89. 1788.
Ludwigia pedunculosa Michx. Fl. Bor. Am. 1: 88. 1803.
Isnardia pedunculosa DC. Prodr. 3: 60. 1828.
Swamps and marshes, Virginia to Florida.

3. LUDWIGIA L. Sp. Pl. 118. 1753.

Represented by fifteen species in the southern United States.

An ecological Study of the Genus Talinum with Descriptions of two Species.

BY J. W. HARSHBERGER.

(PLATE 299.)

There are admitted by Engler and Prantl in their voluminous work, "Die Natürlichen Pflanzenfamilien," seventeen genera of the family Portulacaceae, and, according to the Index Kewensis, the distribution of the species of these several genera is as follows:

Genus.	Number of Species.	Western Hemisphere including N. and S. America and Islands.	Eastern Hemisphere including Asia, Africa, Europe and Oceanica.
1. Talinum	30	25	5
2. Calandrinia	125	100	25
3. Spraguea	2	2	—
4. Calyptridium	3	3	—
5. Talinopsis	1	1	—
6. Pleuropetalon	2	2	—
7. Grahamia	1	1	—
8. Anacampseros	12	—	12
9. Claytonia	25	21	4
10. Hectorella	2	—	2
11. Montia	—	—	—
12. Monocosmia	2	2	—
13. Silvaea	4	4	—
14. Portulacaria	2	—	2
15. Talinella	1	—	1
16. Portulaca	54	20	34
17. Lewisia	2	2	—
	268	183	85

It is at once apparent from an inspection of this table, that more than one-half of the genera are American, and of those found in the eastern hemisphere all are represented by species in the western hemisphere. Out of a total number of 268 species in 16 genera, 183 species are confined to the western hemisphere and 85 species to the eastern. The larger number of species of the eastern hemisphere, numbering some 71, belong to three genera *Calandrinia*, *Anacampseros* and *Portulaca*. Broadly speaking, the order Portulacaceae is an American order, and is interesting to the botanist morphologically, as well as ecologically. There is no more interesting genus from an ecologic standpoint than the genus *Talinum*.

It will be seen, if the American species of this genus are arranged geographically, that the greater number of well-defined species range from Cnili and Peru, where proportionally the greatest number of species is found, through Mexico where the genus is represented by at least 5 species to western North America to New Mexico and Texas.

COUNTRY.	Number of Species.
Chili	6
Peru	2
Venezuela	1
Am. trop	2
Mexico	5
Am. bor. occ	4
N. Mexico	1
Texas	2
Ind. or	1
Am. bor	3

The greater majority of the species of the genus *Talinum* range, therefore, along the backbone of the continent, and the species are discovered in greatest abundance in Mexico and western South America. A few species are isolated, and are separated from the main regiment as stragglers. *Talinum teretifolium* is one of these species, ranging over the eastern and central United States. From Prof. Thos. C. Porter, I learn that in the Herbarium of Lafayette College there are specimens of *Talinum teretifolium* collected in the following localities, in addition to the commonly known one on the serpentine ranges of Chester County, Pennsylvania.

1. Dunn's Mt. and Roan Mountain, N. C. (Small.)
2. Sapulpa, Indian Terr. (B. F. Bush.)
3. Summit, Yonah Mt., Ga. (T. C. Porter.)
4. Sandy Barren, Oquaka, Ill.
5. Arena, Wisconsin.
6. Little-Stone Mt., De Kalb Co., Ga.
7. Rocky Knob, Caldwell Co., N. C.

The following observation by Mr. E. J. Hill is to the point.* *Talinum teretifolium* was found in 1832 on rocks above Taylor's Falls. "It is occasionally met with from Pennsylvania westward to Minnesota in our northern flora, being more common in Minnesota than elsewhere in this range of States." It has also been found at Miller's, Lake County, Indiana. In Illinois, it is found in sandy prairies and barrens. This disconnected distribution in isolated patches of country is hard to explain, unless we accept two propositions, both of which, or either of which may suffice as an explanation. 1. That its distribution as a species is due to the lightness of its seeds. 2. That being at one time a wide spread plant, it has been destroyed over the greater part of its range with the exception of a few localities, where it is still pretty abundant.

It is important also to draw attention to the distribution of the plant as influenced by the soil or rock formations. It is found abundantly in some places on the serpentine outcrops in Chester County, where I have observed its growth. These serpentine outcrops trend in a general southwesterly direction through Delaware and Chester counties, reaching their greatest extent in Pennsylvania on the Maryland line. These serpentine outcrops are essentially rocky oases, which have in some respects a peculiar flora. These barrens are characterized by the presence of the Red Cedar, *Juniperus Virginiana*, which, although scattered elsewhere in the neighborhood, is never so abundant, nor so closely grouped, as on these stony places. Not all of the serpentine barrens have the same association of species, for instance, *Cerastium oblongifolium* and *Talinum teretifolium* are not found on all of the serpentine ledges, but are localized to particular ones. So it is with other

* 1891. E. J. Hill, Botan. Gaz. 16 : 112. Notes on Flora of St. Croix Region.

associated species. They may be abundantly present in one spot, but absent in another. These facts make the study of the flora of the serpentine barrens especially inviting. According to Dana,* serpentine is a hydrous magnesium silicate like talc, but containing more water and less silica. It is of a green color, often clouded and has been made through the alteration of anhydrous magnesian silicates, as chrysolite. It is used as a building material in Philadelphia, the main college hall of the University of Pennsylvania being built of it. Because the plant *Talinum teretifolium* is confined in Eastern Pennsylvania to soil formed by the decomposition of serpentine rocks, it is interesting to inquire whether the chemical composition of the rocks has anything to do with its distribution, especially, as magnesium is so prominent an element in the rock's constitution. The first analysis of the plant made from meagre material by Dr. Owen Shinn of the Harrison Chemical Laboratory (Univ. of Pa.) led me to believe that such was the case. Farther analysis with more abundant material made by Prof. Henry Trimble, of the Philadelphia College of Pharmacy, led to a somewhat different opinion. His letter submitting the analysis is here quoted. "The overground portion contained so much water that there was not enough material in which to more than determine moisture and ash.

	Moisture	Ash in Absolutely Dry Substance.
Overground portion	86.65%	13.63%
Underground portion	24.12%	11.15%

"The ash of the underground portion consisted of potassium sulphate and potassium chloride, also calcium and magnesium phosphate, the magnesium phosphate being very abundant. The ash of the overground portion contained the same compounds, but apparently in different proportions from what there existed in the underground portion, potassium chloride being in this overground portion in great abundance. How this plant gets so much potassium from a magnesian soil is almost a mystery. Certainly it is interesting." It is known that potassium has to do with the formation of carbohydrates. If a plant does not find any potassium in the soil its growth ceases, and the leaves do not de-

* 1886. Dana, Manual of Mineralogy and Petrology (1894) 330.

velop the power of starch formation within the chlorophyll grains. As starch is stored abundantly in *Talinum teretifolium*, it may be that the potassium chloride plays this rôle, but this has not been certainly determined. It is interesting, however, to note that the phosphate of magnesium is present in the perennating stem, having been taken up by the roots. Whether its presence in the plant determines the plant's distribution is still a physiological enigma.

The plant has been recorded from other formations. Gray's manual says serpentine rocks. Upham* records it as occurring on ledges of rock (trap, syenite, granite and quartzite). It was found by Hill in the silicious sands at Miller's, Lake County, Indiana. In Illinois, it is found on sandy prairies and barrens. At Taylor's Falls, three other plants are associated with it on trap rocks, viz.: *Campanula rotundifolia*, *Selaginella rupestris* and *Cladonia rangiferina*. A mention of the habit of the plant in other places than southeastern Pennsylvania shows that *Talinum teretifolium* chooses many different soil formations, and the name of one locality Arena, Wisconsin, is suggestive.

Several species of the genus *Talinum* were found by me in Mexico this last summer growing on the bare faces of rocks. On the Cerrode Guadalupe, a rocky hill on the south front of which is situated the Holy Shrine of "Our Lady of Guadalupe" (Nuestra Senora Guadalupe) were found two species on the face of the weather worn rocks, namely *T. patens* and *T. aurantiacum*. These plants grew in an extremely dry situation, and exposed to the full blaze of the sun. The flat succulent leaves of *T. patens* were rolled up at their edges, so that the plant had a peculiarly curled appeared. This was no doubt an adaptation on the plant's part to meet the direct rays of the sun. The root of this plant is large, fleshy and succulent, and penetrates to a considerable depth (8–10 in.) into the crevices of the rocks. *T. aurantiacum* is consolidated more than *T. patens*, and has a strong swollen taproot, somewhat tuber-like in appearance. The leaves are linear, thick and grooved by two longitudinal grooves, as if the margin had been inflexed. Two other Mexican species *T. Greenmanii* and *T. napiforme* were discovered on exposed volcanic

* 1891. Upham, Botan. Gaz. 16: 112.

rocks. *T. Greenmanii* occurs on volcanic ground, Sierra de Ajusco, 8500 feet altitude; *T. napiforme* in the Pedrigal at Thapam, 7300 feet altitude. Both of these plants are succulent, consolidated and well adapted to stand the long periods of draught which are the rule in these volcanic regions. The roots penetrate into the volcanic pockets, where they find enough of soil for their needs. The leaves of both are terete, clustered at the base and surround a much abbreviated flower-stalk. It is interesting to note, that two other species of the genus, namely *T. confertiflorum*,* and *T. humile*,† are found in the Pinos Altos mountains, New Mexico. Another species, *Talinum spinescens*, is also adapted to dry situations, as shown by its dwarf habit and terete leaves. It was discovered by T. S. Brandegee on bare hills east of Ellensburgh, Washington.

Before describing the particular structure of *Talinum teretifolium*, as determined by microscopic examination, it is expedient to describe the two species, one new, found by me this summer while botanizing with the veteran collector and botanist, Mr. C. G. Pringle.

1. Talinum napiforme DC.

Roots perennial, somewhat tuberous, 1–2 in. long, ½ in. broad, swollen with rounded button-like knobs and covered with corky scales of a dark brown color and bronze-like lustre; scales protective, root fibres long and rooting in the crevices of the rocks; acaulescent; leaves terete, smooth, waxy-green, flattened at base, rounded acute, 1–2½ in. long, clustered at top of root; scape 3–8 in. tall, cymosely many-flowered; bractlets small, sessile, acute; flowers small, ½ in. across; sepals 2;‡ petals 5,§ white veined with purple; stamens 5; ovary short, rounded; style short; stigma capitate, hispid; fruit small, $\frac{1}{5}$ in. long, 3-cornered, sutural dehiscence; seeds small, black, spirally grooved. (Plate 299, fig. 3.)

Valley of Mexico, Tlalpam, Pedregal, growing on volcanic rocks. Resembling *T. confertiflorum* of E. L. Greene. Distributed in Pringle's Plantae Mexicanae as no. 6487.

2. Talinum Greenmanii n. sp.

Tap-root spindle-shaped, forked or straight, 2 in. long; acaules-

* E. L. Greene, Bull. Torr. Club, 8: 121.

† E. L. Greene, Bot. Gaz. 6: 183.

‡ Called bracts by Warming.

§ Called perianth by Warming.

cent, or with stem 1–2 in. long; leaves terete, 1–3 in. long, acute, green, clustered at top of short stem; inflorescence cymose not exceeding the leaves, branched with 5–8 flowers; sepals 2; petals 5; bright yellow; stamens 7–8, filaments long; ovary round; style short; stigma three-grooved; fruit rounded, triquetrous; seeds, small, smooth. (Plate 299, fig. 4).

Volcanic gravel, Sierra de Ajusco, Mexico. 8500 feet. Possibly it is *T. humile* described by E. L. Greene. Distributed in Pringle's Plantae Mexicanae as no. 6472. Named in honor of Mr. Jesse Moore Greenman, of the Gray Herbarium, Cambridge, Mass.

Talinum teretifolium belongs to that group of the genus with round leaves, as distinguished from those species which have leaves more or less flattened, as *T. patens, lineare* and *brevifolium*.* *Talinum teretifolium* is interesting not only on account of its geographical distribution, but also from its significance from an histological and ecological standpoint. The stem is tuberiform, provided with closely appressed scale-leaves (induviae). During the active growing season, the perennating stem becomes more or less elongated, from which the green succulent stem arises bearing the terete foliage leaves. In the fall, just before the cessation of growth, rounded, tuberiform branches appear, which finally break from the main perennating stem as the plant withers. These small tuberous branches remain dormant during the cold of winter, their contents being protected by a thick corky layer until spring opens, when they give rise to new foliage shoots. One of these tuberiform branches, or stems, was planted in a pot January 21, 1896, and watered carefully to determine whether these branches propagated the plant non-sexually. On March 25, 1896, a green outgrowth appeared. By the end of March the green sprout had reached the height of an inch and had eight well-formed terete leaves. (See Plate 299, fig. 2). It is probable, also, that these ball-like branches aid in the distribution of the plant, rolling from place to place.

Histology. The root is long, and in cross section is surrounded with cork from six to eight layers thick. As the long, elastic roots are exposed frequently to the drying action of winds, this cork envelope becomes all the more necessary. Internal to the

*1893. Thomas Howell, A Rearrangement of American Portulacaceae. Erythea, 1: 34.

cork, the cortex is found surrounding the central bundle, or stele. The stem consists of two distinct regions, a lower induviate, perennating, cork protected portion, and an upper green foliage portion. The cork in the lower portion is many layers thick, and when sections are cut and mounted in acetic acid as a preservative, the cork cells are found, after the lapse of a year, to have undergone a change. The walls are found covered with peculiar yellowish beads in chains. The appearance which the walls assume reminds one strongly of a suberized cell-wall, which has been acted upon by potash. The cause of this beaded appearance in *Talinum* is not known. It is probably caused by the long action of the acetic acid.

The cortex of the lower perennating portion consists of parenchyma cells which are filled with starch, as a reserve material. If specimens of *Talinum teretifolium* are gathered when the active storing of starch begins, beautiful leucoplasts in which are imbedded compound, or aggregate starch grains are discovered. In the thicker stems, no chlorophyll is found, except in the region immediately beneath the corky envelope. The bundles of the tuberiform stem are collateral, the phloem is present as soft bast, which in the green foliage portion of the stems adds on the outside some bast fibres for support and strength. In the green portion, the cork has disappeared.

The bundles of the scape of *Talinum teretifolium* illustrate that the development of the various cells of the mechanical tissue is dependent upon the strain imposed upon them. Consequently, the bast fibres here become clearly accentuated and are of a glistening white color, closely investing the wood by a continuous ring. Beneath the epidermis, collenchyma for strength is also found.

The leaves are terete, 1–3 in. long, sessile with a flat base. In section, a leaf is somewhat crescentic at the base, the xylem portion of the vascular strand is toward the upper surface, and the bast toward the lower face. The bast fibres at the base of the leaf are conspicuous for strengthening purposes, and their cell-walls are of a yellowish tinge. A more distal section is the same as to the position of the elements, but the thickened bast elements are wanting. Beneath the epidermis, a zone of chlorophyll tissue completely surrounding the leaf is seen, and if a section be cut near the apex, the chlorophyll is found to reach completely to the bundle, which is not the case farther down. The guard cells of the stomata are slightly sunken and, when viewed from above, are together somewhat ellipsoidal in shape.

The rounded succulent leaves with slightly depressed stomata and waxy bloom are well adapted to withstand the hot suns which beat in summer on the bare exposed ledges of serpentine in Chester county, Pennsylvania. Of *Talinum humile, confertiflorum, Greenmanii, napiforme, spinescens* with terete leaves, the same thing may be said. In the flat-leaved Portulacaceae, although the leaves are somewhat fleshy, the same adaptation is not so clearly marked.

A repetition of the observation made above on *Talinum patens* needs to be repeated at this point. I found this plant growing on a rocky hillside with a southern exposure called Cerrode Guadalupe in the Valley of Mexico. The leaves in the hot sun of midday were found more or less inrolled, thus giving to the plant a remarkably curled appearance. I have no doubt, although my observations did not extend long enough to fully justify the conclusion reached that, as in other plants, the leaves were inrolled as a protective adaptation. An observation of Mr. Meehan, on the night closing of the leaves of purslane, shows that such motions do occur in the Portulacaceae. Mr. Meehan notes* (Proc. Phila. Acad. Nat. Sci.) that in the list of plants having diurnal or nocturnal motion *Portulaca oleracea* does not appear. "At sundown the leaves at other times at right angles with the stem rise and press the upper surface against it. The morning ex ansion begins with dawn, and soon after sunrise the leaves are fully expanded. Mr. Isaac Burk has observed the same thing, not only in *Portulaca* but also in an allied plant of the West Indies, *Talinum patens*." The last observation of Mr. Burk shows that in *T. patens* the motion of the leaves is effected either by the approach of night, or by too great illumination and heat. These facts are in line with the behavior of other plants, notably certain sensitive Leguminosae. Vilmorin says of this plant that "It keeps fresh in spite of heat and drouth, and will grow vigorously on unshaded rocks."†

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*1882. Meehan, Bull. Torr. Club, 9 : 153.

† Les Fleurs de pleine Terre, 1124.

The inflorescence is a dichasium. In *Talinum teretifolium* it is tall and much branched; in *T. napiforme* the stalks are thin and wiry; in *T. Greenmanii*, the inflorescence scarcely rises above the leaves.

The flowers in *Talinum teretifolium* are small (⅔ in. broad), with two sepals or, as some morphologists would have it, two bracts and five petals, or a five parted perianth with parts imbricately arranged. The petals are of a bright rose-purple, ephemeral; stamens 15–20; capsule globular, triquetrous, three-valved, many-seeded. The flowers open regularly at a definite time during the flowering period. Darlington, in his Flora Cestrica (3d ed. p. 35), says, "Flowers bright purple, appearing in succession opening in sunshine at midday for three or four hours, then closing and shriveling." Mr. Meehan observes the same thing more accurately. He finds* that its flowers always open regularly at 1 P. M.; though for one season they closed promptly at 2, and the next time between 2 and 5 P. M.† In order to finally decide the matter as to opening of the flowers in this species, a visit was paid by me to a serpentine outcrop near Westtown, Chester County, Pa., on June 24, 1896.

Observations on the spot, the day being warm and bright, showed me that the flowers opened between 12:30 and 1 P. M., when the flowers were visited by certain hymenopterous insects, namely the male of *Calliopsis flavipes* Smith, and the female of *Calliopsis andreniformis* Smith.‡

The other species of *Talinum* differ from *T. teretifolium*, as to the time of opening of the flowers, so that this peculiarity of the plants is specific. E. L. Greene says,§ with reference to *T. humile*: "The flowers at 2 o'clock P. M., had not yet opened, hence it is one of those species whose flowers open at evening and close in the morning." Prof. Trelease very kindly had one of his pupils make some observations for me on *Talinum patens* growing in the Missouri Botanical Garden. In a letter to me, dated Aug. 7, 1896, he says: "The flower was fully open at 3:15, and by 4:39

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* 1881. Meehan, Bot. Gaz. 6. 280.

† E. J. Hill, Bot. Gaz. 16: 112.

‡ These insects were determined for me by William Fox, of the Academy of Natural Sciences, Phila.

§ Bot. Gaz. 6: 183.

nearly all of the flowers far enough advanced to open, had fully opened. At 6:00 P. M., none had closed. When the next observation was made at 7:30, nine-tenths of the flowers had closed, and by 7:45 all were closed."

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Explanation of Plate 299.

FIG. 1. *Talinum teretifolium*, showing induviate stem, and copiously branched dichasium.

FIG. 2. Tuberiform branch of *T. teretifolium*, produced in the fall of 1895, and sprouted in the spring of 1896.

FIG. 3. *Talinum napiforme* DC.

FIG. 4. *Talinum Greenmanii* n. sp.

Rarities from Montana.—I.

BY P. A. RYDBERG.

(PLATES 300, 301.)

ALLIUM FIBROSUM n. sp. PL. 300

Bulb with a fibrous coating; stem 2–3 dm. high, subterete, somewhat striate; leaves flat, thickish, 3 mm. wide, 1–1½ dm. long; umbel with numerous bulblets and few flowers on pedicels about 1 cm. long; perianth-segments lanceolate-oblong, obtuse, 6 mm. long; filaments slightly dilated below, ¼ shorter than the segments, and a little longer than the style; anthers oblong; ovary evidently 6 crested, with short rounded crests. (Plate 300.)

This somewhat resembles *A. Canadense*, from which it is distinguished by the smaller size, the bright red bulblets, and the crests of the ovary. From *A. reticulatum* and *A. Geyeri*, it is easily distinguished by the presence of the bulblets. Collected on a high dry mountain side near Lima, Mont., June 29, 1895, by P. A. Rydberg, (no. 2606).

ALLIUM SIBIRICUM L. Mant. 562. 1767. (*Allium Schaenoprasum* β L. Sp. Pl. 301. 1753. *Allium Schaenoprasum* Authors.)

This has generally been confused with *Allium Schaenoprasum*, but it is evidently a good species. It is much taller than that plant, being generally 5–6 dm. high, has only one basal leaf and generally several stem-leaves, these thick, about 5 mm. in diameter, and broader perianth-segments. *Allium Schaenoprasum* is only 2–3 dm. high, and its base is surrounded by many narrow leaves.

In rocky places, Sweet Grass Cañon, Crazy Mountains. (Alt. 7000 ft., no. 349.) It has also been collected at Deer Lodge, July 9, 1895, by myself (no. 2601).

CALOCHORTUS ACUMINATUS n. sp. PL. 301.

Stem about 2 dm. high, with a secondary bulb in the axis of the first leaf; leaves 3–5 cm. long, very narrow and involute from a broader sheathing base; sepals narrowly lanceolate, scarious-margined, acuminate, equalling, or more often, exceeding the petals; petals white, rhombic, obovate or oval, acuminate, hairy at the base around the oval-oblong gland; filaments a little dilated, especially below; anthers linear, with slightly sagittate base, tapering a little upward, but not acute; stigma rather large and thick. (Plate 301.)

Dry Mountains, near Lima, P. A. Rydberg, no. 2600, Aug. 5, 1895.

It is apparently nearest related to *C. Nuttallii*, from which it differs by the longer sepals, longer and tapering anthers and the acuminate petals.

HABENARIA DILATATIFORMIS. (*Platenthera gracilis* Lindl. Gen. & Sp. Orch. 288. 1835–9. *Habenaria gracilis* S. Wats. Proc. Am. Acad. **12**: 277. 1877. Not Hook. Exot. Fl. *pl. 135*. 1825.)

In general habit this most resembles *H. hyperborea*, from which it differs in the larger white flowers, in the lip, which is broadened at the base as in *H. dilatata*, although less so, and in the spur which is thickened at the end. From *H. dilatata* it differs in the less dilated lip and the shorter more saccate spur, which is slightly shorter than the lip.

Common in marshy places at an altitude of 5000–6000 feet. Spanish Basin by J. H. Flodman (nos. 360 and 361); also collected by P. A. Rydberg, in 1895, at Bozeman (no. 2607), and at Deer Lodge (no. 2608).

HABENARIA STRICTA (Lindl.). *Platentera stricta* Lindl. Gen. & Sp. Orch. 288. 1835–9.

This differs from the preceding in the greenish or purplish flowers, the narrower lip and the very short and much more saccate spur, which is scarcely more than one-half as long as the lip. *Habenaria saccata* Greene, Erythea, 3: 49, 1895, seems, from the description, to be the same. It is fairly common in swampy places of central Montana. Spanish Basin, collected by J. H. Flodman (no. 362), and by myself in 1895, near Mystic Lake, no. 2609.

ALNUS SINUATA (E. Regel).

Alnus viridis β Hook. Fl. Bor. Am. **2**: 157. 1837.

Alnus viridis sinuata E. Regel in DC. Prod. **16**: Part 2, 183. 1868.

Shrub 1–5 m. high; young bark brown and glossy with scattered white lenticels; older bark grayish; leaves 3–10 cm. long, oval, acute or acuminate at both ends, sinuately lobed and doubly and sharply serrate, thin, green and glabrous on both sides, very glutinous when young, in age shining; peduncles racemiform, very warty; staminate catkins 2 cm. long, sessile; pistillate ones shortly ellipsoid, 8–10 mm. long and 6–7 mm. in diameter, on pedicels 3–15 mm. long.

It most resembles *A. viridis*, but is easily distinguished by the thinner, more shining leaves, which are always more or less lobed and quite without any development of pubescence. In *A. viridis*, the veins on the lower surface are more or less ferruginously puberulent. In the same species the pistillate catkins are generally over 1 cm. long. *A. sinuata* has also been confounded with *A. tenuifolia* Nutt., which, according to Sargent, is an older name for *A. incana glauca* Regel or *A. incana virescens* Wats. I have not access to Nuttall's Sylva and am not able to verify this point. In the plate of *A. tenuifolia* in the Silva of North America, the leaves resemble more the present species than *A. incana glauca*, but Prof. Sargent's description and synonomy belongs evidently to the latter. In *A. tenuifolia, i. e., A. incana glauca*, the leaves have much rounder lobes and less sharp dentations, are less acuminate, thicker, and generally somewhat pubescent on the veins. The pistillate catkins are, as a rule, nearly sessile on the common peduncle.

It is fairly common in the mountain regions of Montana. (Flodman, no. 369, Spanish Basin, July 10, 1896.) In the Columbia herbarium there are three specimens of this species, viz.: one collected by Mertens at Sitcha, one by Scouler (no. 59) from the Columbia, and one received from Hooker, but without any indication of collector or locality. Probably it was collected by Douglas.

✓Urtica cardiophylla n. sp.

Urtica dioica (?) Rydberg, Contr. Nat. Herb. 3: 179. 1895.

Stem about 1 m. high, angled and striate and, as well as the leaves, nearly devoid of bristles; leaves broadly cordate, or the upper somewhat narrower, 6–10 cm. long, coarsely toothed, very thin, dark green, perfectly glabrous and shining; petioles about 3 cm. long, very slender; flower clusters small, rather few-flowered, in the specimens seen scarcely more than half as long as the petioles; stipules linear-lanceolate, 5–10 mm. long, very thin.

On a wooded creek bank, near Castle, Montana, Aug. 1, 1896, J. H. Flodman, no. 370. A specimen was collected by the author near Whitman, Neb., in 1893. In the report it was doubtfully referred to *U. dioica* (Rydberg, no. 1790). It is evidently near *U. gracilis*, from which it differs in the broader thinner leaves, the smaller flower-clusters and the nearly complete absence of bristles.

Coriospermum villosum n. sp.

Stem 2–4 dm. high, much branched from near the base, the branches divergent, striate, when young with the leaves and bracts villous with many branched hairs, in age glabrate; leaves linear, 2–4 cm. long, 1–3 mm. wide, cuspidate-mucronate; spikes rather dense, with more or less imbricated bracts; lower bracts linear-lanceolate, 5–10 cm. long, the upper ovate-acuminate and cuspidate, 4–5 mm. long and about 3 mm. wide with broad scarious margin; achene 2–2½ mm. long and 2 mm. wide, acutely margined but scarcely at all winged.

The following specimens belong to this species: *Montana:* P. A. Rydberg, no. 2623, 1895, from Manhattan, in flower. *Colorado:* Isabel Mulford, from Salida, in fruit. S. Watson, no. 993, from Carson Desert, Nevada, 1867, seems also to belong here.

There are at least three species of *Coriospermum* in the United States, viz.:

C. hyssopifolium L. with a low branching stem, more or less pubescent when young, very dense spikes with imbricated bracts, which are all broadly ovate, generally over 5 mm. long, and large achenes about 3½–5 mm. long and with broad wing margins. It grows around the Great Lakes and northward to the Arctic and westward to Washington.

C. nitidum Kit (*C. hyssopifolium microcarpum* Wats.), with tall slender perfectly glabrous stem, ascending branches, lax spikes, whose bracts are not overlapping each other and are much narrower and shorter, 3–4 mm. long and generally narrower than the small, 2 mm. long, broadly winged achenes. I have compared the American form with the European and cannot find any character by which to separate it. It grows from Texas, Kansas, Nebraska to Arizona and Washington (?).

C. villosum, described above, which resembles *C. hyssopifolium* in the spikes and the low branching, and *C. nitidum* in the size of bracts and achenes and narrow leaves, but differs from both by the lack of the wing-margin and by the longer pubescence.

New or noteworthy American Grasses.—VI.

BY GEO. V. NASH.

PASPALUM BIFIDUM (A. Bertol.)

Panicum Floridanum Trin. Mem. Acad. St. Petersb. (VI.) 3: Pt. 2, 248. 1834. Not *Paspalum Floridanum* Mx. 1803.

Panicum bifidum A. Bertol. in Mem. Acad. Sci. Bolog. 2: 598. *pl. 41. f. 2, e–h.* 1850.

Panicum Alabamense Trin.; Steud. Syn. Pl. Gram. 64. 1855.

Paspalum racemulosum Nutt.; Chapm. Fl. S. St. 571. 1860.

Paspalum interruptum Wood, Classbook, 783. 1861.

The above seems to be the oldest available name for this plant, the *Panicum Floridanum* of Trinius being excluded by the *Paspalum* of the same name previously published by Michaux. The excellent plate and description of Bertoloni, and the fact that his plant was from Alabama, leaves little to be desired in its identification. I have been unable to ascertain where Dr. Chapman secured the name of *P. racemulosum* Nutt. The publication by Nuttall of such a name I have failed to discover up to the present. The only name resembling that accredited to Nuttall by Chapman is *P. racemosum*, published by the former in the Transactions of the American Philosophical Society ((II.) 5: 145. 1837), but this is antedated by that of Lamarck. Nuttall secured his plant in southeastern Indian Territory, and just what he had I am as yet unable to determine. From a comparison of our plant with his description, I think it will become apparent at once that whatever plant he did have, it was some other than that which has been known for so long as *Paspalum racemulosum* Nutt. The racemes in his species are described as "brevibus" and the rachis as "pilosis," neither of which characters are to be found in our plant, which has the racemes exceptionally long for this genus. "Clavellate receptacle of the flowers pilose" and "calix villous" are surely not descriptive of these parts in this grass, the spikelets of which are very glabrous and the pedicels only puberulent.

There is in the herbarium of Columbia University a specimen ticketed as follows: "'Panicum Alabamense' Trin. in lit. 11. Jul. 1832. Alabama, Dr. H. Gates, 1831." This is apparently in Dr. Torrey's hand writing, and is pretty clear evidence as to the plant of Trinius published by Steudel. I can discover no essential differences between it and *Paspalum bifidum*. The leaves are somewhat broader and the racemes more numerous, but the habit, character of the spikelets, racemes and pubescence, and its distribution are the same. Other specimens from the Gulf States are similar to the one labeled as above.

Judging from the description given by Prof. Beal in Grasses of North America (2: 87, 1896), I take the *P. racemosum* of that work, which he has accredited to Lamarck, to be this plant. I am at a loss to understand, if the description has been seen by him, why he should adopt this name, as a mere casual comparison of Lamarck's description with our plant would show the error of such a decision. The *P. racemosum* Lam., was originally published in his Illustrations (1 : 176), but a much more extended description, in which a reference is made to the first publication, is given in the Encyclopedia Methodique (5 : 32), where it is stated that the plant is remarkable for its branching culms, and, further, that the inflorescence is composed of a large number of short spikes, 40–50, and that the rachis is flat. He also remarks that his plant came originally from Peru. This would hardly describe the grass which I think Prof. Beal had in mind, in which the culms are never branching but always simple, the racemes unusually long for this genus and erect, and the rachis somewhat triquetrous and narrow but not flat. Moreover, one would hardly expect to find native in the southern Atlantic and Gulf States a plant which is indigenous to Peru.

PANICUM BICKNELLII n. sp.

Whole plant, with the exceptions noted below, smooth and glabrous. Culms erect, or sometimes decumbent, slender, 2–4 dm. tall, at length somewhat branched, the lower internodes puberulent, the nodes sparingly barbed; sheaths generally longer than the internodes, ciliate on the margins, the lowermost pubescent; ligule a fringe of very short hairs; leaves elongated, increasing in length toward the top of the culm, erect, linear, acuminate at the apex, narrowed toward the ciliate base, scabrous on the margins, 7–9 nerved, the midnerve prominent at the base, the primary leaves 8–16 cm. long, 5–10 mm. wide, the uppermost one usually about equalling the panicle, the leaves on the branches shorter, the upper ones much exceeding the panicle; primary panicles ovate, 6–8 cm. in length, the main axis scabrous as are also the ascending slightly flexuous branches, the secondary panicle much smaller with usually appressed branches; spikelets obovate, obscurely pointed, 2.5–3 mm. long, the first scale broadly ovate or triangular, acutish, one-quarter as long as the spikelet, sparsely pubescent, 1-nerved, the second and third scales membranous, equal in length, 9-nerved, pubescent with short spreading hairs, the latter enclosing a hyaline palet about one-half its length, the fourth scale chartaceous, yellowish, oval, obtusely apiculate, enclosing a palet of equal length and similar texture.

The type specimens were collected by Mr. Eugene P. Bicknell, in whose honor I take pleasure in naming it, in Bronx Park, on July 21, 1895. It was also obtained by Dr. Thomas C. Porter, on the slate hills near Chambersburg, Pennsylvania, on July 30, 1896.

A most peculiar grass, resembling much in habit *P. depauperatum*, and evidently allied to it, but the leaves are much broader and of a different shape and the spikelets smaller and but obscurely pointed.

√ PANICUM BRITTONI n. sp.

Whole plant, with the exception of the spikelets, smooth and glabrous. Culms coarsely striate, densely caespitose, slender, erect, rigid, 1–2 dm. tall, simple or sparingly branched; sheaths closely embracing the culm, striate, less than one-half the length of the internodes; ligule a ring of short hairs, about .5 mm. long; leaves longer than the sheaths, the basal ones broadly lanceolate, more or less spreading, 1.5 cm. long or less, 3–4 mm. wide, those on the culm three in number, the middle one the longest, 1–3 cm. long, 1.5–3 mm. wide, strictly erect, acuminate at the apex, generally somewhat narrowed toward the rounded base, primary nerves 5–7; panicle broadly ovate, 2–3 cm. long, the branches spreading or ascending, the lower ones 1–2 cm. long, the ultimate divisions sparingly scabrous, twice as long as the spikelets or longer; spikelets obovoid, or nearly oval, obtuse, about 1.3 mm. long, the first scale about one-third as long as the spikelet, membranous, usually purplish, glabrous or sparingly pubescent, acutish, the second and third scales equal in length, membranous, broadly oval, 7-nerved, densely pubescent with slightly ascending hairs, the third scale enclosing a hyaline palet about one-half its length, the fourth scale chartaceous, yellowish, oval, obtusely apiculate, enclosing a palet of equal length and similar texture.

In moist sand in the "pine barrens" at Forked River, N. J. Collected by Dr. Britton during an excursion of the Torrey Botanical Club to that region May 29–June 2, 1896.

Panicum ciliiferum n. sp.

Culms caespitose, 2–8 dm. tall, erect, at length much branched and decumbent, hirsute, except a naked ring below the barbed nodes, with ascending or nearly appressed hairs, which are usually more scanty at the summit or nearly wanting. Sheaths papillose-hirsute with ascending or nearly appressed hairs, the basal ones crowded, the remainder shorter than the internodes; ligule a ring of hairs about 1 mm. long, often with an upper supplemental row of much longer hairs; leaves rough and pubescent on the lower surface with short rigid appressed hairs, at least at first, the upper surface smooth and glabrous, or sometimes a few scattered long hairs near the base, ciliate with ascending hairs, 9–11-nerved, rounded at the base, acuminate at the apex, oblong-lanceolate to lanceolate, erect or ascending, those toward the base of the culm more and more spreading, shorter and broader, the primary leaves 2.5–9 cm. long, 3–12 mm. wide, those on the branches 6 cm. long or less, 2–5 mm. wide; mature primary panicle broadly ovate, 7–9 cm. long, 6–10 cm. wide, the branches spreading or slightly ascending, the longer 5–6 cm. in length, the panicles on the branches much smaller and exceeded by the leaves, with the bases included; spikelets obovate, somewhat acute, 3 mm. long, the first scale glabrous, about one-half as long as the spikelet, 1–3-nerved, acute or obtuse, or sometimes 3-toothed, the second and third scales equal in length, 9-nerved, strongly pubescent with somewhat ascending hairs, the latter scale enclosing a hyaline palet about one-half its length, the fourth scale chartaceous, oval, obtusely acute, enclosing a palet of equal length and similar texture.

Type collected by the writer in the "high pine land" at Eustis, Lake Co., Florida, March 12–31, 1894, no. 147. Nos. 27, 75, 79, 94, 96, 103, 1118, 1231, and 1518 of the same collection also belong here; as well as no. 1857, collected in the same place in 1895, and well representing the late and much-branched state.

The harsher papillose pubescence, the broader and shorter leaves, glabrous above, and the larger more open panicle readily separate this from *P. malacon,* which is described below.

I was at first inclined to consider this the *P. ovale* of Elliott, but after a careful comparison with the description and with a specimen so named by Elliott, I feel justified in the above disposition of it.

PANICUM GLABRIFOLIUM n. sp.

Whole plant, except just below the lower nodes, smooth and glabrous and somewhat shining, especially the panicle and spikelets. Culms caespitose, 1.5–4 dm. tall, erect, rigid, slender, leafy to the top, the longer culms pubescent for a greater or less distance below the lower nodes, at length somewhat branched; nodes purplish, the lower ones generally upwardly barbed; sheaths strongly striate, the lowermost ones pubescent, particularly at the base, 3 cm. long or less, closely embracing the culm, a tuft of hairs on each margin at the apex; ligule a fringe of hairs .5 mm. long; leaves narrowly linear, 7–9-nerved, erect, rigid, thickish, long acuminate, narrowed toward the base, those on the sterile shoots 15 cm. long or less, 3–4 mm. wide, those on the fruiting culms 3–9 cm. long, 1–3 mm. wide; panicle ovate, 4–6 cm. long, 3–4 cm. wide, its branches spreading or somewhat ascending, single, the longer branches about 2 cm. long, bearing 3 or 4 distant ultimate divergent divisions which are 2–6 times as long as the spikelets; spikelets slightly exceeding .5 mm. in length, tinged with purple, obovate, the first scale less than one-half the length of the spikelet, membranous, orbicular-ovate, obtuse, 1-nerved, the second and third scales broadly oval, membranous, 5–7-nerved, the latter enclosing a hyaline palet one-half its length, the fourth scale oval, chartaceous, white, enclosing a palet of equal length and similar texture.

Collected by the writer in the "flatwoods" at Tampa, Florida, on August 20, 1895, no. 2415a. It grows in dense tufts, the long narrow erect leaves and the wiry culms giving it a striking appearance.

PANICUM LINDHEIMERI n. sp.

Whole plant, with the exception of the lower sheaths, usually the lower internodes, and the spikelets, smooth and glabrous. Culms slender, erect, at length branched, the lower internodes sparingly papillose-hirsute, or sometimes glabrous; nodes often barbed with spreading or somewhat reflexed hairs; sheaths shorter than the internodes, somewhat loosely embracing the culms, ciliate on the margins, the lower ones sparingly papillose-hirsute; ligule a fringe of hairs about 2 mm. long; leaves ascending, 2–7 cm. long, 4–12 mm. wide, thickish, narrowly oblong-lanceolate, acute at the apex, rounded or truncate at the somewhat clasping base, 7–9-nerved, the margins scabrous; primary panicle orbicular-ovate, 4–5 cm. long, its branches spreading, the longer 2–3 cm. long, single, dividing at or near the base into 3–5 branches which subdivide into 1–3 branchlets, these usually appressed ultimate divisions rarely exceeding twice the length of the spikelets, the secondary panicles somewhat smaller; spikelets obovate, 1.5 mm. long, the first scale about one-third as long as the spikelet, white, glabrous, broader than long, rounded or almost truncate at the apex, sometimes slightly apiculate, 1-nerved, the second and third scales equal, membranous, yellowish green, broadly oval, 9-nerved; strongly pubescent with spreading hairs, the latter enclosing a hyaline palet one-half its length, the fourth scale chartaceous, broadly oval, yellowish white, enclosing a palet of equal length and similar texture.

The type was collected by F. Lindheimer in 1846, no. 565. The following also are to be referred here:

Heller, Kerrville, Kerr Co., Texas, 1894, no. 1752.

Nealley, Base of House Mt., McCulloch Co., Texas, June, 1890.

Wright, New Mexico, no. 2085.

Panicum malacon n. sp.

Whole plant often purplish, pubescent with white ascending hairs, those on the sheaths and culms longer, scantier on the upper sheaths and the upper part of the culms, the pubescence of the surfaces of the leaves dense and short. Culms caespitose, at first simple, erect, later branching at all the nodes and decumbent at the base; nodes barbed with spreading hairs; sheaths loosely embracing the culm, shorter than the internodes in the simple state, in the branching condition much crowded; ligule a fringe of hairs about 1 mm. long; leaves firm, rigid, sometimes sparingly ciliate, linear, acuminate at the apex, truncate or somewhat rounded at the base, 5–9-nerved, the midnerve prominent on both surfaces, the primary leaves 3–11 cm. long, 3–7 mm. wide, ascending, or the upper ones erect, those on the branches strictly erect, 5 cm. long or less, 3–4 mm. wide; primary panicle but little exserted, 7–10 cm. long, 2–4 cm. wide, its branches ascending or erect, the ultimate divisions 3–10 times as long as the spikelets, appressed to the branches, capillary but rigid, the lower and longer branches 4–6 cm. long, usually more contracted than those on the upper part of the panicle; spikelets obovate, a little exceeding 3 mm. in length, the first scale more or less pubescent, about one-half as long as the spikelet and 3–5 nerved, acute, the second and third scales membranous, equal, 9-nerved, densely pubescent with ascending hairs, the latter scale enclosing a hyaline palet about one-half its length, the fourth scale chartaceous, oval, enclosing a palet of equal length and similar texture.

Collected by the writer in the "high pine land" at Eustis, Lake County, Florida, May 1–15, 1894, no. 628, and distributed as *P. pauciflorum* Ell. It appears quite distinct from a specimen of that species, so named by Elliott, preserved in the herbarium of Columbia University, the character of the pubescence and the spikelets serving well to distinguish it.

√PANICUM MALACOPHYLLUM n. sp.

Whole plant, except the leaves, papillose-hirsute with rather soft long spreading hairs. Culms 4 dm. tall or less, erect, at length branching toward the summit; nodes densely barbed with reflexed hairs; ligule a ring of hairs about 1 mm. long; sheaths shorter than the internodes, loosely embracing the culms; leaves erect or ascending, narrowly oblong-lanceolate, narrowed toward the rounded base, acuminate at the apex, softly pubescent on both surfaces, rough on the margins, 7-nerved, the primary leaves 5–8 cm. long, 4–11 mm. wide, the leaves of the branches 4 cm. long or less, 3–5 mm. wide; panicle slightly exserted, ovate, 3–5 cm. long, the branches spreading, somewhat flexuous, the lower 1.5–2 cm. long, bearing 4–8 spikelets on pedicels shorter than themselves; spikelets obovate, 3–3.5 mm. long, acute, the outer three scales membranous, densely pubescent with long spreading hairs, the first scale orbicular-ovate, acute, about two-fifths as long as the spikelet, 1-nerved, the second and third scales equal in length, broadly oval, 9-nerved, acute, the latter enclosing a hyaline palet about one-half its length, the fourth scale chartaceous, broadly oval, yellowish white, enclosing a palet of equal length and similar texture.

Type collected by Mr. B. F. Bush on May 19, 1895, at Sapulpa, Indian Territory, no. 1228. The grass secured by Dr. Edward Palmer in 1868, on the False Washita, between Fort Cobb and Fort Arbuckle, Indian Territory, no. 383, belongs here. Dr. Gattinger also obtained it in the cedar barrens of Tennessee, in May, 1880.

This appears to be sufficiently distinct from *P. Scribnerianum* to warrant giving it specific rank. Its more slender habit, the long hirsute pubescence of the culm and the panicle, including its branches and pedicels, the densely barbed nodes, the softly pubescent leaves, and the somewhat smaller acute spikelets which are densely pubescent with hirsute hairs, appear to make the above disposition of the plant necessary. In *P. Scribnerianum* the pubescence is much more rigid, the culm and panicle glabrous, or rarely with a few scattered hairs, and the leaves and spikelets glabrous, or the latter occasionally somewhat pubescent with shorter hairs.

Dr. Palmer's no. 382, collected probably in the same locality as his no. 383, referred to above, is *P. Scribnerianum*, and strikingly shows the differences, already noted above, between this and *P. malacophyllum*, when growing in the same region.

PANICUM NEURANTHUM Grisebach, Cat. Pl. Cub. 232. 1866.

There is no doubt as to the occurrence of this species in the United States, its range extending, so far as the specimens to which I have had access indicate, from southeastern Virginia, thus bringing it into the region covered by the Illustrated Flora, to Florida, and westward to Louisiana.

Grisebach based his species on Wright's Cuban Collection no. 3453. This exactly matches the plant collected by A. H. Curtiss, in Duval Co., Florida, no. 3567*, and also my no. 1243, secured at Eustis, in the same State, during July, 1894.

I would refer to this species, in addition to those already cited above, the following:

N. L. Britton, Virginia Beach, Va., Sept. 10, 1895.
Ravenal, Aiken, S. C., May 28, 1867.
J. K. Small, near Valdosta, Lowndes Co., Ga., June 6–12, 1895.
J. H. Simpson, Sanibel Island, Fla., March, 1891, no. 298.
Chapman, Appalachicola, Fla.
S. M. Tracy, Ocean Springs, Miss., Aug. 3, 1889, no. 421.
C. L. Pollard, Biloxi, Miss., July 1, 1895, no. 1417.
Drummond, New Orleans, 1832.

Curtiss' plant, and also my own, both cited above, well represent the late and much branched state, while Simpson's no. 298, and the plant collected by Ravenal, both also alluded to above, present the state of the plant in its early and simple condition.

This is closely related to *P. angustifolium* Ell., a specimen of which, so named by Elliott, is in the herbarium of Columbia University. The smaller obtuse spikelets which are broader in proportion to their length and the branches of the primary panicle remaining contracted for some time readily separate it from the *P. angustifolium* Ell., in which the spikelets are acute and considerably larger, and the primary panicle branches not remaining contracted, but spreading at once.

As this grass is apparently quite common, there may be an older name than the above, but up to the present search has failed to reveal it. When a proper disposition is made of the species of Elliott and Michaux, and some of the other early southern botanists, some name among them may be found to apply to this plant. There can be no doubt, however, as to this grass being the *P. neuranthum* of Grisebach, for, as stated above, it exactly matches the form upon which he based the species.

PANICUM ANGUSTIFOLIUM Ell. Bot. S. C. & Ga. 1: 129. 1817.

P. neuranthum var. *ramosum* Griseb. Cat. Pl. Cub. 232. 1866.

As stated above, this appears to be clearly distinct from *P. neuranthum* Grisebach. The specimen on which Grisebach based his variety *ramosum*, no. 3454 of Wright's Cuban Collection, matches the late and much branched condition of Elliott's *P. angustifolium*, well represented by Curtiss' nos. 4028 and 4678. In addition to those cited already, I would refer the following to this species:

Vasey, Norfolk, Va., in pine woods, 1884.

Ravenal, Aiken, S. C., June 1, 1867.

M. A. Curtiss, N. C.

A. H. Curtiss, Florida, Duval Co., no. 3583*; Jacksonville, nos. 4028 and 4678.

Nash, Eustis, Florida, 1894, nos. 319, 560, 598, 926, 1226, 1425 and 1436; 1895, no. 1856.

S. M. Tracy, Mississippi, Crystal Springs, no. 117; Biloxi, no. 3091.

Langlois, Louisiana, October 1, 1890.

PANICUM POLYCAULON n. sp.

Plant yellowish green, with the habit of *P. ciliatum* Ell., smooth and glabrous, excepting the margins of the sheaths and leaves, and the axis of the panicle which is sparingly pilose. Culms densely caespitose, the upper portion naked, 2 dm. tall or less, erect, simple, or at length somewhat branched; sheaths coarsely striate, ciliate on their margins, the lower loose, 2.5 cm. long or less, the uppermost one longer than the remainder; ligule a ring of very short hairs; leaves erect or ascending, narrowly oblong-lanceolate, 2–7 cm. long, 2–8 mm. wide, somewhat narrowed toward the rounded base, acuminate at the apex, ciliate on the margins with somewhat ascending hairs, 7–9-nerved, the mid-nerve prominent; panicle broadly ovate, 3 cm. long or less, its branches spreading or ascending, their ultimate divisions several times longer than the spikelets, the main axis and usually the lower branches sparingly pilose; spikelets about 1.5 mm. long, divergent from the branches of the panicle, obovate, obtuse, the first scale about one-half as long as the spikelet, thin membranous, orbicular-ovate, obtuse, 1–nerved, the second and third scales equal in length, membranous, broadly oval, 7-nerved, the latter enclosing a hyaline palet about one-half its length, the fourth scale chartaceous, oval, white, enclosing a palet of equal length and similar texture.

Type specimen collected by the writer on Aug. 20, 1895, in the "flatwoods" at Tampa, Florida, no. 2420a. A specimen in the Columbia University herbarium collected by Chapman belongs here; no. 3875 of Wright's Cuban Collection of 1865, distributed as *P. dichotomum* L., is also to be referred to this species.

The narrower leaves, more slender culms, and smaller and glabrous spikelets well distinguish this from *P. ciliatum* Ell., to which it is most nearly allied.

Gyrothyra, a new Genus of Hepaticae.

By Marshall A. Howe.

(Plates 302, 303.)

GYROTHYRA.

Stem creeping, foliose, subsimple or somewhat sparingly branching, radiculose. Leaves succubous, entire, alternate; underleaves present, free, bifid, segments narrowly lanceolate or subulate; walls of the leaf-cells with triangular thickenings at the angles. Antheridia short-stalked, in the axils of smaller saccate leaves, forming short median or, at first, terminal spikes. Involucral leaves 2–4 pairs (commonly 3 pairs). Perianth terminal, confluent for half its length or more with the bases of the involucral leaves, the greater part of the calyptra, and the tissues of the stem, to form a thick-walled tube (perigynium), with a small bulbous or saccate base; perigynium erect or ascending, making, at maturity, nearly a right angle with the stem. Capsule cylindrical, long-exserted, dehiscing spirally by four very long and slender valves; capsule-valves of two layers of cells, whose walls are wholly destitute of spiral, semiannular, or other local thickenings. Elaters free, bispiral, acute or bluntly pointed; spores minutely papillate. "Involucellum" of the sporogonium foot well developed. (Name from *γυρὸς*, twisted, and *θύρα*, door.)

GYROTHYRA UNDERWOODIANA.

Dioicous. Plants rather large, 1–2 cm. long, 2–4 mm. wide, mostly in compact light green tufts; stems creeping, thick, often slightly flattened dorso-ventrally, .5–.65 mm. in diameter, about 15 cells wide in cross section, very densely radiculose, slightly ascending at apex, subsimple or with a few irregularly disposed lateral branches, in female plant innovating from near base of perigynium; root-hairs long, nearly colorless or of a dilute yellowish-brown hue, sometimes tinged proximally with purple, springing in older parts of the stem from oblong or linear dark-purple callosities, made up of the closely coherent root-hair bases and of other ventrally elongated cells; leaves obliquely inserted, lingulate or oval, succubous, rather close, translucent, alternate, scarcely decurrent dorsally, often crowded and suberect at stem apex, marginate, commonly concave below, apex decurved, 1.4–2 mm. × 1.7–4 mm.; cells of the margin quadrate or oblong, equalling in size the adjacent or twice as large; other leaf-cells mostly quite regularly pentagonal or hexagonal, 25–70 μ in diameter, oblong and larger towards the base; all with conspicuous trigones; under-leaves free, often wine-colored, .6–1 mm. long, bifid ½–⅔ the length into narrowly lanceolate or subulate segments, usually running out into a single series of cells at apex, concealed by the dense mat of root-hairs, except in the younger portions of the stem; perigynium tubular, 1–1½ mm. in diameter, and, with the free portion of the perianth, 3–4 mm. long, erect or ascending, nearly at right angles with the stem, tinged with purple ventrally, bulbous or saccate at base; wall of perigynium-tube 5–20 cells in thickness; involucral leaves 2–4 pairs (commonly 3 pairs), entire or repand, similar in form to the cauline, margins approximate at base dorsally, distant ventrally; uppermost pair inserted at about middle of perianth-tube or, more rarely, at two-thirds its height, erect, apex and dorsal margins narrowly reflexed and exposing the perianth, or closely appressed and wholly concealing it; next lower pair usually inserted at about one-third height of perianth-tube, more broadly reflexed; the one or two basal pairs but slightly attached to perigynium; involucral underleaves inconspicuous, sometimes subentire and slightly adherent to base of involucral leaves; bulbus of perigynium without radicles, but a dense tuft of root-hairs springs from the stem just back of the bulbus and long root-hairs come from the cells of the involucral leaves near their bases; perianth free for ⅓–½ its length, free portion nearly echlorophyllose, subtubular, somewhat inflated below, contracted and lax above, crenulate at mouth, 3–5 cells thick at juncture with perigynium-tube, 2 cells thick at mouth; calyptra fleshy, upper third or fourth free at maturity, 3–6 cells in thickness; archegonia several, the unfertilized raised on the base of the free portion of calyptra.

Capsule long-cylindrical; valves very slender, 3.3–6 mm. $\times$ .13–.17 mm., widely spreading when dry, attached spiro-radially to a basal disc composed of large hyaline cells, flexuous, contorted, or spiral, on moistening,—always with a spiral twist at the apex; foot of sporogonium forming a more or less goblet-shaped "involucellum"; seta 1½–2 cm. long; elaters bi-spiral, very rarely tri-spiral, acute or sub-obtuse, 210–420 $\times$ 12–15 μ; spores about 12 μ, minutely papillate.

Male plants more slender; antheridia (1–6) in the axils of smaller saccate leaves, forming spikes of 3–6 pairs of leaves decreasing in size upwards, appressed, apices patent or recurved, or, in uppermost pair, erect; antheridia ellipsoidal or pyriform, .15 $\times$ .24 mm., on pedicels ⅓ as long; slender stems (male?) occasionally gemmiferous at apex, gemmae unicellular, 10–24 μ in diameter..

Collected by the author on clay banks near Eureka, Humboldt Co., California, June, 1896; also by Prof. John Macoun (Herb. Underwood), on earth in a brook, Burrard Inlet, British Columbia, April 6, 1889, and on rocks, British Columbia, April 29, 1889.

The leaves of the British Columbia plants stand with their margins more often erect than in the California specimens, upon which our description and figures have been based. In the sterile condition, *Gyrothyra* somewhat resembles the larger forms of *Nardia scalaris*—also collected by Macoun on Vancouver Island (Can. Hep. 80)—but can readily be distinguished by the margined, lingulate, more translucent leaves and by the bifid underleaves.

The involucral leaves, though more or less apparently paired, are in a strict sense alternate like the cauline, and a single unpaired leaf is sometimes found to occur inside the pair we have described as the uppermost.

It should be remarked that but few capsules of the plant have been seen and that these were already open or so young as to be still enclosed within the calyptra, so the actual dehiscence has not been observed, but the extremely long valves, which on being soaked out take easily a position strongly suggestive of the paring of an apple, the spiro-radial attachment to the basal disc, the never failing spiral twist of the valve-apex, and the spiral lines readily discernible on the surface of the embryo capsule (fig. 10) make, in the judgment of the writer, the induction that the dehiscence is spiral so safe and certain that he has felt no hesitation in so describing it and in basing the generic name upon this character. The absence of thickenings in the walls of the cells of the capsule valves is noteworthy. Schiffner states* of all the *Jungermaniaceae akrogynae:* "Die reife Kapsel besitzt eine aus 2 bis mehr Zellschichten bestehende Wand, deren Innenschicht in ihren Zellen stets Verdickungsleisten enthält." In *Gyrothyra*, the transverse walls of these cells usually appear a trifle thicker than the longitudinal, but the walls are otherwise wholly without traces of local thickening.

In respect to structure of the sporogonial envelopes, *Gyrothyra* is one of several very interesting transitions from the ordinary Jungermania type to the various pouch-bearing genera. Considered from this point of view and from certain other gametophytic characters, its nearest affinities are undoubtedly to be found in that section of *Nardia* represented by *Nardia haematosticta* (Nees) Lindb., of Europe. In manner of dehiscence of capsule it recalls the marsupiiferous genus *Kantia;* but the valves of *Gyrothyra* are much longer and their cell-walls lack the local thickening, while, of course, no generic comparison of the two can be made so far as the gametophyte is concerned.

It is with pleasure that the author associates with this novel plant the name of one who, by his numerous papers upon the American Hepaticae, as well as by his unfailing generosity, has placed the younger workers in the same field under lasting obligations. It should be noted that, although Professor Macoun's specimens were without the capsules, which reveal the distinctive generic character of *Gyrothyra*, Professor Underwood had already recognized that they represented something undescribed.

Explanation of Plates 302, 303.

1. Entire ♀ plant. × 5.
2. Cauline leaves. × 18.
3. Marginal and adjacent leaf-cells. × 225.
4. Transverse section through marginal portion of leaf. × 216.
5. Underleaves. × 24.

* Engler and Prantl, Nat. Pfl. Fam. 1: Abt. 3, 71.

6. Transverse sections of stem × 22, showing ventral callosity from which the root-hairs arise.

7. Antheridium. × 40.

8. Median sagittal section of perigynium and adjacent portions of stem, showing embryo sporogonium with capsule, seta, foot, and "involucellum," also unfertilized archegonia, perianth, insertion of involucral leaves, root-hair callosity, etc. × 23 (slightly schematized). The free part of the perianth as drawn here and in the next is proportionally rather too short and not sufficiently inflated below.

9. Sagittal section of mature perigynium from which the seta has been detached, showing fully developed calyptra and the unfertilized archegonia raised upon the base of its free portion, × 20 (slightly schematized).

10. Surface view of embryo capsule, exhibiting the spiral lines, which presumably bound the valves. × 50.

11. Valves of capsules, showing position taken by them when moistened. × 12.

12. Apex of a single valve. × 12.

13. Base of dehisced capsule from above, showing spiro-radial insertion of valves. × 36.

14. Cells of inner surface of capsule valve. × 150.

15. Elater and spores. × 137.

COLUMBIA UNIVERSITY, DEPARTMENT OF BOTANY,
April 9, 1897.

Notes on the American Hydnaceae.—I.

LUCIEN MARCUS UNDERWOOD.

KNEIFFIELLA.

The revival of *Kneiffia* Spach, Hist. Veg. Phan. 4 : 373, 1835, as a genus of Epilobiaceae, necessitates the selection of a new name for the hymenomycetous genus of the same name founded by Fries three years later.* The genus belongs with a group of resupinate plants usually classed with the Hydnaceae, but forming outliers from the typical members of the family in the direction of the simpler Tomentellaceae. Three species are reported from the United States and others are found in the West Indies and elsewhere. The synonymy of the American species is here recorded since it becomes necessary to use them in a publication elsewhere that might not be desirable as a medium of publishing new names since it has primarily a circulation that is not botanical.

* *Kneiffia* Fr. Epicrisis systematis Mycologici, 529. 1836–1838.

1. KNEIFFIELLA ASPERA.

Thelephora aspera Pers. Mycol. Europ. 1 : 153. (excl. icon.) 1822.
Thelephora setigera Fr. Elenchus, 1 : 208. 1828.*
Kneiffia setigera Fr. Epicrisis, 529. 1836–1838.

For this species which is the type of the genus, Fries adopts a name of his own, but at the same time cites in the synonymy an earlier name by Persoon, which it is proper to restore to its place in the necessary change of the genus.

2. KNEIFFIELLA CANDIDISSIMA.

Kneiffia candidissima B. & Rav. Grevillea, 1 : 147. 1873.

3. KNEIFFIELLA TESSULATA.

Kneiffia tessulata B. & C. Grevillea, 1 : 147. 1873.

The first named species appears to have a rather widespread distribution in the United States and Europe. The other two appear from present information to be southern in distribution, though much is still to be desired in regard to them.

Calkins reports *Kneiffia ambigua* Karst. from Florida (Journ. Mycol. 3 : 70), but I have seen no specimens.

March 9, 1897.

An undescribed Species of Kallstroemia from New Mexico.

BY ANNA MURRAY VAIL.

KALLSTROEMIA BRACHYSTYLIS.

A diffuse herb; stems prostrate, branched, slightly enlarged or swollen and very brittle at the nodes, sparingly pubescent with short appressed slightly twisted hairs, and fewer longer spreading cilia; stipules lanceolate to ovate-lanceolate, 4–5 mm. long, ciliate, at length caducous; petioles shorter than the leaflets; leaves 2–5 cm. long; leaflets 3–4 pairs, 6–15 mm. long, obliquely oblong or oval-oblong, slightly falcate, obtuse, or some of the lower ones acutish, ciliate on the margin above with somewhat stiff white hairs, paler, hirsute when young, at length glabrous beneath, the basal leaflets

* I cite the usual date given by Pritzel, Saccardo and others without the means at hand of verification. In my copy of Fries Systema, the "Elenchus" is bound in with volumes 1 and 2 and bears on the title page the date 1830 and the same title as the original Systema with the addition of "Supplementa voluminis, primi."

usually much smaller than the terminal ones; flowering peduncle 6 mm. long (or longer?), in fruit 1.5–2 cm. long, enlarged below the calyx; sepals lanceolate, caducous before maturing of the fruit; corolla orange-yellow. less than 1 cm. broad; fruit minutely pubescent, splitting into 10 1-seeded bony cocci, each with 2–4 very short obtuse tubercles or excrescences on the back, the persistent style 1–2 mm. long, very short and obtuse.

Mesa near Las Cruces, New Mexico, alt. 3900 feet. Collected by E. O. Wooton, August 12, 1895.

"New Mexico" C. Wright, no. 912, 1851, in Herb. Columbia University?

A species intermediate between *K. Californica* and *K. maxima.* It has the leaf form and general appearance of the latter species, the small flowers (though of a darker orange-yellow) and the caducous sepals of *K. Californica.* The specimen of Wright's collection, referred to above, is probably this species, but is too immature for certain determination; the young fruit has the short stout obtuse style which is one of the prominent characters of *K. brachystylis.*

To this species may possibly be referred a specimen from Guaymas, Mexico, collected by Dr. Edward Palmer, no. 107, 1887, and catalogued by Dr. Watson as *Tribulus maximus* var. in Proc. Am. Acad. 24:43, but the fruit is too young for entirely satisfactory comparison.

New West Indian Fungi.

By J. B. Ellis and F. D. Kelsey.

The species here described were collected by Mr. A. E. Ricksecker, in the Island of St. Croix, Danish West Indies, January and February, 1896.

Asterina Colubrinae Ell. & Kelsey.

On leaves of *Colubrina reclinata*, no. 26.

Hypophyllous. Perithecia scattered, superficial, discoid, orbicular, grayish black, 200–275 μ diam., without any distinct mycelium; asci obovate, short-stipitate, 18–21 $\times$ 14–15 μ, without paraphyses, 8-spored; sporidia irregularly arranged, clavate, oblong, uniseptate, only slightly constricted, hyaline, 7–8 $\times$ 2–2½ μ.

Very near *A. stomatophora* E. & M. but perithecia larger and lacking the reticulate margin and asci, and sporidia somewhat smaller.

HYPOSPILA CORDIANA Ell. & Kelsey.

On leaves of *Cordia collococca.*

Perithecia sunk in the parenchyma of the leaf, small, globose, covered by a black suborbicular thin stromatic shield ½ mm. in diameter or less. These black stromatic specks are concentrically arranged and seated on pale yellowish bullate indefinite spots about ½ cm. diameter on the upper side of the leaf; asci clavate-cylindrical, short-stipitate, 8-spored (paraphysate?), $70–80 \times 10–12\,\mu$; sporidia biseriate, fusoid, 3–4-nucleate, greenish-hyaline, $15–20 \times 3\frac{1}{2}–4\,\mu$, mostly a little narrower and pointed below. No septa were seen but the nuclei indicate 3 septa, when mature.

The perithecia are very imperfect, hardly more than mere cavities, so that the fungus might with reason be referred to *Phyllachora.* Sometimes two or even three perithecia are covered by the same stromatic shield.

PUCCINIA VERNONIAE Cke. Grev. 10: 126.

On leaves of *Vernonia* sp.

II. Sori hypophyllous, rusty brown, ¼–½ mm. diameter, scattered, or collected on pale yellowish spots, visible on both sides of the leaf; uredospores subglobose, $20–22\,\mu$, or elliptical, $22–27 \times 20–22\,\mu$, subtubercular-roughened, pale brown; teleutospores oblong-elliptical, $40–50 \times 20–22\,\mu$, only slightly constricted, epispore smooth and almost colorless, scarcely thickened above, but mostly with a narrow papilla which is often prolonged into a hyaline spike-shaped appendage $5–6\,\mu$ long, appearing like the remains of a broken pedicel.

Whether this is really *P. Vernoniae* Cke. cannot be certainly known from the imperfect description in Grevillea.

AECIDIELLA Ell. & Kelsey, n. gen.

Differs from *Aecidium* only in its uniseptate spores.

AECIDIELLA TRIUMFETTAE Ell. & Kel.

On leaves of *Triumfetta*, sp.

Spots light brown, 2–3 mm. diam., with a pale light yellow shaded border; pseudoperidia crowded on the spots, hypophyllous, short-cylindrical, rounded at the top, then truncate with the margin subentire, the component cells oblong or elliptic-oblong,

$25-30 \times 15-20\,\mu$, punctate-scabrous; aecidiospores subglobose or obovate, often subangular, smooth, $20-23 \times 15-20\,\mu$, mostly uniseptate.

UREDO COMMELINACEA Ell. & Kelsey.

On leaves of *Commelina elegans.*

Sori amphigenous, scattered, or seated on suborbicular indefinite dead brownish spots, 3–5 mm. diam., covered by the epidermis which is raised into hemispherical ferruginous pustules ½–1 mm. diam., finally ruptured in the center and often umbilicate; spores echinulate, globose, $19-21\,\mu$, or elliptical, $22-27 \times 20-22\,\mu$, ferruginous; the spots are subbullate.

U. Spegazzinii De Toni has larger smooth spores and *U. Commelinae* Kalch. smaller glabrous spores. Possibly this may belong to *Uromyces Commelinae* Cke.

UREDO GOUANIAE Ell. & Kelsey.

On leaves of *Gouania Domingensis.*

Sori hypophyllous, scattered, minute, hardly ½ mm. diam., rust-color, not on any definite spots, but the leaf, especially above, is mottled with light yellow indefinite spots; spores obovate-echinulate, pale brown, $22-27 \times 18-20\,\mu$.

A new Species of Clematis from Tennessee.

CLEMATIS GATTINGERI n. sp.

A perennial bright green vine. Stems angled, climbing over bushes and rocks, 1–3 meters long, densely glandular, considerably branched; leaves 1–1.5 dm. long, pinnate; petioles 2–4 cm. long, less densely glandular than the stem; leaflets membranous, lanceolate, or broadly lanceolate, 1.5–5 cm. long; more or less pilose and glandular on both sides, acute or somewhat acuminate, glandular-ciliate, subsessile, or short-petioluled, paler beneath than above; peduncles stoutish, 3–5 cm. long, glandular like the stem; bracts ovate, 5–10 mm. long; flowers purple, 10–13 mm. long; sepals elliptic or elliptic-lanceolate, felt-like, often recurved from the middle, crested near the sides below the apex, minutely pilose, ribbed, narrowed into caudate tips which are curled back; stamens pubescent; filaments longer than the anthers which are clothed with ascending hairs especially at the tips, achenes ovate-oval or elliptic, with an ovate or elliptic impression, 6–7 mm. long, minutely pubescent, the styles erect or nearly so, recurved from below the middle, 2–2.5 cm. long, plumose, tawny-green.

Banks of the Cumberland River, near Nashville, Tennessee. Summer.

A remarkable and handsome little species of *Clematis*, a member of the section Viorna, and, although more closely related to *Clematis Viorna* than to any other of its relatives, it is not very suggestive of that species. Dr. A. Gattinger, for whom it is named, discovered some plants on the banks of the Cumberland river, above Nashville, Tennessee, several years ago. He at once saw that it was different from any other species with which he was acquainted; he collected specimens and grew the species in his garden, where the plants have since thrived, the species holding all the characters it exhibited in its native habitat.

The slender habit, the densely glandular pubescence of its foliage, the small flowers with caudate sepals and the short plumose styles all serve to separate *Clematis Gattingeri* from *Clematis Viorna*.

J. K. Small.

Reviews.

Flora of the Southern United States. By A. W. Chapman. Third Edition. Pp. 655. Cambridge, 1897.

It is now over thirty years since the first edition of Chapman's Southern Flora was given to the public; and during this time the author has had the satisfaction of seeing his work become and remain the standard text-book of systematic botany for the region involved. At an advanced age, Dr. Chapman has just brought to completion a third edition of his flora, successfully capping a botanical career covering nearly three-quarters of a century, and he is entitled to the hearty congratulations of botanists throughout the country, by whom he is universally held in affection and esteem.

The book has been entirely reprinted from fresh plates, and the typography and superior grade of paper employed are altogether satisfactory. A hasty proof-reading has however resulted in a number of unfortunate typographical errors, as *Pimpernella, Anemorella*, etc. It is gratifying to observe that the substance of the long appendix to the second edition has been properly incorporated in the text, so that students will no longer need to search for a given species under two distinct headings.

In the style of presentation and in nomenclature, Dr. Chapman adheres closely to old traditions, preferring group-characters interspersed through the specific descriptions rather than artificial keys placed at the commencement of a genus, the usage in most modern systematic works. The disadvantage of the former method is the difficulty which the eye encounters in correlating two or more headings when confused by an intricate maze of daggers and asterisks. Yet the task of constructing systematic keys where none had previously existed would have been too great a labor to undertake in a work intended primarily as a revision. Neither could Dr. Chapman be expected to undertake the bibliographical research necessary to place the nomenclature of his flora on a modern basis. But it is to be regretted that he did not see fit to make such corrections as recent studies have shown to be essential, such as the substitution of *Anemone quinquefolia* L. for the European *A. nemorosa*, and of *Viola tenella* Muhl., for *V. tricolor* var. *arvensis* DC. Many of these changes were made even in the first fascicle of Gray's Synoptical Flora, issued last year, and thus certainly bear the stamp of conservative authority.

The lack of all system in the employment of citations is, as it has always been, a defect in this work. Botanical bibliography has now assumed such enormous proportions that full citations should be given wherever possible; and in a manual in which space does not permit the practice, careful attention should be bestowed on the verification of references. Dr. Chapman indicates new species for the most part by an appended "*n. sp.*," but occasionally these receive no indication whatever, as in *Eupatorium incisum*, requiring an inspection of all the other editions to ascertain that the plant is here described for the first time. The absence of an authority in general signifies a new name given to an old species, as "*Viburnum molle* Michx., var.? *tomentosum*," the synonym cited being "*V. scabrellum* Flora," and the reader being left to infer that the "Flora" mentioned is an earlier edition of the same work, and not the name of a botanist.

In his earlier writings Dr. Chapman was inclined to be more liberal than his contemporaries with regard to generic limitations, recognizing such genera as *Atragene*, *Conoclinium*, *Diplopappus*, *Leptopoda*, *Quamoclit*, *Batatas* and *Pharbitis*. He has now adopted a more conservative view, uniting all the above mentioned genera and many others, with their nearest allies; in this, however, he is by no means consistent, for we find *Hepatica* included in *Anemone*, while *Actinomeris* is distinguished from *Verbesina* and if *Otophylla* and *Dasystoma* are both to be separated from *Gerardia*, *Monniera*, in the same family, should most certainly be removed from *Herpestis*, and *Sophronanthe* from *Gratiola*.

About a dozen new species and innumerable varieties are described in the course of the work, several of them being unpublished names of Dr. Engelmann and other writers. The author has adhered to a rigid rule of exclusion in connection with the numerous new forms proposed during the last few years by other students of southern botany, remarking in the preface, "In a region so vast * * * * there still must remain much to reward the labors of future explorers, and many new species have been proposed by recent collectors as occurring within my limits. These, which are unknown to me, when duly confirmed, * * * * will have place in future issues."

As a future issue embracing any extended revision is a matter of some uncertainty, it is to be deplored that Dr. Chapman did not make some effort to obtain material for examination at least in those genera in which he himself contemplated the establishment of new species. The omission of these well-marked forms is less of an injustice to the botanists who have devoted time and careful study to the plants than it is to the field student who constantly discovers specimens which he cannot match with any of those described. It would be difficult for the chance collector of *Clematis Addisonii* to reconcile it with the diagnosis of *C. Viorna*, or *Nolina Brittoniana* with that of *N. Georgiana;* and yet there is no other recourse for one who is dependent upon this flora alone. We are glad to note, however, that many excellent species of Buckley, Curtis and Shuttleworth, long suppressed by other writers, have been properly reinstated by Dr. Chapman. The chief annoyance to botanists resultant from the omission of recently described species will be the addition to an already overburdened synonymy which some of the very numerous new varieties must make.

Such defects as these, are, however, attributable rather to the conditions under which the work was carried out than to any intentional discrimination on the part of the author. A revision can never assume the proportions of an entirely new book; and the attempt to remodel every feature of a portrait often destroys the likeness. At least until the production of some more comprehensive and more modern volume Dr. Chapman's flora will be indispensable to every student of southern botany.

C. L. P.

Catalogue of the Hanbury Herbarium, in the Museum of the Pharmaceutical Society of Great Britain. Pp. 160. Compiled by E. M. Holmes, Curator of the Museum. Published by the Society.

The Daniel Hanbury Herbarium was donated to the Pharmaceutical Society of Great Britain by Mr. Thomas Hanbury, brother of its deceased owner, on condition that it be kept separate from all other collections, and carefully guarded. Thus maintained, it has been of the greatest service, not only to British pharmaceutical botanists, but to many foreigners who have visited it, or who have sent specimens for comparison to its learned and obliging curator.

The families represented in the Catalogue are arranged in the Benthamian sequence, while the species in each are arranged alphabetically. The specimens under each species are lettered, the character of each indicated and the locality and date of collection stated. Notes and extracts from letters which accompany the specimens in the herbarium are also printed. Most of these are by the collectors, but in many cases they represent critical correspondence concerning them from specialists. The number of species catalogued is 610, the number of specimens probably three times as great. Appendix No. 1 is a list of books quoted in the herbarium, No. 2, a list of the herbaria so referred to, and there is a copious index giving the common as well as the botanical names. There is no need of such a catalogue as this in the United States, as we have no such collection on any extensive scale.

H. H. R.

Demonstration of Absorption of Carbon Dioxide and of the Generation of Oxygen by Diatoms. By T. Chalkley Palmer. Proc. Acad. Nat. Sciences, Phila. F. 1897.

This paper describes a method of demonstrating the normal process of carbon dioxide assimilation in diatoms. It rests upon a color test and is substantially as follows: A dish of suitable size and shape is filled with spring water tinted pale red by a solution of haematoxylin. A glass tube is filled with this solution, its mouth closed with a rubber stopper in which a quill tube is inserted and the whole hung over the dish so the quill tube dips under the surface. Carbon dioxide from the lungs is blown into the remainder of the water in the dish until it loses its reddish tint and becomes brown. Two tubes are now filled with this water, into one of which a few clean living diatoms are put. Both tubes are corked and hung in the same manner as the first. On exposing the apparatus to a bright light, gas rises in the tube containing the diatoms and at the same time the color of the liquid begins to change. In about fifteen minutes it is pale red like that in the first tube, the color deepens until it is blood red, showing that the carbon dioxide has disappeared and oxidation has taken place. The diatoms used for this experiment were the long filamentous forms of *Eunotia*, *E. major* of Rabenhorst. E. L. G.

Beiträge zur Moosflora von Nord-Amerika. Dr. Julius Roell. Hedwigia, 36: 41–66. 1897.

This is an enumeration of several collections sent to Dr. Roell from Ohio, Michigan, Wisconsin, Indiana, Arkansas, Missouri, Washington, Labrador and Greenland, with four species collected by himself at New Durham, New Jersey. It includes long critical notes on several species of *Sphagnum*, especially *F. Austini* Sull. and its forms, and the following new species and varieties: *Dicranum Miquelonense* var. *crispatulum*, *Meesia tristicha* var. *Purpusii; Plagiothecium Roesii* Hpe. (*P. Sullivantiae* Sch.) var. *longifolium* Roell; *Hypnum* (*Campylium*) *simulatum* Kindb., *Hypnum pratense* var. *Purpusii* Roell; *Dicranum flagellare* var. *brevifolium* Roell; *Thuidium lignicola* var. *Roellii* Ren. & Card.; *Hypnum arcuatum* var. *ramosum* Roell; *Eurhynchium strigosum* var. *robustum* Roell; *Fontinalis denticulata* Kindb.; *Hypnum fluitans* var.

excurrentinerve Kindb.; *Sphagnum Mendocinum* var. *recurvum* Roell; *S. platyphyllum* var. *molluscum* Roell; and *Weisia Grönlandica* Kindb. The range of several species is greatly extended, notably *Dicranum Miquelonense*, *D. Canadense* and *Mnium decurrens* from New Jersey; *Cylindrothecium concinnum* from Michigan; *Leucobryum sediforme*, *Fissidens Garberi*, *Leptotrichum Schimperi*, *Webera Lescuriana*, *Atrichum xanthopelma*, *Hypnum Coloradense* and *Amblystegium distantifolium* Kindb. from Hot Springs, Arkansas.

E. G. B.

Nouvelles Contributions a la Flore Bryologique du Bresil. V. F. Brotherus. Bih. till K. Sv. Vet.-Akad. Handl. 21: 1–76. 1895.

This contribution includes an enumeration of the collections of M. Mosen, N. Puiggari, W. Schwacke and others. The author has availed himself of the studies on the flora of Brazil made by Duby, Geheeb and Hampe; has received special assistance from Ch. Müller, and has brought together a list of 70 genera and about 300 species including 65 new ones in the following genera: *Amblystegium*, *Anomodon*, *Bryum*, *Campylopus*, *Catharinea*, *Cryphaea*, *Distichophyllum*, *Entodon*, *Eustichia*, *Fissidens*, *Helicodontium*, *Hookeria*, *Hyophila*, *Hypnum*, *Isopterygium*, *Lepidopilum*, *Leucobryum*, *Leucoloma*, *Leucomium*, *Macromitrium*, *Microthamnium*, *Mniadelphus*, *Neckera*, *Papillaria*, *Pilotrichella*, *Prionodon*, *Rhaphidostegium*, *Stereodon*, *Syrrhopodon*, *Thuidium and Trichosteleum.* The largest number of species are found in the genera *Fissidens* and *Hookeria*, with *Campylopus*, *Papillaria*, *Rhaphidostegium* and *Syrrhopodon* also represented by numerous species.

E. G. B.

Die Laubmoose. K. G. Limpricht. Rab. Kryptfl. 4: (3) 129-256. 1897.

This includes parts 29–30 beginning with the remainder of the *Brachytheciums*, describing the two varieties of *B. rivulare* and recognizing *B. latifolium.* *Bryhnia* and *Hyocomium* do not include any American species. Of the four species of *Scleropodium* three are American, including *H. purum;* in *Eurhynchium* there are only 7 out of 22, of these *E. cirrhosum* is described with fruit and three varieties are recognized. In *Rhynchostegium* the only American species, *R. rusciforme*, is described with five varieties, and in *Raphi-*

dostegium, *R. demissum* is figured. The subgenus *Rhynchostegiella* is raised to generic rank with 5 species, of which *H. curvisetum* has been found in America.

E. G. B.

Recherches sur les Bacteriacees fossiles. By M. B. Renault. Ann. Sci. Nat. **65**: 275–349. *pl. 46.* 1896.

Until recent years the most ancient known bacteria were those discovered in the bones and teeth of Egyptian mummies. In 1879 M. Van Tieghem noted their existence in remains of fossil plants from the environs of St. Etienne. M. Renault in this learned and interesting study describes and illustrates numerous species preserved in animal and vegetable fossil remains from various parts of France.

A. M. V.

Proceedings of the Club.

Tuesday Evening, March 9, 1897.

There were 32 persons present, President Brown presiding.

The Secretary read a letter stating conditions of a grant of money offered from the Newberry research fund. This letter was from Dr. N. L. Britton as Secretary of the Council of the Scientific Alliance of New York, and indicated that the award for the present year is to be in Geology or Paleontology, to amount to $50, payable July 15, 1897. The award applies to researches yet to be begun or completed, and which are to be embodied in a paper submitted to the Council within three months from the present notification. Each society within the Scientific Alliance is invited to nominate a recipient.

The scientific program was then taken up, the evening being devoted to the subject of Ferns with papers as follows:

1. Mrs. Elizabeth G. Britton, "Notes on some Mexican Ferns," presented, in Mrs. Britton's absence, by Dr. Rusby, with exhibition of numerous specimens, including species of *Pellaea*, *Polypodium*, *Cystopteris* and *Cheilanthes*. Dr. Rusby, having been himself present at their collection, described vividly the tongues of hard, black lava on which the collectors walked, and which was

filled with large cavities often forming caves, containing some accumulation of soil and crowded with a luxuriant growth of ferns, although in November and practically the winter season.

2. Mr. Willard N. Clute, "The New York Stations for *Scolopendrium*." Mr. Clute contrasted the wide distribution of the Hart's-tongue Fern in the old world, from Great Britain to Japan, with the extremely local North American occurrence, in five areas only, Mexico, Tennessee, Central New York, Owen Sound in Ontario, and New Brunswick. The Central New York locality was made known early in the present century by Pursh in July, 1807, who found it five miles west of Syracuse on the farm of J. Geddes, where it has recently been rediscovered. About 1827 Wm. Cooper discovered it at Chittenango Falls, where Mr. Clute found hundreds of plants growing last summer. Mr. Clute described the Chittenango ravine and its ferns. On sunny exposures of the limestone walls of the ravine grow rue spleenwort and purple cliff-brake in quantities; in shady places, the slender cliff-brake; on the talus, upon the larger bowlders, the walking fern, and in the shade of these bowlders, the *Scolopendrium*, with fronds chiefly in clusters of 6 to 12, at first erect, finally somewhat drooping. The spores are ripe in September. Mr. Clute added that the species seems to be increasing at present, being now under the protection of an association.

Prof. Burgess remarked upon the former scarcity of the fern in that locality as reported to him by Dr. Torrey, of Chittenango, about 1874, and by Dr. Morong, who could find none at his visit about 1876.

Prof. Underwood spoke of the Jamesville locality, also on the corniferous limestone in Onondaga County, where 20 years ago he found it quite common about two small lakes, but becoming soon exhausted as the one most frequently visited. He queried why it should not occur at other ledges of the corniferous limestone throughout western New York, and why it should confine itself to that rock here, while in England it frequents sandstone, shale and limestone indifferently. Dr. Britton then remarked that in Europe (and Nova Scotia) *Campanula rotundifolia* grows in meadows, but here on rocks; *Cerastium arvense* also grows in Europe in fields, but here on rocks.

Dr. Britton said that *Scolopendrium* is probably a case like that of *Sequoia* and *Brasenia* of originally much wider distribution, where the isolated plants owe their survival to favorable conditions. He cited *Epipactis* among orchids as a parallel in distribution, confined here to central New York and Ontario, but widespread in the old world.

Mr. Benj. D. Gilbert added an interesting comparison of the growth of *Scolopendrium* at stations where he had collected it at Jamesville and Chittenango Falls, also in southern France, northern Italy, and Undercliff in the Isle of Wight. In the warm shelter of the latter place, it is more luxuriant than anywhere else, showing great tendency to sport, displaying forking tips and deeply cordate bases, as at Chittenango Falls.

3. The third paper was by Mr. B. D. Gilbert, of Utica, N. Y., entitled, "New and interesting Ferns from Bolivia," with exhibition of specimens of two new ferns, a *Blechnum* and a *Dryopteris*, the first peculiar in being fully pinnate, the second in being a one-sided dwarf persistently under a foot and a-half high, instead of 4 or 5 feet as its type. The paper will be printed in the BULLETIN

4. The fourth paper, also by Mr. Gilbert, "Jamaica, the Fern-Lover's Paradise," described the abundance of species and of individuals which the speaker had collected there, illustrating the subject by numerous specimens. He remarked that Swartz in his *Species Filicum*, 1783–86, enumerating all then known ferns, described 709 species, of which 140 were from Jamaica; the Jamaican number was raised to 300 by Grisebach and now to 500 by resident botanists there, an estimate confirmed by Mr. Gilbert.

Probably no other equal area produces half that number. Among reasons which account for this are the warm latitude of Jamaica, its south shore sheltered from cooler breezes by a mountain-wall, its mountains themselves rising to 7,000 feet and reaching into a cool temperate climate, and its great variation in moisture, with daily rains in the mountains and sometimes but twice in six months on the plain. Mr. Gilbert described in particular his experiences with the tree-ferns reached by a long journey on foot, high in the Blue mountains, there forming unmixed groves, their stems supplying the only wood readily obtainable. One, *Alsophila armata*, reaches 50 feet in height, though its slender stem is but a few inches in diameter. No class of ferns is as yet so poorly described as the tree-ferns; description should be from the living specimen and at the locality; the only such in English are those in Thwaites' Flora of Ceylon. Jamaica is remarkable in particular for its numerous Filmy Ferns, 26 species (out of 280 known); these are all in the three eastern parishes. In the east part *Blechnum occidentale* is the common fern of the roadsides; *Polypodium reptans* was seen everywhere, now growing erect; one bank 30x25 feet, was completely covered with *Gleichenia pectinacea.* The great number of endemic species is surprising; as if the work of differentiation had gone on there with greater activity and vital power than anywhere else in the world; every genus in Jamaica shows one or more endemic species.

Mr. Gilbert closed by exhibiting specimens of three new species from Jamaica, belonging to *Asplenium*, *Dryopteris* and *Polypodium*, and also of a number of rare species as *Entomosora Campbellii*, *Gymnogramma schizophylla* and *Adiantum Candollei.* His paper was discussed by President Brown, Prof. Underwood and Dr. Rusby, the latter referring to the uses made of tree-ferns in New Zealand, as compared with the use for timber and for posts in Jamaica.

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AND OTHER MEMBERS OF THE CLUB.

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BULLETIN

OF THE

TORREY BOTANICAL CLUB.

Vol. 24. Lancaster, Pa., May 29, 1897. No. 5.

Emily L. Gregory.

By ELIZABETH G. BRITTON.

Botany and Barnard College have lost an earnest and devoted worker by the death of Doctor Gregory. Her loss is particularly sad just now when Barnard is at the threshold of its new and enlarged career, its scope and accommodations widened and its new home nearly ready for occupancy. That Dr. Gregory was one of the principal attractions of the College in the early days of its career, cannot be denied, for at first, the number of special students in botany exactly equalled, for three successive years, the total number of students in the College. She gave herself enthusiastically to her work and spared neither her time nor her strength in her devotion to her pupils, encouraging them to do original investigation and showing them by her own work and guidance in the laboratory how to do it. Her own attainments were high and diverse and she sometimes, perhaps, failed to realize that she befitted more advanced and special work than her students were qualified to accomplish, but whatever achievements are recorded from those who have worked with her, have always been of true scientific merit and often worthy of publication. Several have been read before the Torrey Botanical Club and published in the BULLETIN and elsewhere. Besides this Dr. Gregory did her share of "popularizing" botany by assisting with her pupils at the three "Annual Exhibits of the Progress of Science," held by the Academy of Sciences of New York in the spring of 1895–96 and 1897. and by various private evening classes of men and women. The high and special character of her training guided her studies entirely into the lines of Morphology and Physiology, and for Systematic Botany she had very little interest, other than what was necessary for the accomplishment of her work in her own chosen fields. Neither can it be claimed that she accomplished a great deal of original investigation on widely different lines, but her frequent reviews in the BULLETIN show that she kept informed on the most advanced German investigations and theories and her little textbook on the "Elements of Plant Anatomy" demonstrates that she had thoroughly mastered a wide range of subjects and adapted them for the use of her pupils. She was not clear nor côncise in her lectures and quizzes, but this came from her desire to impart all that she could of the wealth of information she had in store and is amply compensated for by the lasting influences which she has left among those who have had the advantage of studying with her.

Personally Dr. Gregory was extremely attractive, not only for her cheery good temper, but for her faculty in making friends and for her kindly and personal interest in all with whom she came in contact. She was simple and domestic in her tastes, preferring quiet and social pleasures to any show or ostentation, enjoying her "work for the work's sake," loving the truth and living an unselfish life which ended without any long or gradual failure of her powers, or any serious suffering or painful iliness. She died peacefully, believing in the faith of her parents, with full confidence that everything had been done for her comfort by the friends and relations about her and was accompanied to her grave at Angola, N. Y., by loving friends and beautiful flowers. Her memory remains among us, full of gayety and kindliness and sweet content.

BIOGRAPHY.

Emily Loriva Gregory was born at Portage, New York, on December 31st, 1841. She received her early education at Albion Seminary and after graduating from there she taught at Dunkirk (Fredonia) Friendship Seminary and earned enough to go to Cornell University in 1876, where she studied botany and literature, taking her degree as Bachelor of Literature in 1881. She held a position at Smith College from 1881–1883 as teacher of botany, and the following winter had charge of the laboratory work in botany of the Harvard Annex. In 1883–1884 she went abroad and studied for two years at Strasburg under Prof. Wigand and one year at Zürich, where on July 23d, 1886, she received her degree of Doctor of Philosophy, having been one of the earliest of American women to whom this honor was accorded. On her return to America she held a position at Bryn Mawr for two years as associate in botany to Prof. E. B. Wilson, who was then professor of biology at that institution. She resigned this position because it was not congenial to her, and during the following winter was associated with Prof. W. P. Wilson at the University of Pennsylvania in developing its botanical laboratory.

In the spring of 1889 she was appointed instructor in botany at Barnard College, and spent the summer abroad studying with Prof. Schwendener, at Berlin, and purchasing microscopes, charts, models and books for the new laboratory, the funds for the equipment of which were supplied from private subscriptions by members of the Torrey Botanical Club. She also spent her summer vacations abroad in 1893, 1894, and 1896, and always came back with renewed energy and zeal, as well as stores of books and fresh knowledge.

Her department grew rapidly in popularity and in numbers, and it soon became necessary to secure the assistance of Miss Effie Southworth, now Mrs. Volney M. Spalding, and later of Miss Jean Howell. The collections for the laboratory were first begun with the herbarium of Elizabeth G. Knight as a nucleus, and subsequently that of Dr. Thomas Morong was added by purchase, also with a fund raised by private subscription among the members of the Torrey Botanical Club. A fellowship in botany was also endowed by Mrs. Esther Herrman, one of our members.

The laboratory soon outgrew its cramped accommodation on the top floor of 343 Madison avenue and in 1895 it was moved to the top floor of No. 518 Fifth avenue. In 1896 Dr. Gregory was appointed full Professor of Botany and Dr. Herbert M. Richards was called to assist her. Together they had planned the new courses and laboratories in Brinckerhoff Hall, but Dr. Gregory did not live to see them completed, dying on April 21, 1897, just as the arrangements for moving her residence and laboratory had been made. She will be missed at the meetings of the Torrey Club at which she read several original papers. She has been connected with the BULLETIN as associate editor since 1889 and has contributed thirty-five articles and reviews to its volumes, beginning in 1886. She was also an occasional contributor to the Botanical Gazette and an active member of the Society of American Naturalists, whose yearly meetings she frequently attended. She was elected a member of the American Association for the Advancement of Science in 1892, having attended the meeting at Rochester of that year and read a paper before the Botanical Section. She had also studied for a brief period at Woods Holl, where she had planned to spend the coming season. Her death leaves the botanical laboratory without any natural successor, though its founders hope that one may be secured who will continue the policy which she so ably represented.

The following minute was adopted by the Executive Committee of the Board of Trustees of Barnard College at their meeting on Thursday, April 22, 1897:

Professor Gregory gave to Barnard College, through the eight years of its existence, a service in the highest degree loyal, enthusiastic and successful. Her influence in creating and maintaining a high standard in scientific work was of great importance in determining the character of the college. She had the good fortune to possess, together with great intellectual gifts, the graces of character to make them effective, and her scholarship was in the service of kindliness, of courage and of truth. The college bears witness not only to her love of sound learning, but to the modesty and openness of mind which were the rare and beautiful setting of her powers.

The following preamble and resolutions were adopted by the Club at its meeting, held May 11, 1897:

WHEREAS: our esteemed fellow-member, Miss Emily L. Gregory is lost to us by death, therefore it is

Resolved: that in realization of our loss we express our deep sorrow for this sad event, at this untimely period when she was just about to enter upon a new era in her career as a teacher, to which we all, with her, had looked forward with happiest anticipation, and

Resolved: that we have lost in her an accomplished scientist, a devoted teacher, a warm hearted, generous friend, and

Resolved: that a copy of these resolutions be presented to her surviving relatives, to whom we extend our sincerest sympathies.

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Studies in the Botany of the Southeastern United States.—X.

BY JOHN K. SMALL.

THE GENUS TRADESCANTIA IN THE SOUTHERN STATES.*

Six years' experience with *Tradescantia*, both in the field and in the herbarium, has convinced me that there is something fundamentally wrong in the several existing treatments of the genus. Since I became interested in the forms occurring in the Southern States Dr. J. N. Rose has arranged to monograph the North American Commellinaceae and I publish these notes with his knowledge and consent.

Linnaeus described a single North American species, namely, *T. Virginiana.*† Of American authors, Walter,‡ Michaux,§ Pursh,‖ Elliott ¶ and Darby,** each described two species, while Chap-

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* I have had the privilege of examining material in the herbaria of Lafayette College, through Professor Thos. C. Porter, and of Franklin and Marshall College, through Professor J. S. Stahr. Professor S. M. Tracy has sent me specimens at various times. I have also received material from regions beyond the area with which this paper is concerned, from Mr. B. F. Bush, Rev. E. J. Hill and Rev. J. M. Bates.

† Sp. Pl. 288.

‡ Fl. Car. 119.

§ Fl. Bor. Am. 119.

‖ Fl. Am. Sept. 218.

¶ Bot. S. C. & Ga. 380–381.

** Bot. S. States, 547–548.

man* added a third, *Tradescantia pilosa.* With the exception of Walter all these authors used the same two specific names, applying Ventenat's *Tradescantia rosea* properly and making *Tradescantia Virginiana* elastic enough to embrace everything else savoring of *Tradescantia* that existed in their respective regions. Walter applied the name *Virginica* not to the Linnaean type, but to the form that Ventenat later described as *Tradescantia rosea* and proposed the name *cristata* for one of the larger forms which most authors thought was the real *Tradescantia Virginiana* of Linnaeus, but judging from Walter's description I am inclined to think he had in mind a later described species.

Rafinesque's work on the southern *Tradescantias* must needs be mentioned. This eccentric author described no less than twenty-six species and varieties in eastern North America, thus treating the genus from the standpoint of extreme segregation just as the authors mentioned above treated it from the standpoint of extreme aggregation. Rafinesque apparently founded a species on nearly every specimen he collected and of course his work needs extensive reduction, but to what previously described species to refer many of the Rafinesquian names is a difficult task. However, several of the forms he described, prove to be excellent species, for example, *Tradescantia brevicaulis* which Dr. Morong restored several years ago † and *Tradescantia reflexa* which I restore in this paper.

An attempt to segregate the material in an herbarium on the lines laid down in the several different works above referred to must at once prove futile and not until we recognize the several segregates into which the *Virginiana* type naturally separates itself can we hope for a clear or scientific interpretation of the group from a specific standpoint.

Key to the Species.

Umbel-like cymes peduncled, subtended by small or minute bracts.
- Leaves ovate or ovate-lanceolate; sepals 2–3 mm. long. 1. *T. Floridana.*
- Leaves linear or almost filiform; sepals 5–6 mm. long. 2. *T. rosea.*

Umbel-like cymes sessile, subtended by large leaf-like bracts.
- Leaves linear or linear-lanceolate, 12–50 times longer than broad, more or less involute; plants glabrous, villous, hirsute or glandular.

* Fl. S. States, 498.

† Bull. Torr. Club, 20: 470.

Stems abbreviated, 1 to rarely 10 cm. long; bracts longer than the leaves. 3. *T. brevicaulis.*

Stems elongated, 20–100 cm. long; bracts shorter than the leaves.

Sheaths not imbricated at the base of the stem.

Stem glabrous; pubescence, when present on other organs, villous and silvery.

Plant bright green; pedicels 2.5–5 cm. long, villous; sepals 12–18 mm. long, villous, about twice as long as broad, becoming membranous. 4. *T. Virginiana.*

Plants glaucous; pedicels 2–2.5 cm. long, glabrous; sepals 8–10 mm. long, with a tuft of hairs at the apex, 3–4 times as long as broad, leathery. 5. *T. reflexa.*

Stem hirsute; pubescence brownish. 6. *T. hirsuticaulis.*

Sheaths imbricated for 5–20 cm. at the base of the stem.

Plant densely glandular; sepals linear-lanceolate or linear-oblong, 1 cm. long. 7. *T. longifolia.*

Plant glabrous except the villous sheaths at the base of the stem; sepals ovate or oblong, 7 mm. long. 8. *T. foliosa.*

Leaves lanceolate or narrowly lanceolate, 4–10 times longer than broad, flat; plants glabrate, pilose or villous.

Stem clothed with long villous hairs. 9. *T. comata.*

Stems glabrous, or pilose.

Plant usually slender; stems mostly strict; umbels solitary and terminal or on corymbed branches; flowers 2–2.5 cm. broad; species Alleghenian. 10. *T. montana.*

Plant usually stout; stems mostly flexuous; umbels terminal and sessile in the upper axils; flowers 2.5–3 cm. broad; species campestrian. 11. *T. pilosa.*

1. Tradescantia Floridana S. Wats.

Tradescantia Floridana S.Wats. Proc. Am. Acad. 17: 381. 1882.

Perennial by creeping stems, slender, nearly glabrous, bright green. Stems procumbent, more or less matted, flaccid, 1–3 dm. long, rooting at the lower nodes; leaves ovate or ovate-lanceolate, 1–2 cm. long, thinnish, acute, ciliolate; sheaths funnelform, minutely roughened, fringed with long white cilia; cymes solitary or 2 together, terminal, their peduncles .5–1.5 cm. long, subtended by ovate or ovate-lanceolate bracts; pedicels filiform, 2–6 mm. long, villous and somewhat glandular; sepals ovate, about 2–3 mm. long, acutish, purple, pubescent; petals white; filaments glabrous; anther-cells contiguous; capsules oval, nearly 2 mm. long, glabrous.

Damp shady places, peninsular Florida: Miss Reynolds; Merritt's Island, A. H. Curtiss, 2995 (two collections under the one number); Sumpter county, J. D. Smith; Indian River, W. M. Canby.

2. TRADESCANTIA ROSEA Vent.

Tradescantia Virginica Walt. Fl. Car. 119. 1788. Not *T. Virginiana* L.

Tradescantia rosea Vent. Hort. Cels, *pl. 24.* 1800.

Perennial by rootstocks, slender, nearly glabrous, bright green. Stems erect or nearly so, often densely tufted, 1–5 dm. tall, usually simple; leaves narrowly linear or nearly filiform, 1–3 dm. long, flat or involutely folded, acuminate, sometimes surpassing the peduncles; sheaths cylindric or funnelform, .5–1 cm. long, fringed with long white cilia; cymes usually solitary, or sometimes 2 together, terminal, their peduncles 8–15 cm. long, subtended by linear bracts; pedicels 1–1.5 cm. long, glabrous; sepals lanceolate or ovate-lanceolate, 5–6 mm. long, acutish, petals pink or rose-color, orbicular-oblong, obtuse; filaments glabrous, anther-cells contiguous; capsules subglobose, 4–5 mm. in diameter.

Sandy soil, Maryland to Missouri, south to Florida and Texas. Spring and summer.

3. TRADESCANTIA BREVICAULIS Raf.

Tradescantia brevicaulis Raf. Atl. Journ. 150. 1832.

Tradescantia pumila Raf. New Fl. Part 2, 86. 1836.

Tradescantia Virginica var. *villosa* S. Wats.; Wats. & Coult. in A. Gray, Man. Ed. 6, 539. 1890.

Perennial by a cluster of slender roots, low, stoutish, more or less villous, bright green. Stems solitary or usually clustered, erect, almost wanting or 1–10 cm. tall, simple; leaves linear or narrowly linear, 1.5–3 dm. long, flattish, acute or sometimes rather obtuse, sheaths 1–2.5 cm. long, mostly imbricated; involucre of 2 nearly equal leaf-like bracts which are longer and broader than the leaves; pedicels stoutish, 3.5–5.5 cm. long, villous; flowers mostly purplish-blue, 5–15 in an umbel-like cyme, about 2 cm. broad; sepals ovate or oblong-ovate, 10–11 mm. long, obtuse; petals suborbicular, obtuse, delicately nerved; mature capsule not seen.

Hillsides and woods, Illinois to Missouri and Kentucky. May to June.

4. TRADESCANTIA VIRGINIANA L.

Tradescantia Virginiana L. Sp. Pl. 288. 1753.

Tradescantia rupestris Raf. Atl. Journ. 150. 1832.

Perennial by a cluster of rather thick white or yellowish roots, stout or stoutish, glabrous or nearly so, bright green. Stems usually clustered, erect, 2 dm. or mostly 3–4 dm. tall, nearly straight, simple; leaves linear or linear-lanceolate, 1 or usually 2–7 dm. long, acuminate, more or less curved, nearly flat or involutely folded; sheaths 1–3 cm. long, sometimes slightly ciliate; involucre of 2 lanceolate or linear-lanceolate nearly equal or very unequal leaf-like bracts which are usually much smaller than the leaves; flowers dark blue or purplish or rarely white, large, 3–4 cm. broad; pedicels 2.5–5 cm. long, sepals large, elliptic, ovate or ovate-lanceolate, 12–18 mm. long, obtuse or acutish, villous with long non-glandular hairs about twice as long as broad, becoming membranous; petals sub-orbicular, 1.4–2 cm. in diameter; capsule 5–7 mm. long, glabrous; seeds oblong, about 3 mm. long.

Hillsides and along streams, New York and Illinois, Virginia nd Arkansas. May–June.

5. Tradescantia reflexa Raf.

? *Tradescantia canaliculata* Raf. Atl. Journ. 150. 1832.

Tradescantia reflexa Raf. New Fl. Part 2, 87. 1836.

Tradescantia reflexa var. *drepisia* Raf. New Fl. Part 2, 88. 1836.

Perennial by a rootstock and numerous rather delicate roots, slender or stout, glabrous, glaucous. Stems solitary, erect, 4–9 dm. tall, nearly straight, commonly much branched, sometimes purplish; leaves linear, 2–5 dm. long, straight, or somewhat curved, long attenuate; sheaths large, 1–3 cm. long, glabrous or rarely slightly villous; involucres of 2 unequal finally reflexed leaf-like bracts; flowers blue, or often red, 2–3 cm. broad, the umbel-like cymes at maturity usually dense; pedicels slender, 2–2.5 cm. long, crowded; sepals oblong or elliptic, apparently lanceolate by the involute edges, 8–10 mm. long, hooded, mostly with a tuft of hairs at the apex, sometimes glabrate, 3–4 times as long as broad, leathery; petals suborbicular; capsule ovoid or oblong, 5–6 mm. long, glabrous, constricted above the middle; seeds oblong, 3 mm. long, with irregular transverse ridges.

In sandy or clay soil, in the Gulf States and from South Carolina to Indian Territory and Texas; ascends the Mississippi Valley to Minnesota. May–August.

South Carolina: Elliott; Georgia: Small; Florida: Garber, Nash; Alabama: Earle and Underwood; Mississippi: Tracy; Texas: Drummond; Indian Territory: Palmer.

Conspicuous on account of its tall and proportionately slender habit, its narrow elongated leaves and usually very dense flower clusters. I have adopted the specific name *reflexa* of Rafinesque because the original description agrees very well with the specimens I have collected in the Southern States and the original locality lies within the bounds of the range shown by my specimens. The plant is usually glabrous except a more or less distinct tuft of hairs near the apex of the sepals.

6. TRADESCANTIA HIRSUTICAULIS n. sp.

Perennial by a cluster of coarse elongated (1–2.5 dm.) roots, slender, hirsute throughout with long brownish hairs, or partially glabrous above, otherwise bright green. Stems several together, erect or nearly so, 3–4 dm. tall, leafy throughout, densely hirsute, simple; leaves narrowly linear, 2–3 dm. long, more or less curved, involutely folded, less densely hirsute than the stem; sheaths rather pale, 1–2.5 cm. long, conspicuously ribbed; involucre of two linear very unequal leaf-like bracts which are somewhat smaller than the stem leaves; pedicels slender, 2–2.5 cm. long; flowers purple, large, 2.5–3 cm. broad; sepals variable in the same flower, ovate or lanceolate, 9–15 mm. long, rather villous and somewhat glandular; petals suborbicular, broader than long and undulate; mature capsule not seen.

Sandy places, Georgia to Florida; occurs at 400 meters on Stone Mountain. May to July.

Florida: Chapman, Wood; Georgia: Stone Mountain, Small. A very distinct and beautiful species related to *Tradescantia reflexa* but much more slender in habit. Remarkable for the abundant development of brownish hirsute pubescence on the stem, leaves and inflorescence. The flowers are larger and of a deeper blue than those of *Tradescantia reflexa*.

7. TRADESCANTIA LONGIFOLIA n. sp.

Perennial by a short rootstock and slender roots which are 1 dm. or rarely 2 dm. long; rather slender, glandular-pilose, dull green. Stems solitary, erect or assurgent, 4–5 dm. tall, strict, simple or sparingly branched above, densely glandular; leaves linear or nearly so, chiefly basal or confined to the lower part of the stem, 2–4 dm. long, even the lower ones surpassing or almost equalling the stem, gradually narrowed from near the base, flat, densely glandular-pilose like the stem; sheaths 2–2.5 cm. long, ciliate with long hairs, imbricated below; involucre of two small leaf-like bracts, or one often almost wanting; pedicels stoutish, 1.5–2 cm. long; flowers deep blue, 2.5–3 cm. broad; sepals linear-lanceolate or linear-oblong, 1 cm. long, obtuse, 1½ to 2 times shorter than the pedicels; filaments at length as long as the sepals, spirally twisted; capsule oblong, 8–9 mm. long, glandular-pilose; seeds oblong or ovoid, more or less flattened, gray, conspicuously marked with irregular transverse ridges.

Sandy soil in pine barrens, Florida: Curtiss, 2996 and 4680; Nash, 1574.

Many *Tradescantias* possess more or less glandular pubescence, but in this Floridian species, we find the whole plant covered with a short glandular pubescence which extends even to the petals. Its affinities are with *Tradescantia hirsuticaulis*, from which it differs primarily in the pubescence and the broader and elongated leaves which are chiefly confined to the base of the stem which they either surpass or nearly equal. The sepals are narrow and conspicuously elongated.

8. TRADESCANTIA FOLIOSA n. sp.

Perennial by a cluster of slender much elongated (more than 3 dm.) roots, rather stout, glabrous above, villous at the base, dull green. Stems solitary, erect, 4–7 dm. tall, simple or nearly so, very leafy near the base, glabrous or glabrate; leaves narrowly linear, 2–6 dm. long, nearly equalling or surpassing the stem, long-attenuate, crowded at the base; sheaths large, often densely villous, imbricated and sheathing the stem for 1–2 dm., prominently ribbed; involucre of 3 unequal leaf-like bracts; pedicels slender, 1–1.5 cm. long; flowers blue, about 2 cm. broad, the cymes at maturity dense; sepals ovate or oblong, about 7 mm. long, obtuse, two strongly hooded and with a tuft of hairs near the apex, one scarcely hooded and nearly glabrous at the apex; capsule oblong, 5–6 mm. long, glabrous; seeds irregular, 2–2.5 mm. long, not much longer than broad.

In clay soil, chiefly on hummocks, eastern and southern Florida: Keeler; Nash, 610 in part. May to June.

As in the case of *Tradescantia longifolia*, the leaves of this plant are crowded toward the base of the stem but they are much more numerous. The sheaths are loose, densely imbricated and villous, with very long delicate hairs. The upper part of the plant is apparently glaucous, the flowers are small, the sepals short and the fruiting calyx small and plump. The plant is destitute of glandular pubescence.

9. TRADESCANTIA COMATA n. sp.

Perennial, stoutish, pubescent with long villous hairs. Stems erect or ascending, 3–5 dm. tall, simple or sparingly branched, very villous; leaves lanceolate or narrowly-lanceolate, 1–3 dm. long, acute or short-acuminate, ciliate, villous on both surfaces or glabrate above, somewhat narrowed near the base; sheaths villous like the stem, 1–3 cm. long; involucre of 1–2 bracts like the leaves but smaller; flowers blue, 1.5–2 cm. broad; pedicels usually densely villous; sepals oblong or elliptic-oblong, 7–9 mm. long, villous, acute or acutish; capsules oblong, 4–5 mm. long, glabrous; seeds oblong, 3 mm. long, tuberculate-ridged.

Upper districts and mountains of Georgia; Chapman, two collections.

Allied to *Tradescantia montana*, but readily distinguished by the conspicuous villous pubescence.

10. TRADESCANTIA MONTANA Shuttl.

Tradescantia montana Shuttl.; Britton, in Britton & Brown, Ill. Fl. 1: 377. 1896.

Perennial by a cluster of elongated roots, slender, nearly glabrous, dark green. Stems usually solitary, erect, 3–7 dm. tall, straight or nearly so, simple or sparingly branched above; leaves narrowly lanceolate or linear-lanceolate, 1–3 dm. long, usually minutely pubescent, or rarely glabrate, acuminate, flat; sheaths 1–2 cm. long, ciliate; involucre of two lanceolate leaf-like bracts, one of which is at least one-half smaller than the other; flowers blue, small, 2–2.5 cm. broad; pedicels slender, 1–1.2 cm. long; sepals ovate or oblong, sometimes apparently lanceolate by the involute edges, 5–6 mm. long, pilose or villous, obtuse, hooded, often minutely glandular; petals sub-orbicular or orbicular-ovate; capsule oblong or oval, 5–6 mm. long, glabrous, or pilose especially above the middle; seeds oval-oblong, 3 mm. long, irregularly tuberculate and coarsely granular.

Sandy hillsides in the Allegheny mountains from Virginia to North Carolina and South Carolina; ascends to 1200 meters in North Carolina. June to August.

Virginia: Britton, Small; North Carolina: Rugel, Porter, Small & Heller; South Carolina: Small.

Tradescantia montana appears to be strictly Alleghenian in its distribution. It is more closely related to *Tradescantia pilosa* than to any other species, but it is smaller throughout, with a straight or almost straight stem, narrower and thinner leaves and usually less pubescence.

Last July I found this plant abundantly on Paris mountain, near Greenville, South Carolina. It grew on the upper slopes and top of the mountain, chiefly in thickets. The species is apparently a late bloomer; although the season was far advanced the plants had not produced any capsules.

11. TRADESCANTIA PILOSA J. G. C. Lehm.

Tradescantia pilosa J. G. C. Lehm. Nov. Act. Leop. **14**: Part 2, 822. *pl. 48.* 1828.

Tradescantia flexuosa Raf. Atl. Journ. 150. 1832.

Tradescantia axillaris Raf. New Fl. Part 2, 87. 1836.

Tradescantia axillaris var. *flexuosa* Raf. New Fl. Part 2, 87. 1836.

Tradescantia Virginica var. *flexuosa* S. Wats.; Wats & Coult. in A. Gray, Man. Ed. **6**: 539. 1890.

Perennial, stout, pilose and more or less puberulent, dull green; stems erect or ascending, 4–8 dm. tall, flexuous, often puberulent, or glabrate, leafy to the top, simple or sparingly branched; leaves lanceolate or sometimes rather narrowly lanceolate, 1–2.5 dm. long, acuminate, dark green above, paler beneath; sheaths 1–1.5 cm. long, ciliate, inconspicuously ribbed; involucre of 2–3 bracts similar to the leaves, one about twice as long as the others; pedicels normally slender, 1.5–2 cm. long, villous-pilose, or often glabrate; flowers pale blue or deep blue, large, 2.5–3 cm. broad, the cymes usually crowded at maturity; sepals ovate or oblong, about 7 mm. long, apparently lanceolate by their involute edges, two strongly hooded, the third not hooded, mostly villous-pilose; petals ovate-orbicular, obtuse; capsule globose-oblong, 5 mm. long, constricted at the middle, pilose at the summit; seeds oblong or ovoid, 2–3 mm. long.

Thickets and shady hillsides, Ohio to Missouri, south to West Virginia and Tennessee. Naturalized about Bartram's Garden, Philadelphia. May to August.

In size, habit and leaf form, especially in the breadth of the leaves, this is our most conspicuous *Tradescantia*; the lanceolate leaves with their pilose pubescence, the normally flexuous stems and the usually axillary flower-clusters readily separate it from all other species. In range it is campestrian with Kentucky and Tennessee as its center of distribution; it is unknown west of the Mississippi river except in eastern Missouri.

Reinke's Discussions of Lichenology.—IV.

By Albert Schneider.

IV. OUTLINES OF A COMPARATIVE MORPHOLOGY OF THE LICHEN THALLUS.*

Numbers IV. and V. of Reinke's papers treat of the same subjects, that is the polyphylogeny, relationships and comparative morphology of the genera.

The author considers the system of Tuckerman as being the nearest approach to a natural arrangement. Reinke's system differs in that the relative position of tribes as well as of the families and genera has been modified. While Tuckerman proceeded from the higher to the lower, Reinke bases his system on the reverse arrangement. The author wishes to have it distinctly understood that the proposed system is by no means perfect; it is only an attempt at a natural arrangement of lichens based upon the very deficient data obtained from the study of the phylogenetic history of these plants.

The profuse illustrations accompanying the papers represent the morphological characters of generic types. The illustrations of sections of the thalli and apothecia are more or less semi-diagrammatic, no attempt being made to give exact anatomical details, which is rather to be regretted in a work otherwise so complete. It seems also that the author has in many instances relied wholly upon the observations of others.

V. THE NATURAL SYSTEM OF LICHENS.†

The author precedes the consideration of the arrangement of lichen groups by a lengthy theoretical discussion of the phylogenetic relationship of the groups to each other and to fungi. Much of it is a repetition of what had been stated in preceding papers. The same may be said of the general considerations of the sub-classes, families and genera.

*Reinke, J. Skizzen zu einer vergleichenden Morphologie des Flechtenthallus. Jahrbücher für wissenschaftliche Botanik, **28**: 70–150, 359–486. 1895.

†Reinke, J. Das natürliche Flechtensystem. Jahrbücher für wissenschaftliche Botanik, **29**: 171–236. 1896.

The following is the arrangement proposed by Reinke. The symbiotic algae and fungal affinities are deduced from a consideration of previous papers. The results plainly show that much is yet to be done in the investigation of the lichen-algae and in the study of the relationship of lichens to fungi.

LICHENES.

	Symbiotic Algae.	Approximate fungal affinities.
I. CONIOCARPI.		
(*a*) *Caliciacei.*		*Patellariacei.*
1. Mycocalicium.	No algae.	(*Protocaliciacei.*)
2. Calicium.	Pleurococcus.	
3. Coniocybe.	"	
(*b*) *Acoliacei.*		*Patellariacei.*
1. Acolium.	Pleurococcus.	(*Protocaliciacei.*)
2. Pyrgillus.	"	
3. Tylophoron.	"	
4. Tholurna.	"	
5. Acroscyphus.	"	
6. Pleurocybe.	"	
7. Sphaerophoron.	"	
II. DISCOCARPI.		
A. GRAMMOPHORI.		
(*a*) *Graphidacei.*		*Hysteriacei.*
1. Melaspilea.	Chroolepus.	Mycomelaspilea.
2. Arthonia.	"	Mycarthonia.
3. Lecanactis.	"	Patinella.
4. Placographa.	"	Mycoplacographa.
5. Platygrapha.	"	
6. Pachnolepia.	"	
7. Opegrapha.	"	Hysterium.
8. Graphis.	"	"
9. Glyphis.	Protococcus.	
10. Chiodecton.	Chroolepus.	
11. Schizopelte.	"	
12. Dendrographa.	"	
13. Dirina.	"	
14. Rocella.	"	
15. Combea.	"	
(*b*) *Xylographacei.*		*Hysteriacei.*
1. Xylographa.	Pleurococcus.	
B. LECIDIALES.		
(*a*) *Gyalectacei.*		*Patellariacei.*
1. Coenogonium.	Cladophora.	(*Stictideae.*)
2. Gyalecta.	{ Protococcus. / Chroolepus.	
3. Jonaspis.	Chroolepus.	
(*b*) *Lecideacei.*		*Patellariacei.*
1. Lecidea.	Pleurococcus.	Patinella.
2. Biatora.	"	
3. Bacidia.	"	Mycobacidea.
4. Thalloidima.	Protococcus.	
5. Sphaerophoropsis.	Gloeocystis.	
6. Toninia.		

7. Bombylospora.		
8. Lopadium.		
(*c*) *Umbilicariacei.*		*Patellariacei.*
1. Psora.	Protococcus.	
2. Umbilicaria.		
(*d*) *Cladoniacei.*		*Patellariacei.*
1. Icmadophila.	Protococcus.	
2. Pilophoron.	"	
3. Stereocaulon.	"	
4. Argopsis.	"	
5. Pycnothelia.	"	
6. Baeomyces.	"	
7. Cladonia.	"	
8. Glossodium.	"	
9. Thysanothecium.	"	
10. Sphyridium.	"	
11. Gymnoderma.	"	
12. Gomphillus.	"	
C. PARMELIALES.		
(*a*) *Urceolariacei.*		*Stictideae.*
1. Conotrema.	Chroolepus.	
2. Ascidium.	"	
3. Gyrostomum.	"	
4. Thelotrema.	"	
5. Polystroma.	Protococcus.	
6. Belonia.		
7. Urceolaria.	Protococcus.	
(*b*) *Pertusariacei.*		*Patellariacei.*
1. Megalospora.	Pleurococcus.	
2. Ochrolechia.	Protococcus.	
3. Pertusaria.	"	
4. Varicellaria.		
5. Phlyctis.		
(*c*) *Parmeliacei.*		*Patellariacei.*
1. Lecanora.	Protococcus.	
2. Parmelia.	"	
3. Cetraria.	"	
4. Dactylina.	"	
5. Evernia.	"	
6. Usnea.	"	
7. Cornicularia.	"	
8. Alectoria.	"	
9. Heterodea.	"	
10. Ramalina.	"	
(*d*) *Physciacei.*		*Patellaricei.*
1. Buellia.	Pleurococcus.	Karschia.
2. Rinodina.	Protococcus.	
3. Pyxine.	"	
4. Physcia.	"	
5. Anaptychia.	"	
(*e*) *Theloschistacei.*		*Patellariacei.*
1. Callopisma.	Protococcus.	Karschia ?
2. Candelaria.	"	
3. Placodium.	"	
4. Xanthoria.	"	
5. Theloschistes.	"	
(*f*) *Acarosporacei.*		
1. Biatoridium.	Pleurococcus.	
2. Acarospora.	Protococcus.	
3. Anzia.	"	
4. Thelocarpon.	"	

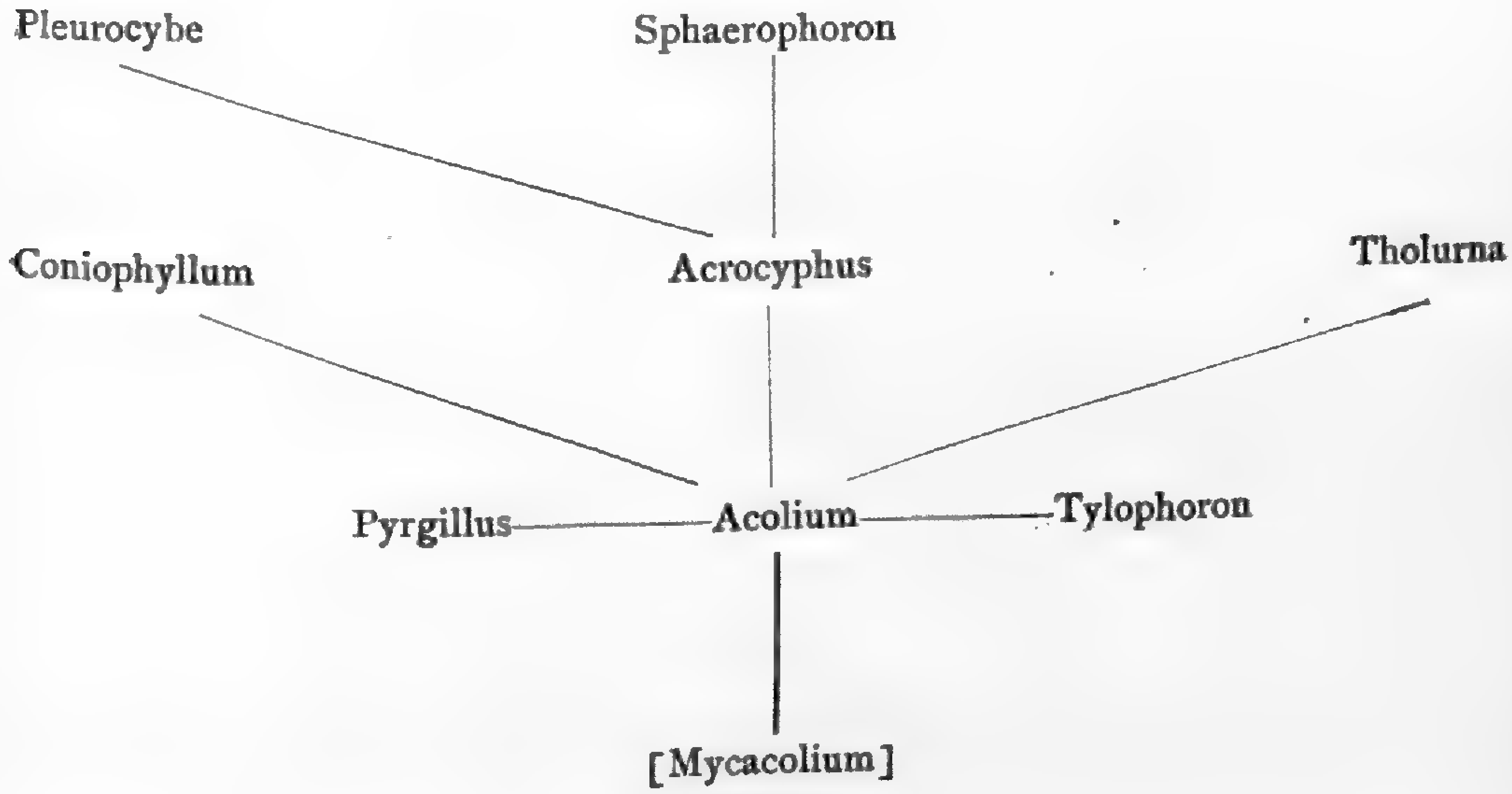
D. CYANOPHILI.		
(*a*) *Lichinacei.*		*Patellariacei.*
1. Calothricopsis.	Rivularia.	Patinella ?
2. Lichina.	"	
(*b*) *Ephebacei.*		
1. Thermutis.	Scytonema.	
2. Pterigiopsis.		*Patellariacei.*
3. Ephebe.	Stigonema.	Patinella.
4. Spilonema.	"	
5. Lichenosphaeria.	"	
(*c*) *Pannariacei.*		*Patellariacei.*
1. Parmeliella.	Nostoc.	
2. Placynthium.	Scytonema.	
3. Polychidium.	"	
4. Leptodendriscum.	"	
5. Leptogidium.	"	
6. Pannaria.	Protococcus.	
7. Heppia.	Scytonema.	
8. Heterina.	"	
9. Coccocarpia.	"	
10. Hydrothyria.	"	
11. Erioderma.	"	
12. Psoroma.	Protococcus.	
13. Lepidocollema.	"	
14. Leprocollema.	Nostoc.	
(*d*) *Stictacei.*		*Patellariacei.*
1. Massalongia.	Nostoc.	
2. Stictina.	"	
3. Sticta.	Protococcus.	
4. Ricasolia.	"	
(*e*) *Peltigeracei.*		*Patellariacei.*
1. Peltigera.	Protococcus.	
2. Peltidea.	"	
3. Nephromium.	Nostoc.	
4. Nephroma.	Protococcus.	
5. Solorinina.	Nostoc.	
6. Solorina.	Protococcus.	
7. Solorinella.		
(*f*) *Collemacei.*		*Patellariacei.*
1. Lecidocollema.	Nostoc.	
2. Pyrenocollema.	"	
3. Collema.	"	
4. Leptogium.	"	
(*g*) *Omphalariacei.*		*Patellariacei.*
1. Cryptothele.	Gloeocapsa.	
2. Pyrenopsis.	"	
3. Synalissa.	"	
4. Peceania.		
5. Phylliscidium.	Chroococcus.	
6. Paullia.	Gloeocapsa.	
7. Omphalaria.	Chroococcus.	
8. Anema.	"	
9. Psorotichia.		
10. Euchylium.		
11. Collemopsidium.		
12. Pyrenopsidium.		
13. Phylliscum.	Chroococcus.	
III. PYRENOCARPI.		
(*a*) *Verrucariacei.*		*Sphaeriaceae.*
1. Verrucaria.	Chroolepus.	
2. Strigula.	"	

3. Endopyrenium.	Chroolepus.
4. Endocarpon.	"
5. Pyrenothamnia.	"

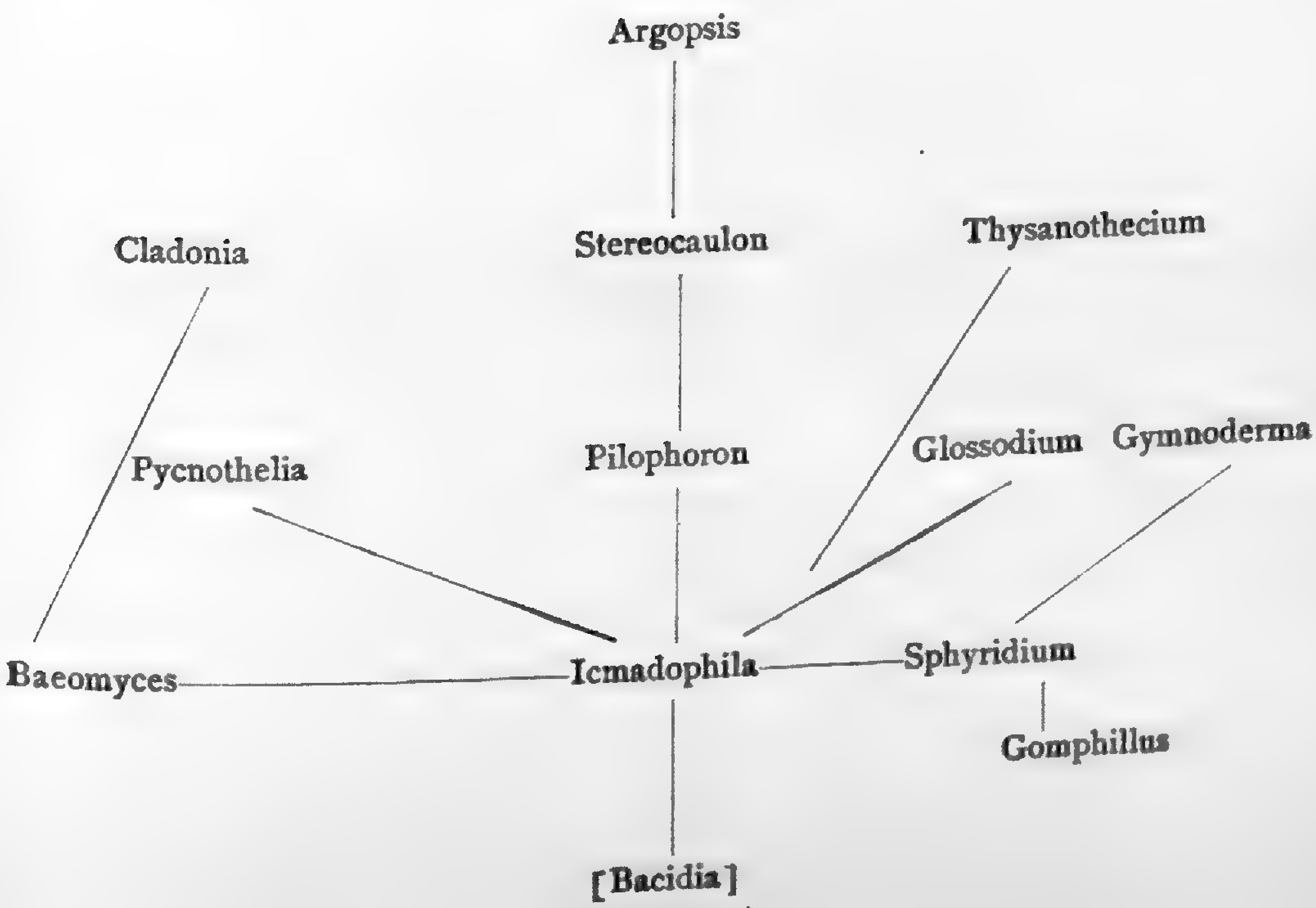
LICHENES IMPERFECTI.

1. Thamnolia.	Protococcus.
2. Siphula, etc.	

The following diagrams show the probable phylogenetic relationships of the genera of some of the families. The remaining families are not sufficiently well understood to indicate this relationship.

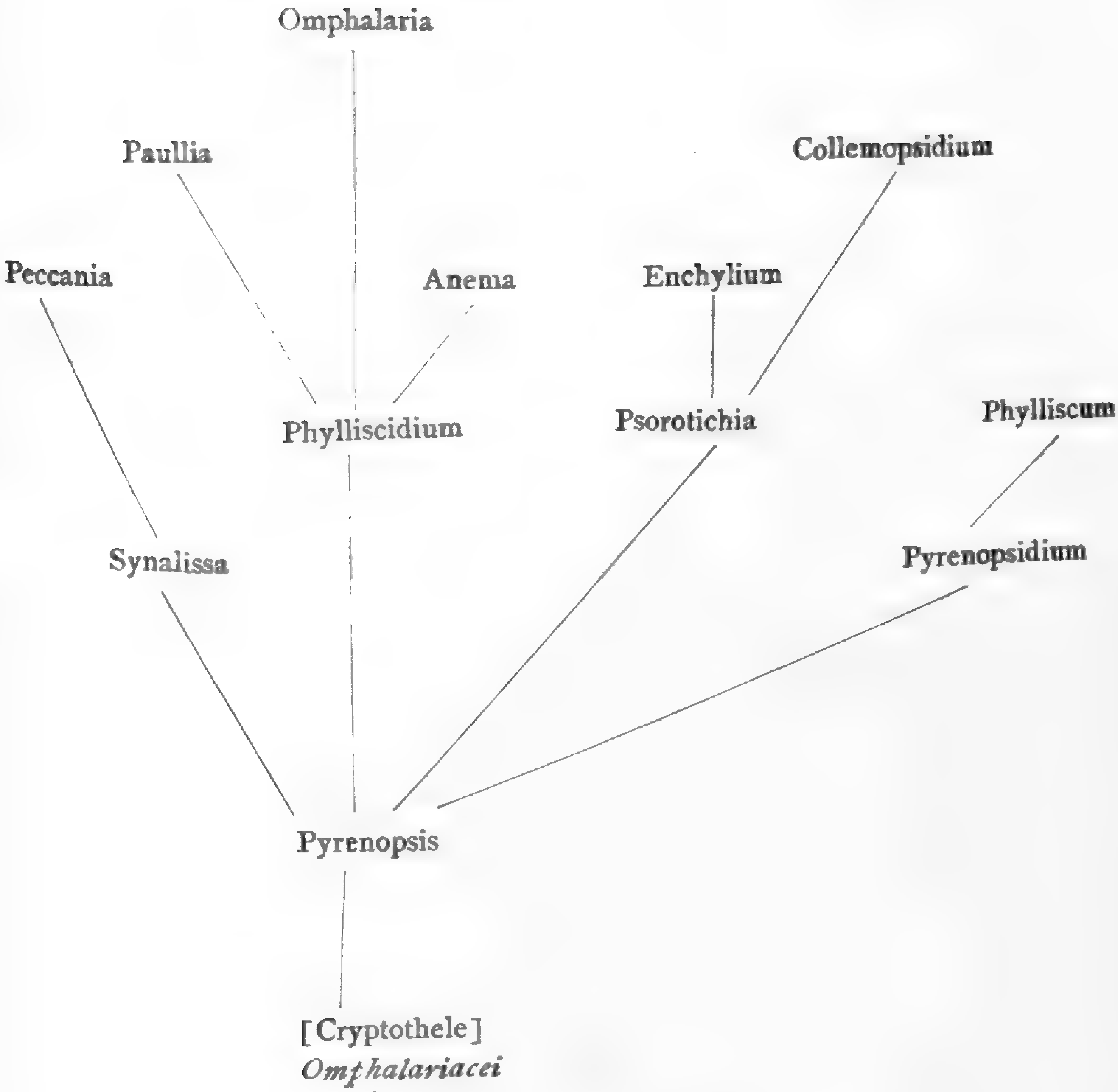


Acoliacei.



Cladoniacei


Dactylina
Evernia
Alectoria
Ramalina
Cetraria
Cornicularia
Heterodea
Parmelia
Lecanora
[Biatora]
Parmeliacei
Nephroma
Nephromium
Solorinina
Solorina
Solorinella
Peltidea
Peltigera
[Hydrothyria]
Peltigeracei
Coccocarpia
Erioderma
Leptogidium
Stictacei
Psoroma
Leptodendriscum
Heterina
Polychidium
Heppia
Pannaria
Lepidocollema
Placynthium
[Parmeliella]
Leprocollema
Pannariacei



Rarieties from Montana.—II.

By P. A. Rydberg.

(Plates 304–307.)

Polygonum Austinae Greene, Bull. Cal. Acad. 2: 212. 1885.*

This little interesting *Polygonum* was collected on the side of one of the highest peaks of the Crazy Mountains, September 8, 1896, at an altitude of 8000 feet.

Polygonum Engelmannii Greene, Bull. Cal. Acad. 1: 126. 1884.

This has hitherto only been collected in the higher mountains of Colorado. It is not uncommon in central Montana at an altitude of 6000 feet or more. Cottonwood Creek, July 30, 1896,

* This and the next have been determined by J. K. Small.

Flodman, no. 400. Sweet Grass Cañon, Crazy Mountains, September 8th, no. 399.

SILENE REPENS Patrin, in Pers. Syn. 1: 500. 1805.

This Siberian species has been collected in Montana at the following stations: Spanish Basin, July 11, 1896, Flodman, no. 412; Mystic Lake, Bozeman Cañon, July 24, 1895, Rydberg, no. 2635. As far as I can find, there is no reference in print regarding its occurrence in America. Dr. B. L. Robinson, to whom the specimens were sent for identification and who has determined it as well as the next following species, writes:

"Your specimens of *S. repens* are very interesting. I have seen specimens from Alaska, but never before from other parts of North America. I have no doubt, however, of the identity of your plants with the real Asiatic plant, having just made careful dissections of the two alongside of each other. However, the matter of distribution is not so surprising after the discovery of *Stellaria dichotoma* in Montana some years ago."

ALSINE CALYCANTHA (Ledeb.)

Arenaria calycantha Ledeb. Mem. Acad. St. Petersb. **5**: 534. 1812.

Stellaria calycantha Bong. Veg. Ins. Sitcha, 127. 1831.

This species was collected in a damp place just below a little patch of snow near the top of Yogo Baldy in the Little Belt Mountains, August 24, 1896, Flodman, no. 432.

ALSINE LONGIPES EDWARDSII R. Br.

Stellaria Edwardsii R. Br., Parry's 1st Voy. 271.

This is, I think, the first time this variety is reported from within the United States. Only a few specimens were collected, at an altitude of 8000 feet on Spanish Peaks, July 14, 1896, Flodman, no. 429.

ARENARIA SUBCONGESTA (Wats.)

Arenaria Fendleri subcongesta Wats. Bot. King's Exp. 40. 1871.

A. congesta subcongesta Wats. Bot. Cal. 1: 69. 1876.

Arenaria congesta subcongesta as generally understood, I think, contains more than one distinct type; at least, that is the case with the material in the Columbia herbarium. The form represented by Watson's original from the King Expedition and the common plant of Montana, I think, is perfectly distinct from both *A. Fendleri* and *A. congesta*, and the relationship is rather with *A. capillaris.* Depauperate specimens of *A. subcongesta* resemble strikingly *A. capillaris nardifolia.* It differs, however, in the scarious bracts and the more acute sepals, which are nearly as broad as in *A. capillaris.* It surprises me that it ever could have been made a variety of *A. Fendleri*, which has very narrowly lanceolate attenuate sepals. I do not see any reason for uniting it with *A. congesta*, which has lanceolate, decidedly carinate sepals and headlike inflorescence, while in *A. subcongesta* the sepals are ovate rather than lanceolate, are not carinate, but three-nerved, and the inflorescence is open. As stated before, it comes in every respect nearer to *A. capillaris*, but I think it has just as good right to specific rank as any of the species mentioned.

A. subcongesta is common in central and southwestern Montana. Flodman, nos. 433 to 438, Rydberg, 2642, etc.

AQUILEGIA JONESII Parry, Am. Nat. **8**: 211. 1874.

This rare little columbine was collected in fruit on a mountain top near the Neihart Pass in the Little Belt Mountains, August 10, 1896, Flodman, no. 451.

ATRAGENE TENUILOBA (Gray) Britton, Bull. Herb. Boiss. 3: 206. 1895.

Clematis alpina var. *occidentalis* subvar. *tenuiloba* A. Gray in Newton & Jenney, Rep. Geol. Black Hills, 531. 1880.

Clematis Pseudoatragene var. *subtriternata* Kuntze, Verh. Bot. Ver. Prov. Brand. **26**: 160. 1884.

This species has been reported hitherto only from the Black Hills and Colorado Mountains. In the Little Belt Mountains near Neihart Pass, at an altitude of 7000 ft., Aug. 10, 1896, Flodman no. 467; also near Helena in 1895, Rydberg, no. 2652.

RANUNCULUS SABINI R. Br. in Parry's 1st Voy. App. 264.

Specimens collected near the snow on Long Baldy, altitude 8000 ft. in the Little Belt Mountains, agree fully with the description of R. Brown's species. It is not to be referred to *R. pyg-*

maeus, neither does Brown's description, especially that of the flower, agree with that species. Flodman, no. 469.

RANUNCULUS SUKSDORFII Gray, Proc. Am. Acad. 21: 371.

The range of this species is much extended eastward by its discovery on the Spanish Peaks at an altitude of 8000 ft., July 14, 1896, Flodman, no. 471.

√ RANUNCULUS SUBAFFINIS (Gray).

R. Arizonicus subaffinis Gray, Proc. Am. Acad. 21: 370. 1886.

R. subsagittatus subaffinis Greene, Pittonia, 2: 110. 1890.

The author agrees fully with Prof. Greene that both the varieties of *R. Arizonicus* ought to be removed from that species, but is inclined to believe that *subaffinis* is specifically distinct from *subsagittatus*. I have seen Prof. Greene's specimens from the San Francisco Mountains, as well as others collected by Dr. Mearns and by Mr. Wooton in the same region; Flodman's no. 472, from the Bridger Mountains, July 28, 1896, agrees in every respect with them.

√ CARDAMINE UNIJUGA n. sp.

Stem from a very slender rootstock, slender, glabrous, simple, strict, 2–3 dm. high; basal leaves simple, about ½ cm. in diameter, broadly cordate or reniform in outline, round-sinuately 3-lobed; lower stem leaves with a pair of oblong leaflets below the terminal one, which resembles the basal leaves or is a little more rhomboid in outline; upper leaves similar but with all the leaflets oblong; raceme slender and narrow; flowers about 2 mm. in length, white; sepals ovate, obtuse; fruiting pedicels about 1 dm. long, nearly erect; silique erect, 15–18 mm. long and about 1 mm. wide, with a short thick style and 8–12 seeds. (Plate 304.)

The inflorescence and the silique much resemble those of *C. oligosperma*, but the plant is more slender and simple and the leaves in all specimens seen have only one pair of leaflets and the basal ones are simple, while in *C. oligosperma* the basal and lower stem leaves have 3–5 pairs. Spanish Basin, July 18, 1896, Flodman, no. 494.

CARDAMINE LEIBERGII Holz. Cont. U.S. Nat. Herb. 3: 212. 1895.

This species was rediscovered by myself in 1895, but only a few specimens were preserved. It was growing in cañons at two widely separated stations, viz., near Lima, in Beaverhead County, no. 2663, and in Bozeman Cañon in Gallatin County, no. 2664. It resembles a depauperate *C. Breweri*, but differs in the much thicker and more angular toothed leaves. The latter species is very common in Montana.

LESQUERELLA ALPINA (Nutt.) Wats. Proc. Am. Acad. **23**: 254 1888.

Vesicaria alpina Nutt; T. & G. Fl. N. Am. **1**: 102. 1838.

The true *L. alpina* has been found by me at the following stations: Lima, no. 2666; Melrose, no. 2667, both in 1895. Most of the specimens named *L. alpina* in the herbaria belong to *L. spathulata* Rydberg.

DRABA DENSIFOLIA Nutt.; Torr. & Gray, Fl. N. Am. **1**: 104. 1838.

D. glacialis var. *pectinata* Wats. Proc. Am. Acad. **23**: 260.

It is very doubtful if this is a variety of *D. glacialis*. The more tufted habit, the more flattened, more hairy and few- (4–6) seeded pod may well give it the rank of a species. Under all circumstances the name *densifolia* is much older than Watson's name and should not be suppressed. Mr. Flodman's specimens from the Little Elk Mountains, Aug. 10, 1895, no. 499, are nearly identical with Nuttall's type in the Torrey herbarium. It was also collected by the author at Silver Bow in 1895, no. 2669.

DRABA OLIGOSPERMA Hook. Fl. Bor. Am. **1**: 51. 1830.

This has been merged into *D. glacialis*, and yet has still more right to a specific rank. It has a very slender flowering and fruiting stem, much smaller leaves, and a pod that is not half the size and with only 2–4 seeds. It was collected growing with the preceding. Flodman, no. 488. Also collected by the author on a mountain near Lima in 1895, no. 2668.

THEROFON HEUCHERAEFORME.

Saxifraga Jamesii Hook. Fl. Bor. Am. **1**: 47. 1833. Not Torr.

Caespitose with a thick scaly caudex, glandular-hirsute, 1–2 dm. high; basal leaves round-reniform, deeply and often doubly crenate, on petioles about ½ dm. long; raceme simple or somewhat compound; calyx campanulate or turbinate, tinged with purple; sepals ovate, erect; petals obovate-oblanceolate or oblong-spatulate, dark violet, about equalling the sepals; stamens 10; styles free. (Plate 305, fig. 3.)

This has generally been confused with *T. Jamesii*, which it much resembles in habit. The main characters that distinguish the two are: in *T. heucheraeforme* the petals are dark bluish violet, scarcely exceeding the sepals and comparatively narrow, and the styles free (see plate 305, fig. 3); in *T. Jamesii* the petals are reddish purple, orbicular on a long claw, and often twice as long as the sepals, and the styles are united to near the top (see fig. 4). Both have 10 stamens, and differ in that respect as well as in habit from the other species of *Therofon.* In habit they much more resemble *Heuchera.* They may constitute a fairly good genus; but the arctic *T. Richardsonii* seems to connect them with the other species with 5 stamens, small white flowers and diffuse panicles.

T. heucheraeforme extends from the Black Hills of South Dakota to the Teton range of Wyoming and northward. The following specimens from Montana have been seen: Flodman, no. 514, July 28, 1896, from Bridger Mountains; P. A. Rydberg, no. 2677, July 23, 1895, from Bozeman Cañon; Frank Tweedy, no. 255, 1887, from East Boulder. *T. Jamesii* (Torr.) Wheelock, is as far as I know, confined to the alpine peaks of Colorado.

MITELLA VIOLACEA n. sp.

Stem from a perennial rootstock, slender, about 3 dm. high, leafless, finely puberulent and with a few long silky hairs. Basal leaves on petioles 5–10 cm. long, the blade and petiole sparingly hispid, broadly cordate in outline, slightly 5–7-lobed with rounded finely crenate lobes; raceme very short with small nearly sessile flowers; flowers about 2 mm. in diameter; sepals ovate, rather obtuse, very thin and petal-like, veined and tinged with violet; petals oblanceolate, entire or slightly 3-cleft, a little exceeding the sepals (Plate 305, figs. 1–2).

In the form of the flower this stands nearest to *M. diversifolia* Greene. The sepals and petals are of the same size and form, but the former are generally tinged with violet and the latter less deeply 3-toothed, or entire. The leaves are broader and rounder in outline, the lobes shallower and rounder and evidently crenate. In other words the leaves are almost identical with those of *M. pentandra* Hook., from which the plant is easily distinguished by the small, nearly sessile flowers and the form of the petals. With

M. trifida, which also has 3-cleft petals, it can scarcely be confused, as that species has reniform leaves, larger flowers, and the segments of the petals are filiform.

Type: J. H. Flodman, no. 527, Spanish Basin in the Madison Range, Montana, July, 11, 1896, altitude 6000 ft.

POTENTILLA CANDIDA Rydberg, Bull. Torr. Club, **24**: 6. 1896.

A few specimens of this species were collected by me in 1895, at Deer Lodge, no. 2688, and at Lima, no. 2687.

POTENTILLA CONVALLARIA n. sp.

Stem tall, erect, 4–10 dm. high, long-villous but not very dyensel so, glandular or viscid, especially above, branched above with long erect branches. Stipules ovate or lanceolate, more or less toothed, about 1 cm. long; basal leaves several, with villous petioles 5–10 cm. long, pinnate of 4–5 pairs, glabrate or slightly pubescent; leaflets 2–5 cm. long, broadly obovate and obtuse, coarsely serrate and incised with ovate teeth; stem leaves with fewer more acutish leaflets; cyme with rather elongated upright branches, but with short pedicels, and therefore rather elongated and narrow; flowers 10–18 mm. in diameter; calyx densely glandular-viscid, villous, not much enlarged in fruit, 8–10 mm. in diameter; petals broadly obovate, white, in drying turning yellow, a little longer than the sepals; bractlets lanceolate, much smaller than the ovate-lanceolate sepals; stamens about 25, anthers flat, slightly cordate at the base. (Plate 306.)

This species resembles *P. arguta*, but is more slender. The branches of the cyme are rather elongated, the calyx smaller, the stamens fewer and the leaflets rounder and nearly glabrous. The leaves most resemble those of *P. glutinosa*, from which the plant differs mostly in its smaller and white petals and in the narrow cyme. It has been labelled *Potentilla arguta* whenever collected. It is apparently a rather rare plant, representing that species in the valleys of the northern Rockies. The following specimens have been examined:

Montana: Rydberg and J. H. Flodman, no. 602, in the Elk Mountains; no. 603 in the Spanish Basin; no. 604 (type) near Bozeman; no. 605 in the Bridger Mountains, all in 1896. F. L. Scribner, no. 42, 1883.

Washington: Wilkes Exp. no. 817; C. V. Piper, no. 1528.

Assiniboia: J. Macoun, no. 41, 1880. (?)

Idaho: A. A. & Gertrude Heller, no. 3230, 1896.

Wyoming: T. H. Burglehaus, 1894; E. Stevenson, no. 72, 1894.

Alberta (?): Macoun, no. 623, 1885 (Kananaskis).

POTENTILLA PSEUDORUPESTRIS n. sp.

(?) *Potentilla rupestris* Presl, Epim. Bot. 198. 1849. Not L.

Potentilla glandulosa Nevadensis Wats. Bot. Cal. 1: 178. In part. 1876. Not *P. Nevadensis* Boiss.

Stem erect, slender, striate, 2–5 dm. high, branched, with slender ascending branches, sparingly glandular-villous. Stipules ovate, more or less toothed. Basal leaves several on rather short petioles, pinnate with 3–4 pairs, sparingly and finely pubescent or glabrate; terminal leaflet obovate-cuneate-flabelliform, the lateral ones obliquely elliptical or nearly orbicular, all coarsely serrate and incised with ovate mucronulate teeth; stem leaves generally few, 2-paired or ternate with more rhomboid leaflets; cyme open, with ascending branches and slender pedicels; flowers 15–20 mm. in diameter; calyx more or less glandular-viscid, villous, in fruit not much enlarged, 8–10 mm. in diameter; petals white, drying yellowish, broadly obovate, exceeding the sepals by ⅓; bractlets oblong or lanceolate, much shorter than the ovate lanceolate pointed sepals; stamens about 25; anthers flat, a little cordate at the base. (Plate 307.)

This species is exceedingly similar to the European *P. rupestris*, from which it differs only in the smoother leaves and the longer pubescence of the stem. It differs from the other white-flowered American species in the open cyme, the slender pedicels and the larger petals, which nearly equal in size those of *fissa* and *glutinosa*. It grows in the mountains at an altitude of 2000 to 3000 m. The form growing at lower elevations is more leafy, with larger and glabrate leaflets and less viscid stem; this I took for *P. lactea* Greene, but Professor Greene has assured me that it is not that plant. In alpine regions it is more glandular viscid and with smaller leaflets. The following specimens have been examined:

Montana: Rydberg and J. H. Flodman, Long Baldy, Little Belt Mountains, no. 598 (type); Yogo Baldy, no. 499: Spanish Basin, nos. 597 and 600; Little Belt Mountains, no. 601 (altitudes, 6–8000 feet); R. S. Williams, no. 754, 1888.

Idaho: B. W. Evermann, no. 363, 1895; J. H. Sandberg, no. 164, 1888; J. B. Leiberg, 1890.

California: W. H. Brewer, no. 1714, 1863; Kellogg & Harford, no. 211, 1868–9.

Washington: W. H. Suksdorf, 1885.

Yellowstone National Park: T. H. Burglehaus, 1893.

Rocky Mountains of British America: Dawson, nos. 7471, 7870, 18734, 1430, 1881; J. Macoun, no. 10474, 1895.

SPIRAEA DENSIFLORA Nutt.; T. & G. Fl. N. Am. **1**: 414. 1840. Under *S. betulaefolia.*

S. chamaedrifolia β Hook. & Arn. Bot. Beechy, 123. 1841.

S. betulaefolia rosea in herb., not Gray.

This seems to be well distinct from *S. lucida*, which is common in the same region. The latter grows mostly in open places, while *S. densiflora* is found only in the deeper woods. Bridger Mountains, Flodman, no. 543, and Little Belt Mountains, no. 544. The following specimens also are in the Columbia Herbarium: Nuttall (type) Rocky Mountains of Columbia; Beechey's Voyage, Kotzebue's Sound; J. M. Macoun, British Columbia, 1890.

✓ HEDYSARUM SULPHURESCENS.

H. flavescens Coulter & Fisher, Bot. Gaz. **18**: 300. 1893. Not Regel & Schmalh.

This was collected by J. H. Flodman in 1896 in the Spanish Basin, no. 650, and in the Bridger Mountains, no. 651, and by the author in 1895 near Bozeman, no. 2720.

TRIFOLIUM HAYDENII Porter in Hayden's Surv. **1871**: 480. 1871.

This was referred to *T. Kingii* by Watson, but has nothing to do with it. It is rather common in certain localities of central and southwestern Montana. Flodman, no. 623, from the Bridger Mountains, and no. 624, from the Spanish Peaks; Frank Tweedy, Park Co., Montana, 1887, and in the Yellowstone Nat. Park, 1884. Also collected by the author and T. A. Williams in the Spanish Basin.

VACCINIUM MICROPHYLLUM (Hook.)

V. Myrtillus var. *microphyllum* Hook. Fl. Bor. Am. **2**: 33. 1834.

In my opinion this is just as good a species as any, differing from

V. Myrtillus in the bright green branches, the small leaves, which are more pointed and scarcely half the size of those of that species, in the smaller nearly sessile flowers and the small bright red berries, which become dark purple only when fully ripe, never bluish black as in *V. Myrtillus*. It is common in Montana and was collected by Flodman in the Spanish Basin, no. 712.

GENTIANA CALYCOSA MONTICOLA.

G. calycosa stricta Griseb. Gen. & Sp. Gent. 292. 1839. Not *G. stricta* Willd., nor Klotzsch.

This beautiful little gentian was collected on the top of Yogo Baldy in the Little Belt Mountains, Aug. 24, 1896, Flodman, no. 726.

POLEMONIUM VISCOSUM Nutt. Journ. Acad. Phil. (II.) 1: 154. 1847. Not Gray.

In describing *P. viscosum*, Gray* states that it has rounded calyx-lobes, and gives as reference: Pl. Gamb. 154 mainly, excluding what relates to the "elongated lanceolate segments of the calyx." The *Plantae Gambellii* were published in the Journal above cited. Nuttall describes there the calyx-segments as being elongated lanceolate, both in the Latin description and in the general notes written in English. In order to settle the matter I have written to the Curator of the Philadelphia Academy of Sciences, Mr. Stewardson Brown, who has kindly loaned me Nuttall's type. This is not a very good specimen, is past blooming, but it is satisfactory for my purpose. It shows that the inflorescence was subcapitate or subspicate and that the calyx-segments were elongated lanceolate. On the same sheet as Nuttall's type there is another specimen collected by T. S. Brandegee in the state of Washington; under the two specimens is penciled in the handwriting of the late Mr. Redfield the following remarks: "These all seem quite different from *P. confertum* in the flowers and mode of flowering. Yet I cannot fit them to Gray's description of what he regards as Nuttall's *P. viscosum*."

From the more complete material I have at hand, viz.: specimens collected by J. H. Flodman, no. 742, August 19, 1896, on

* Syn. Fl. 2: part 1, 150.

the top of Long Baldy, Little Belt Mountains, and by Frank Tweedy, 1887, in Park County, Montana, I can easily see that *P. viscosum* Nutt. is a near relative to *P. confertum* Gray. It has the same general habit and inflorescence. The corolla is, however, shorter, more open-funnelform and dark blue and the segments of the leaves are much smaller and rounder. The plant is very strong scented.

What Dr. Gray regarded as *P. viscosum*, I think I know, as there is a specimen in the Torrey herbarium, received from Dr. Gray and labelled in his handwriting. This specimen agrees also fully with Dr. Gray's description. It should be known under the name

POLEMONIUM PARVIFOLIUM Nutt. mss.

P. Mexicanum Nutt. Journ. Acad. Phil. 7: 41. 1834. Not Cerv.

P. viscosum Gray, Proc. Am. Acad. 7: 280. Not Nutt.

I have also examined Nuttall's type of *P. Mexicanum* collected by Wyeth, on the Flathead River. It differs from Gray's *P. viscosum* in no respect except that the calyx-lobes are a little longer. Nuttall himself has changed the name on the label to *parvifolium* probably because he had found that the name *P. Mexicanum* had been used before. That Gray had seen this specimen can be seen from a postal card from him, pasted on the same sheet, dated January 6, 1880, and on this, he states that he regarded it as being near *P. pumilum* var. *pulchellum*, and adds: "If I had to do it over, I would add a var. *parvifolium* to it." As *P. Mexicanum* and *P. parvifolium* are both based on the same specimens it is strange to find that Dr. Gray in 1886,* makes the following remark under *P. foliosissimum*. "To this probably belongs *P. Mexicanum* Nutt. Journ. Acad. Philad. 7: 41, from the northern Rocky Mountains." It is evident that the Nuttallian specimens of *P. Mexicanum* both in the Philadelphia and the Torrey herbaria belong to the same species as Gray's *P. viscosum*, which is a very near relative of *P. pulchellum*, at least as that species is understood in America, differing mainly in the smaller flowers. Flodman, Spanish Basin, nos. 739 and 740. 1896.

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* Syn. Fl. 2: part 1, Suppl. 412.

Notes on two Species of Alternaria.

By L. R. Jones and A. J. Grout.

(Plate 308.)

During the summer of 1896 we were engaged at the University of Vermont in the study of certain plant diseases, particularly the early blight of potatoes. The economic results of the work have been fully treated by Professor Jones in the Ninth Annual Report of the Vermont Agricultural Experiment Station of 1895, issued in December, 1896.

The present article aims to deal more fully with the taxonomic results of the work than was possible in the article cited above. Careful cultures, which were begun by Mr. C. C. Tracy the winter before, were carried on for several months and established beyond a doubt that two entirely distinct species of *Alternaria* were found on the cultivated potato; and a study of material from many different localities has also shown that these two species have not been distinguished by most students of the early blight, but have both passed under the name of *Macrosporium Solani* E. & M. Even Dr. Paul Sorauer (Zeitschrift für Pflanzen Krankheiten, 6: Heft I.,) failed to distinguish the two species, although he made cultures from diseased leaves bearing both fungi, as is clearly indicated by his figures and the fact that both species were raised from potato leaves sent Professor Jones by Dr. Sorauer.

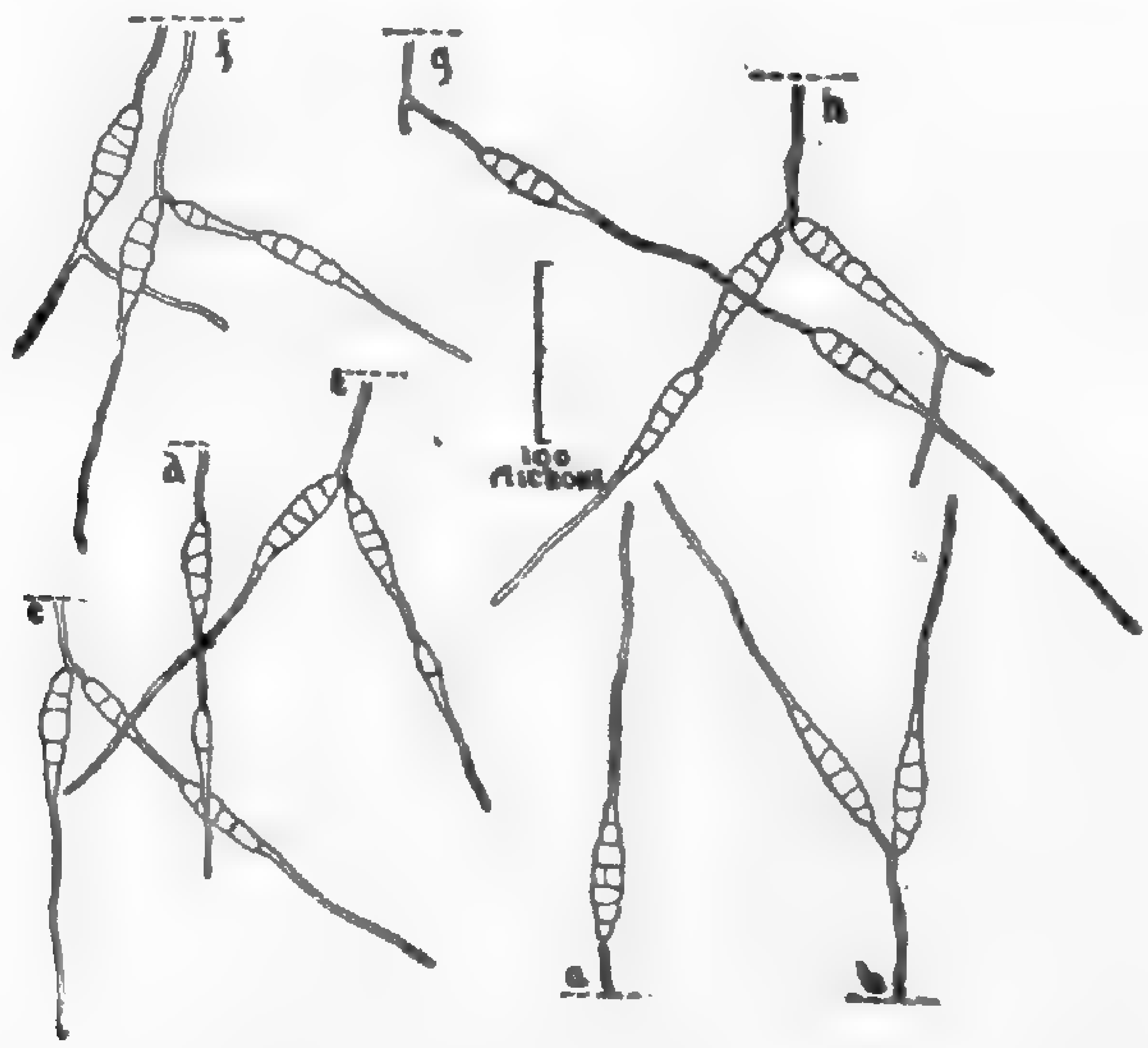
The significance of this separation of the two species lies in the fact that one of the species is an active parasite causing the destructive early blight of the potato, while the other is in no way parasitic but a saprophyte growing on most decaying vegetable matter of every sort, being easily compared in this respect to the omnipresent *Cladosporium herbarum*. The true *Macrosporium Solani* E. & M., is the parasitic species. It is very destructive to the leaves of the potato early in the season before *Phytophthora infestans* begins to affect them. It forms peculiar "target boards" markings on the leaves as shown in this figure.

In the central portions of these spots the characteristic spores may usually be found. We have seen whole fields with foliage so

riddled with these "target boards" that the growth of the crop was stopped and the plants practically killed, showing only a little green at the top of the stems. The parasitism of this species was fully proved by experiments which are described in detail in the report above mentioned.

To state the case in a word, healthy plants under normal out-of-door conditions were successfully inoculated with spores from a pure culture made in the University of Vermont Laboratory.

Usually he spores of this species are borne singly, but in one particularly luxuriant pure culture they were found in chains as is here shown. This places the species in the genus *Alternaria.*



The other species, which ought to be known by the name *Alternaria fasciculata*, for reasons given below, is found abundantly on the dead leaves of the potato, but all attempts at inoculation of living tissues failed to produce any infection, even under the most favorable green house conditions.

During the same summer studies of fungus diseases of the onion were undertaken and on some of the dead onion leaves a fungus was found which so closely resembled *Alternaria fasciculata* as to be indistinguishable from it. Spores of *Alternaria fasciculata* from a pure culture from potato leaves were sown on dead onion leaves still attached to a living plant. A rank growth of mycelium bearing the characteristic *Alternaria* spores soon appeared on the inoculated spots, but none elsewhere. This experiment thoroughly demonstrated the undiscriminating nature of the plant, for a fungus which will grow on dead leaves of onions and of potatoes can scarcely be restricted to any group or groups of plants.

When later on in the summer the study of the tomato rot was taken up, it was found that the fungus which causes the black patches on the rotting fruit was an *Alternaria* not distinguishable from the one on the onion and the potato. It was further proved that this fungus did not cause the rot, for green tomatoes inoculated with spores from a pure culture from the tomato remained for ten days in a moist chamber until they ripened without showing signs of the rot, and cultures made from tomatoes just beginning to rot would not yield the *Alternaria*. *Alternaria fasciculata* was found on the dead leaves of beans, cabbage, *Lathyrus palustris*, on hulls of oats and dead stems of buckwheat; also on dead leaves of corn where it equals *Macrosporium maydis* E. & E., on pasteboard, equalling *M. chartarum* Pk., on ripe pods of radish, equalling *M. fasciculatum* E. & E.

Doubtless, further investigations will identify many other *Macrosporium* species with this omnipresent saprophyte, and doubtless an older name than the one given above will be given to it.

ALTERNARIA SOLANI (E. & M.) Sorauer, Zeit. Pfl. Krankh. **6**: 6. 1896.

Macrosporium Solani E. & M. Am. Nat. **16**: 1003. 1882.

Conidiophores dark brown, erect or ascending, somewhat curved, septate, 50–90 by 8–9μ; conidia obclavate, brown, 145–370 by 16–18μ, terminating in a very long hyaline septate beak, equalling fully ½ length of spore, body of spore with 5–10 transverse septa, longitudinal septa few or lacking.

Forming characteristic target-board markings on leaves of *Solanum tuberosum*; sporulating sparsely in pure cultures. (Pl. 308, figs. 1, 2, 3.)

ALTERNARIA FASCICULATA (C. & E.)

Macrosporum chartarum Pk. 25th N. Y. Report. 93. 1873. Not Preuss. 1848.

Macrosporium fasciculatum C. & E. Grevillea, **6**: 6. *pl.* 96. 1877.

Macrosporium Maydis C. & E. l. c. 87.

Macrosporium tomato Cooke, Grevillea, **12**: 32. 1883–84.

Conidiophores brown, erect or ascending, irregularly curved, solitary or caespitose, septate, diameter uniform, 40–130μ long by 3μ wide; conidia dark brown, oblong-ovate, minutely apiculate, 9–14μ wide by 35–90μ long, endochrome transversely 2–7-septate, with usually several longitudinal septa, the apical cell short or elongated into a straight somewhat hyaline beak.

Fruiting freely in pure cultures. On dead leaves and decaying vegetable matter of all kinds. (Pl. 308, figs. 4, 5, 6.)

The spores vary a great deal according to the stage of development, as seen in the figures, which accounts for the discrepencies in the descriptions.

There has been no opportunity of comparing this species with *Alternaria chartarum* Preuss; (Sacc. Syll. 4: 546,) consequently the above binomial has been used.

Careful comparisons have been made with Ellis & Everhart's Fungi Columb. 396, *Macrosporium chartarum* and 399, *M. fasciculatum.*

Two new Bolivian Ferns of the Miguel Bang Collection.

By B. D. Gilbert.

There are about fifty species of ferns belonging to the Miguel Bang collection yet to be published. All of them, however, belong to well established and recognized species except the two described below. The only other genus of the collection containing especially desirable species is *Acrostichum*, which is particularly strong; and while the specimens do not always contain fruited fronds, they are of such a character that little doubt can be entertained in regard to the identity of the species.

The new species and variety are as follows:

Blechnum nigro-squamatum n. sp.

Stipes 1 ft. long, stout, ¼ in. diameter, furrowed, thickly clothed for 6 in. from base with narrow lanceolate acuminate black scales ½–¾ in. long; rachis strong, stramineous, naked, deeply channeled on upper side, with a wing on each edge in upper ¾ of frond connecting the pinnae; frond 4–4½ ft. long, 1 ft. broad in center, fully pinnate in lower quarter, tapering rather abruptly upward and moderately downward; pinnae numerous, 6–7 in. long in middle of frond, ½–⅝ in. wide, dilated on both sides at base and slightly connected except in lower quarter; lower pinnae 2 in. apart, reduced to 2 in. long, but broader in comparison, blunt but not rounded at tip, mid-pinnae about same width throughout until within 1–1½ in. from tip, where they decrease and become acute; edge finely serrate and wavy; texture coriaceous, both surfaces naked; costae stramineous, conspicuous; veins distinct, simple and occasionally forked; sori extending from near the base of costa on each side, to about 1 in. from tip of pinna, sorus on upper side of costa shortest at the base; indusium broad, conspicuous, dark brown.

This species is intermediate between *B. nitidum* Presl. and *B. Finlaysonianum* Wall. It differs from *B. nitidum* by its much larger size, longer stipes thickly clothed with black scales, reduced lower pinnae and fully pinnate character. It resembles *B. nitidum* in general cutting of frond, in having undulato-dentate pinnae and a conspicuous indusium. It comes nearest *B. Finlaysonianum* in size, but differs in color and vestiture of stipes, narrower pinnae which are connected in upper part of frond, serrate edges and less reduced lower pinnae.

Growing in running water, Colapampa. Collected July 4, 1894 (2314).

Dryopteris villosa inaequalis n. var.

Frond 1–1½ ft. long, tripinnatifid, pinnae on one side 6–10 in. long, 2–3¼ in. wide; on the other side 3–5 in. long, ¾–1¼ in. wide; stipes and rachis very scaly to within 6 in. of tip of frond; sori small, indusium inconspicuous.

This differs from the type by its much smaller size, by its very unequal pinnae on the two sides of the rachis, by having nearly the entire stipes and rachis scaly as well as pubescent, the sori few in number and smaller and the indusium much less prominent. Had there been but one frond of the *Dryopteris*, it might possibly have been looked upon as an abnormal form of *D. villosa;* but there were two separate fronds, both of them identical in character, and it seems quite certain that they may be regarded as a true variation from the original type. Uchimachi, Yungas, August 22, 1894. Growing in wet mould, forest-shade (2394).

Three new Ferns from Jamaica.

By B. D. Gilbert.

Asplenium bianthemum n. sp.

Caudex very small, crowned with short ovate-lanceolate dull brown or almost black scales; stipes ½ to 1 in. long, scantily pubescent; rachis green-margined throughout, extending beyond the frond and proliferous at summit; frond 3 to 4 in. long, ½ to ¾ in. wide in middle of frond, pinnae gradually decreasing in size each way but not so small at base as at tip of frond; pinnae 12 to 18 on side alternate stalked, rhomboidal in center, flabellate at tip of frond lower side cut straight at right angle to rachis, inner edge truncate, upper and outer edges slightly sinuate toothed; veins, two main ones, superior once forked, inferior with 4 to 5 branches, lowest branch parallel with inferior edge; sori 1 to 3, generally 2 at outer end of pinnae, lower one parallel with lower edge of pinna, upper one oblique, forming a V with the other, the broad end of V opening outward; indusium broad, whitish, distinct, opening toward center of pinna.

Between *A. projectum* and *A. viride*, larger than *A. projectum* but with same rooting rachis. Pinnae more rhomboidal than in *A. viride*, less toothed and with fewer sori, which are at outer end of pinnae instead of inner end.

Blue Mt. Peak, Jamaica, growing on trees. Collected by Alexander Moore.

Dryopteris contermina bisymmetros n. v.

Stipes about 6 in. long with a few scales at base, rather stout, dirty brown, finely pubescent, rachis similar; frond 10–15 in. long, 3–6 in. broad, lanceolate, tapering from middle to both extremities, pinnate; end of frond long and narrow, pinnato-entire, rigidly chartaceous; upper surface nearly naked, rachis costae and costulae on under side densely villose; pinnae narrow, lanceolate, spreading, numerous, sessile, alternate to tip of frond, pinnatifid nearly to midrib, segments blunt, hardly subfalcate, lowest segments on superior edge diminished in size, middle pinnae 2 in. long, lower pinnae ¾–1 in. long with some auricles on stipe below, rather remote, several of lowest pairs same shape as frond tapering to each end, small upper pinnae entire, connected by narrow wing; veins all free and simple, 6–8 on a side; sori near the edge naked or indusium early evanescent.

Fern Gully, Jamaica, collected by myself.

This variety differs from *D. contermina* proper by its more rigid texture, its stronger and darker colored stipes and rachis, and especially by the shape of the pinnae which are spindle-shaped instead of having the basal segments enlarged as in *D. contermina*. Both the frond and the segments are spindle-shaped, which was the reason for giving it the varietal name of *bisymmetros*.

Polypodium leucolepis n. sp.

Caudex rather stout, ascending, covered at summit with lanceolate acuminate dark brown ciliate scales; stipes of young fronds covered with soft brown hairs, which fall away with age except at very base, reddish brown, 2½–5 in. long; mature frond 7–11 in. long, 2–3 in. wide, pinnate, tapering abruptly at base to auricles, but gradually to tip of frond, sometimes 5 in. of upper end of frond being about ⅝ in. wide throughout, while sometimes the shape is very regular, tapering to a blunt point and almost pinnate to the end; pinnae opposite or alternate, nearly linear, blunt, notched on lower side at base, slightly auricled on upper side, irregular in length but presenting a generally uniform character; surfaces naked, rachis only pubescent; costae and veins very distinct beneath, blackish purple; veins all simple, terminating short of the edge, each bearing at the end a round sorus with edge of frond showing beyond it; edges and ends of pinnae ciliate with scattered hairs of the same color as veins, which fall away with age; receptacles punctured through to upper side of pinnae, each one bearing a white button, after the fern reaches a certain age; texture coriaceous, veins not showing on upper side.

Nearest to *P. Plumula* but differs in texture, in larger size, in broader pinnae, in more distinct venation and in the white buttons on upper side of frond.

Blue Mountains, Jamaica, collected by Alexander Moore.

Botanical Notes.

The Vermont Botanical Club held an extremely interesting session at its second annual meeting on February 5th and 6th 1897.

The meetings were held in one of the lecture rooms in the new Williams Science Hall. Papers were read in person by President Ezra Brainerd and Profs. E. A. Burt and H. M. Seeley, of Middlebury College; Profs. L. P. Jones, G. H. Perkins and F. A. Waugh, of the University of Vermont; Mr. C. G. Pringle, of Charlotte, Vermont, and several others.

Mr. Pringle's paper, which will be printed in full in another issue of the BULLETIN, was probably the most highly appreciated of all. We have all known of Mr. Pringle's great achievements as a collector and explorer, but I think very few realize what a delightful speaker and writer he is when induced to lay aside his habitual timidity and reserve.

The importance of a botanical survey of the State was urged upon all interested in Vermont botany by Prof. Jones, Prof. Burt and others, and it was decided to publish in '98 or '99 a new State Flora which shall embody the large amount of information collected by members of the club and others since the publication of Prof. Perkins' Flora in 1888. It is intended that the list shall contain not only a list of Phanerogams and Pteridophytes, but also of the Musci and possibly of the Hepaticae and Fungi.

The meetings of the club were attended not only by members but by many others, the attendance varying from fifty to one hundred. The air was fairly electric with botanical enthusiasm, affecting even the reporters present.

It has been the aim of the club to arouse a general interest in botany and foster enthusiasm by bringing together all persons in the State who are at all interested in the study of plants. Its marked success in this direction is due very largely to the efforts of President Brainerd and Prof. Jones, both of whom have been indefatigable in the work of interesting others in our varied and interesting flora.

The success of this club ought to encourage the organization of similar associations elsewhere. The first meeting was held on July 4, 1895, in the heart of the Green Mountains in Stratton, where half a dozen enthusiasts had gathered to celebrate by collecting rare carices. A temporary organization was formed with President Brainerd as president and Prof. Jones as secretary, and a committee was appointed to arrange for the first in-door meeting in February, '96. That meeting was successful beyond all anticipations, as was the field meeting and excursion to Mt. Mansfield in July, '96.

An excursion to Mt. Willoughby or some other point of botanical interest is planned for the summer.

A. J. Grout.

Note on Dicksonia dissecta Sw. Considerable discrepancy exists among authors concerning the synonymy of species in the genus *Dicksonia*. Swartz, who was the original author of *D. dissecta*, as well as of its congeners *D. cicutaria* and *D. apiifolia*, describes it as "very decompound, pinnules oblong, obtuse, sinuato-pinnatifid, laciniae obtuse *gibbous* subcrenulate." Hooker, in the "Species Filicum," described *D. dissecta* Sw. as a fern "which might without violence to nature be considered a variety of *D. cicutaria.*" Judging from his description this is true, for it reads as if it might have been drawn from a frond of that species. Grisebach, however, while still retaining Swartz as the author of the species, gave it as "non Hook," thus showing that he did not agree with Hooker's description. Then came the "Synopsis Filicum," which gave *D. dissecta* as a synonym of *D. adiantoides* H.B.K., a bipinnate fern, and also gave it as "Grisebach, non Hooker," thus agreeing with Grisebach who gave "*D. adiantoides* W. non Hook," as a synonym for *D. dissecta.* This still further complicated the matter. The latest author to treat of the subject is Mr. G. S. Jenman in his "Ferns of Jamaica," 1891. He makes *D. adiantoides* H.B.K. the same as *D. Pavoni* in Hooker's "Species," and places it next to *D. Plumieri* HK. which has sori extending all around the edge of frond. His *D. dissecta* is placed next after *D. cicutaria* and *D. apiifolia*, thus making it accord with them in a general way, as it undoubtedly does.

The synonymy of *D. dissecta* is therefore decidedly mixed; but I accept Mr. Jenman as my guide, not only because he has been the latest to investigate the subject, and has enjoyed the privileges of the Kew herbarium and library, but also because he was for years an active collector in the field, an extremely careful observer, and had unrivalled opportunities for the comparison of living plants in their native habitats. Besides, his descriptions are taken from Jamaica specimens, and it was from this island that Swartz obtained his specimens from which the species was originally described. The only important point which Jenman's description omits is the fact that the sori of *D. dissecta* are not "in a crenature near the base," but on the summit of a tooth near the base, the whole width of which they cover, being about twice as broad as they are deep. Perhaps the "gibbous" feature of Swartz's description may refer to this hump near the base of the crenature.

The fact is that while the cutting of the frond quite closely resembles that of *D. cicutaria,* the situation of the sorus and the character of the sorus itself are distinctly different from that species. The sorus is twice as broad as long, the involucre proper is scariose, and the edge of frond is not changed in texture and hardly ever reflexed. As the sporangia mature they simply push down the involucre, and almost, if not quite, cover and conceal it, but the edge of frond remains unchanged. In other words the involucre is distinctly two-valved, instead of being united with the edge of frond and therefore cup-shaped or campanulate; and I should be inclined to place it in the broad, two-lipped *Balantium* group, instead of the cup-shaped *Patania* group where *D. cicutaria* belongs.

Fertilization of Alnus incana and Salix discolor.—(1) *Alnus incana* (L.) Willd. Anemophilous; self-fertilization is prevented by the amentiferous branches curving downward at the end, bringing the pistillate aments above the pendulous staminate. Usually monoecious, but the number and condition of the two kinds of aments varies greatly upon different plants. Many of the bushes have the staminate aments large and fully developed, a part of the branches bearing no other kind, the number of staminate ones to a branch then increases from 3 or 4 to 6, 8 or 9. On the other hand, a part of the bushes have the staminate aments small and poorly developed, many branches bearing only the pistillate kind, which are then more numerous than when the branch is monoecious. It is not rare for a large bush to produce only pistillate aments, which are then larger in size (about 1″ longer) and a deeper brownish red. Young plants generally produce only staminate aments (from 4 to 7 branches are amentiferous) but this is never true of medium or large-sized bushes. The staminate aments are frequently injured by insect larvae. A branch two feet in length bore 297 aments of both kinds. The pistillate are much more numerous than the staminate; of 663 aments examined on several branches of a single plant 471 were pistillate, 192 staminate. A staminate ament 2½′ long was composed of 31 scales, 77 flowers and 310 stamens. The parts of the flower are usually in fours, petals none, but occasionally a flower is five-parted, when five petal-like scales alternating with the sepals may be present. The pollen is abundant and easily set free by the wind.

Visitor: During eight years I have never, except in one instance, seen this species of *Alnus* visited by insects. On April 6, 1892, on a sunny hillside I observed a score or more of the honey-bee, *Apis mellifica* ☿, collecting pollen. Examination showed that the "pollen-baskets" were loaded with pollen.

(2) *Salix discolor* Muhl. Entomophilous, but probably descended from anemophilous ancestors. Dioecious, blooming in early spring before the appearance of the leaves, when the bright yellow anthers render the staminate plants very conspicuous, odor marked and agreeable, honey and pollen abundant. A staminate ament about 1′ long contained 270 flowers. The pollen is not easily dislodged when a branch is shaken, and it is often retained by the silky hairs with which the ament is clothed after it has fallen from the anthers.

In a pistillate ament 1′ 1″ long there were 142 pistils, stigmas two, bilobed, nearly sessile, honey-yellow, papillose; the honey is secreted on the tip of a small flat gland at the base of the ovary on the inner side.

Owing to the pollen, of which there is a large store, the staminate aments attract a more numerous company of insects than the pistillate. Both bees and diptera are very common. Numerous black ants climb the stems and steal the honey, I have alao seen them struggling over and carrying off living *Rhamphomyia.*

According to H. Muller (Fertilization, p. 524) many species of *Andrena* visit the willows almost exclusively in search of food for their young.

Visitors: A. Hymenoptera—(1) *Apis mellifica* ☿, (2) *Andrena* sp. (3) *Halictus parallelus* ☿, (4) *Nomada bisignata;* B. Diptera—(5) *Myops vicaria*, (6) *Pristiphora idiota*, (7) *Borlorus* sp. (8) *Gonia frontosa*, (9) *Lucillia cornicina*, (10) *Homalomyia scalaris*, (11), (12), (13) *Rhamphomyia* three species; C. Coleoptera—(14) *Cyphon obscurus*, (15) *Dorytomus* sp. D. Hemiptera, one species. (Taken on aments of both kinds, April 20–24, Waldoboro, Me.)

Note.—In the identification of insects I am indebted to Dr. Henry Skinner, of Philadelphia.

John H. Lovell.

Waldoboro, Maine.

Reviews.

Catalogue of the African Plants collected by Dr. Friedrich Welwitsch in 1853–61. Dicotyledons, Part I. By William Philip Hiern, M.A., F.L.S. Pp. 336. 8vo. London. Printed by order of the Trustees of the British Museum, 1896.

The volume under discussion is the first of a series and contains Ranunculaceae to Rhizophoraceae. Many new species are described and the very copious notes in reference thereto add materially to the value of the work and bear testimony to the indefatigable ardor and ability of the collector, who had all the usual concomitants of African travel to struggle against, as well as to the patience and skill of the compiler. Dr. Welwitsch's African collections have been estimated at upward of 5,000 botanical species and some 3,000 species of insects and other animals, a large proportion of which were new to science. A second part will finish the Dicotyledones and a third one will be devoted to the remaining groups. In the nomenclature line there is much of interest, and among generic changes the following should be noted: *Chienfugosia* Cav. (1786) replaces *Fugosia* Juss.; *Cracca* L. (1753), *Tephrosia* Pers. (1807); *Meibomia* Heister (1732) ex Fabric. (1759), *Desmodium* DC. (1813); *Canavali* Adans. (1763), *Canavalia* DC. (1825); *Dotichotus* Medik. (1787), *Rhynchosia* Lour. (1790); *Amerimnon* P. Br. (1756), *Dalbergia* L. f. (1781); *Deguelia* Aubl. (1775), *Derris* Lour. (1790).

A. M. V.

Nature, Structure and Phylogeny of Daemonelix. E. H. Barbour. Bull. Geol. Soc. Am. **8**: 305–314. *pls. 31–39.* Ap., 1897.

In this contribution we have the author's final conclusions in regard to this exceedingly interesting organism—conclusions which are amply defended by an array of facts which skeptics will find it difficult to controvert.

What appears like phylogeny is represented by the vertical arrangement of the organisms in well-defined zones, beginning with simple fibres and evolving upwards through "cakes" and "balls" of matted fibres into "fingers" and finally into the gigantic coiled stems at the summit—a vertical range all told of some 75 meters.

The structure, as demonstrated by the microscope, is undoubtedly vegetable and the author finally says: "The study of the great tubes of *Daemonelix*, made possible by the recent discovery of perfectly preserved specimens, threatens to make radical, if not revolutionary change—removing *Daemonelix* altogether from the dominion of the algae and exalting it to that of the dicotyledons."

A. H.

Stratigraphy and Paleontology of the Laramie and related Formations in Wyoming. By T. W. Stanton and F. H. Knowlton. Bull. Geol. Soc. Am. 8: 127–156. F. 1897.

How the Laramie formation should be limited and defined has been a burning question with geologists for more than a quarter of a century. Numerous local sub-divisions have been included or withdrawn, and the limits expounded or contracted by one authority or another, and its position in the geological column has been shifted back and forth between the Cretaceous and Tertiary periods.

The authors have wisely avoided depending upon one class of evidence only in drawing their conclusions and have drawn freely from both invertebrate palaeontology and palaeobotany, in trying to determine the relative ages of the several beds and the limits of what should be called the Laramie formation. Apparently the formation is defined by the authors as lying between the highest marine Cretaceous beds of the Rocky Mountain region at the base and including the lowest of the Fort Union plant beds as the summit.

A. H.

The American Fruit Culturist. By John J. Thomas. 20th edition, revised and enlarged, by Wm. H. S. Wood.

A timely book, sure to receive a hearty welcome. First written about thirty years ago, editions have quickly succeeded one another until the twentieth, now under consideration. It is a handy volume of less than 800 pages, presenting in a condensed, but always clear and practical form, a survey of the whole field of fruit culture, from the pineapple, banana and orange of semi-tropical Florida, to the many common small fruits of northern gardens. The only two omissions noticed are the almond and olive which have, perhaps, as good a claim to recognition as the fig and date. All varieties which have approved themselves to the experimenters of later years, and become standard, are carefully described, while many others of lesser importance are relegated to a convenient descriptive index. The editor has sought the aid of experts in their several specialties and made diligent use of the copious literature from the State Experiment Stations, so that every subject is fully up to date. An admirable feature of the work is its wealth of illustration, all cuts of fruit being from nature and life-size. An interesting, but too short chapter is that on "Wild Fruits," including Buffalo berry, Huckleberries, June berry and Papaw (*Asimina triloba*). Under this head, but in a larger book, the reviewer might also expect to see several species of barberry, choke-cherry, yucca, cereus, opuntia, etc.

This work aims chiefly at the imparting of "practical directions for the propagation and culture of all fruits adapted to the United States," and in so far is certainly very successful. The botanical part, that is the scientific naming and classification of species and varieties, was apparently considered of little relevancy and importance, and neglected accordingly. Yet I cannot help thinking that in a standard work of this kind proper efforts at a scientific arrangement of the many kinds of fruits described, referring them, so far as known, to their parent species, varieties and races, would give it a distinct additional value. Under blackberry, currant, grape, etc., the generic, still less the specific names are not even mentioned, the various kinds being arrranged mostly according to color. Raspberry, plum and strawberry fare much better, being naturally classified. The improved cultivated forms of hickories are referred to the "shellbark (*Hicoria laciniosa*)" instead of the shagbark (*H. ovata*). Valuable fruit trees seemingly are the black walnut and butternut "whose nuts are highly appreciated and much used;" the better and more promising fruit of the California walnut is not mentioned.

Despite these little imperfections, showing the lack of a botanist's touch, this book remains our best manual of fruit culture, and the most useful guide and counsellor for all fruit growers.

V. H.

Plants and their Children. By Mrs. William Starr Dana. Illustrated by Alice Josephine Smith. Pp. 272. American Book Company, 1896.

The author presents in a popular form the study of plant life so as to bring it within the comprehension and adapt it to the tastes of a child.

An appreciation of the psychologic truth, "activity is the law of childhood" is shown by the attention accorded to the special contrivances and mechanisms by which insects are trapped and attracted, and seeds disseminated. Vital processes, similar to those in the child's experience such as sleep, respiration and circulation are simply and clearly treated. Several cuts, reproduced from the Natural History of Plants, translated from the German of Kerner von Marilaun, add to the general attractiveness of the book, which might profitably be used at times as a reader to supplement the work of a class studying botany.

M. A. S.

Proceedings of the Club.

WEDNESDAY EVENING, March 31, 1897.

In the absence of the President, Vice-President Allen presided. There were twenty persons present.

The first paper, by Dr. Albert Schneider, "The Phenomena of Symbiosis," and a paper by Leonard Baron on "Horticulture in Botanical Gardens," were read by title, owing to unavoidable detentions.

The evening was occupied by a paper by Professor Edward S. Burgess on "*Aster macrophyllus* and its Allies," illustrated by charts of relationship and by numerous specimens.

The speaker sketched briefly the history of the species *Aster macrophyllus*, in which it has been the custom of American botanists to include all large-leaved *Asters*. He showed how diverse these *Asters* are and in what confusion their assignment to a single species results, and indicated the characters according to which they form two groups each of several species and varieties.

The paper which will soon appear in print, was discussed by

Mr. E. P. Bicknell, who confirmed the distinctions offered by the results of his observations about New York, and by Dr. Britton, who paid a tribute to the masterly manner in which Dr. Gray had treated the subject of the genus *Aster* so far as material was then available and who referred to the special need for extended field-work and further collaboration which this genus had long presented.

TUESDAY EVENING, April 13, 1897.

In the absence of the officers, Dr. N. L. Britton presided. There were thirteen persons present. Mr. Ellis A. Apgar and Mr. Charles H. Coffin were elected active members.

In pursuance of a resolution adopted at the next previous meeting, the Secretary announced the following Field Committee for 1897: Chairman, Dr. John K. Small; Committee-members, Dr. N. L. Britton, Mr. John H. Stotler, Mr. L. G. Fay, Mr. W. A. Bastedo.

The subject of a nominee from the Club for the forthcoming award from the Newberry Research Fund was then considered, and the application of Mr. Arthur Hollick for that nomination was read. Action was deferred to the next meeting.

The scientific program was then taken up. Dr. Albert Schneider presented a paper entitled, "Methods employed in the Examination of Powdered Drugs and their Adulterants."

He described certain microscopic structural features which he had investigated with a view to find characters by which to distinguish the more important drugs, giving details of such characteristics determined by him for mace, senna, leaves of *Eucalyptus globulus*, etc.

Dr. Britton spoke of the utility of this work and its object in behalf of the new edition of the U. S. Pharmacopoeia.

The paper was followed by an early adjournment to facilitate the attendance of members upon the annual exhibit given by the N. Y. Microscopical Society.

WEDNESDAY EVENING, April 28, 1897.

In the absence of officers, Prof. Underwood was elected chairman of the meeting and Prof. Britton, secretary. There were twenty-six persons present.

The application of Mr. Arthur Hollick for recommendation to the Council of the Scientific Alliance for the grant of $50 for original research in palaeontology from the Newberry Research Fund, was endorsed and the secretary of the club was instructed to certify this action to the secretary of the Council of the Scientific Alliance, and to transmit with the certification a copy of Mr. Hollick's application.

Dr. Small, Chairman of the Field Committee, reported progress in the arrangement of excursions for the season.

The Chairman announced to the Club the recent death of Dr. Emily L. Gregory, Professor in Botany in Barnard College, and remarked on her life and works. Dr. H. M. Richards, Dr. H. H. Rusby and Miss Alexandrina Taylor were appointed a committee to draw suitable resolutions and report them to the club at a subsequent meeting.

The Corresponding Secretary reported that all the corresponding members recently elected had accepted their elections.

The scientific programme comprised the following papers:—

1. By Prof. L. M. Underwood, "Notes on the Ferns of Japan."

The immediate occasion of this paper was the receipt during the past year of two separate collections of Japanese ferns of about fifty species each, which, being from different portions of the island, scarcely duplicated each other. Some of the more interesting were shown, including *Camptosorus Sibiricus*, *Cystopteris Japonica*, and *Struthiopteris orientalis*.

The insular position of Japan together with a considerable range of latitude, equalling that from St. Paul, Minn., to Mobile, Ala., gives Japan a larger proportion of ferns than we have in the United States, although the area of the islands is only that of the northeastern States as far as the Virginias, together with about one-half of Ohio.

The forms are those of temperate climates and agree well with those of the adjacent mainland so far as the latter are known. A few subtropical forms enter the flora, but the really tropical species do not reach the islands.

Many species are common inhabitants of Furope as well as the eastern United States, but the ferns of Japan offer very little support to the once prevalent notion of the great similarity of its flora to that of the eastern United States. In fact about as many Japanese species have as many near allies in Pacific America as in other portions of the country, if we exclude the species quite generally distributed through the north temperate zone.

Discussing the paper, Prof. Britton cited a number of instances among spermatophytes, in which species supposed to be common to Japan and eastern North America had been shown to be distinct. He maintained that the theory of migration, as ordinarily accepted, was insufficient to account for such similarity between the floras of the two regions as actually exists. Mr. T. H. Kearney, Jr., remarked that in comparing the grass flora of the two regions he had found that, exclusive of circumboreal species, only two species are in common.

The second paper was by P. A. Rydberg, entitled "Floral Features of Western Nebraska." It is a popular misconception that the country from Illinois to the Rocky Mountains constitutes one undifferentiated region. In fact there are two entirely different regions, viz.: 1. The Prairie Region with rich loam and a comparatively good supply of rain and extending into the Eastern Dakotas, Nebraska and Kansas. 2. The Region of the Great Plains, with dry hard soil and scanty rainfall and comprising the western portion of said States, Eastern Colorado and Montana and the larger portion of Wyoming. In Nebraska the prairie region includes the eastern and south central portion of the State. The north central portion constitutes a region unique to Nebraska, the Sand-Hill Region, described at one of the February meetings of the Club. Mr. Rydberg corrected a statement made by him then, viz.: that he had seen "blow outs" in that region 300 feet deep; he had intended to say 300 feet in diameter and 60 to 70 feet deep.

The western portion of the State is made up of high plains, except a small portion of the northwestern corner containing the "Pine Ridge" and the "Bad Lands" of White River and Hat Creek. The plains have very few rivers, and the drainage is mostly by means of "sand-draws." Seen from a hill a sand-draw resembles a well-beaten and winding sandy road. It is a stream with no visible water. The water is running from one to fifteen feet below the surface. Even the larger streams, as the Lodge Pole and South Platte, sometimes sink down in the sand.

The plains are mostly covered by short grasses, the so-called Buffalo grasses. In the hot dry autumn, these become self-cured, and form an excellent winter pasture for the stock. A little hay is cut on the lowlands and fed to the animals during snowstorms. Otherwise the cattle and horses feed out during the whole winter. The Buffalo grasses are: the original Buffalo grass, *Bulbilis dactyloides*, Blue and Black Grama, *Bouteloua oligostachya* and *B. hirsuta* and "Nigger Heads," *Carex filifolia.*

In a region where the rainfall is comparatively scant and distributed only during certain seasons of the year, the plants must be so constituted as to be able to withstand a good deal of drought. In other words the evaporation must either be reduced to a minimum or the plant must have special stores of water. The planst peculiar to this region may be divided into the following groups:

1. Very hairy plants generally covered by thick pannose pubescence, which retain the moisture; as species of *Eriogonum*, *Astragalus*, *Eurotia*, *Senecio*, *Evolvulus* and *Artemisia.*

2. Plants with glaucous foliage having a hard epidermis, as *Yucca glauca*, *Rumex venosus*, *Argemone alba*, and several grasses.

3. Plants with white often shreddy bark, as species of *Mentzelia* and *Anogra.*

4. Plants with very narrow and often involute leaves, as *Lygodesmia juncea*, *L. rostrata* and several grasses and sedges.

5. Plants with fleshy stems in which the surface is reduced to a minimum and no leaves as the Cacti.

6. Plants with a deep-seated, enlarged root as the Bush Morning glory, *Ipomoea leptophylla*, and the Wild Pumpkin, *Cucurbita foetidissima.* Mr. Rydberg had seen a root of the former three feet long and almost two feet in diameter.

7. Plants covered with glands, containing essential oils, as *Dysodia papposa* and *Pectis angustifolia.* The oils are supposed by some to have a cooling effect, partly by taking up heat when evaporated, and partly by surrounding the plant with a cooler atmosphere, their specific heat being much less than the air.

Numerous specimens were exhibited.

Two papers followed by Dr. J. K. Small, (a) "The Sessile-flowered *Trillia* of the Southern states." (b) "Notes on Epilobiaceae." Both papers are published in the April issue of the BULLETIN.

Dr. Britton exhibited a specimen of *Silene conica* L., collected by Mr. A. D. Selby, at Clyde, Ohio. This species is a recent immigrant from Europe.

Index to recent Literature relating to American Botany.

Bailey, L. H., Jr. Sketch of the Relationship between American and Eastern Asian Fruits. Yearbook, Dept. of Agric. **1894**: 437–442. 1895.

Baker, J. G. *Agave Haseloffii.* Curt. Bot. Mag. **53**: *pl. 7527.* Ap. 1897.

Baker, J. G. *Agave Kewensis.* Curt. Bot. Mag. **53**: *pl. 7532.* My. 1897.

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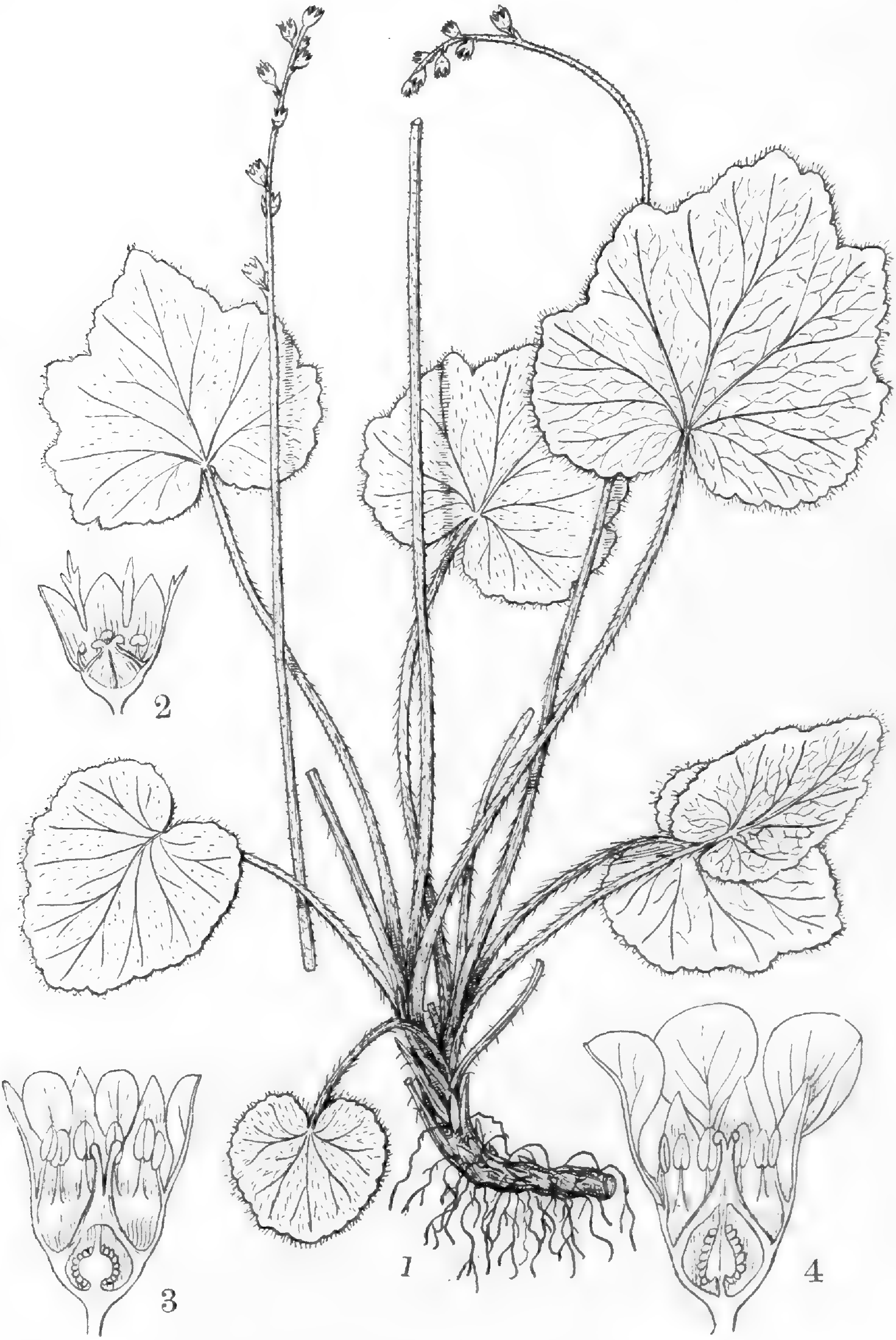

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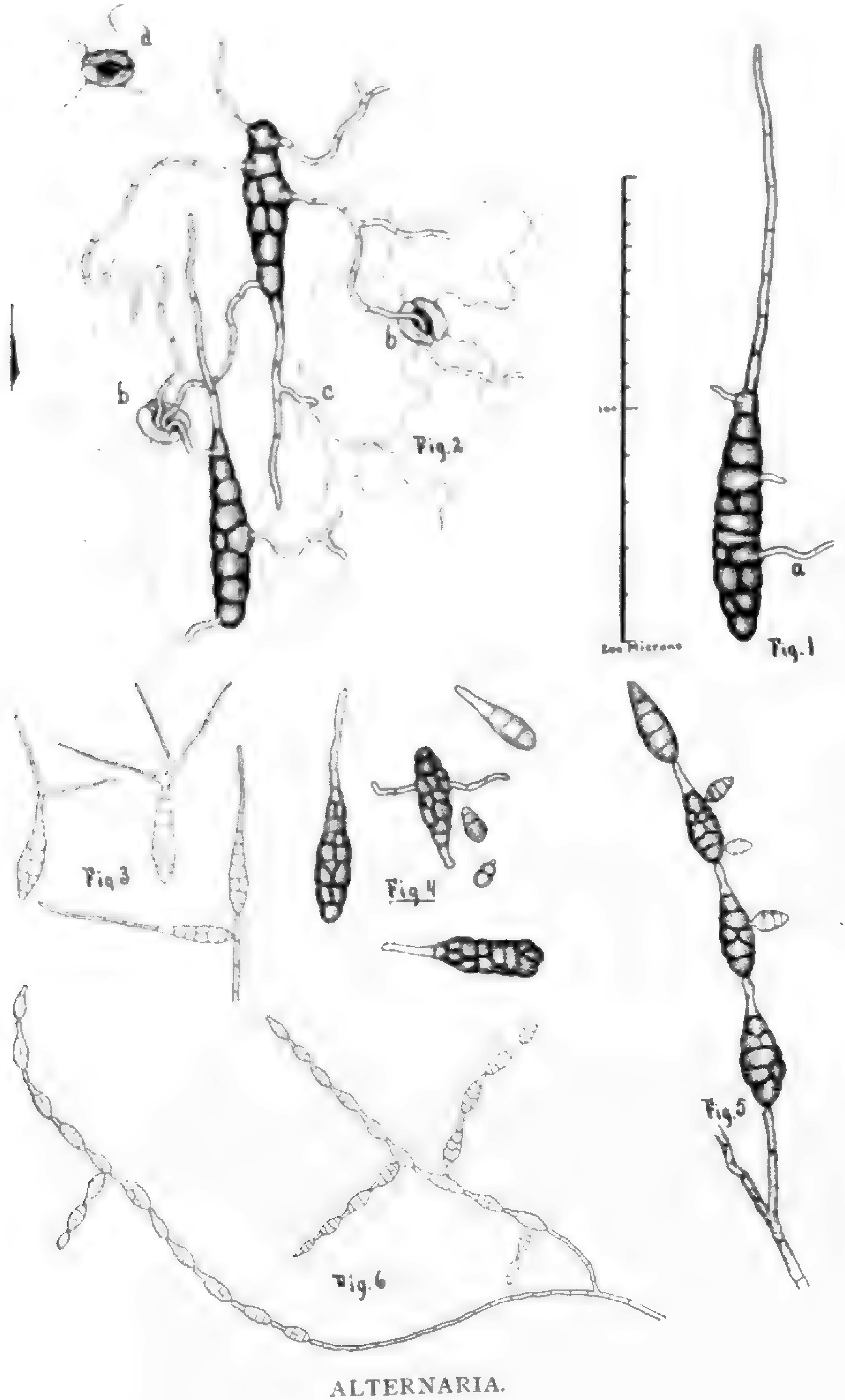

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CRYPTOGAMIA,

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The Club meets regularly at Columbia University, 49th Street and Madison Avenue, New York City, on the second Tuesday and last Wednesday of each month, except June, July, August and September, at 8 o'clock, P. M. Botanists are cordially invited to attend.

MEMBERS OF THE CLUB will please remit their annual dues for 1897, now payable, to Mr. Henry Ogden, Treasurer, 11 Pine St., New York City.

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BULLETIN

OF THE

TORREY BOTANICAL CLUB.

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New Species of North American Fungi from various Localities.

By J. B. Ellis and B. M. Everhart.

HYMENOMYCETES.

Myriadoporus subsulphureus E. & E.

On decaying wood, Denver, Colo., May, 1897. (Prof. E. Bethel, no. 239.)

Effused, immarginate, wood-color or grayish-white outside, light sulphur-yellow within, of a brittle corky texture, stratose, 4–5 mm. thick, extending continuously for 5–6 cm. or more; pores imperfectly developed, not continuous and cylindrical, but mere cavities scattered irregularly through the substance, more abundant near the surface.

Has the general appearance of *Poria vulgaris* Fr. or *P. obducens* Pers.

Peniophora occidentalis E. & E.

On dead limbs of deciduous trees, Canada to Colorado, westward. N. A. F. 2314.

Effused for 4–6 cm. in extent, with margin more or less reflexed and strigose-tomentose, dirty white, not zonate; hymenium pale lilac color, fading out, farinose; cystidia slender, rugulose-roughened and slender-pointed, $75–110 \times 13–16\mu$; spores elliptical, 1–2 nucleate, $12–15 \times 5–7\mu$.

PYRENOMYCETES.

Rosellinia subcompressa E. & E.

On old decorticated cottonwood limbs, Aberdeen, So. Dakota, Apr., 1897 (D. Griffiths, no. 7).

Gregarious, depressed-globose, about ¼ mm. diam., base slightly sunk in the surface of the wood; ostiolum papilliform; asci cylindrical, short-stipitate, paraphysate, 8-spored; sporidia uniseriate, elliptical, compressed, 6–9×5–6μ and about 3½μ thick.

The sporidia are obtusely rounded at the ends when viewed in front, but subacute when seen edgewise.

AMPHISPHAERIA MELANTERA E. & E.

On bark of *Quercus undulata*, Deansbury, Colo., Apr., 1897. (E. Bethel, no. 230.)

Perithecia erumpent-superficial, ovate-globose, black, ½–¾ mm. diam., scattered; ostiolum obscure, at length perforated; asci oblong-cylindrical, subsessile, 100–110×20–22μ, with abundant filiform paraphyses; sporidia biseriate, oblong, uniseptate, strongly constricted at the septum so that the two cells easily separate, the lower cell mostly narrower, brown, 20–35×12–15μ.

A. Querceti Cke. & Mass., has larger perithecia and uniseriate smaller sporidia only slightly constricted.

TEICHOSPORA POPULINA E. & E.

On decorticated weather-beaten limbs of *Populus monilifera*, Rooks Co., Kansas. (Bartholomew, 2388.)

Perithecia scattered, semierumpent, subglobose, about ½ mm. diam., partly covered by the loosened fibers of the wood; ostiolum papilliform; asci cylindrical, subsessile, paraphysate, 8-spored, 110–120×8–10μ; sporidia uniseriate, ovate-elliptical, 3–5-septate, constricted at the septa, more strongly so at the middle one, brown, 15–22×7–8μ, the inner cells divided by a longitudinal septum.

LOPHIOSPHAERA RHODOSPORA E. & E.

On the inner surface of cast-off bark, Ohio. (Morgan, no. 1162.)

Perithecia erumpent-superficial, gregarious, ovate-conical, laterally compressed, 200–250μ diam., submembranous, ostiolum narrow, subcompressed or simply papillate, soon perforated; asci clavate-cylindrical, 70–75×10–12μ (paraphysate)? 8-spored, short-stipitate; sporidia uniseriate and oblique or biseriate, ovoid-elliptical, rosy-hyaline, uniseptate, scarcely constricted, 12–14×5–6μ.

The mass of sporidia is distinctly rose-colored, giving by translucence the same color to the young perithecia which, however, soon become black. On account of the slightly compressed ostiolum this might be referred to *Melanopsamma*. The material was too scanty to decide conclusively.

Lophiosphaera zeicola E. & E.

On old corn stalks (*Zea Mays*), Rooks Co., Kansas, May, 1897. (Bartholomew, no. 2407.)

Perithecia gregarious, ovate-globose, buried, except the apex and erumpent black shining narrow compressed ostiolum, about ½ mm. diam; asci oblong-ovate, short-stipitate, obsoletely paraphysate, 8-spored, $35–45 \times 10–12\mu$. Sporidia biseriate, ovate, uniseptate, not constricted, smoky-hyaline, $8–10 \times 4\mu$.

The asci and sporidia resemble those of *Sphaerella*.

Pleospora Juglandis E. & E.

On dead limbs of *Juglans nigra*, Rooks Co., Kansas, April, 1897. (Bartholomew, no. 2405.)

Perithecia gregarious, small, $400–500\mu$ diam., whitish inside, sunk in the bark but raising the epidermis into numerous small pustules which are barely pierced by the minute punctiform ostiolum; asci cylindrical, $75–85 \times 10\mu$, short-stipitate, 8-spored, paraphysate.; sporidia uniseriate, oblong-elliptical, 3- (exceptionally 5-) septate, the two inner cells divided by a longitudinal septum, scarcely constricted, but the 5-septate spores sometimes constricted in the middle, yellow-brown, $15–22 \times 8–10\mu$.

Has the habit of *Clypeosphaeria Hendersonia* Ell.

Metasphaeria seriata E. & E.

On dead herbaceous stems (Umbelliferae)? Deansbury, Colo., Apr. 1897. (Bethel 233.)

Perithecia semierumpent, globose, minute ($80–100\mu$), arranged in narrow elongated strips, several centimeters long and about ½ cm. wide, the surface of the stem occupied by these being slightly blackened; ostiola papilliform, indistinct; asci clavate-cylindrical, sessile, $45–50 \times 8–10\mu$, paraphysate, 8-spored. Sporidia crowded-biseriate, fusoid, hyaline, faintly 1–3-septate, $25–27 \times 3\mu$.

Metasphaeria rubicola E & E.

On dead canes of *Rubus deliciosus*, Golden, Colo., March, 1897. (Bethel 179 & 208).

Perithecia scattered or seriate, sometimes in groups of 3–4, connected at base by a thin stromatic crust, globose, $400–500\mu$ diam. slate-color inside, buried in the bark and penetrating to the wood, with the apex and papilliform ostiolum erumpent; asci cylindrical, subsessile, paraphysate, $100–115 \times 10–12\mu$; sporidia uniseriate, oblong or oblong-elliptical, 3-septate, not constricted, ends rounded and obtuse, hyaline, $15–20 \times 8–10\mu$.

VALSA MACROCARPA E. & E.

On dead limbs of *Quercus macrocarpa*, Rooks Co., Kansas, Ap. 1897. (Bartholomew, no. 2393.)

Perithecia ovate-globose, about ½ mm. diam., 15–30 in a cortical stroma formed from the unchanged substance of the bark, closely packed in a single layer, subangular from mutual pressure; ostiola erumpent mostly around the margin of a light-brown disk, black, rounded at the tips, becoming flattened and umbilicate; asci clavate-cylindrical, p. sp. $23–30 \times 5–6\mu$; sporidia biseriate, allantoid, rather strongly curved, hyaline, $6–7 \times 1\frac{1}{4}–1\frac{1}{2}\mu$.

The disk is at first convex, but finally plane, rising but little above the epidermis which it perforates and raises into slight pustules.

EUTYPELLA TILIAE E. & E.

In bark of dead *Tilia Americana*, Canada (Macoun).

Stroma cortical, formed of the unaltered substance of the bark, not circumscribed; perithecia circinate, ovate-globose, ½ mm. diam., buried in the inner bark, necks converging and terminating in an erumpent fascicle of ovate-conical quadrisulcate ostiola; asci clavate-cylindrical, 40μ long (including the slender stipe), p. sp. $22–25 \times 3\mu$, paraphysate, 8-spored; sporidia biserate above, allantoid, hyaline, $4–4\frac{1}{2} \times 1\mu$.

The tufts of ostiola are ½–¾ mm. across, the tips slightly spreading.

VALSARIA XANTHOXYLI E. & E.

On *Xanthoxylum Clava-Herculis*, St. Martinville, La., March, 1897. (Rev. A. B. Langlois, no. 2500.)

Stromata pulvinate, 2–6 mm. diam. consisting mainly of a brownish-black subcarbonaceous crust of rather loose texture, covering the small, ovate-oblong, $1 \times \frac{1}{4}–\frac{1}{3}\mu$, membranous, perithecia which are seated in a closely packed group on the unaltered surface of the wood; ostiola tuberculiform-conical, at length broadly perforated or umbilicate; asci cylindrical, p. sp., $75–80 \times 8–10\mu$, with abundant paraphyses; sporidia uniseriate, elliptical, uniseptate and mostly constricted, brown, $12–14 \times 6–7\mu$.

CURREYA RIMOSA E. & E.

On dry hard wood of *Arctostaphylus tomentosa* (Manzanita), San Diego, Calif., July, 1896. (Bethel, no. 87.)

Stroma erumpent, superficial, tuberculo-hemispherical or oftener hysteriiform-elongated, 1–2 mm. long, ½ mm. broad, flattened above, surface minutely roughened, black or, when prematurely dried, reddish and transversely cracked; ascigerous cells globose, minute; asci obovate, 75–80×40–45μ, subsessile, paraphysate, 8-spored; sporidia crowded, biseriate, obovate-oblong, slightly curved, yellowish, obtusely rounded at the ends, at first 3-septate, becoming 5–7-septate and muriform, 30–40×15–20μ.

DISCOMYCETES.

SARCOSCYPHA ALPINA E. & E.

On the ground, Nederland, Colorado, May 4, 1897. (D. M. Andrews.) Comm. Prof. E. Bethel, no. 238.

Stipitate, 2 cm. high. Stipe, 1½ cm. high, about 2 mm. thick, clothed with short grayish-white tomentum, enlarged above into the cyathiform ascoma ½ cm. high, 3–4 mm. broad with the margin erect and sublobate, clothed externally like the stipe and with a few white spreading hairs, substance carnose, with a rose-colored tint; hymenium orange; asci cylindrical, 210–250×20–22μ; paraphyses stout, clavate, thickened above; sporidia uniseriate, elliptical, subinequilateral, subattenuated towards each end but obtuse, with one large nucleus and 1 or 2 smaller ones, 30–35×13–16μ.

Closely allied to *S. floccosa* (Schw.) but lacks the abundant spreading hairs of that species and has larger sporidia.

TAPESIA TUMEFACIENS E. & E.

On swollen dead stems of *Bigelovia graveolens*, Colorado, Jan., 1897. (E. Bethel.)

Ascomata densely gregarious, or in broad strips erumpent through cracks in the bark, seated on a thin sporidesmoid subiculum, when fresh orbicular, about 2 mm. diam., mouse-color, disk concave, margin slightly incurved; substance soft carnose, cellular, the margin fringed with olivaceous septate straight hairs, about 75μ long, and 3–4μ thick at the tips; asci clavate-cylindrical, 70–75×8–10μ, short-stipitate, 8 spored; paraphyses stout, simple, subundulate above, about 2μ thick, sporidia obliquely uniseriate, elliptical, hyaline, 8–11×5–6μ.

When dry the opposite sides of the ascomata are rolled together in a hysteriiform manner. The habit is that of *Angelina rufescens* Duby. The mycelium penetrates the wood and causes the stems to swell in the same manner as *Montagnella tumefaciens* E. & H.

Coryne microspora.

On decaying logs, Canada (Macoun.)

Cespitose. Ascomata carnose-gelatinous, light liver-color, ½–1 cm. across, depressed in the center, contracted below into a short thick stipe; when dry, almost exactly the color of dried raisins, and more or less wrinkled and folded; asci cylindrical, stipitate, paraphysate, $70–75 \times 5–6\mu$, 8-spored; sporidia uniseriate, elliptical, 2-nucleate, hyaline, $5–6 \times 2\frac{1}{2}–3\mu$.

Has the general aspect of *Coryne urnalis* Nyl., but ascomata larger and sporidia much smaller.

Ustilago Sporoboli E. & E.

On *Sporobolus cryptandrus* Gray, foothills of the Rocky Mountains, Colorado, July, 1895. Coll. J. C. Cowen, Comm. Prof. C. S. Crandall, no. 156[e].

Investing the culms within the sheaths and completely surrounding them for several cm. in extent with a thin even brownish-black layer of minute globose or elliptical $3–4\mu$ spores.

UREDINEAE.

Uromyces bicolor E. & E.

On leaves on *Allium rigidum*, Tulare Co., California, August, 1891. "Death Valley Expedition," no. 1499, Coville & Funston.

Aecidia amphigenous, on the tips of the leaves, thickly scattered; pseudoperidia hemispherical and closed at first, then erumpent and open, about ¾ mm. diam., margin coarsely toothed; aecidiospores obovate, elliptical or subglobose, $22–30 \times 15–20\mu$, smooth; uredo-sori small (¾–2 mm.), oblong or elliptical, soon naked, light yellow; uredospores elliptical, smooth, pale, membrane $2–3\mu$ thick. Teleutospore-sori punctiform, black, densely gregarious or confluent in crowded groups ¾–1½ mm. long by ½–1 mm. wide, permanently covered by the epidermis. Teleutospores obovate or pyriform, $20–30 \times 15–22\mu$, pale brown; epispore smooth, scarcely thickened at the apex; pedicels short ($15–25\mu$), hyaline, easily deciduous.

A well marked species, easily recognized by the difference in color and structure of the uredo and telentospore sori.

Puccinia Erigerontis E. & E.

On leaves of *Erigeron caespitosus* Crow Creek, Wyoming, July, 1896. (Prof. Aven Nelson, no. 2847.)

III. Sori amphigenous, naked, ½–¾ mm. diam., mostly clustered in patches 2–4 mm. across, sometimes subcircinately arranged, orbicular, black, seated on pale yellowish spots; teleutospores oblong or oblong-elliptical, broadly constricted, uniseptate in the middle, the lower cell paler and rounded below; upper cell mostly broader and darker, contents granular; epispore smooth, thickened above, with or without a papilla, $38–60 \times 15–21\mu$ (mostly $40–50 \times 18–20$); yellowish-brown, on pedicels mostly a little longer than the spores, persistent and yellowish above.

Differs from *P. doloris* Speg., in its amphigenous growth, black sori and rather larger spores.

PUCCINIA DUTHIAE Ell. &. Tracy.

II., III. Amphigenous; sori small, oval, black, distinct; uredospores subglobose, epispore thin, slightly echinulate, 30–40 by 35μ; teleutospores broadly oval, slightly constricted, ends rounded, not thickened, smooth, dark brown when mature, 40–45 by $26–30\mu$; pedicel with a distinct enlargement at the base of the spore, tapering below, tinted, twice or thrice the length of the spore.

On *Andropogon intermedius* and *A. pertusus*, India. Com. by. J. F. Duthie.

PUCCINIA NUTTALLII E. & E.

On living leaves, petioles and flowers of *Cyrtorhyncha Nuttallii.* Foothills of the Rocky Mountains, Colorado, June, 1895. (J. H. Cowen), comm. Prof. C. S. Crandall.

III. Sori at first covered by the lead-colored epidermis, soon naked, pulverulent and then nearly black; on the leaves thin and small, confluent and flat; on the petioles, elongated, sub-linear; spores elliptical, varying to oblong or obovate-elliptical, rounded at the ends, and mostly crowned with a small flat papilla, epispore thick but not distinctly thicker at the apex, nearly even at first, but in the mature spore coarsely but not prominently tubercular-roughened, yellowish-brown becoming dark-brown, $25–40 \times 18–20\mu$.

Closely allied to *P. Ranunculi* (Seymour) and to *P. gibberulosa* Schrtr., but the habit and roughening of the epispore is different.

PUCCINIA IRREGULARIS Ell. & Tracy.

On *Solidago* sp. Pike's Peak, Colo. (Tracy); on *Solidago spectabilis* var. *rigidiuscula*, Nebraska (Bates).

III. Amphigenous but more abundant below; sori small, subhemispherical, clustered or subcircinate on small pallid spots; teleutospores elliptical or oblong-elliptical, constricted, $50–70 \times 20–30\mu$, epispore smooth, pale brown, strongly thickened at the apex and prolonged into a subhyaline conical papilla; pedicels slightly tinted, 80–110μ long.

The spores are sometimes quite irregular; sometimes 3-celled, with upper septum perpendicular or inclined, and the upper cell with two apiculi. Mesospores (unilocular spores) tolerably abundant, 30–40$\times$18–22μ.

Differs from *P. Solidaginis* Pk. in its much smaller sori, narrower, more pointed spores and longer pedicels.

PUCCINIA LUDIBUNDA E & E. Proc. Acad. Nat. Sci. Phil. 1893: 153. N. A. F. no. 3243.

The description of this species is incomplete, no mention being made of the *Uredo*. This occurs in minute oblong pale orange-colored sori, about 1 mm. long, at first covered by the epidermis, but soon exposed, though inconspicuous. Uredospores obovate, 16–22$\times$12–14μ, pale orange, faintly aciculate. Pedicels deciduous. The teleutosori also occur on both sides of the leaf.

AECIDIUM PHLOGIS E. & E.

On *Phlox longifolia*, near Lewiston, Idaho, Apr., 1896. (Heller, no. 2992.)

Aecidia hypophyllous, evenly scattered, pustuliform at first, soon open and shallow cup-shaped with the margin coarsely lacerate-toothed; spores globose or sub-elliptical or sub-angular, orange-yellow, smooth, 15–20μ diam.

This is not improbably the *Aecidium* of *Puccinia plumbaria* Pk. which is found on this same host.

AECIDIUM ILICINUM E. & E.

On living leaves of *Ilex opaca*, Nuttallburg, West Va., Apr. 20, 1896. (L. W. Nuttall, no. 839).

Spots amphigenous, purplish-black above, dirty-orange below, indefinite. Aecidia hypophyllous, mostly only one in the center of a spot, hemispherical or tuberculiform and closed at first, then laciniately dehiscent and margin coarsely toothed; aecidiospores irregular in shape, globose, ovate, elliptical or subangular, 18–22μ in the longer diameter, epispore more or less wrinkled or tuberculate-roughened.

AECIDIUM TISSAE E. & E.

On leaves and stems of *Tissa macrotheca*, San Jacinto, Calif., March, 1896. (McClatchie, no. 1137.)

Scattered or clustered; aecidia small; short-cylindrical, margin slightly toothed; spores sub-globose or elliptical, smooth, 14–18μ diam., bright orange, at first soon fading.

UREDO ERIOCOMAE E. & E.

On leaves of *Eriocoma caespitosa*, Mojave Desert, Kern Co., Calif., May, 1892. Coll. D. W. Coquillett; comm. Miss May Varney.

Sori mostly epiphyllous, linear, soon naked, dark brown, 1–4 mm. long; uredospores elliptical, pale brown, 20–30$\times$10–12μ, epispore thick, rather coarsely, but only slightly tuberculo-echinulate-roughened, mostly filled with large oil globules; pedicels weak, slender, hyaline, deciduous, 20–30μ long.

SPHAEROPSIDEAE.

PHYLLOSTICTA LIVIDA E. & E.

On leaves of *Quercus Douglasii*, Amador Co., Calif. (Hansen, no. 1218.)

Spots large (1 cm.), subindefinite, brown below, livid brown above; perithecia amphigenous, numerous, covered by the livid epidermis, which is raised into small pustules and only tardily ruptured; sporules minute (3$\times$1μ), numerous, hyaline.

PHYLLOSTICTA GALLICOLA E. & E.

Parasitic on the fungoid gall known as "*Rhytisma Solidaginis*," Colorado, 1896. (Bethel, no. 221.)

Perithecia numerous, amphigenous, globose, about 210μ diam., fringed with brown mycelium, buried except the erumpent apex, which is rather broadly perforated; sporules elliptical, smoky-hyaline, 6–15$\times$6–8μ.

PHYLLOSTICTA EUCALYPTI E. & E.

On the dead brown extremities or upper half of the leaves of *Eucalyptus*, California. (Bethel.)

Perithecia amphigenous, evenly scattered, innate-erumpent, globose, 100–120μ diam.; sporules oblong, 5–8$\times$1½–2½μ.

PHYLLOSTICTA WISLIZENI E. & E.

On leaves of *Quercus Wislizeni*, Amador Co., Calif., 1896. (Hansen, no. 1502.)

Epiphyllous, on dirty brown subindefinite spots or dead areas of the leaf, often terminal or lateral, and subconfluent; perithecia at first covered by the blackened pustuliform-elevated epidermis, which is at length variously ruptured, often by a fissure running across the pustule, with the aspect of *Hysterium*, 250–300μ diam., globose or oblong; sporules oblong-elliptical, hyaline, 10–12× 5–6μ, sometimes a little bulging on one side.

PHYLLOSTICTA SPHAEROPSISPORA E. & E.

On leaves of *Solidago confinis*, Pasadena, Calif., Dec. 1895. (Professor A. J. McClatchie, no. 1051.)

Spots suborbicular, white, 3–10 mm. diam., with a narrow brown slightly raised margin; perithecia epiphyllous, hemispheric, prominent, black, 100–120μ diam; sporules obovate-elliptical, 13–16× 6–7μ, brownish, on stout pedicels 15×2½μ.

PHYLLOSTICTA FIMBRIATA E. &. E.

On leaves of *Arbutus Menziesii*, Ashland, Oregon, June, 1895. (Dr. J. J. Davis, no. 956.)

Spots amphigenous, rusty brown below, cinereous, purple-margined and slightly raised above, irregular in shape, 2–6 mm. diam.; perithecia epiphyllous, not abundant, gray, 200–300μ diam.; hemispheric-prominent, fringed around the base with straight spreading simple closely septate hyphae 50–75×5μ. Sporules variable in shape, oblong, 3–5×1½, elliptical, 4–6×2–3μ, or globose, 5–6μ.

PHOMA THAPSI E. & E.

On dead stems of *Verbascum Thapsus*, Newfield, N. J., May, 1897.

Perithecia subhysteriiform, covered by the blackened epidermis which is pierced by the papilliform ostiolum; sporules oblong-elliptical, binucleate, obtuse, 5–6×2½μ.

Differs from *P. verbascicola* (Schw.) in its differently shaped perithecia and larger 2-nucleate sporules.

PHOMA CALIFORNICA E. & E.

On dead and dying stems of *Gentiana serrata*, San Bernardino Mts., Calif., S. B. Parish; comm. A. J. McClatchie.

Perithecia subcuticular, covered by the slightly raised and blackened epidermis; sporules oblong, 3×¾μ.

Differs from *P. Niesslii* Sacc. and *P. Gentianae* J. Kuhn, in its much smaller sporules.

MACROPHOMA NERVICOLA E. & E.

On the nerves of the leaves of *Quercus alba*, in company with *Leptothyrium dryinum* Sacc., Racine, Wis., Aug., 1896. (Dr. J. J. Davis, no. 963.)

Perithecia buried with the apex slightly erumpent, 80–120μ diam., sometimes two or three subconfluent; sporules oblong-fusoid, hyaline, 14–21×6–8μ.

M. dryina (B. & C). is a ramicolous species with smaller (15×6–7μ) spores.

APOSPHAERIA NUCICOLA E. & E.

On old hickory nuts lying on the ground, Newfield, N. J., April, 1897.

Perithecia superficial, gregarious, often clustered and subconnate, ovate, smooth and black above, with a distinct papilliform ostiolum; sporules elliptical, hyaline, $2\frac{1}{2}$–$3\frac{1}{2}\times1\frac{1}{4}$–$1\frac{1}{2}\mu$.

ASTEROMA SENECIONIS E. & E.

On leaves of *Senecio Rawsoniana*, Yosemite, California, June, 1895. (Davis, no. 9513.)

Spots orbicular, light yellow, $\frac{1}{4}$–1 cm. diam.; perithecia amphigenous, 50–90μ diam., astomous at first, then with a large opening above, seated on a mycelium like that of the Erysipheae; sporules minute, cylindrical, 4–$5\times$ less than 1μ.

The perithecia are densely gregarious and form a broad black belt around the margin of the spots, the central portion (2–3 mm. diameter) being occupied by *Gloeosporium Senecionis* E. & E.

This is an anomalous *Asteroma*, lacking the usual radiating fibrils.

FUSICOCCUM PERSICAE E. & E.

On dead limbs of peach trees, St. Martinville, La., March, 1896. (Langlois, no. 2466.)

Stroma tuberculiform, $\frac{3}{4}$ mm. diameter, semierumpent through the epidermis, of coarse cellular structure, multilocular cells small (150μ), white, numerous; sporules oblong-fusoid, hyaline, continuous, 18–22×6–7μ, on basidia shorter than the sporules.

CYTISPORELLA CARNEA E. & E.

On dead limbs of *Castanea*, Nuttallburg, West Va., March, 1896. (L. W. Nuttall.)

Stroma at first tuberculo-hemispherical and covered by the epidermis, soon erumpent through the transversely or laciniately ruptured epidermis, brown outside, white and of firm consistence within (except the central portion), multilocular cells light-colored; sporules elliptical, hyaline, continuous, 5–$7\times2\frac{1}{2}$–3μ.

The stroma is about $1\frac{1}{2}$ mm. wide and 1 mm. high and finally shrinks away from the ruptured epidermis and then is more or less distinctly flesh-colored.

CYTISPORA TUMULOSA E. &. E.

On dead buds of *Magnolia Fraseri*, Nuttallburg, West Va., March, 1896. (Nuttall, no. 808.)

Stroma cylindric-conical, erumpent, brown, lighter inside, about 1 mm. rboad, the upper erumpent part 3/4 mm. high; sporigreous cells perithecioid, whitish, globose, sunk in the lower part of the stroma; sporules allantoid, hyaline, curved, $6–8 \times 1\frac{1}{2}\mu$.

CYTISPORA ANNULARIS E & E.

On bark of dead *Fraxinus Americana*, Aberdeen, So. Dakota, Apr. 1897. (David Griffiths, no. 1.)

Stroma sunk in the inner bark, ovate-globose, about 300μ diam., cells obsolete, apex erumpent, with a small round opening surrounded by a white ring, presenting outwardly almost the same appearance as *Stictis stigma* C. & E; sporules allantoid, $4–5 \times 1\frac{1}{4}\mu$ on fasciculate basidia $12 \times 1\frac{1}{2}\mu$ branched above.

Sporules smaller than in *C. leucosticta* E. & B. or *C. albiceps* E. & K. and larger than in *C. leucostoma* B. & C.; evidently different from *C. Persicae* Schw. and from *C. leucostoma* Sacc.

SPHAEROPSIS COMPTONIAE E. & E.

On dead shoots of *Comptonia*, Newfield, N. J. Apr. 1897.

Perithecia scattered, globose, 300μ diam., buried except the erumpent apex; sporules oblong-elliptical $15–20 \times 9–10\mu$.

DIPLODIA MELIAE E. & E.

On dead limbs of *Melia*, Louisiana. (Langlois, no. 2446.)

Perithecia scattered, or sometimes 2 or 3 together, at first covered by the epidermis but soon suberumpent; sporules oblong-elliptical, $17–20 \times 8–10\mu$, becoming tardily uniseptate.

DIPLODIA PARAPHYSATA E. & E.

On bark of *Tilia*, Nuttallburg, West Va., March, 1896. (L. W. Nuttall, no. 832.)

Perithecia sub-cuticular, depressed-globose, pilose-tomentose, black (white inside) $300–400\,\mu$ diam., with papilliform ostiolum, raising the epidermis into pustules and finally rupturing it, thickly scattered, often 2–3 sub-confluent; sporules ovate-elliptical, hyaline at first, then brown and uniseptate but not constricted, $22–27 \times 12–15\mu$, accompanied by stout branching paraphyses $100–110\mu$ long by $1\frac{1}{2}–2\mu$ thick and borne on stout basidia mostly shorter than the sporules.

Melanconis tiliacea Ell. was found on the same specimens.

Ascochyta Fraserae E. & E.

On stems of *Frasera speciosa*, Deansbury, Colo., Apr., 1897. (Bethel, 234.)

Perithecia scattered, sub-cuticular, depressed-globose, 80–110μ diam., perforated above, of cellular-membanous texture; sporules oblong, obtuse, uniseptate, narrower in the middle, hyaline 1,2–15$\times$4–5μ.

Hendersonia cylindrospora E. & E.

On some coarse umbelliferous plant, Denver, Colo., May, 1897. (Bethel, 247).

Perithecia scattered, minute, subcuticular; sporules cylindrical, obtuse, 3-septate, yellow-brown, slightly constricted at the septa, 18–22$\times$6–7μ.

Camarosporium Chenopodii E. & E.

On dead stems of *Chenopodium*, Fort Collins, Colorado, March, 1896. (Crandall and Cowen, no. 240.)

Perithecia erumpent, conic-globose, 110–140μ diam., coarsely cellular, perforated above, membranous; sporules oblong-elliptical or subcubical, yellow-brown, 3-septate and muriform, 10–20$\times$8–12μ, mostly on blackened areas of the stem.

Septoria Jussiaeae E. & E.

Spots white with a red-shaded border, suborbicular, small (1–1¼ mm.); perithecia few (1–6) on a spot, oftener only a single one and that in the center of the spot, punctiform, black, epiphyllous, semierumpent; sporules filiform, curved, nucleate-septulate, 30–50$\times$1–1¼μ.

On leaves of *Jussiaea pilosa*, Florida. (Geo. V. Nash, no. 2402.)

Septoria Ulmi E. & E.

On leaves of *Ulmus fulva*, Canada (Dearness), and on *Ulmus rhombifolia*, California (Hansen).

Spots orbicular, light yellow ⅓–1 mm. diam. Perithecia minute, collected in the center of the spot; sporules lunate, 3-septate, 20–30$\times$2μ.

Septoria sigmoidea E. & E.

On leaves and sheaths of *Panicum virgatum*, Ames, Iowa, Oct., 1895. Coll. Geo. W. Carver, comm. L. W. Pammel.

Spots none. Perithecia covered, evenly scattered or subseriate, 80–110μ, lying between the nerves of the leaf and visible as minute black specks through the epidermis which is only very slightly raised; sporules arcuate-fusoid or sigmoid, 3–6 (mostly 5-) septate, sometimes distinctly, but for the most part only slightly constricted at the septa, 35–52μ long, 4½–5½ thick in the middle, tapering to each end, often bent in the form of the letter S.

Comes near *S. epigeios* Thum. but has sporules more strongly curved, broader and tapering to each end.

SEPTORIA MYRICAE E. & E.

On leaves of *Myrica* Newfield, N. J., Sept., 1895.

Hypophyllous. Spots rusty-brown, 3–6 mm. diam., often interruptedly confluent over the entire leaf, giving it a mottled appearance; spots sometimes subconcentrically marked; perithecia subcuticular, then erumpent, black, conical, with a broad opening at the apex; sporules bacillary, hyaline, continuous, $8–10 \times 1\frac{1}{4}\mu$.

MELANCONIEAE.

MELANCONIUM ARUNDINACEUM E. & E.

On dead canes of *Arundinaria*, St. Martinville, La., March, 1896. (Langlois, no. 2444.)

Acervuli gregarious, elliptical, $1–1\frac{3}{4} \times \frac{3}{4}–1$ mm, lenticular, covered by the lead-colored epidermis, which finally splits along the middle; conidia globose, 15–20μ diam., or elliptical, $18–22 \times 13–16\mu$; basidia inconspicuous, shorter than the spores.

Differs from *M. hysterinum* Sacc. in its larger acervuli, and mostly obovate-elliptical conidia and inconspicuous basidia.

MYXOSPORIUM CORNI E. & E.

On bark of dead *Cornus florida*, near Mich. Ag. College, Jan., 1892. (G. H. Hicks, no. 154.)

Acervuli subcuticular, convex-discoid, slate-color within, 1–1½ mm. diam., slightly raising and splitting the epidermis; sporules oblong, hyaline, 2-nucleate, $6–8 \times 3\mu$, expelled in a flesh-colored globule.

M. nitida B. & C., has acervuli and sporules smaller.

GLOEOSPORIUM SENECIONIS E. & E.

On leaves of *Senecio aronicoides*, Wawona, Calif., June, 1895. (Davis, no. 9513.)

Spots orbicular, 5–10 mm. diam., often confluent over the greater part of the leaf, mostly darker around the margin but becoming a uniform light yellow; acervuli more abundant below, yellow, about 75μ diam.; conidia oblong, $12–23 \times 3–3\frac{1}{2}\mu$, slightly curved and obtusely pointed at the ends, continuous.

This can hardly be *Cylindrosporium Senecionis* B. and Br. Ann. Nat. Hist. no. 1613; Grev. 5: 58, which "forms white conspicuous patches," with flexuous flocci and cylindrical spores and belongs apparently among the Mucedineae.

On the California specimens are also small superficial perforated perithecia, on a mycelium like that of the Erysipheae. (*Asteroma Senecionis* E. & E.)

Cylindrosporium Kelloggii E. & E.

On living leaves of *Quercus Kelloggii* Amador Co., Calif. (Hansen, no. 1357.)

Spots numerous, small (1–2 mm.) very dark brown at first, more or less whitening out in the center with a dark narrow margin, often confluent, forming irregularly shaped light brown dead areas ½–1 cm. or more in extent; acervuli hypophyllous, 110–150μ diam., erumpent in flesh-colored conglutinated heaps becoming nearly black; conidia cylindrical, more or less bent, nucleate, becoming about 3-septate, $40–65 \times 2\frac{1}{2}–3\mu$.

Cylindrosporium Lupini E. & E.

On leaves of *Lupinus cytisoides* and *L. latifolius*, Yosemite, Calif., June, 1895. (Davis, no. 9514.)

Spots irregular, suborbicular, 2–4 mm. or often extending along the side of the leaf or occupying the upper part of the leaf, dull reddish brown; acervuli amphigenous, pale, about 75μ diam.; conidia fusoid-filiform or spiculiform, nucleate, straight, continuous, $15–23 \times 1\frac{1}{4}–1\frac{1}{2}\mu$.

Differs from *C. longispora* Ell. & Dearness, in its larger spores and much shorter continuous conidia.

Marsonia Baptisiae E. & E.

On leaves of *Baptisia leucantha*, Ames, Iowa, Oct., 1895. (Coll. Geo. W. Carver, comm. Prof. L. H. Pammell.)

Spots orbicular, 2–4 mm. diam., yellowish brown, with a broad almost black border, zonate; acervuli $150–200\mu$ diameter, covered above by the blackened cuticle, finally erumpent; conidia oblong-elliptical, obtusely rounded at the ends, $14–18 \times 6–7\mu$, continuous at first, becoming faintly uniseptate and mostly slightly constricted at the septum.

CORYNEUM PEZIZOIDES E. & E.

On rough outer bark of willow, Golden, Colorado, March, 1897. (E. Bethel, no. 213.)

Acervuli erumpent-superficial, at first punctiform, then orbicular, ⅓–½ mm. diam., black, mostly plane or slightly concave above, with the surface roughened as if by minute projecting ostiola; conidia oblong, 3-septate, constricted at the septa, olive-brown, 20–25×6–7µ, on basidia about 15µ long.

CORYNEUM NEGUNDINIS E. & E.

On dead limbs of *Negundo aceroides*, Denver, Colo., March, 1897. (E. Bethel.)

Acerculi subepidermal, at first separate, soon confluent and throwing off the epidermis, exposing a black continuous uneven layer seated on the inner bark; conidia obovate or elliptical, 2-septate, constricted at the septa or quite as often not constricted, yellow-brown, 20–30 exceptionally 40×12–15µ, on stout (15–20 ×4–5µ), subhyaline, subtorulose, continuous or faintly septate basidia.

The absence of erect sterile hyphae separates this from *Septosporium*, which, in the mature effused state, it much resembles.

HOMOSTEGIA DIPLOCARPA E. & E. Bull. Torr. Club, **24**: 135. 1897.

This should be *Phyllachora diplocarpa*, under which name it was distributed in N. A. F. 3439 & F. Col. 955. The 3-septate spores mentioned being only stylospores could not enable this to rank as *Homostegia*. The stroma too is like that of *Phyllachora*.

Rarities from Montana.—III.

BY P. A. RYDBERG.

PEDICULARIS MONTANENSIS.

Stem 3–4 m. high, simple, rather slender, more or less tinged with dark purple, glabrous; leaves pinnate, glabrous; segments ½–1 inch long, lanceolate, doubly serrate; spike short and dense, 3–6 cm., seldom 8 or 9 cm. long; bracts ovate, acuminate, about half as long as the flower, puberulent and villous-ciliolate and more or less purple-tinged as well as the calyx; calyx-lobes subulate; corolla 1.5 cm. long, purplish except a part of the lip which is yellow; galea much longer than the lip, lower portion straight, the apex cucullate and the tip not rostrate; lip 3-cleft, lateral lobes rounded and broad, middle one generally truncate and ciliolate at the margin.

A very near relative of *P. bracteata*, and perhaps only a variety thereof. The habit and form of the leaves are the same, except that *P. Montanensis* is a much more slender plant and has a shorter spike. In *P. bracteosa* the spike is often 2–3 dm. long, the bracts, especially the lower, fully as long as the light yellow corolla, the lateral lobes of lip are smaller.

Type: J. H. Flodman, no. 796, from Little Belt Mountains, nine miles from Barker, August 18, 1896.

PEDICULARIS CTENOPHORA.

Stem from a thickened caudex, about 3 dm. high, glabrous, strict, striate; leaves numerous, especially at the base, glabrous, rather thickish, pinnately divided into linear-lanceolate serrate segments; spike about 1 dm. long, rather loose; bracts broadly ovate in outline, pectinately divided; calyx gibbous above, purple-striate, more or less villous-ciliate at the base; corolla purplish; galea arcuate, produced into an elongated incurved beak; lip very broad, especially the lateral lobes.

It is a near relative of *P. contorta*, from which it differs in the color of the flowers, the more gibbous and purple-striate calyx, its hairiness at the base and the much larger and broader bracts.

Type: Rydberg, no. 2789, collected on the side of a snowclad mountain, near Lima, Montana, July 29, 1895.

GILIA CEPHALOIDEA n. sp.

G. spicata var. *capitata* Gray, Syn. Fl. **2**; part 1, 144, 1886 (in part): not Proc. Am. Acad. **8**: 274, 1870, nor *G. capitata* Sims, Bot. Mag. **53**: *pl. 2698*. 1826.

Jenney's plant collected in the Black Hills of South Dakota was included by Gray in the Synoptical Flora in *G. spicata capitata*. It is however scarcely the same as Hall & Harbour's no. 461, the type of the variety. The species, represented by Jenney's plant, my own no. 886, collected 1892, in the same region and no. 2764 collected near Lima, Mont., in 1895, differs from *Gilia spicata* not only in the subcapitate inflorescence, but also in the form and color of the flower. In *G. spicata* the corolla is greenish or dull white, has a tube which is fully twice as long as the calyx, and oblong segments that are only one-third the length of the tube. In *G. cephaloidea* the corolla is pure white, tube only ⅓ or ½ longer than the calyx and the segments elliptical and about half as long as the tube. The leaves are fully as much divided as in the former, but the plant is more woolly.

LAPPULA AMERICANA (Gray).

Echinospermum deflexum var. *Americanum* Gray, Proc. Am. Acad. 17: 224.

I think this is quite distinct from the European *L. deflexa.* The species of the Mississippi Valley and westward is a much larger plant, with a many-flowered divergently paniculate-branched inflorescence and broadly oblanceolate leaves. The European *L. deflexa* has almost linear leaves. *L. Americana* was collected by the author at Deer Lodge, Mont., in 1895 (no. 2775), a point much further west than the supposed range of the species.

ERIGERON OBLANCEOLATUS.

Stem from an apparently biennial root, 3–5 dm. high, striate, finely strigose, branched above; basal and lower leaves oblanceolate, tapering into a winged petiole, pointed, the margins ciliolate and with a few small but sharp teeth; stem-leaves linear, diminishing upward, the uppermost bract-like; heads 1–3, comparatively large, 15–25 mm. in diameter and about 10 mm. high; bracts 40–50, narrowly linear, acuminate, strigose; rays numerous, generally about 100, very narrow.

In the size and form of the head and bracts it most resembles *E. speciosus* and *E. subtrinervis.* In general habit it resembles somewhat *E. glabellus* Nutt., but differs by the much larger heads, the toothing of the lower leaves and the weak root system, which indicates a biennial, or a perennial by biennial offsets (the specimens show no stolons). In the latter case the plant should be placed nearest *E. Philadelphicus*, from which it is easily distinguished by the thin narrow leaves, the form and size of their teeth and by the few and larger heads.

Montana: Deer Lodge, July 10, 1895, collected by the author, no. 2822; Helena, June, 1889, by F. D. Kelsey.

ERIGERON ASPERUGINEUS (D. C. Eaton) Gray, Proc. Am. Acad. 16: 91. 1882.

Aster asperugineus D. C. Eaton, Bot. King's Exp. 142. 1871.

This species was collected at Melrose, Mont., July 6, 1895, no. 2823.

ERIGERON SUBCANESCENS.

Diplopappus canescens Hook. Fl. Bor. Am. 2: 21. 1834.

Erigeron canescens T. & G. Fl. N. Am. 2: 179. 1841–2. Not Willd.

This was included in *E. caespitosum* Nutt. by Dr. Gray, but I believe it to be a fairly good species, differing by the more slender and erect stems, the longer and narrower leaves, finer pubescence, smaller heads and narrower bracts.

It was collected by Flodman in the Spanish Basin, July 22, 1896, no. 836.

ERIGERON ANGUSTIFOLIUS (Gray).

Aster salsuginosus var. *angustifolius* Gray, Bot. Calif. 1: 325. 1876.

E. salsuginosus var. *angustifolius* Gray, Proc. Am. Acad. 16: 93. 1880.

From the field observations of Mr. Flodman and myself, I judge this to be as good a species as most of the group. It was collected by Flodman near the Little Belt Pass, Aug. 10, 1896, altitude 7000 ft., no. 854.

✓ERIGERON MINOR (Hook).

E. glabratus var. *minor* Hook. Fl. Bor. Am. 2: 18. 1834.

E. armeriaefolius Gray, Proc. Am. Acad. 8: 648. In part. 1870. Not Turcz.

Gray includes in *E. armeriaefolius* two distinct American plants. Neither agrees with the original description. One of these is Hooker's *E. glabratus minor*, the other his *E. lonchophyllus*. A duplicate of the type of the former is in the Columbia herbarium. There are also the following specimens of the same plant:

Oregon: T. J. Howell, no. 3884. 1884.

Montana: J. H. Flodman, no. 839, 1896; P. A. Rydberg, no. 2824. 1895.

Northwest Territory: John Macoun. 1879.

South Dakota (Black Hills): P. A. Rydberg, no. 786. 1892.

Colorado: M. E. Jones, no. 471. 1878.

All these specimens differ from those cited under the following species in the following respects: The stem is low, 1–2 dm. high, very leafy; basal leaves numerous, the lowest spatulate; stem leaves linear, without petioles, ciliate at the base; inflorescence racemose, with heads on very short pedicels.

ERIGERON LONCHOPHYELLUS Hook. Fl. Bor. Am. 2: 18. 1834.

E. armeriaefolius Gray, l. c., in part. Not Turcz.

This is generally 3–6 dm. high; leaves rather scattered; basal leaves rather few and oblanceolate; stem leaves, except the uppermost, with distinct petioles; inflorescence more irregular and heads generally on elongated pedicels. The following specimens are in the Columbia Herbarium:

Utah: E. Palmer, no. 221. 1877. M. E. Jones, no. 1859. 1880.

Nevada: S. Watson, no. 536. 1868.

Montana: Rydberg, no. 2825. 1895.

ERIGERON MONTANENSIS n.n.

E. Tweedyana Canby & Rose, Bot. Gaz. 15: 65. 1890. Not *E. Tweedyi* Canby, Bot. Gaz. 13: 17. 1888.

This species has been collected again in Montana by J. H. Flodman, at the following stations: Elk Mountains, no. 837; Little Belt Mountains, near the Pass, no. 838.

ARTEMISIA GRAVEOLENS.

Perennial, somewhat woody at the base, with numerous simple branches, these strict and striate, glabrous; leaves twice or thrice pinnately dissected into narrow divisions, glabrous, or finely grayish pubescent beneath; heads in a narrow strict panicle, distinctly pedicelled, about 4 mm. in diameter; bracts ovate, glabrous, with a brownish scarious margin; flowers brown; whole plant heavy-scented and covered with glutinous dots.

It comes nearest to *A. discolor*, from which it differs in being almost glabrous, the pedicelled, not nodding heads, and the heavy scent.

Type: J. H. Flodman, no. 881, from Long Baldy in the Little Belt Mountains, Aug. 19, 1896. Also collected by Frank Tweedy, no. 310, in Park county, 1887.

ARTEMISIA CANDICANS.

Stem stout, nearly 1 m. high, tomentose, branched; leaves pinnately or twice pinnately divided into oblong segments, tomentose on both sides, grayish above, white beneath; heads sessile in clusters in a compound interrupted spike, 5–8 mm. in diameter; bracts oval, scarious-margined and tomentose.

It somewhat resembles *A. Tilesii elatior* T. & G. in habit but differs in the leaves, which are tomentose on both sides and have shorter not acuminate segments, and in the somewhat larger, strictly sessile heads with tomentose bracts.

Type: J. H. Flodman, no. 882, 1896, from Little Belt Mountains.

ARTEMISIA FLOCCOSA.

Stem stout, 5–7 dm. high, striate, tomentose; leaves pinnately divided into oblong segments, loosely white-tomentose on both sides; heads 5–6 mm. in diameter, erect, evidently pedicelled, in an elongated narrow raceme or panicle; bracts oval, scarious-margined and tomentose.

It is nearly related to the preceding, differing mainly in the looser tomentum, and the erect pedicelled slightly smaller heads. From *A. Tilesii elatior* it differs in the tomentum, the form of the leaves, and the erect heads with tomentose bracts.

Type: P. A. Rydberg, no. 2942, Lima, Aug. 6, 1895.

ARNICA FULGENS Pursh, Fl. Am. Sept. 2: 527. 1814.

I think that this is distinct from *A. alpina*, differing in the following characters: taller, stem often 3–4 dm. high, shorter pubescence, often 3 or 4 smaller heads, much broader and dentate leaves and often as many as many as 3 or 4 pairs of stem leaves.

It was collected by Mr. Flodman at Little Belt Pass, no. 891. 1896. My own specimens, no. 823, from the Black Hills, also belong here.

ARNICA GRACILIS.

Stem slender, 1–2 dm. high; whole plant glabrous, except a little glandular puberulence on the pedicels and involucre; basal leaves broadly ovate, petioled, dentate, 3-ribbed; stem leaves about 2 pairs, similar, the upper sessile; heads 1–3; disk 10–15 mm. high; bracts 12–15, oblong-lanceolate, acuminate; rays about 15 mm. long; achene almost glabrous.

It much resembles the preceding and may perhaps be a form of it, but differs by the smaller heads, the glandular-puberulent involucre and pedicels and the glabrous foliage and stem. It approaches depauperate forms of *A. latifolia*.

Type: J. H. Flodman, no. 901, 1896, from the Spanish Peaks.

ARNICA PEDUNCULATA.

Stem 3–6 dm. high, finely villous-pubescent, striate; basal leaves broadly oblong to almost linear, entire, 3-ribbed, tapering into a more or less winged petiole; stem leaves about 2 pairs, similar, but narrower and sessile; head on a peduncle that is often 2–2½ dm. long; bracts 18–20, linear or lanceolate, acute but not acuminate, villous-pubescent: disk 15–18 mm. high; rays fully 1½ cm. long, orange; achenes hirsute, pubescent.

It is somewhat between *A. foliosa incana* and *A. alpina* in habit, but differs from both by the long-peduncled solitary head and finer pubescence. It was collected by J. H. Flodman in the Spanish Basin, July 11, no. 899 (broad leaved) and July 10, no. 900 (narrow leaved), 1896. Also collected in Idaho by A. A. & Gertrude Heller, no. 3293, 1896, and in Washington during the Wilkes expedition.

Senecio saliens.

S. triangularis β T. N. G. F: Am. 2 & l. 441. 1834.

Periennial from a thick rootstock and numerous matted roots; stem stout, 3–5 dm. high, glabrous, striate; leaves fleshy, deltoid-triangular, with salient teeth, the lower petioled, the upper sessile; inflorescence short, corymbose; heads about 1 cm. high; bracts linear; rays about 8 mm. long; achenes glabrous.

It is nearest related to *S. triangularis*, differing in the lower stature, the smaller thick and rather fleshy leaves, with fewer coarser less pointed teeth. The following specimens belong to it:

Montana: J. H. Flodman, no. 919, 1896, from Yogo Baldy in the Little Belt Mountains, altitude 7000 feet.

Wyoming: Fremont, in the Wind River Mountains, altitude 7000 feet.

Washington: Frank Tweedy, 1883, Yakima Region, altitude, 6700 feet.

Senecio pseudaureus.

Perennial from a creeping rootstock; plant perfectly glabrous except the tips of the bracts; stem 5–8 dm. high; basal leaves broadly ovate, somewhat cordate at the base, serrate, 4–7 cm. long, long-petioled; stem leaves more or less laciniate at the base, the upper sessile; inflorescence corymbose, flat-topped, of 8–10 heads about 8 mm. high; bracts linear; rays orange, about 8 mm. long.

It most resembles *S. aureus* and represents it in the Rockies. It has the same large basal leaves as that species, but they are less cordate at the base, not quite as wide and serrate instead of crenate. *S. aureus* is a strictly Eastern species.

Montana: J. H. Flodman, no. 918, from Little Belt Mountains (type), and 918½ from Spanish Basin, 1896; Frank Tweedy, no. 340, Park county, 1887.

Nevada: S. Watson, no. 667, 1868.

SENECIO CROCATUS.

S. aureus var. *croceus* Gray, Proc. Acad. Phila. 1863: 68. 1863. Not *S. croceus* DC.

This is well distinct from both the preceding and from *S. aureus*, differing in its smaller oval or obovate, coarsely and bluntly dentate, somewhat fleshy basal leaves. It represents *S. obovatus* of the East. It was collected in Montana by Mr. Flodman in the Little Belt Mountains, near the pass, no. 911.

CREPIS RUNCINATA ALPICOLA.

Stem scapose, about 1 dm. high, generally only 1-flowered; leaves entire, or with a few small teeth, and with very short petioles.

In habit it is very unlike the typical *C. runcinata*, but I have been unable to find any essential characters in the heads, involucre, pappus or achenes, by which to separate it as a species. The short 1-flowered stem, smaller and more entire leaves may be due to the high altitude, 7000 feet, at which it grew.

Type: Flodman, no 931, August 24, 1896, from Yogo Baldy, Little Belt Mountains.

Antennaria dioica and its North American Allies.

BY P. A. RYDBERG.

In 1892 when I began to determine my Black Hills collection, I felt that there must be something wrong in the genus *Antennaria*, especially in the group of which *A. dioica* is the representative species. My studies then, my field work in 1895 and 1896, and Mr. Flodman's collection have made it possible I think to remove at least a part of the difficulty. What have been named in our herbaria *A. dioica* and *A. alpina* constitute not less than six distinct species. I suspected that *A. plantaginifolia* contains more than one species, but have not been able to satisfactorily solve the problem. This seems to have been done by Prof. E. L. Greene in a recent number of "Pittonia"; I shall, however, add a description of the prairie plant of Nebraska, Kansas and Dakota, referred to in Prof. Greene's paper. As far as I know the species at present, I shall arrange them as follows:

Heads sessile at the ends of short leafy branches resembling the stolons. *A. rosulata.*

Heads in cymose or subcapitate clusters, or solitary on evident erect stems.

- Basal leaves and those of the stolons narrowly oblanceolate; bracts generally rose-color. *A. parvifolia.*
- Basal leaves and those of the stolons spatulate or obovate.
  - Basal leaves .5–4 cm. long and less than 1.5 cm. wide, one-ribbed or indistinctly three-ribbed.
    - Heads 5–7 mm. high.
      - Plants less than 1.5 dm. high; heads in subcapitate clusters.
        - Bracts of the pistillate plant dark greenish brown, acute or acuminate. *A. alpina.*
        - Bracts of the pistillate plant umber, obtuse. *A. umbrinella.*
      - Plants generally over 2 dm. high; heads in an open cyme.
        - Basal leaves ½–1 cm. long; stem leaves linear. *A. microphylla.*
        - Basal leaves 2–3 cm. long; stem leaves spatulate, broadly oblong and ovate-lanceolate. *A. pedicellata.*
    - Heads about 1 cm. high.
      - Basal leaves broadly spatulate, with a distinct petiole, generally tomentose on both sides; bracts of pistillate plant obtuse, or the innermost seldom acute. *A. dioica.*
      - Basal leaves more glabrate above, without distinct petiole; bracts of pistillate plant acute or acuminate, or the outermost obtuse.
        - Stem slender, 2–3 dm. high; stolons very long; basal leaves narrowly cuneate. *A. neglecta.*
        - Stem stout, short, about 1 dm. high; stolons short; basal leaves obovate. *A. campestris.*
  - Basal leaves over 4 cm. long and 1.5 cm. wide, prominently 3 ribbed.
    - Heads cymose; bracts of pistillate plant lanceolate.
      - Basal leaves broadly cuneate without distinct petiole. *A. Howellii.*
      - Basal leaves oval with a distinct petiole. *A. plantaginifolia.*
    - Head solitary; bracts of pistillate plant almost linear. *A. solitaria.*

Heads racemose or paniculate. *A. racemosa.*

ANTENNARIA ROSULATA.

Antennaria dioica var. *congesta* Gray, Syn. Fl. 1: pt. 2, 233. At least in part. 1884. Not DC.

The two sheets of the American plant found in the Columbia University herbarium differ considerably from European specimens in the same herbarium. The European is evidently a depauperate form of *A. dioica* or at least nearly related to it. The American plant, besides having a more trailing habit, possesses an almost turbinate involucre, of which only the innermost row of bracts have a broadly oblong obtuse papery appendage; the outer ones are even destitute of scarious margins. The whole involucre is densely white tomentose. Specimens seen: E. A. Mearns, no. 40, 1887, from the Mogollon Mountains, Arizona; E. Palmer, no. 109, 1869.

ANTENNARIA PARVIFOLIA Nutt. Trans. Am. Phil. Soc. 7: 406.

A. dioica var. *rosea* D. C. Eaton, Bot. King's Exped. 186. Name only. 1871.

Stems very slender, 1½–3 dm. high; pubescence of the whole plant fine, silky and somewhat yellowish; leaves of the stolons narrowly oblanceolate, 2–3 cm. long; stem leaves linear; heads small, 5–7 mm. high, in a contracted almost capitate cyme; bracts of both staminate and pistillate heads in several rows, yellowish, the scarious portion oblong, obtuse, nearly always tinged with rose or pink.

It is nearest related to *A. dioica*, differing in the slender habit, small heads, narrow leaves and the color of the plant and bracts; the staminate plant is very rare. The following specimens are in the Columbia herbarium:

California: Mrs. R. M. Austin, 1894; J. Torrey, no. 256, 1865.

Oregon: Wilkes expedition.

Washington: W. N. Suksdorf, no. 2190, 1892.

Idaho: A. A. & Gertrude Heller, no. 3441, 1896.

Nevada: S. Watson, no. 652, 1868.

Utah: M. E. Jones, no. 1390, 1879.

Colorado: Parry; F. N. Pease; Dr. E. Penard, nos. 282 and 284, 1891.

South Dakota (Black Hills): P. A. Rydberg, no. 79, 1892.

Montana: J. H. Flodman, no. 863, 1896.

Vancouver Island: John Macoun, 1887.

Subarctic America: R. Kennicott, 1861–62.

ANTENNARIA ALPINA (L.) Gaertn. Fr. & Sem. 2: 410. 1791.

Gnaphalium alpinum L. Sp. Pl. 856. 1753.

A. alpina is characterized by the bracts of the pistillate head, which are dark greenish brown, lanceolate and acute. The staminate plant is exceedingly rare; in the Columbia herbarium there are only three small plants, two, both monocephalous, collected by M. W. Harrington in Alaska, and the third received from Dr. Hooker, without any reference to locality or collector.

A. alpina has been collected in Montana by J. H. Flodman on Yogo Baldy, August 24, 1896, no. 861; Long Baldy, August 19, no. 862, and by Frank Tweedy in the Bozeman Pass, 1883.

ANTENNARIA UMBRINELLA n. sp.

Stem generally about 1 dm. high; leaves of the stolons spatulate, 1–1.5 cm. long, those of the stem linear-oblong; heads small, about .5 cm. high, conglomerated in small subcapitate clusters; scarious portion of the bracts in the pistillate head oblong, obtuse, in the outer varying from umber to isabel-colored, in the inner lighter colored and sometimes almost white; in the staminate heads all elliptic, obtuse and isabel-colored or yellowish white.

In habit it much resembles *A. alpina*, from which it differs by the oblong obtuse bracts of the pistillate plants and somewhat smaller heads. The staminate plants of the two species are almost identical in every respect except that the bracts are of slightly lighter color in *A. umbrinella*. I describe this species as new, with some hesitation, not that I have any doubt concerning its distinctness from *A. alpina* and our North American species, but it is so closely similar to *A. Magellanica* Sch. Bip.* that if it were not for the great distance between their ranges and for the slightly longer leaves and more slender caudex of the latter, I would regard the two as one species. The staminate plants are nearly as common as the pistillate ones. The following specimens are in the Columbia herbarium:

Montana: J. H. Flodman, no. 859, August 19, 1896, from Long Baldy in the Little Belt Mountains (type) and no. 860, July 18, from Spanish Basin.

Wyoming: Aven Nelson, no. 885, 1894 (labelled *A. dioica*).

Nevada: S. Watson, no. 650 (*A. alpina*) and 651, 1868.

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* Flora 38: 117. 1855.

Idaho: I. Mulford, 1892 (*A. dioica*).

Oregon: Wilkes Expedition (*A. dioica*).

Arctic America: Dr. Richardson, 301 (*Gnaphalium dioicum*).

ANTENNARIA MICROPHYLLA.

Stem slender, strict, 2–3 dm. high; pubescence very fine; leaves of the stolons small, .5–1 cm. long, spatulate; stem-leaves linear-oblong; heads small, 5–7 mm. high, in a rather open corymb; bracts of the pistillate heads tinged with greenish yellow, linear-oblong or lanceolate, mostly acute, those of the staminate head with oval-oblong white scarious margins.

In the characters of the head and bracts, it is intermediate between *A. alpina* and *A. plantaginifolia.* The head is scarcely as large as that of the former, the stem is much more slender than in either and the leaves smaller than in any of the group. It has been variously labelled in collections as *A. dioica*, *A. luzuloides*, *A. Carpatica*, etc. The following specimens are in the Columbia herbarium:

Montana: P. A. Rydberg, no. 2831, 1895, from Manhattan (type); J. H. Flodman, no. 864, 1896, from Bozeman.

Yellowstone National Park: Frank Tweedy, no. 203, 1884; A. Brown, 1893.

Wyoming: Fremont; A. Nelson, no. 762.

Colorado: C. C. Parry, 1872; Letterman, no. 200, 1884.

Utah: S. Watson, no. 651, 1869.

Saskatchewan: E. Bourgeau, 1858.

ANTENNARIA PEDICELLATA Greene, Pittonia, 3: 175. 1897.

Specimens of what I take to be this species were collected by Mr. Flodman in the Little Belt Mountains, Mont., in 1896, no. 867. These have large stem leaves about 3 cm. long and 1 cm. wide; the lower ones are cuneate, obtuse, the middle ones broadly oblong and the upper ones ovate-lanceolate and acute.

ANTENNARIA DIOICA (L.) Gaertn., Fruct. & Sem. 2: 410. 1791.

Gnaphalium dioicum L. Sp. Pl. 856. 1753.

In the American specimens seen the stem is seldom 1.5 dm. high, rather stout, with larger heads often over 1 dm. high, the scarious portion in the staminate heads elliptic, in the pistillate oblong and obtuse, or the innermost rarely acutish, and the leaves of the stolons broadly spatulate, or obovate, about 2 cm. long. In America it ranges from the Arctic regions to New Mexico and Arizona, and is the most common species in Montana.

For ANTENNARIA NEGLECTA Greene, A. PLANTAGINIFOLIA (L.) Hook. and A. HOWELLII Greene, see Prof. E. L. Greene's descriptions in Pittonia, 3: 173–4.

ANTENNARIA CAMPESTRIS n. sp.

Stem low, about 1 dm. high; basal leaves obovate-cuneate, 2–3 cm. long and about 1 cm. wide, without a distinct petiole, 1-ribbed or indistinctly 3-ribbed, the upper surface glabrate in age; stolons very short; pistillate heads about 1 cm. high, bracts lanceolate. the lower portion greenish, the upper brownish and ending in a scarious white acute or acuminate tip; staminate heads somewhat smaller; the white scarious tips of the bracts elliptical and obtuse.

It is nearest related to *A. neglecta* Greene, from which it differs mainly in the low habit, broader basal leaves, and short stolons. It is confined to the prairies and plains west of the Mississippi.

Nebraska: H. J. Webber, 1887; G. D. Swezey; J. M. Bates, 1891; P. A. Rydberg.

South Dakota: P. A. Rydberg, no. 794, 1892 (Black Hills).

Saskatchewan: Dr. Richardson.

ANTENNARIA SOLITARIA n. n.

Gnaphalium monocephalum Carpenter, in Torr. & Gray, Fl. N. Am. 2: 431. 1843.

Antennaria plantaginifolia monocephala Torr. & Gray, l. c.

Antennaria monocephala Greene, Pittonia, 3: 176, 1896. Not DC. Prod. 6: 269. 1837.

To the characters given by Prof. Greene, may be added the exceedingly narrow bracts of the pistillate head.

Studies in the Asclepiadaceae.—I.

By Anna Murray Vail.

NOTES ON THE GENUS PHILIBERTELLA IN THE UNITED STATES.

PHILIBERTELLA.

[Sarcostemma H.B.K. Nov. Gen. et Sp. **3**: 193. 1818. As to the three species described and not R. Br. 1809.]

[Ceramanthus (subgenus) Kunze, Linnaea, **20**: 26. 1847. Not Hassk. 1844.]

[Philibertia Benth. and Hook. Gen. Pl. **2**: Part 2, 750. In part, 1876. Not H.B.K. 1818.]

[Philibertia A. Gray, Proc. Am. Acad. **12**: 64. 1876. Not H.B.K. 1818.]

The genus *Philibertia*, dedicated to J. C. Philibert, author of some French elementary botanical works, was established in H.B.K. Nov. Gen. et Sp. **3**: 195. *pl. 230*, and founded on one species, *Philibertia solanoides*, from Tomependa on the Amazon river, a species reduced by K. Schumann in Engler and Prantl, Nat. Pfl. Fam. 1895, to the genus *Oxystelma* R. Br. 1809 where it seems rightfully to belong.

Most of the North American species have been originally described by various authors under *Sarcostemma* and were reduced by Dr. Asa Gray to *Philibertia* in 1876. *Sarcostemma* is a genus with leafless jointed stems, and as far as is known does not occur on the American continent, those of the South American species described under that genus belonging either to *Philibertella* or to *Oxystelma.*

The genus *Philibertella* is here accepted as described under *Philibertia* by K. Schumann in Engler and Prantl, Nat. Pfl. **4**: 229, 1895, as follows:

Calyx small, 5-parted, the lobes acute; corolla campanulate or rotate, deeply 5-parted, the lobes acute or obtuse, with a shallow entire or undulate ring forming an outer crown in its throat, the inner or stamineal crown consisting of five turgid fleshy or hard scales, or flattish appendages, attached in a circle at the base of the sessile or slightly stalked gynostegium (column), forming a hollow entire or undulate spreading surface near the level of the conical stigmas; follicles naked, slender, attenuate at both ends or obtuse at the base.

Twining herbs, or partly shrubby plants, of warm regions, with opposite glabrous pubescent or woolly leaves and umbellate sometimes fragrant and showy flowers. Some thirty species are known from North and South America, according to Schumann, extending from southern Utah to South Brazil and Argentina.

The following species occur within the limits of the United States:

PHILIBERTELLA CLAUSA (Jacq.).

Cynauchum clausum Jacq. Select. Am. 1: 87. *pl.* 60. *f.* 2. 1763.

Asclepias viminalis Swartz, Prodr. 53. 1788.

Sarcostemma Brownii G. F. W. Meyer, Prim. Fl. Esseq. 139. 1818.

Sarcostemma clausum Roem. & Schult. Syst. Veg. 6: 114. 1820.

Sarcostemma crassifolium Chapm. Fl. 368. 1860. Not Decaisne, 1844.

Philibertia viminalis A. Gray, Proc. Am. Acad. 12: 64. 1876.

Very variable. Some of the narrower leaved forms are so close to *Philibertella crassifolia* (Decsne) and *Philibertella Cumanensis* (H.B.K.) as to possibly include them both. *Philibertella Palmeri* (A. Gray), another closely related species, may also, on further study of the Mexican species, prove to be a more pubescent and broader leaved form of *P. clausa*.

Original locality, Cartagena, Columbia.

Florida: Key West, Blodgett; Indian River, A. H. Curtiss, no. 2306, Palm Beach, Webber, no. 68.

Demerara: Jenman, no 4381.

New Granada: Holton, no. 458, 1853.

British Guiana: Jenman, no. 2025.

PHILIBERTELLA CRISPA (Benth.)

Sarcostemma crispum Benth. Pl. Hartw. 291. 1841.

Sarcostemma undulatum Torr. Bot. Mex. Bound. Surv. 161. 1859.

Sarcostemma heterophyllum var? Torr. Bot. Mex. Bound. Surv. 162. 1859.

Philibertia undulata A. Gray, Proc. Am. Acad. **12**: 65. 1876.

Philibertia crispa Hemsley, Biol. Centr. Am. **2**: 318. 1881.

Very variable as to the size and undulation of the leaves. No. 1326, collected by C. G. Pringle in Chihuahua, is undoubtedly this species, but there is scarcely any undulation on the leaf margin and no trace, except on a few young leaves, of the whitish midvein, so prominent on the Texan specimens. Wright, no. 1679, from New Mexico, also belongs here, though the gynostegium is somewhat more sessile than in most specimens. In the original description by Dr. Torrey of *Sarcostemma undulatum* there is reference to its similarity to *Sarcostemma crispum* Benth., doubting, however, its identity with that plant, owing to the latter being "a humble species only half a foot long, the peduncles barely equal the petioles;" but as specimens of *S. undulatum* have since been collected (Austin, Texas, E. Hall, 1872, no. 518, in U. S. Nat. Herb.) which measure only 12 cm. in length, and others again with very short petioles and peduncles, there is little doubt that this is the species described by Bentham, of which only one original specimen is known. In other respects the description of *S. crispum* is that of *S. undulatum* in every detail except as regards some of the larger leaved Texan specimens.

Original locality, Aguas Calientes, Mexico. Type in Herb. Kew.

Texas: Tom Greene Co. Tweedy, 1879; Blanco, Wright, nos. 1678[a], 547, October, 1849; Mexican Bound. Surv. nos. 1066 and 1068; T. Havard, October, 1881; Dallas, Reverchon, 1881; Austin, Hall, no. 518.

New Mexico: Wright, no. 679.

Arizona: E. Palmer, 1869.

Mexico: C. G. Pringle, no. 1326, 1887.

PHILIBERTELLA CYNANCHOIDES (Decne.)

Sarcostemma cynanchoides Decne. in DC. Prodr. **8**: 540. 1844.

Gonolobus viridiflora Torr. Ann. Lyc. N. Y. **2**: 219. 1828. Not Nuttall, 1818.

Philibertia cynanchoides A. Gray, Proc. Am. Acad. **12**: 64. 1876.

Philibertia viridiflora Britt. & Rusby, Trans. N. Y. Acad. Sci. **7**: 11. 1887.

Original locality, Matamoros, Mexico.

Type in Herb. Mus. Par. Authentic specimens, Berlandier, no. 2334 in Herb. Columbia University.

Along rivers, southern Utah, New Mexico, Arizona and Texas to Guatemala.*

Arizona: Fort Verde, Mearns, no. 238.

New Mexico. Rusby, no. 261; Wright, no. 1680.

Texas: San Diego, Mary Croft, no. 70; Mexican Boundary Survey, below Presidio del Norte; Berlandier, no. 904.

Mexico: Berlandier, no. 2334; Thurber, no. 368, 1851; Paso del Norte, Chihuahua, no. 1324.

PHILIBERTELLA HARTWEGII. 1897

Sarcostemma lineare Decne.; Benth. Pl. Hartw. 25. 1840. Not Sprengel, 1822.

Philibertia linearis A. Gray, Proc. Am. Acad. **12**: 64. 1876.

Original locality, Leon, Mexico.

Type, Hartweg, no. 217.

Southern Arizona to Lower California and South Mexico.

Fremont's Expedition to California, 1849, without locality.

Southern California: Parry and Lemmon, no. 230. 1876.

Lower California: Lieut. Pond, 1889; Lagoon Head, Palmer, no. 814. 1889.

Mexico: Gregg, 1847; Sonora, Capt. Smith; Sonora, Thurber, 369, 1851.

PHILIBERTELLA HARTWEGII HETEROPHYLLA (Engelm.).

Sarcostemma heterophylla Engelm., in Torr. Pac. R. R. Rep. **5**: Appendix, 362. 1856–57.

Philibertia linearis var. *heterophylla* A. Gray, Proc. Am. Acad. **12**: 64. 1876.

Very variable. The broader leaved forms seem to approach the narrower-leaved specimens of *P. crispa*, but they are thinner and much shorter. The gynostegium seems to be invariably sessile or nearly so, and the lobes of the corolla are always acute.

Original locality, Fort Yuma, California. Type in Herb. Co.

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* A specimen of this species labelled *Gonolobus viridiflorum* Nutt., preserved in Herb. Columbia University is claimed to have been collected near St. Louis, Missouri, by Dr. Baldwin.

lumbia University. California to Arizona, New Mexico and Mexico.

New Mexico: Wright, no. 1681.×

California: Fort Yuma, Major Thomas; Mexican Boundary Survey, San Luis Rey, 1850.

Lower California: Palmer, no. 5. 1887.

Mexico: Pringle, no. 1051.

PHILIBERTELLA HIRTELLA (A. Gray).

Sarcostemma lineare var. *hirtella* A. Gray, Bot. Calif. **1**: 478. 1876.

Philibertia linearis var. *hirtella* A. Gray, Syn. Fl. **2**: Part 1, 88. 1878.

Stems many, in clusters, mostly branched near the base, erect and twining above from a stout corky-barked decumbent? or prostrate? stem or rhizome; densely and softly cinereous-pubescent and pale gray-green throughout; leaves sessile, or very short petioled, 1–3.4 cm. long, narrowly linear, thickish, densely cinereous-pubescent on both surfaces; peduncles 1–4 cm. long, 8–12-flowered or more; pedicels 5–8 mm. long, slender; calyx-lobes lanceolate, acute; corolla 8–9 mm. broad, the lobes acutish, dull purple? with a scarious ciliate margin, unequally granulose above, cinereous-pubescent beneath; outer crown shallow, slightly undulate; scales of the stamineal crown flattened, acutish; follicles usually in pairs, conspicuously diverging, 5–5.5 cm. long, fusiform, long-attenuate at the apex, less so or obtuse at the base, densely cinereous-pubescent, 3–4 seeded, possibly more; seeds 7–8 mm. long, flat and thin, the margin slightly revolute, entire at the apex, strongly tuberculate on the inside and granulose on the outside; coma 2–2.5 cm. long. May.

Original locality, Sandy River, Fort Mohave, California.

Type in Herb. Harvard University.

Arizona: The Needles, Jones, no. 3815; Palmer, 1884.

California: Colorado River Valley, Palmer, no. 441, 1876; Willow Creek Cañon, Panamint Mountains, Coville and Funston, no. 817, 1891. Said to extend into Texas and Mexico.

PHILIBERTELLA TORREYI (A. Gray.)

Sarcostemma elegans? Torr. Mex. Bound. Surv. 161. 1859. Not Decne. 1844.

Philibertia Torreyi A. Gray, Proc. Am. Acad. 12: 64. 1876.

Apparently only collected once. Close to *Philibertella elegans* (Decne.); but differing in its slightly less acute corolla segments, and less conspicuous outer crown. The scales of the stamineal crown in *Philibertella elegans* are vertically flattened, acute and almost petaloid, whereas those of *P. Torreyi* are truncate, rounded or flat on top.

Original locality, Rocky Hills on the Cibolo, a tributary of the Rio Grande, southwest Texas.

Type in Herbarium, Columbia University.

The specimens examined for these notes are those contained in the Herbarium of Columbia University and the U. S. Nat. Herbarium at Washington.

Plants from Nez Perces County, Idaho.

By A. A. Heller.

(Plates 309, 310.)

Four months of the season of 1896 were spent in northern Idaho by Mrs. Heller and myself, during which time many interesting species were collected. Among these a dozen or more seem to be new, and have already been distributed as such, although not yet described. As soon as possible a complete report on the work will be published, with descriptions of the new species, and notes on all of the others. The following new and noteworthy species are discussed in this paper:

Poa scabrifolia n. n.

Poa filifolia Vasey, Cont. U. S. Nat. Herb. 1: 271. Not Schur.

The very appropriate name which Dr. Vasey gave to this beautiful species, is not tenable on account of the earlier *Poa filifolia*, published by Schur, in Enum. Pl. Transs. 768. 1866. It is plentiful at the type locality, on the left bank of the Clearwater river, near the Upper Ferry, east of Lewiston.

Ranunculus arcuatus n. n.

Ranunculus tenellus Nutt.; T. & G. Fl. N. A. 1: 230. 1838. Not Viviani.

Ranunculus Nelsonii var. *tenellus* A. Gray, Proc. Am. Acad. **8**: 374. 1872.

Ranunculus occidentalis var. *tenellus* A. Gray, Proc. Am. Acad. **21**: 373. 1886.

Ranunculus Nelsonii glabriusculus Holzinger, Cont. U. S. Nat. Herb. 3: 210. 1895. Not *R. glabriusculus* Rupr.

Ranunculus Bongardi var. *tenellus* Greene, Erythea, 3: 54. 1895.

A species which is abundant in moist or wet places in the Craig mountains. It was collected in two localities at Lake Waha, one at the head of the lake, and the other in the Sweetwater cañon. It was also noticed about Forest. In this connection it may be well to call attention to an unjust custom which botanists have fallen into. Professor Greene, in 1895, published *Ranunculus Bongardi* as a new species, and at the same time reduced to it as a variety the *Ranunculus tenellus* of Nuttall, published in 1838. In doing this he has merely followed a prevalent custom. Would it not be better if we, who are working for a stable nomenclature, would show more justice in such matters. If a new plant is discovered, do we have a right to describe it as a new species, while reducing to it as a variety, some plant described as a species years before? The proper way, as it appears to me, is to describe our own new plant as a variety of the old species, if we must describe varieties.

Sophia filipes (A. Gray).

Sisymbrium incisum β filipes A. Gray, Pl. Fend. 8. 1849.

Sisymbrium longipedicellatum Fourn. Sisymb. 59. 1865.

This species is very common about Lewiston, and at various other places in Nez Perces county. It bids fair to become a weed in wheat fields, as well as in grass lands. The type specimen was "from Clear Water, Oregon, by Mr. Spaulding," but that is a mistake, if the Clearwater river is meant, for the Clearwater empties into the Snake at Lewiston, and no part of it flows near the State of Oregon.

Dodecatheon puberulentum n. sp.

Crown 1–2 cm. long, covered with the petioles of fallen leaves, not producing bulblets; leaves spatulate or oblong-obovate, 5–6 cm. long, including a margined petiole of 2 cm., glabrous, light green, thin, but firm, entire or slightly crenate, somewhat pointed, midvein prominent, yellowish; scape 2 dm. high, slender, tinged with purple, puberulent; umbel usually three-flowered, subtended by five narrowly lanceolate bracts 3–4 mm. long; pedicels 2–4 cm. long, slender, puberulent, the upper half somewhat striate; calyx puberulent, 5 mm. long, the five lanceolate lobes equalling or slightly exceeding the tube; corolla 1 cm. long, rose-purple, the everted tube marked with a bright band of yellow; stamens 5 mm. long, five in number; filaments 2 mm. long, bright yellow, the connectives lanceolate, half the length of the anthers, with yellow base and purple tip; style slender, 6 mm. long, hence longer than the stamens; capsule narrowly ovate-oblong, slightly longer than the calyx, tipped with a knob-like point, which splits into five segments. (Plate 309.)

The type is no. 2985, collected April 29, 1896, on the left bank of the Clearwater, near the Upper Ferry. It is not uncommon in that vicinity, growing on grassy hillsides. Some of no. 63, listed in Cont. U. S. Nat. Herb. 3: 239, as "Dodecatheon sp." was first collected here by the writer, but specimens from other places were later placed under the same number. It is related to *D. Cusickii* Greene, but pronounced distinct by Professor Greene. No. 3169, collected at Lake Waha June 3, 1896, and distributed as *D. puberulentum*, is probably *D. Cusickii.*

FRASERA FASTIGIATA (Pursh).

Swertia fastigiata Pursh, Fl. Am. Sept. 101. 1814.

Frasera thyrsiflora Hook. Kew. Journ. Bot. 3: 288. 1851.

The original locality of this species is given by Pursh as "on the Missouri flats, near the Rocky mountains. *M. Lewis* * * * * July." Dr. Gray, in the Synoptical Flora says: "Idaho and interior of Oregon, on the tributaries of the Columbia, *Lewis, Douglas, Geyer, Spaulding.* Rare and little known. Pursh's plant, seen in herb. Lambert, where the true station is recorded: 'in moist and wet places on the Quamash flats, June 4, 1806,' at which date Lewis and Clarke were on the Kooskooskie (now Salmon) river, near which the species was collected by Spaulding."

Dr. Gray's statement concerning the identity of the Indian name "Kooskooskie" is erroneous. The Clearwater, and not the Salmon, is known by that name. The "Quamash Flats," or "Camas Prairie," is near Mt. Idaho, on the South Fork of the Clearwater.

The species is common on the Craig Mountains, growing usually on grassy slopes or open glades, or along streams in meadows, at elevations of 2000 to 3500 feet. It is also plentiful in meadows in the vicinity of Genesee and Moscow, Latah county.

It was collected at Lake Waha, near Moscow, by Sandberg, MacDougal and Heller, in 1892, while acting as field agents for the Department of Agriculture. It is their no. 239, erroneously determined by Mr. Holzinger as *Frasera speciosa* Dougl., a species which belongs to a different section and is easily separated from *F. fastigiata* by having the leaves in fours and sixes instead of threes, by their different shape, and by the more leafy stem.

THALESIA PURPUREA n. sp.

Rootstock stout, fascicled or sparingly branched, 5–6 cm. long; scales glabrous, broad, acute, prominently veined; scapes stout, 1–1.5 dm. long, channeled, glandular-pubescent, especially above; calyx equally 5-lobed, glandular-pubescent, prominently 3-nerved, the lateral nerves close to the margin, the lobes twice the length of the tube, long-acuminate from a triangular base, and reaching to the curve of the corolla; corolla deep violet-purple, 3 cm. long, curved near the middle, glandular-pubescent, lobes broadly oblong or obovate, usually notched or sometimes merely rounded, fringed with short, glandular hairs, marked with three yellowish veins; stamens smooth, the anthers obovate, short, acuminate at the base; style flat; stigma flat, broad, 2-lobed, the lobes obovate, somewhat granular-roughened; ovary glabrous. (Plate 310.)

The type is no. 3099, collected May 20, 1896, near the mouth of the Potlatch. The species resembles *T. uniflora* in the dried state, but is of an entirely different habit. Instead of growing in shaded woods, in rich, loose ground, it is found in open, gravelly, or rocky ground, where it flourishes best. Specimens found near bushes were always dwarfed and stunted.

The same plant was collected on the rocky hills on the right bank of the Clearwater above Lewiston, by Sandberg, MacDougal and Heller, in 1892, under no. 11, and determined by Holzinger as *T. uniflora*, in Cont. U. S. Nat. Herb. 3: 245. Although I have often collected *T. uniflora* in the woods of Pennsylvania, this Idaho plant, when seen growing, was not for a moment considered identical with it.

UNIVERSITY OF MINNESOTA, MINNEAPOLIS, MINN.

Botanical Notes.

The Botanical Society of America.—The third annual meeting of the Society will be held in Toronto on Tuesday and Wednesday, August 17th and 18, 1897, under the presidency of Dr. John M. Coulter. The Council will meet at 1 p. m. on Tuesday and the first session of the Society will begin at 3 p. m. The address of the retiring president, Dr. Charles E. Bessey, will be given on Tuesday evening at 8 o'clock. The British Association for the Advancement of Science will meet in Toronto August 18th to 25th. The opening address is to be given on Wednesnay evening, August 18th.

A new Botanical Serial.—The Royal Botanical Garden of Palermo, has just issued the first number of its new Bulletin under the title of Bolletino del R. Orta Botanico diPalermo. It is edited by Sig. Alberto Reber and is to be published every three months, the first number consisting of about 40 pages with a few illustrations in the text. A following number is to contain the Annals of the famous old garden from which the new Bulletin has also taken its title.

Mosses of the Southern States, issued by Dr. John K. Small. The first half century of this interesting set of mosses is ready for sale. The specimens have mostly been collected by Dr. Small, but he has also had the assistance of other collectors, such as Professor Wetherby in North Carolina. Dr. Small has made repeated visits to several interesting localities such as Toccoa, and Tallulah Falls, and Stone and Grandfather Mountains. The first half century includes the following rare or interesting species: *Hypnum nemorosum*, *H. Marylandicum*, *Entodon Drummondii*, *Thamnium Alleghaniense*, *Anomodon Toccoae*, *Fissidens Ravenelii* and *F. polypodioides*, *Clasmatodon parvulus*, *Syrrhopodon Floridanus* and *Campylopus Tallulensis.* There are two new species issued: *Rhynchostegium spinoserratum* closely allied to *R. serrulatum*, and *Dicranodontium innundatum* both newly discovered by Dr. Small. *Dicranodontium Millspaughii* is also distributed for the first time. The sets may be had at $5.00 for 50 species. E. G. B.

Fondation Müller-Argau, 1896. It is due to Ed. Tuckerman († the 15th of March 1886) that libraries accessible to all have been recognized as one of the actual requirements for the development of the special branches of botany, at all events for lichenology. This eminent lichenologist has left his lichenological library to Amherst College Library, Mass., U. S. A., with the condition that this library should be preserved and developed as a special department of this institution. This foundation is known under the name of "The Tuckerman Memorial Library." Every student of lichens who wishes to see his science progress will carry out the last wishes of Tuckerman.

It is satisfactory to hear that the example of Tuckerman has found an imitator. At the suggestion of a well known lichenologist, Dr. A. Minks, of Stettin, the directors of the Boissier Herbarium have instituted a *Hall Müller-Argau*, especially consecrated to the lichenological library and exsiccata, the basis of the works of Müller-Argau. By an ageeement signed January 6, 1886, the scientific collections of Müller-Argau have become at his death, January 25, 1896, the property of the Boissier Herbarium, under the name of FONDATION MUELLER-ARGAU.

In a purely scientific interest the directors of the Boissier Herbarium beg botanists to be so good as to send to the address below all lichenological publications which have appeared since the death of Müller or may appear hereafter. As papers reprinted for private circulation are and should be found in special libraries in series as complete as possible, the attention of authors is called to this point that they may forward their works to the library.

Another not less important desideratum is that creators of new lichen species, collectors of rare lichens, or of important materials for morphological and biological researches in the domain of lichens, be so good as to deposit specimens in the LICHENOTHECA UNIVERSALIS MUELLER-ARGAU, which contains already the complete herbarium of the Bernese F. Schaerer (1785–1853).

A special receipt will be sent for each gift, which will be annually recorded in the "Bulletin of the Boissier Herbarium."

We beg botanical societies and editors of botanical periodicals to kindly help towards the success of this new foundation by making it widely known.

EUGENE AUTRAN,
Curator of the Boissier Herbarium.

CHAMBESY NEAR GENEVA.
March 20, 1897.

Reviews.

Annual Report of the State Botanist of the State of New York. (48 Regent's Report.) Charles H. Peck. 4to. Pp. 241. Plates A, 1–43. 1896.

The familiar but unfortunately too rare report of the State Botanist appears this time under a new form and as a special separate in order to accommodate a part of Professor Peck's work on the Edible Mushrooms of New York. The body of the work contains the usual report of plants new to the State, including 11 new species of Fungi (pp. 11–17), followed by a descriptive synopsis of the New York species of *Carex*, by E. C. Howe (pp. 20–104). But the most important portion of the work is the account of "Edible and Poisonous Fungi of New York" (pp. 105–238, 42 plates). After some general discussion of the subject there follow detailed descriptions of 63 edible species and four that are poisonous or unwholesome. Each species is illustrated with a colored plate. The demand for the report has been so great that the limited edition was rapidly exhausted. It is to be issued, however, in the usual octavo form of the reports of the State Museum and can be purchased from the State Librarian at Albany.

Mr. Peck's accuracy of description is too well known to need any commendation here. The plates, while rendered by the process of reproduction in a rather stiff form and lack of artistic spirit, are recognizable and will readily serve as a guide to the objects they represent. The plates of the morels and *Fistulina* are probably the poorest of the series, but these are fortunately not likely to be confused with anything else. In the absence of any work of the kind obtainable at a low price—Gibson's artistic volume being beyond the means of many—the present work will prove a real help in aiding the rapidly growing number of mycophagists in recognizing the edible species of woods and fields, and introduce the subject to many citizens who ought to know something of the valuable food supply that every year goes to waste in prodigious quantity.

L. M. U.

Age of the Lower Coals of Henry County, Missouri. David White. Bull. Geol. Soc. Am. **8**: 287–304. Mr. 1897.

The correlation of these coals with those of other regions, is made by means of an examination of the fossil flora. The species determined number 123: Fungi, 2; Ferns, 70; Calamariae, 14; Sphenophyllae, 5; Lepidodendrae, 13; Sigillariae, 6; Taeniophylleae, 2; Gymnosperms, 10; doubtful, 1.

It is of interest to note that the one species of doubtful classification is *Palaeoxyris* which is placed under Animalia (?) A table of distribution is given for such species as occur in other American coal basins, also tables showing distribution of the same or closely related species in Great Britain and Franco-Belgium.

The conclusions from such comparisons are that the coals in question are about the horizon of the Lower Kittaning of the bituminous series of the Marcy (D) coal of the northern anthracite field of eastern North America, the middle and upper coal measures of Great Britain and the upper zone of the Valenciennes series, the Geislantern beds of the Saarbrück series of the Rhenish coal regions in the upper part of the Schatzlar series and in the Radnitz series of central Bohemia.

A. H.

An Illustrated Flora of the Northern United States, Canada and the British Possessions, from Newfoundland to the parallel of the southern boundary of Virginia, and from the Atlantic Ocean westward to the 102d meridian. By Nathaniel Lord Britton, Ph.D., Emeritus Professor of Botany in Columbia University and Director-in-Chief of the New York Botanical Garden, and Hon. Addison Brown, President of the Torrey Botanical Club. In three volumes. Volume II. Royal 8vo. Pp. 643. New York. Charles Scribner's Sons. 1897. Price per volume, $3.00.

The second volume of this admirable work, which has just been issued from the press, will be gladly welcomed by all those who have made the acquaintance of the first one. In accurate typography, as well as in the keys, descriptions and illustrative figures of the species, it is fully up to the high standard of its predecessor, so well and thoroughly reviewed by Dr. Rusby in the BULLETIN of September, 1896.

The families contained in it occur in the following order:

CHORIPETALAE (continued) 1 546

GAMOPETALAE 548–623

The two volumes now published afford satisfactory material for a fair judgment upon the claims of the Flora as a whole, and every student of the pteridophytes and anthophytes of the region covered by it cannot fail to admire its excellence and feel surprised at the large number of new species gleaned from fields already well explored. The promise is that its appearance will give a fresh and lasting impulse to the study of systematic botany not only within the geographical limits chosen, but in other portions of our country further south and west. Its moderate cost, in view of its great wealth of illustration, must bring it into general favor and use, even among those whose interest in the plant-world is not strictly or purely scientific; and the wide diffusion of such accurate knowledge is a thing of inestimable value.

The third volume, now in the printer's hands, will be issued at an early day, perhaps before the year closes, and will end with the *Compositae*, the family to which the highest place in the vegetable creation has been assigned.

THOS. C. PORTER.

Proceedings of the Club.

TUESDAY EVENING, May 11, 1897.

In the absence of officers, Dr. N. L. Britton was called to the chair. There were 13 persons present.

Three new members were elected: Robert P. Leslie, George H. Payne, Miss Harriet M. Denison.

The Chairman of the Field Committee, Dr. John K. Small, reported three excursions held as announced well attended and productive of much interest.

The Club adopted the following resolutions presented by Dr. H. M. Richards, in memory of Dr. Gregory, the late honored professor of botany at Barnard College.

" WHEREAS, our esteemed fellow member Miss Emily L. Gregory is lost to us by death, therefore, it is

"*Resolved*, That in realization of our loss we express our deep sorrow for this sad event, at this untimely period when she was just about to enter upon a new era in her career as a teacher, to which we all, with her, had looked forward with happiest anticipations, and

"*Resolved,* That we have lost in her an accomplished scientist, a devoted teacher, a warm-hearted, generous friend, and

"*Resolved,* That a copy of these resolutions be presented to her surviving relatives to whom we extend our sincerest sympathy."

Dr. Britton anuounced that Mrs. Britton had prepared an obituary notice of Miss Gregory, with the aid of relatives and of Dr. Richards; to be accompanied by an artotype for publication in the BULLETIN.

Prof. Underwood announced that an excellent portrait of Dr. Gregory had been presented by friends to the Department of Botany at Barnard and to that at Columbia.

Prof. Underwood also announced the recent gift by President Low to Columbia University of a valuable series of 50 water-color plates prepared by the late lamented William Hamilton Gibson, for illustration of his work on mushrooms. It is the intention to frame them and place them on the walls of the new laboratory where they will be prized for their unusual combination of artistic excellence with scientific accuracy.

Prof. Britton made a report relative to the progress of the Botanical Garden. A beginning is made in planting the systematic herbaceous garden. Eight acres are set aside for this with the families grouped in beds; the intention is to get as many of each genus together as will grow in this climate in the open. Several hundred species are already in place, and quite a display is already produced by the beds of the Ranunculaceae, Compositae, Iridaceae and Cruciferae. Seeds of some 3,000 different species are now planted in the nurseries, including 2,240 species generously sent from Kew.

The paper of the evening was by Mr. Marshall A. Howe, entitled, "A preliminary Comparison of the Hepatic Flora of California with that of Europe and of the eastern United States."

Mr. Howe alluded to the distribution of *Cephalozia Turneri,* a rare hepatic of Europe, frequent in the coast ranges of California, and occurring in limited numbers in a few localities in Ireland, England, France and the Mediterranean region.

Mr. Howe presented the following table exhibiting the comparative distribution so far as yet known:

	Cal.	Gray Manual Region.
Total No. of Species	77	145
In common with the British Isles	34 or 44 %	78 or 54%
In Central and Northern Europe	40 or 52 %	91 or 63%
In Mediterranean Region	45 or 58½%	78 or 54%
Peculiar to Pacific Coast	26 or 34 %	
In common with the Gray Man. Reg.	37 or 48 %	
Peculiar to Gray Manual Region		40 or 28%
In common with California		32 or 22%

It will be seen that the hepatic flora of California has more in common with that of northern and central Europe than with the eastern United States, and is still more allied to that of the Mediterranean region. In particular species of *Asterella* and *Riccia* are better developed in California and southern Europe than in the eastern United States.

The apparent absence in California of *Bazzania* and *Mylia* which are especially characteristic of medial and boreal regions, serves to heighten the similarity to southern Europe.

The paper was followed by exhibit of photomicrographs of sections of *Cryptomitrium*, illustrating the development of the archegonia.

Discussion by Prof. Underwood, Prof. Britton and others followed. Prof. Underwood, in answer to inquiry as to the region where the Hepaticae are most abundant, suggested the Amazon region and the eastern slope of the Andes, also Java. Insular tropical regions have furnished many where examined, as Cuba and Jamaica. Quite a number are peculiar to Australia. New Zealand is well supplied with them. Many have been recently collected in Africa, and have been described by Herr Stephani of Leipsic, whose industry has doubled the number of described Hepaticae. As a whole the maximum development of the Hepaticae is tropical, though some genera and certain groups within genera are wholly high-temperate or subarctic.

Prof. Britton remarking the indications of circumboreal and circumtropical distribution of certain species, referred to the argument for an equatorial distribution of flowering plants and of ferns, and queried if there were anything corresponding among Hepaticae.

Prof. Underwood referred to the influence of the Gulf Stream in permitting the occurrence of the subtropical genus *Lejeunia* on the coast of Ireland, a genus not elsewhere found in Europe. Comparing the Hepaticae of Florida, they are only in part known; a few species are in common with the Appalachian flora; most of the Florida hepatica are close-creeping forms found on bark, as *Frullania* and *Lejeunia*, having water sacs on their leaves as aids in resisting drought. Some tropical Marchantiaceae occur in Florida, and also, especially, species of *Riccia* and *Anthoceros*. *Thallocarpus* is known only from Florida and South Carolina.

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BULLETIN

OF THE

TORREY BOTANICAL CLUB.

Vol. 24. Lancaster, Pa., July 29, 1897. No. 7.

A new fossil Monocotyledon from the Yellow Gravel at Bridgeton, N. J.*

By Arthur Hollick.

(Plates 311–313.)

Anomalophyllites Bridgetonensis n. sp.

Leaf remains consisting of linear, or sub-linear, or broad, parallel-margined fragments, varying from two and one-half inches to three-fourths inch in width; the broader fragments gently wavy longitudinally and occasionally with a narrow, flattened area, parallel with one of the margins; the narrower fragments often longitudinally plicated or folded. Median nerves generally well defined in the broader fragments, less so, or absent in the narrower ones, occasionally with a well-defined parallel nerve on each side, or buried between the central folds. Surface smooth or obscurely striated longitudinally. Petioles two inches or more in width, rounded (semicircular?) in outline, finely striate longitudinally.

Formation and locality: Tertiary (Miocene?), Bridgeton, N. J.

The fragments figured on the accompanying plates have been selected from a large number collected, which undoubtedly represent the remains of a monocotyledon, almost certainly belonging to the palms.

The first specimens, found many years ago, were of medium size

* Other references to the locality or to the fossil may be found in the following contributions:

1. Palaeobotany of the Yellow Gravel at Bridgeton, N. J. Bull. Torrey Bot. Club, 19: 330. 1892.

2. New Species of Leguminous Pods from the Yellow Gravel at Bridgeton, N. J. *l. c.*, 23: 46. 1896.

3. A New fossil Grass from Staten Island. *l. c.*, 24: 122. 1897.

and were thought by Dr. N. L. Britton to be portions of grass leaves, allied to or identical with *Zizania*.* Some of these are depicted in figs. 1, 2 and 3, plate 313.

A yet smaller fragment, represented by fig. 6, plate 311, was submitted to Prof. Leo Lesquereux, who identified it as "*Cyperites*, spec?" †

Material subsequently collected by the late Dr. J. I. Northrop, by the Geological Survey of New Jersey and by me personally indicates that the fragments are not parts of single blade-like leaves, but dismembered portions of palmate leaves, like those of a fan palm, connected toward the petiole and separated into free divisions toward the margin.

Basal portions I consider to be represented by figs. 2–5, pl. 313, which are narrow and strongly plicated or folded; median portions by figs. 1–4, pl. 312, and figs. 1, 6 and 7, pl. 313. In figures 1 and 6 of the latter plate the place of separation of the free divisions is indicated at the summits. Portions of the free divisions are apparently represented by figs. 1–3, pl. 311, and portions of the petioles by figs. 4 and 5, pl. 311. Leaves of *Ulmus plurinervia* Ung. and *Quercus Klipsteinii* Etts., included respectively in figs. 1 and 5, pl. 311, have no special significance, except as an indication of the accompanying vegetation, which, it is hoped, will be described in full at some future time. The almost total absence of surface striations I believe may be accounted for by the character of the medium in which the fragments are preserved—a rather coarse, friable sandstone.

Upon examining the literature of tertiary palaeobotany many fragments similar to ours may be found described and figured by Gaudin, Heer, Watelet and others, under the genera *Cyperites*,‡ *Flabellaria*,§ *Phoenicites*,‖ *Anomalophyllites*,¶ etc.—the first one supposed to represent the sedges, the others palms.

* Proc. Am. Assn. Adv. Sci. 31: 359 (1882); Trans. N. Y. Acad. Sci. 4: 31 (1884–85).

† Proc. U. S. Natl. Mus. 10: 36 (1887). Museum no. 2314.

‡ *Cyperites Montalionis* Gaud. Mem. Gisem. Feuill. Foss. Toscane, 1: 29. *pl. 11, fig. 7*; *C. multinervosus* Heer, Fl. Tert. Helvet, 1: 76. *pl. 28, fig. 6.*

§ *Flabellaria* (indéterminés) Wat. Plant. Foss. Bass. Paris, 97. *pl. 27, figs. 6, 7.*

‖ *Phoenicites eocenica, l. c.*, 98. *pl. 27, figs. 1–5.*

¶ *Anomalophyllites tricarinatus, l. c.*, 100. *pl. 28, figs. 1–5*; *A. dubius, l. c. figs. 6–8.*

As I consider the Bridgeton specimens to almost certainly belong in the latter family, but without any characters by which they can be identified positively with any living genus, I have thought it advisable to include them under *Anomalophyllites*, with a specific name to indicate the locality where they were found.

The abundance of these remains is evidence that the plant to which they belonged was an important element in the flora of the region and of that of the geological age in which they flourished, and considerably extends our knowledge of the geographical range of palms in the past.

Explanation of Plates.

PLATE 311.

Figs. 1–3.—*Anomalophyllites Bridgetonensis* Hollick. Fragments of free divisions; fig. 1 including leaf cf *Ulmus plurinervia* Ung.

Figs. 4 and 5.—Fragments of petioles; fig. 5 including leaf of *Quercus Klipsteinii* Etts.

Fig. 6.—Fragment of a free division. ("*Cyperites*, spec?" Lesq.)

PLATE 312.

Figs. 1–4.—*Anomalophyllites Bridgetonensis* Hollick. Fragments of median portion of leaf.

PLATE 313.

Figs. 1, 6 and 7.—*Anomalophyllites Bridgetonensis* Hollick. Fragments of median portion of leaf; figs. 1 and 6 showing indications of separation into free divisions at summits.

Figs. 2, 3–5.—Fragments of basal portion of leaf, showing folds.

Studies in the Botany of the southeastern United States.—XI.

BY JOHN K. SMALL.

I. NOTEWORTHY SPECIES.

SAGITTARIA FILIFORMIS J. G. Smith, Rep. Mo. Bot. Gard. 6: 46. *pl. 15.* 1894.

Mr. A. H. Curtiss has sent me fine fruiting specimens of this rare species, collected near Jacksonville, Florida. They are apparently the first specimens found with mature achenes; these are of the same general outline as the immature achenes figured by Mr. Smith, but slightly broader. In the center of each face there is an oblong swelling surrounded by a depression, while the edges are crested. The lengths of numerous achenes vary from 1.5–2 mm.

ARENARIA BREVIFOLIA Nutt.; T. & G. Fl. N.A. 1: 180. 1838.

I have long suspected the occurrence of this, the rarest of our eastern American *Arenarias*, in North Carolina. In 1890 Mr. Heller collected fragmentary and imperfect specimens of an *Arenaria* in Rowan County. Some years later I found similar specimens on Dunn's Mountain, near Salisbury. During the spring of 1896 I had an opportunity to visit Dunn's Mountain and found the species in full bloom just as it occurs on Stone Mountain, Georgia; the plants from the two mountains are almost identical.

RHEXIA MARIANA L. Sp. Pl. 346. 1753.

As far as I have observed, *Rhexia Mariana* prefers sandy places at no great distance from the Atlantic and Gulf coasts, although it does occur at many points in the middle districts of the Southern States, and is said to extend up the Mississippi Valley to Missouri. The first altitude worthy of note at which I found the species was at about 300 meters on Stone Mountain, Georgia. The following year, 1895, I collected a few specimens of a delicate form, apparently referable to this species, on the mountains near Ellijay, Gilmer County, Georgia, at an altitude of about 400 meters. The leaves of this form are thin, oval, ovate or elliptic and short-petioled. Much to my surprise, on reaching the summit of Table Mountain, South Carolina, last summer, I found the typical state of the plant thriving at an altitude of almost 1000 meters.

SABBATIA CAMPANULATA (L.) Britton, Mem. Torr. Club, 5: 259. 1894.

Dr. Gray has recorded * the mountains of Georgia as an extension of the range of this normally coast plant. I do not know to how great an altitude the species ranges in Georgia, but I have collected it at an elevation of nearly 1000 meters on the summit of Table Mountain, South Carolina, and the only noticeable difference between the mountain specimens and those from the low-

* Syn, Fl. 2: Part 1, 115.

lands is the proportionate breadth of the leaves, these being wider in the plants from the higher altitudes.

PHACELIA HIRSUTA Nutt. Trans. Am. Phil. Soc. (II.) **5**: 191. 1833–37.

Although classed as an annual, this *Phacelia* appears to be a biennial. Mr. Nuttall, in the original description, says "annual or perhaps also biennial." On Stone Mountain, Georgia, the species flowers in the spring, the plants soon die and disappear on account of the extreme heat, the seeds falling to the ground at once germinate, producing tufts of spatulate, oblong-spatulate or obovate, short-petioled, sharply serrate leaves which are not in the least pinnatifid, as are those of the following season.

VITEX AGNUS-CASTUS L. Sp. Pl. 637. 1753.

This shrub is fast becoming naturalized in the Southern States. Miss K. S. Taylor found it about Columbia, South Carolina, in 1891, and I collected it in 1895 at both Darien and near Fort Barrington, in southeastern Georgia.

CESTRUM PARQUI L'Her. Stirp. Nov. 73. 1783–84.

We have no record of the occurrence of this species on our eastern sea-board, but it is now doubtless established at many places in the Southern States. In 1895 I found quantities in and about Darien, Georgia.

LEONOTIS NEPETAEFOLIA Ait. Hort. Kew. Ed. 2, **3**: 409. 1811.

Dr. Chapman reports this introduced plant from Georgia and Florida. We now have excellent specimens collected by Prof. Underwood at Auburn, Lee County, Alabama.

FILAGO NIVEA.

Evax multicaulis DC. Prodr. **5**: 459. 1836. Not *Filago multicaulis* Lam. 1778.

This is one of the Compositae belonging west of the Mississippi River that has been traveling gradually eastward; in 1895 I found it very plentiful about Stone Mountain, Georgia.

II. New Species.

Listera reniformis.

Perennial, fleshy, deep green. Stem erect, 1–3 dm. tall, slender glabrous or nearly so below, densely glandular-pubescent above, simple; leaves 2, opposite, about the middle of the stem, reniform or ovate-reniform, 1–3 cm. in diameter, apiculate or short acuminate, glabrous above, more or less pubescent beneath, cordate or subcordate, sessile; racemes 2–10 cm. long; flowers greenish; bracts lanceolate or ovate-lanceolate, 3–5 mm. long, acute; pedicels slender, 4–7 mm. long, glabrate, or much less pubescent than the stem; sepals oblong or linear oblong, about 3 mm. long, obtuse or acutish, reflexed; lip wedge-shaped, 6–7 mm. long, with 2 prominent teeth on both sides near the base, sharply cleft to near the middle, the lobes rounded; capsules oval, 4–5 mm. long; mature seeds not seen.

Damp thickets on the mountains of Maryland, Virginia and North Carolina, ranging from about 1000 to 1750 meters altitude. Spring and summer.

It seems strange that this well marked species should have been so long associated with the northern *Listera convallarioides* It is confined to the higher parts of the southern Alleghany mountains, while *Listera convallarioides* appears to have a northern transcontinental range suggesting that of *Polygonum Douglasii.* *Listera reniformis* differs from its northern relative in its more slender habit, the reniform type of the leaves, which are apiculate or short-acuminate at the apex and cordate or subcordate at the base, and the lip, which is sharply cleft, often nearly to the middle, by a V-shaped sinus. The leaf of *Listera convallarioides* is oval and obtuse at both ends, while the lip is cut by a U-shaped sinus.

Asarum callifolium.

Perennial, deep green, nearly glabrous. Leaves tufted, long-petioled, the blades ovate, 5–9 cm. long, obtuse or sometimes acutish, finely undulate or crenulate, rarely mottled, deeply cordate at the base; petioles 2–3 times longer than the blades, sparingly pubescent; bracts reniform, ciliate; pedicels as long as the calyx, or much shorter; calyx urn-shaped, 1.5–2.5 cm. long, dark green without, dark purple within, the segments broadly ovate or broader than high, the throat slightly contracted; stigmas 2-cleft, capsule not seen.

In shady woods, Florida. (Chapman.)

This is probably the *Asarum arifolium* of Dr. Chapman's Flora, but not the plant of Michaux, specimens of which I have never seen from further south than Georgia. It differs from *Asarum arifolium* in both foliage and infloresence. The leaf-blades are simply ovate, and lack the halberd-shape so characteristic of those of the Michauxian plant, and the margin instead of being entire is finely undulate or crenulate. The pedicels are always short, never elongating like those of *A. arifolium*, while the perianths of the two species are entirely dissimilar in shape; that of *Asarum callifolium* being larger, much shorter in proportion to the length and with a rounder base.

ARISTOLOCHIA CONVOLVULACEA.

Perennial, slender, bristly-pubescent throughout. Stems erect or decumbent, 1–3 dm. long, angled, slightly flexuous, simple, or rarely branched below; leaves thinnish, becoming firm at maturity, broadly ovate to oval, 2–8 cm. long, short-acuminate or rarely acute, ciliate, deeply cordate at the base, short-petioled; petioles .5–1.5 cm. long, hirsute; peduncles slender, 1–2-flowered, flexuous, angled; calyx densely hirsute, the tube .5–1 cm. long, the limb 6–8 mm. broad, scarcely lobed; capsule subglobose, 6–7 mm. in diameter, pubescent.

In woods, " . . . Columbus, Georgia. Grows from Athens to near this place" (Boykin).

Dr. Boykin noticed the differences between *Aristolochia Serpentaria* and the one here described as new, many years ago. Besides observing the plant in the field, he cultivated it in his garden, and sent both native and cultivated specimens to Dr. Torrey in whose herbarium they are preserved.

Aristolochia convolvulacea can readily be distinguished from *A. Serpentaria* by either the pubescence or the foliage. In place of the soft pilose hairs characteristic of *Aristolochia Serpentaria*, we find a bristly-hirsute pubescence on all parts of the plant. The leaves are much broader in proportion to their length than those of its relative, resembling closely those of some Convolvulaceae, whence the name.

PARONYCHIA SCOPARIA.

Perennial, rather slender, the foliage minutely pubescent. Stem much branched at the base, the branches tufted, erect or ascending, 2–3 dm. tall, simple below, sparingly forked above, roughish; leaves linear-filiform, 1–3 cm. long, acute, grooved on either side of the midrib, serrulate-ciliate, especially near the apex, sessile; stipules linear-lanceolate, 1–1.5 cm. long, attenuate; branches of the cymes erect or strongly ascending; sepals linear-lanceolate, gradually narrowed to the apex, 3–3.5 mm. long, firm, keeled, usually with a short lateral nerve on each side of the keel, hooded, prolonged into a stout ascending cusp, which is one-third to one-fourth as long as the body; petals none; stamens half as long as the sepals; anthers yellowish.

The specimens on which the above species is founded were collected by Dr. Edward Palmer, in the Indian Territory, between Fort Cobb and Fort Arbuckle, in 1868. (No. 27.)

As far as I know, *Paronychia scoparia* has not been referred to any previously described species. It is related to *P. dichotoma*, differing in the more robust habit, the minutely pubescent foliage and the strict few-flowered cymes. *Paronychia scoparia* has a larger calyx than *P. dichotoma*, the cusps are longer and more densely spiny-ciliate, and the calyx-segments are more strongly ribbed on the back.

Paronychia chorizanthoides.

Annual, slender, minutely pubescent. Stem erect, 1–2 dm. tall, forking from a point 3–8 cm. above the base; leaves linear-filiform, .8–2 cm. long, acute, with a stout midrib, sessile; stipules lanceolate, silvery, acuminate; calyx short-pedicelled, or nearly sessile, 1.5 mm. long, strigose at the base, finally urn-shaped, the base much enlarged; sepals ovate or ovate-lanceolate, with a stout midrib, abruptly contracted into the ascending cusps which are about one-half as long as the body at maturity; utricle nearly 1 mm. broad.

The specimens on which the species here described as new is founded were collected by Dr. Edward Palmer at Bluffton, Burnet County, Texas, 50 miles west of Georgetown, October 10–15, 1879, according to printed ticket, or 1883, no. 1169, according to written label. Heretofore specimens of this collection have been referred to *Paronychia setacea*, which species, however, they but slightly resemble. *Paronychia chorizanthoides*, as the name suggests, bears a remarkable resemblance to some species of *Chorizanthe*, chiefly on account of the involucre-like calices. In *Paronychia chorizanthoides* the bracts subtending the calyx are shorter than that organ, while in *P. setacea* they are longer. The calyx of the new species is sharply diagnostic, being urn-shaped with a much enlarged base, the calyx of *P. setacea* being turbinate and narrowed at the base. The cusps terminating the sepals are much stouter and only about one-half as long as the very slender cusps of *P. setacea.* Mr. Heller's number 1729, distributed as *P. setacea*, is *Paronychia chorizanthoides*, but, being quite young, it has not yet assumed the characteristic habit that Dr. Palmer's specimens exhibit.

Siphonychia corymbosa.

Perennial, stoutish, the foliage pubescent with recurved hairs. Stem branched at the base, the branches tufted, 1–3 dm. tall, erect or ascending, olive-green or brownish, forking, especially above, ribbed, topped by the corymbosely disposed cymes; leaves oblanceolate to oblong-oblanceolate, .5–1.5 cm. long, acutish, ciliate, sessile; stipules ovate, silvery, long-acuminate; inflorescence silvery; calyx 2–2.2 mm. long, pubescent at the base, the segments oblong or ovate-oblong, white, longer than the tube, obtuse, concave, slightly hooded at the apex; stamens included; style exserted; utricle ovoid, 1 mm. long.

The original specimens were collected by Professor L. M. Underwood on Ship Island, on the coast of Mississippi, in June, 1896.

Siphonychia corymbosa is most closely allied to *Siphonychia erecta*, which it simulates in habit. The characteristic difference in appearance between the two species is in the foliage, that of *S. erecta* being glaucous, while that of the new species is clothed with a pubescence consisting of short recurved hairs; the inflorescence of *Siphonychia corymbosa* is more lax; the calyx furnishes good distinctive characters: that of the new species is shorter and stouter, the segments oblong, with converging tips, instead of lanceolate, with erect tips, as in that of *S. erecta.*

Clematis glaucophylla.

Perennial, bright green, glabrous. Stem rather slender, 2–5 meters long, climbing over bushes or trees, nearly simple, dark red, furrowed, much enlarged at the nodes; leaves ovate, 3–10 cm. long, thickish, acute, often apiculate or acuminate, entire, 3-lobed or trifoliolate, with conspicuous white nerves above, prominently nerved and glaucous beneath, cordate or subcordate; floral leaves with petioles 1 cm. long, the nerves gradually diverging from the midrib; flowers reddish purple, glossy, 2–2.5 cm. long; calyx conic-ovoid; sepals lanceolate, acuminate, the tips very slightly spreading; achenes suborbicular, 6–8 mm. in diameter, puberulent, abruptly narrowed at both ends, with an orbicular impression in the middle, sometimes slightly inequilateral, the plumose style erect or slightly oblique, 5–6 cm. long, tawny, lustrous, the hairs spreading.

Collected by the writer in the Yellow River valley, near McGuire's Mill, Gwinnett county, Georgia. In flower July 2, 1895, in fruit July 11, 1893.

A handsome species between *Clematis Addisonii* and *C. Viorna*, with foliage somewhat resembling that of the former and with the habit of the latter. It differs from *C. Addisonii* in its much elongated and climbing stem, and the distinctly petioled and acute floral leaves. It may readily be distinguished from *C. Viorna* by its suborbicular achene and longer plumose styles, as well as by the foliage.

LOBELIA FLACCIDIFOLIA.

Perennial, slender, deep green, glabrous or nearly so. Stems erect, 2–6 dm. tall, solitary, or loosely tufted, usually branched above, or, in small plants, rarely simple, the branches wire-like; leaves thin, the basal or lower cauline obovate or oblong-spatulate, the rest linear-oblong or rarely linear-lanceolate, 3–10 cm. long, obtuse, undulate or crenate-undulate, short-petioled; racemes interrupted, .5–2 dm. long, recurved; pedicels erect, slightly curved, 4–5 mm. long, usually exceeded by their bracts; calyx glabrous, its tube broadly turbinate, becoming globose-hemispheric and strongly ribbed, its segments linear-lanceolate, 4–5 mm. long, acute, spiny-toothed, auricled at the base, slightly revolute; corolla about 1.5 cm. long, blue, sparingly pubescent without, the segments of the upper lip reflexed, crisped, about ½ as long as the tube, the lower lip as long as the tube, its segments acute, the middle one lanceolate, the lateral ones oblong-lanceolate; staminal tube ascending, anthers pubescent; capsule ovoid, 5–8 mm. long, beaked, the free portion somewhat shorter than the part adnate to the calyx-tube.

In sand in deep river swamps, southern Georgia. Summer.

The species here described as new is, on the whole, most closely related to *Lobelia Ludoviciana*, from which it differs in the delicate habit, the very thin texture of the leaves and the branching stems; there are characters in the flower to separate it from the Louisiana plant in the narrower calyx-segments and narrower segments of the lips of the corolla.

The original specimens were collected by the writer in the Ochlockonee River swamp, near Thomasville, Georgia, July 12–22, 1895.

ASTER CAMPTOSORUS.

Perennial, slender. Stems erect, 4–6 dm. tall, finely ridged, slightly flexuous, green or purplish green, simple or nearly so, glabrous, or very sparingly pubescent near the top; leaves few, the blades lanceolate, 6–15 cm. long, resembling the leaves of *Camptosorus rhizophyllus*, attenuate from near the base to the finely acute apex, entire, undulate, sometimes crisped, dark green, smo th and lustrous above, paler and hispid beneath with a scattered pubescence, the lower ones deeply cordate at the rounded ear-like base, the upper ones subcordate or truncate, petioled; petioles slender, villous, the lower ones nearly as long as the blades, the upper about $\frac{1}{5}$ as long as the blades; heads usually few; pedicels angled, bearing minute appressed bracts, scabrous with short, stiff, spine-like hairs; involucres cylindric-campanulate, constricted at the middle (or turbinate in the dry state), 5 mm. high, the bracts linear-subulate, in 4 or 5 series, incurved, with a narrow green midrib and green acute tip; corolla about 6 mm. long; stamens and style glabrous; rays purple, linear-oblancelate, 1 cm. long, slightly 3-toothed at the apex.

In open woods, in and near the mountains, Georgia and Alabama. September to October.

A very curious and handsome species on account of the close resemblance of its leaves to those of *Camptosorus rhizophyllus*. Compared with its nearest relative, *Aster Shortii*, the new species is more slender and, in addition to the *Camptosorus*-like leaves, and the characteristic gradual attenuation from the base to the apex, these organs are smooth, dark green and lustrous above. The involucre of *Aster Shortii* is campanulate, whereas that of *Aster Camptosorus* is cylindric-campanulate and constricted at the middle; the bracts in the new species are rigid, linear-subulate and incurved, while those of *Aster Shortii* are rather thin, hardly rigid and simply linear.

Fine specimens were sent to me by Prof. Carl F. Baker from Wright's Mill, five miles south of Auburn, Alabama. They were collected on October 17, 1896. In addition to these I find an old sheet in the Columbia University Herbarium on which are two specimens collected in the mountains of Georgia by Mr. Buckley.

Cryptogams collected near Jackman, Maine, August, 1895.

By F. L. Harvey and O. W. Knight.

In August, 1895, we spent a few days near Jackman, Maine, where the Canadian Pacific crosses the boundary of Maine, and collected the following cryptogams which may be interesting for locality. A few species collected at other points on the route are included. So far as we know, this region of the state has not been much explored.

Hymenomycetes.

Clitocybe phyllophila Fr. Greenville.
Pleurotus ostreatus (Jacq.) Fr. Jackman.
Hygrophorus parvulus Pk. Greenville. New to Maine.
Russula atropurpurea Pk. Greenville. New to Maine.
Panus stipticus (Bull.) Fr. Jackman.
Trogia crispa (Pers.) Fr. Jackman.
Lenzites sepiaria Fr. Jackman, Greenville and Pamedomcook.
Schizophyllum commune Fr. Decaying wood. Jackman.
Polyporus brumalis (Pers.) Fr. Jackman.
Polyporus simillimus Pk. Jackman. New to Maine.
Polyporus betulinus Fr. Jackman.
Fomes pinicola Fr. Jackman.
Fomes applanatus (Pers.) Wollr. Jackman.
Fomes fomentarius (L.) Fr. Jackman.
Fomes carneus Nees. Jackman.
Polystictus perennis (L.) Fr. Jackman.
Polystictus pergamenus Fr. for. *pseudopergamenus* Thum.
P. cinnabarinus (Jacq.) Fr. Jackman.
P. versicolor (L.) Fr. Jackman.
P. abietinus Fr. Jackman.
Poria attenuata Pk. Jackman.
Trametes mollis Fr. Greenville. New to Maine.
Solenia fasciculata Pers. Greenville.
Tremellodon gelatinosum (Scop.) Pers. Jackman.

Clavarieae.

Clavaria aurea Schaeff. Jackman.

C. gracilis Pers. Greenville. New to Maine.
C. inequalis Mull. Greenville.
Calcocera carnea Fr. Jackman.

TREMELLINEAE.

Hirneola Auricula-Judae Berk. Jackman.

THELEPHOREAE.

Plicatura Alni Pk. Jackman.

GASTEROMYCETES.

Lycoperdon eubincornatum Pk. Greenville.
L. gemmatum Batsch. Greenville.
L. molle Pers. Jackman.
Bovista pila. Jackman.

UREDINEAE.

Uredo iridicola DC. On Iris. Jackman.
Puccinia asteris Duby. Jackman.

LICHENES.

Cetraria Jumperina Pinastri Ach. On coniferous trees and rail fences.

C. ciliaris Ach. Rail fenches.
Usnea barbata plicata Fr. Spruce trees.
U. longissima Ach. On spruce trees.
Alectoria jubata colybeiformis Ach. Common.
Parmelia plycodes (L.) Ach. On trees.
Physcia hypoleuca (Muhl.) Tuck. On trees.
Pyxine sorediata Fr. Specimens which Miss Cummings thinks are this.
Sticta amplissima (Scop.) Mass. Rocks and trees.
S. pulmonaria (L.) Ach. On trees.
Nephroma arcticum (L.) Fr. On rock. Sandy Bay Mt.
Peltigera polydactyla Hoffm.
Stereocaulon paschale (L.) Fr. Ground.
Cladonia pyxidata (L.) Fr. Rotton wood and earth.
C. fimbriata tubaeformis Fr. Ground.
C. gracilis verticillata Fr. Ground.
C. gracilis hybrida Schaer. Ground.
C. gracilis elongata Fr. Ground.

C. squammosa Hoffm. Ground.

C. furcata crispata Fr. Ground.

C. furcata racemosa Fl. In moss on rocks. Tumble-down-Dick stream, head of Pamedomcook L.

C. rangiferina (L.) Hoffm.

C. rangiferina sylvatica L.

C. amaurocrea (Fl.) Schaer.

Buellia parasema (Ach.) Th. Fr.

Graphis scripta (L.) Ach.

Pyrenomycetes.

Microsphaera Vaccinii (Schw.) C. & P. Jackman (Harvey). On *V. corymbosum atrococcum* Gray.

Hypoxylon coccineum Bull. On beech. Greenville.

H. Morsei B. & C. Jackman.

Helvellaceae.

Physalacria inflata Pk. = (*Mitrula inflata* Schw.) Greenville, Aug. New to Maine.

Helotium citrinum (Hedw.) Fr. Rotten logs. Jackman.

Helotium aeruginosum. Jackman.

Dasyscypha Agassii (B. & C.) Sacc. On dead birch twigs. Jackman.

Embolus ochreatus Sacc. Jackman. New to Maine.

Calicium tigillare Sacc. Jackman. New to Maine.

Hyphomycetes.

Heydenia, n. sp. Peck, MSS. On *Polyporus abietinus*. Jackman, Aug., 1895. F. L. Harvey.

Protophyta.

Myxomycetes.

Fuligo septica (Link.) Geml. On moss and rotten logs. Head of Pamedomcook. Late Oct.

Tilmadoche nutans (Pers.) Rostaf. Jackman, Aug.

Tubulina cylindrica (Bull.) DeC. Rotten logs. Jackman.

Arcyria nutans (Bull.) Grev. Greenville.

Lycogala epidendrum Buxb. Decaying stumps and logs. Jackman.

Trichia subfusca Rex. Jackman. This is new to Maine.

Some rare Washington Plants.

By K. M. Wiegand.

The writer has recently had the opportunity of studying a set of several hundred Washington plants collected by Mr. J. B. Flett during the summer of 1895 and 1896. These were all either from the vicinity of Tacoma or from Mt. Rainier, and although many of them are common, some are rather rare or otherwise interesting on account of their distribution. It seemed important therefore to publish the subjoined list, which includes thirty-three of the more interesting species together with the localities furnished by Mr. Flett.

Batrachium aquatile (L.) Dumort. (With floating leaves) ponds Tacoma.

Thlaspi alpestre L. Grassy slopes, Mt. Rainier, alt. 6000 ft.

Cardamine bellidifolia L. Mt. Rainier.

Cardamine Breweri Wats. Wet places, Tacoma. Two forms, one very weak, leaves thin and flaccid; the other more strict, leaves thicker and more purplish.

Draba aureola Wats. Rocky ridges, Mt. Rainier, alt. 10,500 ft. (see Piper, Bot. Gaz. **22**: 488, 1896).

Arenaria propinqua Rich. Crevasses of rocks, Mt. Rainier.

Arenaria tenella Nutt. Prairies, Tacoma.

Arenaria paludicola Rob. Bogs, Tacoma. (See Piper, Bot. Gaz. l. c.)

Silene acaulis L. Mt. Rainier.

Cerastium alpinum L. Mt. Rainier.

Geranium pusillum L. Prairies and Streets, Tacoma.

Saxifraga Notkana Moc. Swamps, Tacoma.

Oenanthe sarmentosa Nutt. Swamps, Tacoma.

Ligusticum Grayi C. & R. Grassy places, Mt. Rainier, alt. 5000 ft.

Berula erecta (Huds.) Coville. Swamps, Tacoma.

Solidago Canadensis L. Moist rich ground, Tacoma.

Grindelia Oregana Gray. At tide-water on sandy sea-shores.

Apargidium boreale T. & G. Mt. Rainier.

Hemizonia pungens T. & G. Dry waste ground, Tacoma: probably introduced.

Cotula coronopifolia L. Salt marshes on the sea-coast, introduced.

Hypochaeris glabra L. Prairies, Tacoma, introduced.

Luina hypoleuca Benth. Mt. Rainier among talus at 5500 ft. alt.

Aplopappus Brandegei Gray. Loose rock and sand, Mt. Rainier, alt. 8000 ft.

Cassiope Stelleriana DC. Mt. Rainier, alt. 5000 ft.

Newberrya congesta Torr. Dry hills in partial shade, Tacoma.

Gilia Nuttallii Gray. Grassy places, Mt. Rainier, alt. 5000 ft.

Gilia Larseni Gray. Rock piles, Mt. Rainier, alt. 7000–8000 ft.

Romanzoffia Sitchensis Bong. Above snow line, Mt. Rainier.

Pinguicula vulgaris L. Mt. Rainier alt. 3000 ft.

Polygonum Newberryi Small. Immediately above timber line, Mt. Rainier, alt. 6000 ft.

Stenanthium occidentale Gray. On rocks above the snow-line, Mt. Rainier.

Poa Lettermani Vasey. Loose sand and stones, Mt. Rainier, alt. 10000 ft.

CORNELL UNIVERSITY.

New or noteworthy American Grasses.—VII.

BY GEORGE V. NASH.

ERIANTHUS LAXUS n. sp.

Culms erect, stoutish, 2–3 metres tall, pubescent with appressed hairs, toward the base scanty and short, at the apex longer and copious. Nodes densely pubescent with appressed grayish hairs; sheaths striate, the inner surface spotted and tinged with red-brown, the outer surface densely hirsute with ascending gray hairs, the lower sheaths throughout, the upper ones only at the base and apex, with the intermediate portion but sparingly pubescent; ligule 3–4 mm. long, rounded at the apex, irregularly lacerate-toothed; leaves flat, 2–5 dm. long, 6–12 mm. wide, long-acuminate at the apex, a little narrowed toward the base, rough on the margins, hirsute on both surfaces, the upper surface becoming glabrous when old; panicle gray in hue, 4–5 dm. long, 1 dm. wide or less, loose, the main axis copiously pubescent with long, silky appressed hairs, as are also the elongated lax and flexuous ascending branches, the larger of which are 2–2.5 dm. long; internodes of the rachis densely pubescent with silky hairs, 6–8 mm. long, the lower internodes much exceeding the spikelets; spikelets 4–5 mm. long, one-half as long as the basal hairs, and about one-half again as long as the clavellate pedicels, which are pubescent with very short appressed hairs, and also with fewer long ascending hairs; outer scales of the spikelet pubescent with long hairs, at least at first, the first scale slightly 2-toothed at the apex, the second similar, but not so distinctly nerved, the third scale pubescent on or near the margins toward the apex, the fourth scale glabrous, or with a few hairs at the apex, purple on the margins, acuminate into a scabrous, untwisted, straight or somewhat contorted awn about 2 cm. long.

Collected by Mr. W. T. Swingle in a wet hammock between Paola and the Wekiva River, along the J. T. & K. W. R. R., on Aug. 22, 1894, No. 1732a of my first distribution of Florida plants.

The elongated branches of the panicle, the long internodes of the rachis, and the longer basal hairs of the spikelet distinguish this at once from any form of *E. saccharoides*, to which it is related.

PANICUM AGROSTIDIFORME Lam. Ill. 1: 172. 1791.

This name was given by its author to a grass from South America, probably from Cayenne, and its application to the plant so common in our region, the *P. agrostoides* Muhl., has never been satisfactory, not only because the description failed to fit our plant, but also on account of the remoteness of the region from which the Lamarckian plant originally came—a region the flora of which is tropical and not likely to contain among its members a grass native and plentiful in the eastern United States. A careful comparison of a fuller description of this plant, in Encycl. Meth. (4: 748. 1797), with material from northern South America, where this grass was originally secured, leaves little doubt as to its proper identification. Among the characters given by Lamarck is that of the ciliate margins of the sheath fissure. There are three specimens in the herbarium of Columbia University which show this character in a marked degree, one of them from northern South America, another from Turk's Island, W. I., and the third from Truando Falls, on the Isthmus of Panama, collected by Schott. These specimens agree with the description of Lamarck, in the height and the jointed and leafy character of the culms, and in the size and form of the panicle, and the arrangement of its spikelets. The culms arise from a creeping base, a character about which Lamarck says nothing, his specimens probably not exhibiting this feature. It differs from *P. agrostoides* Muhl. in the ciliate margins of the sheaths, in the shorter leaves, the smaller spikelets, and the creeping base of the stem. In *P. agrostoides* Muhl. the leaves are much elongated, the margins of the sheaths entirely naked, and the culms are caespitose, or at all events not creeping at the base.

The plants in the herbarium of Columbia University to which allusion is made, and which are referable to this species, are:

"I. F. Holton, La Paila, April 19, 1853, No. 91," sent out in his distribution of plants from "Neogranadina-Caucana."

"Graminaceae. Saxicolae. Ripariae. Truandofalls. Schott II. 858," and in red ink "No. 6."

"Dr. Madiana, Turk's Island."

PANICUM ATLANTICUM n. sp.

Whole plant, with the exceptions noted below, papillose-pilose, with long white spreading hairs, the hairs on the upper surface of the leaves and on the summit of the culm scantier, those on the lower surface of the leaves shorter. Culms caespitose, at length branched, 3–5 dm. tall, erect or ascending, the nodes barbed with spreading hairs, a bare ring about 1 mm. long below each node; sheaths shorter than the internodes; ligule a ring of hairs 2–5 mm. long; leaves erect, rigid, thickish, linear-lanceolate, 3–10 cm. long, 4–7 mm. wide, acuminate, rough on the margins, 7–11-nerved, the middle leaves the longest; panicle broadly ovate to orbicular, 4–6.5 cm. long, 3–7 cm. wide, its main axis somewhat pilose at the base, the remaining portion, as well as the ascending somewhat flexuous branches and their divisions, hispidulous, the lower branches 2.5–4.5 cm. long; spikelets many on hispidulous pedicels several times their length, obovate, about 2 mm. long, about 1.3 mm. broad, obtuse, the first scale about one-half as long as the spikelet, broadly ovate, acute, sparingly pubescent, 1-nerved, the second and third scales equal in length, membranous, orbicular when spread out, 9-nerved, densely pubescent with short spreading hairs, the third scale enclosing a hyaline palet about one-half its length, the fourth scale chartaceous, oval to almost orbicular, about 1.75 mm. long, enclosing a palet of equal length and similar texture.

Type specimens collected by the writer on dry somewhat shaded knolls in the grounds of the New York Botanical Garden.

It has also been secured on Staten Island, New York, by Dr. N. L. Britton; and also in southeastern Virginia, east of the Dismal Swamp and south of Great Bridge, by Dr. John K. Small.

This well-marked grass is related in habit and general appearance to *P. pubescens* Lam. and *P. villosissimum* Nash, differing from the former in the larger spikelets and the longer hairs clothing the sheaths and leaves, and from the latter in the smaller and differently shaped spikelets and in the smaller panicles.

PANICUM ELONGATUM Pursh.

The longer and acuminate spikelets serve well to distinguish this from *P. agrostoides* Muhl. Another equally important and so far constant character is the distinct stalk to the scale of the perfect flower. In *P. agrostoides* the fourth scale is sessile, or nearly so, and much broader in proportion to its length.

Dr. Geo. Vasey (Contr. U. S. Nat. Herb. 3: 35, 1892) noted this feature in what he considered an eastern form of *P. agrostoides* Spreng., and which is presumably the plant now known as *P. elongatum.*

PANICUM PARVISPICULUM n. sp.

Culms 3–5 dm. tall, caespitose, erect, or later decumbent and creeping at the base, glabrous, or toward the base appressed-hirsute, nodes blackish brown, usually more or less pubescent. Sheaths shorter than the internodes, the lower ones usually appressed-hirsute, the upper puberulent or glabrous and ciliate on the margins; ligule a copious ring of hairs 3–4 mm. long; leaves erect or ascending, rigid, thickish, linear-lanceolate, rough on the margins, glabrous above, pubescent beneath, usually with short hairs, acuminate at the apex, rounded at the base, the primary leaves 3–9 cm. long, 4–8 mm. wide, the later leaves 5–6 cm. long or less; primary panicle broadly ovate, 8–10 cm. long, its branches spreading or somewhat ascending, much divided from the base, the larger 4–6 cm. long and frequently pilose at the base; spikelets numerous, 1.5 mm. long, on divergent pedicels 1–3 times as long as the spikelets, the first three scales membranous, green, densely pubescent with short spreading hairs, the first scale one-quarter to one-third as long as the spikelet, orbicular, acute, 1-nerved, the second and third scales about equal in length, broadly oval and obtuse when spread out, 7-nerved, the third scale enclosing a hyaline palet less than one-half its length, the fourth scale chartaceous, elliptic, acutish, white, enclosing a palet of eqal length and similar texture.

Type collected by Dr. John K. Small at Darien Junction, McIntosh Co., Ga., June 25–27, 1895. It is related to *P. leucothrix* Nash, in habit, but the longer and more robust culms, the sheaths which are longer in proportion to the internodes and much less hirsute or glabrous, and the larger panicle and spikelets make manifest its specific validity.

I would also refer to this species the grass collected by Mr. A. H. Curtiss, near Jacksonville, Fla., on May 4, 1893, No. 4033, and distributed as *P. nitidum* Lam. The panicle and spikelets are somewhat smaller, but in other respects it agrees.

✓ Panicularia borealis n. sp.

Plant glabrous throughout. Culms 6–15 dm. tall, from a creeping base, smooth, erect; sheaths loosely embracing the culm, over-lapping, smooth or roughish, the terminal one often embracing the base of the panicle; ligule 5–15 mm. long; leaves 9–23 cm. long, 2–10 mm. wide, erect, rather abruptly acuminate, rough on both surfaces toward the apex, the upper surface also often rough throughout, the smaller leaves usually conduplicate, at least when dry; panicle, sometimes nearly simple, 1.5–5 dm. long, its main axis smooth, with the lowest internode 6–11 cm. long, branches erect, smooth, single, or in 2's or 3's, the lower bearing 3–12 spikelets 4–15 cm. long; spikelets 10–17 mm. long, 7–13-flowered, appressed, on pedicels shorter than themselves, the empty scales with a broad scarious margin, 1-nerved, smooth and shining, the first acute or obtuse, one-half as long as the second, which is obtuse and erose at the apex and one-half to two-thirds as long as the first flowering scale, flowering scales 3.5–4 mm. long, about three times as long as the internodes of the rachilla, thin, a broad scarious margin at the obtuse and erose apex, 7–nerved, the nerves hispidulous, palets hyaline, slightly shorter than the scales, narrowly elliptic, shortly 2-toothed at the obtuse apex, 2–nerved, the nerves green and narrowly winged, the wings serrulate; stamens about 1 mm. long.

In water or wet places from Maine to the Catskill Mts., N. Y., Idaho, California and Washington, and northward.

The smaller spikelets with thin flowering scales, which are hispidulous on the nerves only, clearly separate this from *P. fluitans* (L.) Kuntze, in which the flowering scales are hispidulous all over the back, and of much firmer texture.

I would refer to this the following specimens:

Fernald, Van Buren, Me., July 25, 1893. No. 193.

Nash, Cairo, N. Y., July 10, 1893.

Aiton, Idaho, June and July, 1892, No. 25.

Ballard, Swan Lake, Minn., June, 1892.

Brewer & Chickering, Geneva, N. Y., June 19, 1858.

Dr. Geo. Vasey recognized this plant as distinct from *Glyceria fluitans*, giving it the varietal name of *angustata*, but I cannot find that it was ever published. The *G. angustata* T. Fries would, however, invalidate its use in this connection.

PANICULARIA BRACHYPHYLLA n. sp.

Whole plant, except the flowering scales and a slight roughness on the branches of the panicle just below each spikelet, smooth and glabrous. Culms simple, from a decumbent and creeping base, erect, slender, 6–9 dm. tall; sheaths usually longer than the internodes, closed for nearly the entire length, striate, the uppermost one elongated, somewhat keeled toward the summit, loosely embracing the culm, and enclosing the base of the panicle; ligule 6–9 mm. long, lacerated at the apex; leaves linear, acuminate at the apex, 6–13 cm. long, 4–5 mm. wide, inclined to become conduplicate, especially when dry; panicle narrow and slender, the exserted portion 3–4 dm. long, the lower internodes of the rachis 5–7 cm. long, gradually decreasing in length to the summit, where they are 1–2 cm. in length, the branches appressed, or nearly so, the lower ones in 2's or 3's, one of which is 6–11 cm. long and bears 2–3 spikelets, the remaining one or two being much shorter and bearing a single spikelet; spikelets 2.2–3 cm. long, compressed-cylindric, 7–12-(usually 8–10) flowered, on pedicels 1–2 mm. long; empty scales of the spikelet 1-nerved, acutish, with a broad white margin, the first scale about one-half as long as the second, which is 5–6 mm. in length, the flowering scales hispidulous, 7-nerved, the lower ones a little exceeding twice the length of the internodes of the rachilla, about 5.5 mm. long, 2.5 mm. wide when spread out, elliptic, the obtuse, not truncate, apex somewhat obscurely and irregularly few-toothed; palets about 6 mm long, a little exceeding the flowering scales, acuminate, the margins infolded, the apex shortly 2-toothed, 2-nerved, the nerves wing-keeled, the wing serrulate and about .3 mm. wide in the broadest part; anthers purple, 1.5–1.7 mm. long.

Growing in water in large masses in an open swamp near the N. Y. & Harlem R. R., just north of the northern line of the grounds of the New York Botanical Garden, in company with *P. fluitans*, from which it is markedly different, the shorter and more slender culms, the shorter leaves, and the much narrower panicle readily distinguishing it; in addition to these differences, the flowering scales in *P. fluitans* are shorter (about 4 mm. long), truncate, and equal or exceed the palets. *P. brachyphylla* is really intermediate between *P. fluitans* and *P. acutiflora*, resembling the latter in habit, but at once separated from it by the smaller flowering scales, which are obtuse and not acuminate as in that species.

Robinson & Schrenk's No. 221, collected in a wet meadow at St. John's, Newfoundland, August 7, 1894, appears to be a small and simple-panicled form of this; the spikelets are fewer-flowered and the flowering scales are slightly longer, sometimes about equalling the palet, but otherwise the plant is the same.

This well-marked species doubtless occurs in other sections, but, owing to its strong resemblance in habit and general appearance to *P. acutiflora*, it has been overlooked. I should be exceedingly glad to receive more material.

Reminiscences of Botanical Rambles in Vermont.*

By C. G. Pringle.

Friends: If I can offer to-night for your entertainment only a dull and dimly outlined story of my early botanical rambles in the summer fields of my native State, let my excuse be that thronging memories of treading a thousand desert trails between the Columbia and the Tehuantepec overlie the recollections of those early glad days,

> "When the feelings were young, and the world was new
> Like the fresh bowers of Eden unfolding to view."

I cannot remember the birth of my love for plants. It must have been inborn, inherited. And it has been my happy fortune all my life to have had appointments to botanical work laid upon me, which I have accepted as in the way of destiny, and opportunities for such work to open before me, which, improved, have led on to wider and wider fields.

My boyish botanizing about home fields, which made me acquainted with our common plants, may be passed over with bare mention, as also the rambles with manual in hand on summer

* Address delivered before the Vermont Botanical Club. Reprinted from the Burlington Daily Free Press, Feb. 9, 1897.

holidays when a school boy at Hinesburgh and Bakersfield and Dunham.

After some years devoted rather to the culture than to the collecting of plants, it was membership in the Massachusetts Horticultural Society which brought me in touch with the botanists of Boston and Cambridge. This was in 1873. Twenty years had elapsed since the publication by Thomson of Oakes' catalogue of Vermont plants, with Professor Torrey's appendix. During this time little seems to have been done towards enlarging these lists of Vermont plants. The young Horace Mann, shortly before wandering away to die in the Sandwich Islands, had visited Mount Mansfield, and there, in the little tarn which we call the Lake of the Clouds, had found and communicated to Dr. Englemann *Isoetes echinospora* Durieu var. *Braunii* Engelm. John H. Redfield, from the Philadelphia Academy of Sciences, had brought, June 15, 1869, from the highest peak of the same mountain, as a memento of his visit, *Diapensia Lapponica* L. But these, and such as they, seem to have come and passed as summer tourists. J. W. Congdon, Esq., now of Mariposa, California, then of East Greenwich, R. I., was something more than this when, on visits to the native place of his wife at Lyndonville, he diligently made collections of the rarer plants of that part of the State, including Willoughby Mountain. Yet I can call to mind but a single addition made to Oakes' catalogue by that gentleman, *Scirpus pauciflorus* Lightf., now known as *Eleocharis pauciflora* Watson. Charles C. Frost, the learned shoemaker of Brattleboro, remained as the one Vermont botanist, and he was still active, but so absorbed in the mysteries of cryptogams that he was forgetting the names of our common weeds; and the hills within view from his home were competent to supply him with abundant material for his studies to the end of his life. The times yielded me an opportunity and I was ready to grasp it, was fitted by possession of leisure and strength and taste, or absorbing passion, to follow out the task set me. There was at that time a want, even in the best old herbaria, of good specimens of the more interesting plants which had been found in Vermont from the days of Michaux and Pursh to those of Torrey and Frost. New herbaria were being founded, which lacked them altogether. So I was sent out on quests for these treasures. Mr. Congdon, who could never gratify his longing to visit our higher mountains and our lake regions, wrote of a rumor current among botanists that Dr. Robbins' station for *Astragalus Robbinsii* Gray and *Anemone multifida* Poir., in the chasm of the Winooski, had been obliterated. Someone had tried to find it again and had failed. The rumor proved unfounded, yet, alas! a prophecy. The obliteration did not occur, however, till there had been gathered a supply of these plants sufficient for all the herbaria of the world. The first fresh specimens taken from there made glad the heart of Asa Gray, the author of one of the species. So did the sight of ample specimens of *Cypripedium arietinum* R. Br., and the accompanying information that it is an abundant species of Vermont pine woods, swamps and hills. So, too, *Orchis rotundifolia* Pursh, by means of fresh specimens, of which he was enabled to refer it back to the genus in which it truly belongs. And thus began relations between that great and good master and myself which continued till his death—relations which grew ever closer and more tender, until they became as the relations between father and son. It was often "tell me this" or "find me that, for you are always helpful to me." It was but a few months prior to his death that he sent me away from his side, for the third time, fully equipped by his kind and thoughtful care, to explore thoroughly a vast region. Ten years have since passed, and still my feet falter not in reverent obedience to his high commission.

In 1873 George Davenport was beginning his study of ferns. A letter from him asking me to look for *Woodsia glabella* R. Br., started me on a fern hunt. The species had been found on Willoughby Mountain, Vermont, and at Little Falls, New York; might it not be growing in many places in Vermont? When I set out I knew, as I must suppose, not a single fern, and it was near the close of the summer. You can imagine what delights awaited me in the autumn woodlands. I made the acquaintance of not a few ferns, though it was too late to prepare good specimens of them. In this first blind endeavor I got, of course, no clue to *Woodsia glabella.* The next summer the hunt was renewed and persistently followed up. I found pleasure in securing one by one nearly all our Vermont ferns. At the time I thought it worthy of remembrance that a single field of diversified pasture and woodland on an adjoining farm yielded me thirty species. Although the two common species of *Woodsia* were near at hand, *Woodsia glabella* was still eluding my search. I sent a friend to the summit of Jay Peak in a fruitless quest for it. Finally, on September 1st, I joined Mr. Congdon at its old station on Willoughby Mountain and made myself familiar with its exquisite form.

During the first two years of my collecting in earnest, 1874 and 1875, several visits were made to Camel's Hump, the peak most accessible to me. In this way some time was lost, because its subalpine area is limited, and consequently the number of rare plants to be found there is small. Yet, with such dogged persistence as sometimes prevents my making good progress, my last visit to that point was not made till the 20th of June, 1876. On that day I clambered, I believe, over every shelf of its great southern precipice and peered into every fissure amongst the rocks. At last, as I was climbing up to the apex over the southeastern buttress, my perilous toil was rewarded by the discovery not only of *Woodsia glabella*, but of *Aspidium fragrans* Swartz. There were only a few depauperate specimens of each which had not yet succumbed to the adverse conditions of their dry and exposed situation.

Five days previously, on the 15th of June, 1876, I had made my first visit to Mount Mansfield, and had recognized its vastly more extensive field, more alpine in character and admirably varied, so I never again climbed the Camel's Hump. On this first visit to Mount Mansfield my work was restricted to the crest of the great mountain. About the cool and shaded cliffs in front of the Summit House were then first brought to my view *Aspidium fragrans* Swartz and *Asplenium viride* Hudson, for I was still on my fern hunt. The finding of the former added a species to the Vermont catalogue; the latter was an addition to the flora of the United States. Such little discoveries gave joy to the young collector. The north peak yielded me on this visit two or three phaenogams to add to the list of Vermont plants *Vaccinium caespitosum* Michx., *Polygonum viviparum* L., *Prenanthes Boottii* Gray, though the last too mentioned must have been met with previously on Camel's Hump.

The next extended trip of this busy summer of 1876 was to the Willoughby region for the purpose of gathering in quantity the boreal plants known there. I was on the mountain on the 4th of August, and examined the entire length of the cliffs, climbing upon all their accessible shelves. Among the specimens of *Woodsia glabella* brought away were a few which I judged to belong to a different species. Mr. Frost, to whom they were first submitted, pronounced them *Woodsia glabella.* Not satisfied with his report, I showed them to Dr. Gray. By him I was advised to send them to Prof. Eaton, because, as he said, *Woodsia* is a critical genus. Prof. Eaton assured me that I had *Woodsia hyperborea* R. Br.—another addition to the flora of the United States.

On the 22d of August I was back upon Mt. Mansfield with my friend, Dr. Varney, thinking and inquiring chiefly about the cliffs at Smuggler's Notch, which I could see in part from certain points of the summit. From the great cliffs of Willoughby Mountain I had learned the value from a botanist's point of view of such situations, and I was eager to see if these exposed ledges would not yield me something of interest. My expectations were not high, however, because I knew that two noted botanists had been in the Notch, Pursh and Frost. The latter had told me of cartloads of *Aspidium aculeatum* Swartz, var. *Braunii* Koch, to be found there; but he had said nothing of any other rare plants nor of cliffs. Early on the morning of the 23d my friend and I set out for the Notch. From a point on the Stowe road a little below the Summit House we descended the mountain side through the trackless forest. As the masses of broken rock covering the slope were half hidden beneath the shrubs and mosses, the first half of our descent was not without its perils. We entered the highway some distance below the Notch House and followed the trail through the length of the Notch, turning aside here and there to inspect the bases of the cliffs or to follow up the side gullies for a short distance. It was but a hasty survey, but it yielded me many surprises and showed me that here lay still unexplored the best botanizing ground in Vermont. I was prepared to take scarcely a sample of all the plants met with and time was lacking to do so. It was the middle of the afternoon when we turned away from the Notch and set out to climb back to the summit by the brook which descends from the south end of the Lake of the

Clouds. Hours passed while we were struggling to regain the summit and the shelter of the hotel. On all my subsequent visits I never felt a desire to follow the wild course of that first weary day.

Before the middle of September I was again in Smuggler's Notch with an assistant, and this time prepared to camp in the old Notch House amongst hedgehogs, and botanize the region day by day. The long list of plants brought out on this visit caused surprise. Here were found in abundance *Aspidium fragrans*, *Asplenium viride*, *Woodsia glabella* and *Woodsia hyperborea.* On our way home we followed the trail around the south end of Mount Mansfield, through Nebraska Notch to Cambridge, and on the cliffs of this Notch were found both the rare Woodsias mentioned above, and later *Woodsia hyperborea* turned up about the north peak of the mountain.

In the following year my delight in this preserve of boreal plants was shared with not a few genial botanists. Charles Faxon came before any of us suspected that he possessed undeveloped talent for a botanical artist of highest excellence. Edwin Faxon followed his young brother, and with me made the tedious ascent to Stirling Pond, a day of toil well rewarded. Thomas Morong came, before the hardships of his Paraguayan journey had broken him down, and he made a find over us all—a single, puny specimen of *Primula Mistassinica* Michx., possibly the last individual of its species surviving in that field. Our honored president came, and not to that field alone. In those days, as now, he was everywhere over these fields, prying sharply into the secrets of our plants and our rocks. On lake shores, on mountain tops, in sphagnous bogs and darkest swamps, he was often my companion to add delight to my occupation and to reinforce my enthusiasm. Long may his form be seen among you on field days in sedgy meadows and on wildest mountain heights—unless I can allure him away to wider, richer fields. The gentle Davenport came at last to behold for the first time in their native haunts many of the objects of his love and study. When I had found for him yet once more in a fifth Vermont station (this was under Checkerberry Ledge, near Bakersfield) the fern he at first desired, and, together with that had discovered within our limits three or four others quite as rare and scarcely expected, I might feel that I had complied with the request of his letter. But that letter initiated a warm friendship between us and association in work upon American ferns, which has continued to the present time. During these twenty-three years of botanical travel on my part my hands have gathered all but 36 of the 165 species of North American ferns, and from the more remote corners of our continent I have sent home to my friend for description and publication 16 new ones. Yet I trust that the fern hunt upon which he started me in 1873 is still far from its close.

After those strange gardens of boreal plants, Willoughby Mountain and Smuggler's Notch, had yielded up their treasures we began to search the State to find other places offering plants peculiar conditions. We enquired first for mountain precipices, which, swept by unobstructed cataracts of cold air from high summits, would maintain in a measure the conditions of higher latitudes. I recollect having in my boyhood looked down from the verge of Checkerberry Ledge in Bakersfield upon the forest occupying the narrow valley below, and remembered it as a dizzy height. I could not rest till I could find an opportunity, June 16, 1880, to explore the base of its cliff. But after the fearful precipices of our higher mountains the place was disappointing and tame; only *Woodsia glabella* and a rare lichen rewarded my search.

People had told me of Hazen's Notch and its cliff, on the road between Montgomery and Lowell; and the following morning our good friend, Mr. Fassett, of Enosburgh, was conducting me there. This cliff was found to be of but moderate altitude and to have besides a warm southern exposure. Here *Saxifraga Aizoon* Jacq. was growing in greater abundance than I had anywhere previously seen; nothing else of interest.

It is only of phaenogams and ferns that I have yet spoken; it was not alone my duty between 1874 and 1880 to collect these, but all the lower orders as well. Charles James Sprague, of Boston, was then accumulating an herbarium of lichens for presentation to the Boston Natural History Society, and he set me to collect lichens diligently, wherever I went. If Smuggler's Notch offered the rarest of flowering plants, it yielded lichens no less rare—stragglers left behind, when the species retreated to the shores of Labrador. So, too, of mosses, which a good authority of that day was eager to receive from me and name. And not a few were the new species of fungi found among my gatherings by Dr. Peck. To search out these classes of plants through the winter woodlands, when the fall of the leaves of other plants had made them conspicuous, afforded many a day of rarest pleasure.

It were going beyond the limits of my subject to tell of extended trips made during these years to the White Mountains, to join there the Faxons, till we became as familiar with those tempest-swept heights as with our native fields. Or to tell of boat journeys and the ample fruits of such, made in three successive years to the cold fir-set shores of the Lower St. Lawrence; to the Saguenay, low between its palisades of giant cliffs, and through the lone lakes and unbroken forests of the St. Francis to the St. John of northern Maine. Experiences of wild life calculated to fill one with large thoughts, to raise him above fear and to make the modern world of conventions and fads show paltry.

In the fall of 1880, when our thorough survey of these regions was but half completed, I was sent away on forestry service to distant States, and I have ever since wandered further and further on. But year by year I have learned with joy and pride of the achievements since made in this field of my youthful love by you, my associates, who began better prepared than I did (for I was only the first available man). Yet share the secret of success of an old collector, quit the broad plain of dull sameness, seek out every possible situation of exceptional character, and look to find amidst peculiar conditions rare and localized plants.

Reviews.

Cytologische Studien aus dem Bonner botanischen Institut. Jahrbücher für wissenschaftliche Botanik, 30: Heft 2 and 3.

In this collection of papers by Strasburger and his students a powerful impetus has been given to botanical cytology. Through their efforts mitosis in a large number of plant forms is made known, in some cases for the first time. The groups studied include fungi (*Peziza*, *Erysiphe* by Harper, and *Basidiobolus ranarum* by Fairchild); Algae (*Fucus*, 3 species, by Strasburger, *Stypocaulon scoparium* and *Halopteris* sp.? by Swingle); Characeae (*Chara fragilis*, by Debski); Equisetaceae (*Equisetum limosum*, by Osterhout); Dicotyledons *Podophyllum peltatum*, *Helleborus foetidus*, by Mottier); and Monocotyledons (*Lilium Martagon*, *L. candidum*, *Fritillaria Persica*, by Mottier, and *Hemerocallis fulva*, by Juel). The chief results obtained were in regard to the formation of the mitotic figure, the centrosome, and reduction in the chromatin.

All work connected with the origin and structure of the spindle is based upon Strasburger's idea of kinoplasm (equivalent to Boveri's archoplasm) and trophoplasm. Strasburger himself regards these observations as demonstrating the truth of the idea and he offers still more definite views in regard to the nature of the two substances. The active kinoplasm has a fibrous structure, the active trophoplasm an alveolar structure (Wabenstruktur), but during the resting phases both substances may show only the latter structure. Perhaps the idea of Strasburger's conception of the relations of kinoplasm and trophoplasm is given by his comparison of the former with linin in the nucleus and the latter with chromatin. The nucleolus is regarded as a "reserve store" of kinoplasm and the relations therefore of nucleus and kinoplasm are considered very close. Harper's observation on *Peziza* and *Erysiphe* lead Strasburger to regard the cell membrane also as derived from kinoplasm, while Harper in addition gives to the kinoplasm a certain physiological rôle whereby it acts as a "middle-man" between the outer world and the nucleus.

The origin of the spindle-fibres from kinoplasm, and the formation of the spindle, as described by Osterhout and Mottier, are very extraordinary and are certainly not duplicated in any known animal cells. The kinoplasm, which is indicated by a characteristic color after the use of orange solutions, is first seen as radial fibres stretching out in all directions from the nuclear membrane. The fibrils next become tangential and focussed at various points in the cell, so that a multipolar spindle results. The various poles gradually fuse together until only two are left, and these form the definitive poles of the mitotic figure.

Fairchild describes a very different kind of a spindle in the fungus *Basidiobolus ranarum*. Here it arises, as in the other cases, by convergence of bundles of spindle fibres, but convergence is not carried so far as in the bipolar types, and the result is a spindle with truncated ends. The bundles of fibres end in knob-like enlargements, which resemble centrosomes. Similar enlargements were observed by Debski at the ends of the spindle-fibres in *Chara fragilis*.

The general upshot of the various observations in regard to the centrosome is that such a body is absent in most forms of plants. Strasburger observes that centrosomes can be demonstrated in thallophytes and bryophytes, but that in pteridophytes and phanerogams the most careful search for them was in vain. If Osterhout's and Mottier's descriptions of spindle formation are correct, the conception of the centrosome as a permanent morphological element of the cell must be given up, at least so far as these plants are concerned. The very interesting observations of Juel add further evidence in this direction, Juel found that mitoses sometimes occur, in which one chromosome becomes isolated either before or after division. It forms a small cell by itself, with perfect cell-plates between it and the large daughter-nuclei. It acts like a cell in all respects; forms a nuclear membrane; passes into the resting state, and even goes so far as to form a complete spindle and to divide by mitosis. Such a case shows that a centrosome is not a necessary element in mitosis, and one must agree with Juel that "those characters which belong to the cell as such are to be found not only in the totality of the chromosomes, but also in each single chromosome."

In several cases the centrosome was very different in form from that found in most animal cells. Harper observed that the centrosome, if present at all in *Peziza* and *Erysiphe*, must be in the form of a thin flattened disc stretching across the samewhat blunt pole. The centrosome nature of the knob-like thickenings in *Chara* and *Basidiobolus* is questioned by Debski and Fairchild.

In regard to the question of chromatin reduction, the most important observations were made by Mottier on certain Liliaceae. In accordance with these results Strasburger gives up his former idea of a purely quantitative division in *Lilium* by a double longitudinal splitting of the chromosomes, and now sustains the view accepted by Haecker, Rückert and others that the second division is a reducing division in the Weismann sense. The process of reduction in *Lilium* is now regarded by Mottier and Strasburger as follows: the double-spireme of the pollen-mother-cell segments into 12 chromosomes; each double chromosome bends to form a U; each chromosome then splits through the plane of longitudinal division during the first mitosis and the daughter-chromosomes have the form of a V. During the second mitosis each V divides transversely at the angle, a reducing division in the Weismann sense thus taking place. Each of the original double chromosomes has the value of a tetrad, the segregation of the chromatin into the compact solid tetrad being the only step lacking to make the process correspond wfth Haecker's description tion of tetrad formation in certain copepods. Tetrads agreeing exactly with those of animal reproductive cells were observed and pictured by Osterhout in the case of *Equisetum*, but it is to be regretted that he offers no observations regarding their mode of origin or their fate.

In many cases the conclusions drawn from the observations brought together in this important collection are not wholly satisfactory. For example, the general denial of the existence of a centrosome in the higher plants cannot be accepted upon the mere statement. Evidence to the contrary is furnished by some of the figures, as in the case of Figure 63, Plate V, where a structure is pictured at the lower pole of a cell of *Helleborus*, which agrees very closely with the centrosomes described by Guignard.

GARY N. CALKINS.

A Flora of Northwest America. Containing brief descriptions of all the known indigenous and naturalized plants, growing without cultivation, north of California, west of Utah and south of British Columbia. By Thomas Howell. Vol. 1, Phanerogamae, Fasicle 1, Ranunculaceae to Rhamnaceae. Price 50 cents. Portland, Oregon. March 15, 1897.

One of the most interesting and welcome contributions to Botany that has recently appeared is, without doubt, the first fascicle of Howell's "Flora of Northwest America."

The author's remark in his preface, that all the territory of the United States of America, south of the British boundary, except Oregon, Washington and Idaho, is supplied with "Floras," is in a certain sense true. Although we have no local "Floras" that can be called in any sense really good or exhaustive, with the exception, perhaps, of those covering the northeastern part of the continent, all parts of the United States, except the States mentioned, have some publications concerning their flora.

As being the first local flora of the northwestern part of our country, Professor Howell's "Flora" is, therefore, doubly welcome. The territory covered, as indicated by the title, viz., west of Utah, should include the western half of Idaho and a small portion of western Montana. It is doubtful, however, if the "Flora" can be said to represent this region, especially the mountain districts of northern Idaho and western Montana, as their flora is yet comparatively little known, and it is doubtful if Professor Howell has had access to the collections made in the last few years by Sandberg, Leiberg, Heller, McDougal and Henderson, in Idaho, and by R. S. Williams, Professor Kelsey and Frank Tweedy, in Montana.

If the region is limited to Oregon, Washington and a small portion of Idaho, then it is safe to say that none of our local manuals and reports, except those of the northeastern United States, better represents the region covered than does Professor Howell's work. It is well known that the author has spent many years in collecting material for his work, having studied the flora, not only in the herbarium, but also in the field.

In his preface Prof. Howell makes the following humble remarks: "As the writing of descriptions of plants at this late date is, to a great extent, writing or copying what others have previously done, it is hardly right to claim originality for work done in that field, I, therefore, wish to acknowledge here, that I have used the works of Torrey and Gray, . . . and others." In the list given the author has omitted the name of Dr. B. L. Robinson. It is perhaps intended to be included in the words "and others," but if the most important sources are to be given, Dr. Robinson's work, especially as far as the present fascicle is concerned, has more right to be mentioned than that of several given in the list.

Although the descriptions of several species not seen by the author are simply copied, the work can in no way said to be a mere compilation. The individuality of the author shows itself in more than one way. The following new species are described in the present fascicle: *Ranunculus ciliosus, Coptis venosa, Delphinium Oreganum, Aconitum bulbiferum, Roripa Columbiae, Arabis furcata, A. Koeleri, Lepidium reticulatum, Silene Gormani, Alsine Simcoei, Montia humifusa, Sidalcea virgata, Geranium Oreganum, Limnanthes gracilis, L. pumila* and *L. floccosa.*

In the whole fascicle, only six varieties are acknowledged. All others are raised to specific rank. The course taken is, ¡n general, in the right direction. A form that can be well be defined is better regarded as a species, but has not Prof. Howell overdone the matter? If all the rest were made species, why leave those six as varieties?

In raising the varieties to specific rank, Prof. Howell has in most cases, preserved the varietal names, but *Rauunculus occidentalis Lyallii* becomes *R. Greenei, Nasturtium terrestre occidentalis* Wats. becomes *Roripa Pacifica, Silene Douglasii brachycalyx* Robinson becomes *S. Columbia, Arenaria Fendleri subcongesta* becomes *A. Burkei,* for what reason is not apparent.

The sequence is, with some modification, the same as that in the Synoptical Flora, and the general arrangement, keys, etc., are somewhat similar. Synonyms are given whenever the author's nomenclature differs from the generally accepted one.

P. A. R.

Synoptical Flora of North America: Vol. I. Part I. Fascicle II. Polypetalae from the Caryophyllaceae to the Polygalaceae. By Asa Gray, LL.D., continued and Edited by Benjamin Lincoln Robinson, Ph.D., with the collaboration of William Trelease, Sc.D., Director of the Missouri Botanical Garden; John Merle Coulter, Ph.D., Professor of Botany in the University of Chicago; and Liberty Hyde Bailey, M.Sc., Professor of Horticulture in Cornell University. (Issued June 10, 1897.)

The prompt appearance of another fascicle of this important work is a gratifying reminder of the continuous activity which, under notably capable direction, steadily draws nearer the goal sought by the ample enterprise and high abilities of Dr. Gray.

The two sections of the work first issued were published by Dr. Gray in 1878 and 1884, being part I. of volume II. and part II. of volume I. comprising the entire Polypetalae. After an interval of eleven years the first fascicle of part I. volume I. appeared in October, 1895, and was reviewed in the BULLETIN of the following month. This was edited by Dr. Robinson largely from the manuscript left by Dr. Gray and by his immediate successor Dr. Watson. The fascicle now issued is intended to be bound with fascicle I., the two forming together a volume of 505 pages furnished with a complete index and preliminary key to the orders, here so termed. The whole volume covers forty-five families of Polypetalae from Ranunculaceae to Polygalaceae. A third fascicle now in preparation will include the Leguminosae.

The modern principle of coöperation has entered into the making of the fascicle now before us, and the names of President Coulter, Dr. Trelease and Prof. Bailey add their special authorities to the exposition of several important families. The text of most of the families, however, is credited directly to Dr. Gray, and for the most part appears to have been derived verbatim from his manuscript, revealing unmistakably his effective handiwork in technical description. Prof. Coulter has returned to the Hypericaceae and Dr. Trelease to the Geraniaceae, both authors finding something to add to their former useful monographs, but, be it said in regard to certain points, curiously exposing themselves to attack with their guards down. Prof. Bailey has contributed especially the genus *Vitis*.

Dr. Robinson's own contributions to the work, besides the multifarious and exacting detail of editing, has consisted in the treatment of several special genera and minor families, and more particularly of the extensive and attractive family Caryophyllaceae, and of the Sapindaceae and Polygalaceae. The descriptions are, as a rule, admirable, and it is evident that the later hand has caught much of the clear-cut facility of the master.

We cannot help observing, however, that here and there the treatment of species and genera and, what is of less consequence, their names, seems to betray a proneness to linger within the comfortable precincts once occupied by a sound conservatism under the conditions belonging to a period not yet remote but rapidly passing back into the domain of botanical antiquity. We are hence disposed to arraign the editor for a too conscientious adherence in the interest of conformity to the methods and theories which controlled the earlier issues of the work nearly twenty years ago. The intervening time in its almost revolutionary upheaval and advance cannot be slighted, and any work of the present day which does not sufficiently recognize it must fail of quite the position it might otherwise attain. The attitude regardant has its graces but also is not without its dangers. If in the present case it has made it the more difficult to discern the value of recent advanced work in discrimination it is all the more regrettable since a major part of such work, at least in phanerogamic botany, has clearly been done in a spirit of conservatism not the less regardful of the truth of nature because moving more freely in the broader lights of the present day.

It may well be questioned whether the idea that a species is after all but a conception of the individual mind has not been carried too far. At best the doctrine expresses only a half-truth and in practice gives a wide range of liberty either destructive or creative according to the bent of each new systematist. More profound even than the phenomena of change and development resulting in intergradation, is the mysterious fact of fixity of type revealing itself in a certain all but invincible individuality. This in many an organism we find surviving the most diverse environments and remaining unperturbed amid a crowding pressure of other types visually so similar that only a practiced eye and understanding can perceive them to be different. A clear apprehension of such facts as these may well give us pause when tempted to discredit the conclusions of any student who may have had greater advantages or employed greater industry then ourselves in the investigation of any particular group. The too ready reduction of critical species which the future will only reinstate can only have the effect of impairing the prestige of an author and limiting the authority of his work.

However inapplicable these strictures may be to very much in the work before us which is incontestably of a high order of excellence, we wish particularly to disclaim their application to the treatment of the genus *Vitis*. This is truly a piece of constructive work of conspicuous merit both in larger modelling and lesser detail. The simple order which has here been resolved out of the veritable bacchanalian confusion into which our grapes had fallen furnishes an effective illustration of the utility of latter-day practice. The descriptions are the most detailed and lengthy in the volume, perhaps the least technical. It is evident that the author's aim has been not alone to set down the species in formal terms, but to effect in the mind of the intent student some realization of the individuality of the particular species discussed. There is here an escape from the trammels of the labeled sheet to the presence of the living plant, and it is refreshing to find species kept distinct *because they are so*, even though the herbarium may appear to deny it. Professor Bailey knows his species and his own convictions help to carry their realizations into the minds of others.

It must not be understood that here alone in the work facts are held to be paramount to mellowed dicta concerning facts. Elsewhere there is, indeed, a certain inertia of opinion shown here and there which is perhaps justly censurable in some such terms as these. But the progressive spirit, if sometimes dormant, shows itself to be only napping after all and quite capable of an energetic awakening as, for instance, in the case of the genus *Spergularia*, here tenaciously so called. Whatever sacrifice of consistency is involved in the treatment of this group will be criticised by no one viewing the result, which is well and logically worked out. No consensus of opinion will support the author's implied view that the genus represents scarcely more than a single polymorphous species. But this point of view, however oblique, has not been allowed to interfere with a direct and essentially true rendering of the facts. Fourteen species and major varieties are admitted and several minor varieties indicated. Nevertheless it is probably not too much to say that the group will have to be still further enlarged, and that some of the more obscure of the "oft-recurring forms," to use Dr. Robinson's apt phrase, will some day define themselves to us in clearer outlines. It is not probable, for instance, that Professor Greene's species and subspecies have so little power of resistance that they will consent to remain with their faces to the wall as several of them in this genus here find themselves placed.

In connection with the publication of this work should be noted the almost coincident appearance of the second volume of

Professor Britton's and Judge Brown's "Illustrated Flora of the Northern States and Canada." The two works, differing much in scope and purpose, may be taken together as, in some sort, a measure of the widely extended interests and activities connected with the study of our flora which has especially marked the last decade. More than this, they may be understood as being actually an organic part of these very movements—the agency through which a widely diffused subjective interest has found, as inevitably it must have found, its adequate concrete expression.

It is gratifying to note the large measure of accord between the two works; and, after all, most of the points of disaccord may be taken as evidence that our knowledge is still in a formative stage and subject to widely different understandings. But later understandings based on our present lights have so often recently proved to be the correct ones that the generally forward attitude of the "Illustrated Flora" can scarcely fail to make its pages on many points a final court of appeal.

The "Synoptical Flora" covers far the wider field and will be indispensible outside of the boundaries set down for the "Illustrated Flora." Within these boundaries the latter will fill a position of authority and usefulness such as no other publication relating to our flora has hitherto enjoyed.

Certainly no previous period of our botanical history has been enriched with any benefit at all commensurate in proportions and value to that which these works now confer.

E. P. B.

Report on the Coal and Lignite of Alaska. W. H. Dall, 17th Ann. Rept. U. S. Geol. Survey, Part 1, 763–908. *pl. 48–58* and illust. in text. 1896.

This report contains numerous references to the fossil vegetation found at the various localities, and Appendix I. to the report consists of a complete enumeration of the fossil flora as far as known, together with a table of distribution for both America and the Old World, by Dr. F. H. Knowlton. It is almost entirely of tertiary age.

A. H.

Proceedings of the Club.

WEDNESDAY EVENING, MAY 26, 1897.

President Brown presided, and there were 43 persons present.

An announcement from the Scientific Alliance of the city was read, stating that the funds of the Alliance would provide this year for printing the annual directory and monthly bulletins without calling upon the several societies for contributions.

The scientific program was then taken up. Mrs. Britton repeated the lecture given at the Brooklyn Institute on April 20th, the subject being "The Mosses of the Adirondack Mountains," illustrated by lantern slides made by Mr. Van Brunt, and also by about 150 sheets of mounted specimens collected in the vicinity of Adirondack Lodge and Lake Placid in the years 1892, 1894 and 1896. The various locations where these mosses grew were described, including a climb up Whiteface, and the following list of rare species was given. From Avalanche Pass, *Myurella julacea*, *Rhabdoweisia denticulata*, *Schistostega osmundacea* and *Bryum concinnatum*, the latter having been found only once before in the United States, by Professor Peck. From the vicinity of the Lodge, *Anacamptodon splachnoides*, *Dicranodontium longirostre*, *Rhabdoweisia fugax*, *Neckera oligocarpa*, several forms of *Hypnum recurvans*, including *H. laxepatulum*, the capsules of *Dicranum viride*, and *Zygodon viridissimus*, sterile, but bearing gemmules. From Mt. Marcy, *Dicranum Sauteri*, *Raphidostegium Jamesii*, not previously reported for the State, *Hypnum uncinatum* var. *plumulosum*, *Hypnum stramineum*, *Aulacomnion turgidum*, *Sphagnum sedoides* and *Tetraplodon mnioides*. From Moose Id., Lake Placid, *Buxbaumia indusiata*, *Homalia Jamesii* and *Onchophorus Wahlenbergii*. From the cliffs at Cascadeville, *Blindia acuta*, *Myurella Careyana*, *Swartzia montana*, *Didymodon rubellus*, *Bartramia Oederiana*, *Encalypta ciliata*, *Leptotrichum glaucescens*. Duplicates of all of these have been deposited at the State Herbarium at Albany, the main collection having been presented to the Herbarium of Columbia University. Partial sets were sent to the Brooklyn Institute, Cornell University, and various other institutions.

The subject of the lecture was further discussed by Mr. A. J.

Grout and by Mrs. Britton, followed by an inspection of the many sheets of mounted mosses displayed on the walls.

The Club then adjourned to the second Tuesday in October, field meetings to continue Saturdays meanwhile as usual.

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* This record is compiled by the editors with the coöperation of Prof. Conway Mac-millan and Mr. T. H. Kearney, Jr., under advice from the Committee on Bibliography of the Section of Botany, American Association for the Advancement of Science. The titles are reprinted on cards by the Cambridge Botanical Supply Company, furnishing a card catalogue since January, 1894. Authors are requested to communicate omissions from the index to the editor. Under the advice of the Committee, approved by the Section of Botany, titles of purely bacteriological, horticultural and agricultural papers are excluded.

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BULLETIN

OF THE

TORREY BOTANICAL CLUB.

Vol. 24. Lancaster, Pa., August 29, 1897. No. 8.

Revisio Lobeliacearum Boliviensium hucusque cognitarum.

Auctore Dr. Alexandr. Zahlbruckner.

I. Centropogon Presl.

1.	Flores ad apices ramorum corymboso-conferti vel racemosi.	2
	Flores axillares, solitarii.	4
2.	Inflorescentia corymbosa, foliis superioribus multoties brevior.	3
	Inflorescentia breviter racemosa, a foliis non superata.	*C. Yungasensis.*
3.	Lobi calycini tubi corollae dimidio breviores.	*C. Bangi.*
	Lobi calycini tubo corollae subaequilongi vel paulum longiores.	*C. amplifolius.*
4.	Lobi calycini tubum corollae latum subaequantes vel tubo longiores	5
	Lobi calycini tubo corollae multoties breviores.	6
5.	Folia subtus ad nervaturam breviter adpresse pilosa.	*C. Brittonianus.*
	Folia subtus ferrugineo-stellato-tomentosa.	*C. Mandonis.*
	Folia subtus floccoso-lanata, albiora.	*C. incanus.*
6.	Planta glabra vel glabrescens.	*C. Surinamensis.*
	Planta ferrugineo-tomentosa.	7
7.	Lobi calycini patentes, antherarum tubus dense hirsutus.	*C. gloriosus.*
	Lobi calycini erecti, antherarum tubus sparse pilosus.	*C. Unduavensis.*

1. Centropogon Yungasensis Britt. Bull. Torr. Bot. Club, **19**: 371. 1892.

Yungas, 4,000 ft. (Rusby, Pl. Boliv., no. 642!)

A *C. gracili* Drake del Cass. in Journ. de Botan. **3**: 238, 1889, et a *C. nutante* Planch. et Oerst. in Vidensk. Meddel. naturh. foren. Kjobenhavn, **1857**: 156, A. Zahlbr. in Annal. k. k. naturhist. Hofmus. Wien, **6**: 438, 1891, differt foliis glabris obtusis, lobis calycinis patentibus et corolla glabra.

2. Centropogon amplifolius Vatke, Linnaea, **38** : 716. 1874. A. Zahlbr. in Annal. k. k. naturhist. Hofmus. Wien, **6**: 434. 1891.
f. lobis calycinis paulum brevioribus et angustioribus.

Santa Rosa, l. O. Kuntze (April—flor. Exemplum incompletum.)

3. Centropogon Bangi A. Zahlbr. n. sp. Syn. *C. Surinamensis* Britt. Bull. Torr. Bot. Club, **19** : 371. 1892 (quoad no. 1093).

Herbacea, caules subrecti, virides, in partibus junioribus hirti, demum calvescentes et scabriusculi. Folia alternantia, suberecta, ovata vel ovato-oblonga, in petiolum brevem sensim attenuata, apice breviter acuminata et plerumque brevissimme mucronutata, membranacea, in margine inaequaliter calloso-denticulata ; lamina supra viridis opacusque, hirta et scabrida, subtus pallidior, glaucescens, breviter (adnervaturam densius) hirta ; 11–22 cm. longa (inclus. petiolo) et 4–6 cm. lata ; costa crassiuscula, subtus prominens et albidus, nervi laterales 8–9, patenti-adscendentes. Inflorescentia terminalis, corymbosa, pauci-(5–10-)flora, foliis caulinis superioribus multo (circa ¼) brevior ; bracteae oblonga, hirtae, in margine denticulata ; pedunculi tenuies, 22–24 mm. longi, bracteis paulum breviores, hirti. Receptaculum subglobosum, 10-costatum; lobi calycini anguste triangulares, acuminata, viridis, in margine integri, 5–6 mm. longi et basi 3 mm. lati, sinubus acutis. Corolla kermesina, 22–24 mm. longa, e basi parum inflata versus limbum sensim ampliata, limbo inflato, circ. 1 mm. in diam., limbi lobi triangulari-cuspidati, falcati, 2 posteriores latiores. Staminum tubus glaber, fere tubo corollae adnatus, sub antheri parum exsertus ; antherarum tubus basi et dorso parum pubescens ; antherarum 2 minores vertice appendice fere cartilaginea alba coronata. Stigma bilobum, lobis late ovatis obtusisque. Bacca viridis (?), globosa, circ. 1 cm. in diam.; semina numerosissima, anguloso-ovoidea, ad 0.5 mm. longa flavido-brunnea, laevia.

Yungas, 4000 ft. (Bang, Pl. Boliv. no. 500 ! et Rusby, Pl. Boliv. no. 1093 !)

A proximo *C. amplifolio* Vatke differt foliis minoribus eorumque indumento et praesatim lobis calycinis tubi corollae dimidium haud aequantibus ; a *C. gesneraeformi* Drake del Cast. in Journ. de Botan. **3** : 239, 1889, corolla aliter formata.

4. Centropogon Mandonis A. Zahlbr. in Annal k. k. naturhist. Hofmus. Wien, **6** : 438. 1891.

Viciniis Sorata, Gueliguaya, in nemoribus, 2700–2800 mt. s. m.

(Mandon, Fl. Andium Boliv. no. 494!), prope Yungas (Bang, Pl. Boliv. no. 738 et 738a! sub *Siphocampylo giganteo* var. *latifolio* Britt.

5. CENTROPOGON BRITTONIANUS A. Zahlbr. n. sp.

Syn. *Siphocampylus giganteus* var. *latifolius* Britt. Bull. Torr. Bot. Club, **19**: 373. 1892. Non Vatke.

Fruticosa (?). Caules validi, subsulcati, in partibus junioribus grisco-tomentelli. Folia alternantia, suberecta, petiolata, oblongo-lanceolata, apice acutata, basi parum inaequali et in petiolum decurrentia, membranacea, in margine minute denticulata, supra obscuriora, laevia, opaca, subtus imprimis ad nervaturam brunnescentem et in juventute breviter adpresse pilosa (pilis crassiusculis ramosisque), inclus. petiolo 18–20 cm. longa et 5–6.5 cm. lata; nervi secundarii, 20–24, reticulatim connexi. Pedunculi axillares solitarii, suberecti, foliis breviores, 16–18 cm. longi, compressiusculi et tomentelli, supra basim bracteolis 2 filiformibus, 8–10 mm. longis muniti. Flores magni, post anthesin nutantes. Receptaculum subhemisphaericum vel oblongum, griseo-tomentellum, 10-nervum, 12–15 mm. in diam.; lobi calycini e sinubus rotundatis, sat latis assurgentes, lineares, utrinque in margine dentibus 5 obtusis callosisque obsita, tubo corollae longiores, 26–30 mm. longi et circ. 3 mm. lati. Corolla rubra extus tomentella, intus glabra; tubus corollae brevis, amplus, fere rectus, 22–24 mm. longus et 11–13 mm. in diam.; lobi corollae parum inaequales parum falcati. Staminum tubus sub anthesi longe exsertus, 55–60 mm. longus, crassiusculus et pilosus; antherarum tubus undique dense et longe fulvescenti-setulosus. Bacca corollae laciniis haud auctis coronata, circ. 20 mm. in diam., subtomentella; semina minuta, ovoidea, brunneo-lutescentia, laeves, vix 1 mm. longa.

Unduavi (Rusby, Pl. Boliv. no. 638!)

A priori differt indumento, foliis majoribus, petiolis subalatis et lobis calycinis aliter formatis.

6. CENTROPOGON SURINAMENSIS Presl, Prodr. Monogr. Lobel. 48. 1836; Kanitz apud Martius, Flor. Brasil. **6**: Pars 4, 134, *tab. 39*. 1878; Britt. Bull. Torr. Bot. Club, **19**: 371. 1892.

Mapiri, 2500 ft. (Rusby, Pl. Boliv. no. 635!), La Rosa, 2000 mt. April–flor. l. O. Kuntze!

7. CENTROPOGON GLORIOSUS (Britt.) A. Zahlbr.

Syn.: *Siphocampylus gloriosus* Britt. Bull. Torr. Bot. Club, **19**: 373. 1892.

Unduavi, 8000 ft. (Rusby, Pl. Boliv. no. 647 !)

Planta ob baccam ad genus *Centropogon* referenda. Bacca globosa, circ. 2 cm. in diam., 10-nerva, ferrugineo-tomentosa, lobis calycinis coronata. Species distincta et pulchra. *P. Mandonis* A. Zahlbr. affinis.

8. CENTROPOGON UNDUAVENSIS (Britt.) A. Zahlbr.

Syn.: *Siphocampylus Unduavensis* Britt. Bull. Torr. Bot. Club, **19**: 373. 1892.

Unduavi, 8000 ft. Octbr.–flor. (Rusby, Pl. Boliv. no. 649 !)

Ex affinitate *C. barbatae* Planch. in Flore des Serres **6**: 16. 1850 (*Lobelia barbata* Cavan. Icon. et Descript. Plant. **6**: 12, *tab. 519.* 1801.) corolla brevi et lobis calycinis distincta.

9. CENTROPOGON (?) INCANUS (Britt.) A. Zahlbr.

Siphocampylus incanus Britt. Bull. Torr. Bot. Club, **19**: 373. 1892.

Ad hoc genus pertinere videtur, fructus attamen ignotus. A *Siphocampylo Dombeyano* A. DC. apud DC. Prodr. **7**: Pars 2, 406. 1839, cui valde affinis, differt foliis majoribus obovatis, basi angustatis.

Odore foetido (Bang in sched.).

Yungas, 6000 ft. (Rusby Pl. Boliv. no. 648 !) Corvico prope Yungas; Sptbr.–flor. [Bang, Pl. Boliv. no. 2474.]

II. SIPHOCAMPYLUS Pohl.

1. Folia verticellata, ternata. *S. Orbignianus.*
   Folia alterna 2
2. Tubus corollae amplus lobis calycinis brevior vel subaequalis 3
   Tubus corollae lobis calycinis multo (1–6–∞) longior. 4
3. Folia subsessilia, pedicelli foliis breviores, antherarum tubus lanatus. *S. radiatus.*
   Folia petiolata, pedicelli foliis multo longiores, antherarum tubus glaber. *S. Rusbyanus.*
4. Inflorescentia terminalis, racemosa vel corymboso-conferta. 5
   Flores axillares, solitarii 9
5. Plantae erectae 6
   Plantae scandentes 7
6. Inflorescentia racemosa, elongata, caules crassiusculi, folia ovato-lineares. *S. tupaeformis.*
   Inflorescentia corymbosa, caules graciles, folia, late ovata. *S. corymbiferus.*

7. Calycis tubus extus glaber; folia falcata, conduplicata. *S. angustiflorus.*
Calycis tubus extus pubescens vel pulverulentus; folia plana 8
8. Calycis lobi receptaculo duplo circa longiores, folia obovato-linearia. *S. oblongifolius.*
Calycis lobi receptaculo breviores, folia ovato-oblonga. *S. flagelliformis.*
9. Plantae erectae 10
Plantae scandentes 17
10. Tubus corollae amplus lobis corollinis brevior 11
Tubus corollae elongatus lobis corollinis multo longior. 12
11. Lobi calycini receptaculo depresso-turbinato breviores. *S. Tunarensis.*
Lobi calycini receptaculo obconico duplo circa longiores. *S. Vatkeanus.*
12. Folia basi cordata. 13
Folia basi angustata. 14
13. Folia rigida, subtus pilosiuscula, nervatura prominula. *S. bilabiatus.*
Folia tenuia, subtus glaberrima, nervatura non prominens. *S. argutus.*
14. Flores lutei. 15
Flores kermesini vel rubri 16
15. Corollae tubus fauce manifeste constrictus, tubus staminum sub anthesin tubo corollae longe exsertus. *S. Kuntzeanus.*
Corollae tubus fauce non constricta, tubus staminum sub anthesin tubo corollae inclusus. *S. aureus.*
16. Caules graciles, folia ovata, calycis lobi receptaculo longiores, arguta dentata. *S. dubius.*
Caules crassi, folia oblongo-linearia, calycis lobi receptaculo vix longiores, integri. *S. Boliviensis.*
17. Folia internodiis haud vel parum longioria, reflexa. *S. corrioides.*
Folia internodiis multo longioribus, erecta vel suberecta 18
18. Lobi calycis in margine integri. *S. Andinus.*
Lobi calycini utrinque dentibus 3–4 glandulosis muniti. *S. elegans.*

1. Siphocamypylus Orbignianus A. DC. apud DC. Prodr. 7: Pars 2, 2405. 1839. Planch. in Flore des Serres, **6**: 15, *tab. 544*, 1850–51. Botanic. Mag. **79**: *tab. 4713*. 1853.

Syn: *Siphocampylus volubilis* Britt. Bull. Torr. Bot. Club, **19**: 372, 1892, et Mem. Torr. Bot. Club, **6**: 72. 1896. Non G. Don.

In Bolivia late distributa videtur. Chuluma Ya [Orbigny no. 469! Hb. Paris]; provincia Yungas, in fruticetis humidis [Weddell, no. 4320! Hb. Paris], ibidem, l. Bang [no. 642!] et Bang [no. 256!]; in vicin. Guanai, 2000 ft., l. Bang [no. 1593!] et Rusby [no. 643!]; Sierra de Santa Cruz, 3000 mt. s. m. l. O. Kuntze! Hic spectat etiam verosimiliter planta prope Soratam lecta [Rusby no. 650].

Ad descriptionem adde: capsulae pars inferior 10-costate, pars superior libera a corolla persistente coronata; semina minima, flavescentia, nitida, sub-ovoidea; cellulae testae polygonales.

2. Siphocampylus radiatus Rusby, Mem. Torr. Bot. Club, **6**: 73. 1896.

Vicin. Cochabamba [Bang, Pl. Boliv. no. 1106!] ibidem legit etiam plantam cultam O. Kuntze!

Frutex ad 3 m. altus, teste O. Kuntze in schedul. A *S. umbellato* proximo differt foliis angustioribus rigidiorisque, aliter serrulatis et eorum tomento, dein pedicellis glabris et lobis calycinis integris, arcuatim reflexis.

var. minor A. Zahlbr.

Planta omnibus in partibus minor et pedicelli folia superantes. Folia 12–16 cm. longa et 2.5–3 cm. lata; receptaculum calycis 8–10 mm. latum; lobi calycini 20–24 mm. longi; corolla 25–32 mm. longa.

Provinc. d'Atyopaya: Decbr.–flor. [Weddell no. 4178! Hb. Paris].

Frutex 2–3 metralis. [Wedd. in sched.]

3. Siphocampylus Rusbyanus Britt. Bull. Torr. Bot. Club, **19**: 372. 1892.

Mapiri, 5000 ft. Apr.–flor. [Rusby, Pl. Boliv. no. 644!]; Corvico, Yungas, in sylvis. Sptbr.–flor. [Bang, Pl. Boliv. no. 2433!]

4. Siphocampylus Tunarensis A. Zahlbr.

Herbacea, lactescens. Caulis partes superiores compressiusculae et sulcatae, leviter arachnoideae. Folia alternantia, breviter petiolata (petiolo 5–7 mm. longo) oblongo-lanceolata, approximata et suberecta, utrinque (basi parum inaequaliter) acuminata, in margine minute et acute denticulata, tenuia, supra viridia, glaberrima, nitida, tenuiter reticulata, laevia, subtus opaca, dilutioria et (praesertim ad nervaturam) brunnescenti-subarachnoidea; costa crassiuscula, nervis lateralibus 19–21, sat tenuibus, suberecta adscendentibus; lamina 18–19 cm. longa et 4 cm. lata. Flores cinerascentes, lobis corollae fuscescentibus (O. Kuntze in sched.), versus apicem ramorum axillares et solitarii, pedicello longo, foliis tamen breviore, 11–13 cm. longa, compresso, ebracteolato, et suberecto, subarachnoideo-pubescente; gemmae floriferae uncinatae. Receptaculum calycis depresso-terbinatum, in indistincte navosum, more pedicellorum vestitum, 13–15 mm. latum et 6–8 mm. altum, lobis calycinis limbo fere integro, distanter insertis, parvis, triangulari-subulatis, erectis, apice parum recurvis, in margine subintegris, 4 mm. longis et basi 2 mm. latis. Tubus corollae sat latus et brevis, 13–14 mm. longus et basi 11–12 mm. diam., rectus, e basi paulum latiore parum angustatus, 5-nervus, extus pubescens, intus glaber; lobi corollae tubo longiores, lineares, tortuosi et paulum falcati, 35–38 mm. longi et (basi) 3 mm. lati. Tubus staminum glaber parum curvatus, supra basi sat alte 5-fidus et basi corollae insertus; antherarum tubus glaber, 17–18 mm. longus et 4 mm. in diam., anthearum omnes in vertice breviter penicillatae. Ovarium solum parte basali receptaculo adnatum, late conicum; stigma bilobum, lobis oblongo-rotundatis, dorso glabrus. Fructus ignotus.

Tunari, 3600 mt. s. m., April–flor., l. O. Kuntze!

Habitu et formatione florium distincta species.

5. Siphocampylus Vatkeanus A. Zahlbr.

Frutex erectus caules validiusculi, in partibus junioribus, fuscescentes vel fusco-cinerascentes, floccoso-pulverulenti, compressiusculi; dein nudis et cicatricis foliorum dejectorum subcordatis ornati; medulla alba septata. Folia alternantia, petiolato, petiolo floccoso-pulverulento, 8–12 mm. longo-erecta vel suberecta, demum reflexa, ovato-oblonga, utrinque (basi inaequaliter) acuta, subcoriacea, in margine crebre et minute calloso-denticulata, dentibus obscurus et falcatis; lamina 8–14 cm. longa et 2.5–3.8 cm. lata, supra viridis vel viridi-rufescens, opaca, glabra et laevis, subrugulosa, subtus pallida, albido-lutescens, imprimum ad nervaturam brunnescentem subfloccoso-pulverulento, nervis secundariis 11–14 subangulo acuto versus marginem fere recte adscendentibus. Flores axillares, solitarii; pedicelli brunneo-pulverulenti, ebracteolati, compressiusculi, folia aequantia vel paulum superantes, apice curvatis, 8–12 cm. longi. Receptaculum calycis fere pyriforme, pulverulentum vel glabrescens, 7–9 mm. altum et 12–12 mm. latum; lobi calycini e sinubus latis distanter inserti, lanceolato-subulati, erecti, 10–12 mm. longi et basi 2 mm. lati, utrinque glabri, in margine obsolete denticulati, tubo corollae circa duplo breviores. Corollae tubus virescenti-albidus, 5-nervus, extus scabridulus, intus glaber, e basi latiore (12 mm.) angustatus et versus paucem iterum ampliatus, rectus, 2 cm. longus; lobi corollae falcati, 3 minores tubo breviores, 2 majores tubo longiores, usque ad

2.5 cm. longi. Staminum tubus basi 5-fidus, basi corollae adnatus, glaber, validiusculus (2–3 mm. in diam.), paulum curvatus et subanthesi tubo corollae exsertus; antherarum tubus coerulescenti-caesius, glaber vel parce et breviter pilosiusculus, antherarum 2 minores vertice pilosi. Stigma bilobum, lobis oblongis. Capsula demum nutans, pars basalis coriacea, 15–18 mm. alta et 20–22 mm. lata, valvi sublignosi, acuti, 6–7 mm. alti; semina parva, lutescenti-fusca, oblonga, irregulariter angulosa, vix 1 mm. longa.

Provinc. Larecaja, viciniis Sorata, inter Laripeta et Tani, in silvalis, regione temperata, 3000 mt. s. m. Maj.—flor. (Mandon, Pl. And. Boliv. No. 497!)

Ab arcte affini *S. scabrifolio* Schlecht. apud Lechler, Berberid. Amer. austr. 58, 1857, et Lechler, Plant. Peruv. no. 2073! differt indumento ramorum (non glabris), floribus, majoribus et lobis calycinis tubo corollae duplo breviores.

6. Siphocampylus aureus Rusby, Mem. Torr. Bot. Club, **6**: 72. 1896.

Habitu *Lobeliam persicifoliam* fere simulat, attamen ex affinitate *S. virgati* A. DC. et *S. rosmarinifolii* G. Don notis allatis et jam floribus luteis bene distinguenda.

Vicin. Cochabamba, Espirito Santo (Bang, Pl. Boliv. no. 1234!) et loco accuratius non indicato, l. Cumming! (Hb. Vindob.)

Var. latior A. Zahlbr.

Folia ovata vel oblonga (infima angustioria) acuminata, breviter petiolata—petiolo 3–4 mm. longo—in margine plus minus distincte undulata et minute calloso-denticulata, 5–7.5 cm. longa et 2.5–2.7 cm. lata. Flores paulum minores, ut in planta typica.

Sierra de Santa Cruz, 2600 mt. s. m. Maj.—flor. et fruct. l. O. Kuntze!

Capsula hujus varietatis (an etiam plantae typicae?) chartacea, valvae receptaculo subaequilongae, oblongae, apice abrupta acuminatae, in lateribus profunde sulcatae; semina minima, flavido-brunnea, nitida, ellipsoidea vel subovoidea, 0.6–0.8 mm. longa.

7. Siphocampylus Kuntzeanus A. Zahlbr.

Caules teretiusculi, sat crassi (3–5 mm. in diam.) viridilutescentes, nitiduli glabri et striati, dense foliolati et multiflori. Folia alternantia, internodiis multo longioria, subsessilia, linearia, utrinque sensim et longo attenuata, plus minus distincte recurvata, apice obtusiusculo, glaberrima, membranacea, supra viridia, subtus glaucescentia, in margine subintegra vel subundulata vel undulato-repanda, dentibus minutis, calloris, acutisque munita, 7–8.2–10 cm. longa et 0.6–0.8 cm. lata; costa subtus distincta, nervis lateralibus 8–11, ante margine arcuatim convexis. Flores versus apicem ramorum solitarii, axillares, pallide lutei; pedicelli foliis circa duplo breviores, filiformes, tereti, suberecti. Receptaculum turbinatum, 10-costatum, glabrum, 4 mm. altum et 5 mm. latum; lobi calycini receptaculo fere duplo longiores, subulati, recurvi, uninervi, in margine integri et paulum revoluti, e sinubus latis oriuntes, 8–11 mm. longi et 1–1.5 mm. lati. Corolla glabra, 5-nerva, e basi latiore angustata dein iterum versus faucem sensim ampliatus, 18 mm. longa et 6 mm in diam., lobis subulatis, fimbriatis, antico altius soluto. Staminum tubus glaber, basi 5-fidus et corollae parti angustatae adnatus, sub-anthesin corollae longiuscule exsertus; tubus antherarum lutescens, glaber, 8 mm. longa et 2 mm. in diam., antherarum 2 minores vertice breviter penicillatae. Capsula sat parva, chartacea, valvae late ovatae et abrupte acuminatae, in lateribus excavatis. Semina ut in *S. aureo*.

Sierra de Santa Cruz, l. O. Kuntze! loco accuratius non indicato, l. Cumming! (Hb. Vindob., Hb. Barbey-Boissier).

A *S. aureo* Rusby, cui proximus, differt caulibus dense foliatis, multifloris, foliis angustis et recurvis, floribus minoribus, corollae tubo fauce non constricto, tubo staminum longe exserto.

8. Siphocampylus Boliviensis A. Zahlbr. Annal. k. k. naturhist. Hofmus. Wien, **6**: 443. 1891. Britt. Bull. Torr. Bot. Club, **19**; 372 (errore "Bolivianus" citatus). 1892.

In provinc. Larecaja, vallis Tipuani [Weddell! Hb. Paris], prope Soratam, 8000 ft. s. m. [Rusby no. 645!], et ibidem in regione subalpina, 2700–3300 mt. s. m. in sepibus nemoribus undique [Mandon, Pl. And. Boliv. no. 496!], prope Yungas [Weddell, no. 4268! Hb. Paris], Tunari, 3400 mt. s. m. [O. Kuntze!], loco accuratius non indicato. [Lobl, Hb. Vindob.]

9. Siphocampylus angustiflorus Schlecht. apud Lechler, Berberid. Amer. austr. 58, 1857 (nomen!), et Plantae Lechler. Peruv. no. 2649!

Scandens, ramis gracilibus, striatulis, granuloso-scabridis, flavescenti-brunneis. Folia alternantia, chartacea, falcata et conduplicata breviter petiolata—petiolo 2–2.5 mm. longo—ovato-linearia vel ovato-oblonga, basi rotundata, apice acuminata et breviter redunca, in margine paulum revoluta et glanduloso-denticulata; lamina 5.3–5.7 cm. longa et 1.7–2.2 cm. lata, utrinque glaberrima et sub lente tenuiter punctulata, supra viridis subnitidaque, subtus pallidior et magis opaca, nervis lateralibus prominulis 5 sub angulo acuto adscendentibus et ante marginem furcatim divisis et connexis. Racemi et terminales et dein multi- (circa 20-) flori, unilaterales et laterales, breves, pauciflori et patentes. Flores rosei (Weddell in sched.), angusti, nutantes; pedicelli granuloso-scabriduli, retorti, basi incrassata bracteolo parvo muniti. Receptaculum obconicum, glabrum, 5-costatum, 4–5 mm. altum et 5 mm. latum, lobi calycini fauci receptaculi distanter inserti, parvi, recti, anguste triangulares, apice obtusiusculi et paulum recurvi, in margine fere integri vel in uno vel altera latere vel utrinque (rarius) denticulis 1–2 parvis obtusiusculisque obsiti. Corolla tubus utrinque glaber 5-nerva, e basi latiore sensim paulum attenuatus et dein iterum paulum dilatatus et fere cylindricus, 15 mm. longus et 4–5 mm. in diam., lobi corollae subulati, tortuosi, 12–14 mm. longi, 2 parum majores. Staminum tubus basi 5-fidus, glaber, sub anthesi tubo corollae subaequilongus; tubus antherarum glaber, 5 mm. longus, antherarum omnes (2 minores tamen longius) pilosae. Stigma bilobum, lobis ovato-oblongis, obtusiusculis. Capsulae valvae triangulares, circa 8 mm. alta et 7 mm. in diam., pars basalis (receptaculum calycis) nervis 5 validis prominulis et inter eos nervis 5 tenuioribus ornata.

In prov. Larecaja, valli Tipuani (Weddell! Hb. Paris).

10. Siphocamphylus flagelliformis A. Zahlbr.

Syn: *Siphocampylus angustiflorus* Britt. Bull. Torr. Bot. Club, **19**: 373, 1892, et apud Rusby, Plant. Boliv. exsicc. no. 646. Non Schlecht.

Frutex scandens, ramis flagelliformibus, teretibus, striatis, scabridulis, ochraceo-brunneis. Folia alternantia, internodiis paulum longiora, brevissime (circa 3 mm.), petiolata—petiolo crassiusculo, subtomentoso—reflexa, plana ovato-oblonga, apice acuminata, basi subangustata, in margine dentibus 11–14 parvis glandulosis acutiusculis munita, coriacea, lamina 6.8–7 cm. longa et 2.5–3 cm. lata, supra opaca nervatura impressa et pilis brevissimis obsita, viridis, subtus pallidior, imprimum ad nervos brunneos hirta, nervi laterales 7, subangulo semirecto assurgentes. Racemi et etrminales longi, laxiflori et haud unilaterales et dein basi folioloses et axillares nudae; pedicelli contorti, subtomentosi, 10–12 mm. longi, basi bracteolo, filiformi dimidium pedicelli vix attingente obsiti. Receptaculum calycis obconicum, hirtum, pauce incrassatum, 3 mm.

longum et totidem fere latum ; lobi calycini parvi, triangulares, late distantes, extus hirti, intus glabri, 2 mm. longi et basi circa, 1 mm. lati, in margine vel utrinque vel in uno latere dentibus 2 (rarius 1) muniti. Corolla angusta, 25 mm. longa, rosea ; tubus corollae e basi latiore parum constrictus et dein fere cylindricus, lobi corollae lineares, 6–8 mm. longi. Staminum tubus basi fissus ; tubus antherarum glaber, flavidus nitidusque ; antherae omnes, sed 2 minores longius pilosae. Capsulae pars inferior obconica, costulata, 8 mm. alta et 7 mm. lata, valvae subcornutae, 4–5 mm. longae. Semina parva, oblonga, fusca, circa 1 mm. longa.

Prope Yungas, 4000 ft. s. m. [Rusby, Plant. Boliv. no. 646 !]

Differt a proximo *S. angustiflora* Schlecht. ramis elongatis flagelliformibusque, tomento alio, foliis planis, non conduplicatis nec falcatis majoribus, firmioribus et aliter formatis, floribus breviter pedicellatis et lobis calycinis non glabris.

11. Siphocampylus oblongifolius Rusby, Mem. Torr. Bot. Club, **6**: 73. 1896.

Guanai-Tipuani, April–Jun.–flor. [Bang, Plant. Boliv. no. 1461 !]

12. Siphocampylus Andinus Britt. Bull. Torr. Bot. Club, **19**: 373. 1892.

Unduavi, 8000 ft. s. m. [Rusby, Plant. Boliv. No. 941 !]
Sequenti affinis et forma laborum calycinorum species distincta.

13. Siphocampylus elegans Planch. in Flore des Serres, **6**: 19, c. icon. 1850–51.

Var. Boliviensis A. Zahlbr.

Folia apice cuspidata, basi inaequali rotundata vel subrotundata.

Prov. Larecaja, viciniis Sorata, inter Cerro de Chilicca et Alto de Soque, in nemoribus, 2800–3000 mt. s. m. reg. temper. [Mandon, Plant. And. Boliv. no. 498 !] Unduavi, Septbr.-flor. [Bang, Pl. Boliv. no. 2491 !]

Var. cordatus A. Zahlbr.

Folia basi distincte cordata, apice plus minus abrupte cuspidata.

In valle Rio Tuntas, 2000 mt. s. m. Apr.–flor., l. O.

Kuntze ! ; Santa Rosa, 2600 mt. s. m. Apr.–flor., l. O. Kuntze ! ; mont. Tunari, 3000 mt. s. m, Aprl.–flor., l. O. Kuntze !

14. Siphocampylus correoides A. Zahlbr.

Scandens, ramis elongatis, gracilibus (2–3 mm. in diam.), teretiusculis, dense ferrugineo-tomentosis. Folia alternantia, internodia subsequantia vel iis paulum longiora, reflexa, crassiuscula, sat parva, petiolata (petiolo brevi 3–6 mm. longo,) ferrugineo-tomentoso-ovata vel ovato-oblonga, apice acuta, basi paulum angustata vel rotundata, in margine dentibus utrinque 4–5 tenuibus et falcatis munita ; lamina 2.5–3 cm. longa et 0.8–2 cm. lata, supra viridis, opaca, scabrida, subtus albida vel subargentea, nitidula, pilis parvis ferrugineis obsita, costa distincta et nervis lateralibus 3 e parte basali folii oriuntes. Flores solitarii, axillares, longe pedicellata, pedicello teretiusculo, suberecto, ferrugineo-tomentoso, foliis multo longiore, ebracteolato, 5.5–6 cm. longo. Receptaculum calycis obconicum, ferrugineo-subtomentosum, 4–5 mm. altum et 7–8 mm. latum ; lobi calycini parvi, erecti, anguste triangulares, obtusiuscula, in margine utrinque denta unico muniti, e sinubus latis fere rectis adscendentes, receptaculo breviores, 3 mm. alti et basi 2 mm. lati, ferrugineo-puberuli. Corollae tubus e basi ampla sensim angustatus et dein iterum sensim versus paucem ampliatus, extus ochraceo-pubescens, intus glaber, 5-nervus. Tubus staminum glaber, basi alte 5-fidus et tubo corollae adnatus ; antherarum tubus coerulescens, pruinosus, glaber ; antherarum 2 minores vertice penicillatae. Fructus ignotus.

Unduavi, Yungas. Septbr.–flor. [Bang, Plant. Boliv. no. 2483 !]

Planta habitu peculiari. Descriptio ad specimen mancum condita ulterius emendanda.

15. Siphocampylus bilabiatus A. Zahlbr.

Planta suberecta, caulibus sat crassis, teretibus, breviter pubescentibus, lutescenti-viridibus, medulla alba farctis. Folia alternantia (versus apicem ramorum approximata et fere verticillata), internodiis longiora, breviter petiolata (petiolo pubescente, sigmoideo, 9–12 mm. longo) ovata vel ovato-oblonga, versus apicem sensim acuminata, acuta, basi subcordata, in margine inaequaliter et acute denticulata, rigida, fuscescentia ; lamina 8.5–9.5 cm. longa et 2.5–3.5 cm. lata, supra glabra et laevis, nervatura impressa, subtus molliter pubescens, nervatura prominente, pallidiore, nervis secundariis 6–7 subangulo acuto adscentibus et arte marginem arcuatim et farcatim connexis ; flores in partibus superioribus plantae axillares, solitarii vel in apice subracemosi, pedicellis foliis brevioribus, tortuosis, ebracteolatis, pubescentibus patentibus vel subnutantibus, 2.5–3.5 cm. longis. Receptaculum calycis late turbinatum, pubescens, 5-nervum, 4–5 mm. altum et 8–10 mm. latum; lobi calcycini subulati, erecti et subfalcati, integri, uninervi, utrinque (ad extus densius) pubescentes, 16–19 mm. longi et basi 1.5 mm. lati, sinubus latis fere planis innati. Corollae tubus extus pubescens, 5-nervus, subrectus, supra basin latiorem paulum angustatus et versus faucem sensim et parum dilatatus, 3.5 cm. longus et ad paucem 7–9 mm. latus; lobi corollae bilabiati, 2 superiores alte connati, galeiformes, apice breviter liberi et subfalcati, 3 inferiores subaequales, falcati vel involuti, undulati. Staminum tubus basi latiori corollae adnatus, pubescens; antherarum tubus hispidus, antherarum 2 minores vertice longe penicillatae. Stigma sub anthesi paulum exsertum, bilobum. Capsulae receptaculum pauce callosum, 10–12 mm. altum et 12–14 mm. latum, valvae receptaculo breviores, triangulares. Semina oblonga, fuscescentia, nitida, circa 1 mm. longa.

Corvico, Yungas. Septbr.—flor. [Bang, Pl. Boliv. no. 2464!]

Ex affinitate *S. nitidi* Pohl, corolla bilabiata distincta.

16. Siphocampylus argutus A. Zahlbr.

Herbacea, erecta (?). Caules sat graciles, in partibus superioribus 2.5–3 mm. in diam., teretes, glabri, leviter roseo-suffusi, medulla lutescenti-albida farcti. Folia alternantia, suberecti, internodiis multo longiora, petiolata (petiolo paulum tortuoso, 9–11 mm. longo, supra basin bracteolo minuto obsito) ovata vel ovato-oblonga, apice sensim acuminata vel subcuspidata et breviter falcata, basi cordata, in margine inaequaliter et acute denticulata, tenuia; lamina 9.5–10.5 cm. longa et 3–4 cm. lata, supra opaca, viridis, scabridule, pilis brevissimis sparsis obsita vel glabrescens, subtus glabra, nitidula, laevis, costa parum prominente, nervis lateralibus tenuibus 7 subangulo acuto assurgentibus. Flores in apice caulis axillares et solitarii; pedicello tereti striatulo, hirto, petiolo longiore, sed foliis multo breviore, 17–19 mm. longo. Receptaculum calycis campanulato-obconicum, hirtum, 5-nervum; lobi calycini subulati, canaliculati, primum erecti demum recurvi, receptaculo duplo circa longiores, integerrimi, hirti, sinubus latis subplanis distanter inserti, 6–8 mm. longi et basi 1–2 mm. lati. Corollae tubus kermesinus, extus pubescens, leviter curvatus, e basi subglobosa sensim et parum angustatus, dein subcylindricus et iterum parum sensimque ampliatus, versus faucem angustior, 3.2–3.5 mm. longus, angustus; lobi corollae subfalcati, undulati, 1.6–1.8 cm. longi. Staminum tubus pubescens, sub anthesi tubo corollae inclusus, antherarum tubus coeruleus, in commissuris sulcatis albo-pilosa, antherarum 2 minores vertice penicillata. Capsula non visa.

A *Siphocampylo bilabiato* A. Zahlbr. differt indumento, foliis tenuibus, subcuspidato-falcatis, nervatura tenui, floribus breviter pedicellatis et corolla alia. Accedit etiam valde ad *Siphocampylum volubilem* G. Don, scandentem qui tamen distat foliis minoribus, longius petiolatis, tubo corollae glabro, lobis calycinis brevioribus, receptaculum subaequestibus.

Yungas [Bang, Plant. Boliv. no. 2045 !].

17. SIPHOCAMPYLUS TUPAEFORMIS A. Zahlbr. Annal. k. k. naturhist. Hofmus. Wien, **6**: 440. 1891.

Folia usque ad 12 cm. longa et ad 4 cm. lata, apice acuta vel rarius obtiuscula.

Late in Bolivia distributa. Prov. Larecaja, viciniis Sorata, colle Quincocuca, via ad Lacatia, in dumosis in regione subalpina, 2650–3700 mt. s. m. [Mandon, Plant. And. Boliv. no. 495 !], in valle Tipuani, in arvis humidis [Weddell no. 4697 ! Hb. Paris]; Prov. Tomina (départ. de Chuquisaca) in umbrosis, Decbr.–Jan.–flor. [Weddell no. 3760 ! et 3387 ! Hb. Paris]; Vic. La Paz 1000 ft. s. m. [Bang, Plant. Boliv. no. 77 !], Tunari, 3400 mt. s. m., l. O. Kuntze !; locis accuratius non indicatis legerunt Cumming no. 109 ! [Hb. Vindob.] et Bridges ! [Hb. Boissier.]

18. SIPHOCAMPYLUS CORYMBIFERUS (Presl.) Pohl, Plant. Brasil. **2**: 112. *tab. 175*, 1831; Kanitz apud Martius, Flora Brasil. **6**: Pars 4, 154. 1878.

Lobelia corymbifera Presl, Prodr. Monogr. Lobeliae. 37. 1836.

Siphocampylus gracilis var. *glabris* Britt. Bull. Torr. Bot. Club, **19**: 374. 1892.

Rami et folia glabra.

Prov. Larecaja, viciniis Ananea, in silvulis [Mandon, Pl. And. Boliv. no. 499 !], Unduavi [Rusby, Pl. Boliv. no. 639 !], Yungas [Rusby, Plant. Boliv. no. 251, a.].

Var. GRACILIS (Britt.) A. Zahlbr.

Siphocampylus gracilis Britt. Bull. Torr. Bot. Club, **19**: 374. 1892.

Rami et folia utrinque molliter pubescentia. Caeteris characteribus cum planta typica convenit.

Prov. Yungas, in declivibus humidis; Decbr.–flor. [Weddell no. 4219! Hb. Paris, Rusby, Plant. Boliv. no. 256 a! 256 b! et 640!]

Planta quoad indumentum valde variabilis. Speciminum originalium Pohlianorum in Herb. Vindobonensi asservatorum unum [no. 2380!] omnino glabrum, alterum foliis utrinque, subtus ad nervaturam paulum densius, parce et distanter pubescentibus, caulibus tamen glabris gaudet. Var. *gracilis* etiam Brasiliae obvenit, ubi in provincia Minas Geraës, l. Regnell [III Ser. no. 824! et 825 pr. p!]

19. Siphocampylus (?) dubius A. Zahlbr.

Herbacea; caules in partibus superioribus compressiusculi sulcatique, fuscescenti-hirti. Folia alternantia, internodiis 3–4-plo longiora, petiolata (petiolo 6–10 mm. longo), ovata vel ovato-oblonga, apice acuminata, basi in petiolum abrupte angustata, in margine dentibus callosis acutiusculis munita; lamina 6–10 cm. longa et 3–5 cm. lata, supra viridis, opaca, pilis albidis brevissimis et distantibus obsita, subtus glaucescens, nitidulus, excepta nervatura fuscescenti-hirta glabra; nervis lateralibus 6–8 semierectis. Flores versus apicem caulis axillares et solitarii, pedicellis compressiusculis, fuscescenti-hirtis, 5.5–7.5 cm. longis, foliis paulum longioribus. Receptaculum subglobosum, hirtum, 10-costatum; lobi calycini triangulari-subulati, late distantes, erecti, in margine utrinque 4–5 dentibus callosis, acutis patentibusque muniti, 8 mm. longi et basi 2.5 cm. lati. Corolla kermesina, tubus e basi parum latiore subcylindricus, leviter curvatus, 4 cm. longus, lobis corollae longiusculis, ad 15 mm. longis, subulatis et tortuosis. Staminum tubus glaber, tubo alti adnatus; antherarum tubus glaber, coerulescens, antherarum 2 minores vertice appendice triangulari coronatae. Ovarium sub anthesi solum basi receptaculi adnatum, caeterum liberum, fructus ignotus.

Unduavi, 8000 ft. s. m., Octbr.–flor. [Rusby, Pl. Boliv. no. 637! sub *Centropog. surinamensi.*]

An potius *Centropogonis* species, cujus etiam habitum praebet. Ovarium a receptaculo fere liberum peculiare.

20. Siphocampylus membranaceus Britt. Bull. Torr. Bot. Club, 19: 372. 1892.

Yungas, 6000 ft. s. m. [Rusby, Pl. Boliv. no. 651].

Planta mihi ignota.

III. LAURENTIA Neck.

Laurentia micrantha (H. B. K.) A. Zahlbr.

Lobelia micrantha H. B. K. Nova Gener. et Spec. Plant. **3**: 316. 1818. A. DC. apud DC. Prodr. **7**: Pars 2, 373. 1839. Britton, Bull. Torr. Bot. Club, **19**: 347. 1892.

Lobelia parviflora Mart. et Gal. Bull. Acad. Roy. Bruxelles, 9: 41. 1842. Galeotti Pl. Mexic. exsicc. no. 1970!

Calycis lobi tubo corollae sub-cylindrico dorso brevissime fisso subaequilongi vel dimidium superantes; staminum tubus basi 5-fidus sub fauce corollae insertus, antherarum tubus brevis, fere globosus, antherarum 2 minores hirtellae. Ovarium superum, fusiforme; capsulae apice 2-valvata.

Viciniis Sorata, in dumosis, schistosis, ad sepes undique, 2600–2800 mt. s. m. [Mandon, Pl. And. Boliv. no. 493!]; prope Mapiri, 5000 ft. s. m. [Bang, Pl. Boliv. no. 1967.]

Planta in America centrali et meridionali-occidentali late distributa et sat variabilis ab corollae tubum cylindricum solum apice breviter fissum et ab tubum staminum alte insertum ad *Laurentias* ducenda. Valde ei affinis est *Laurentia ovatifolia* Robins. in Proceed. Americ. Acad. Boston, **26**: 166, 1891; Pringle, Pl. Mexic. no. 3302! (sub *L. Michoacana* var. *ovatifolia* Robins.), sed differt foliis inferoribus sat longe petiolatis, basi cordatis. A *Laurentia ramosissima* Benth. et Hook. (*Lobelia ramosissima* Mart. et Gal.), cui etiam accedit, distet jam floribus multo minoribus. *Laurentia Michoacana* Robins. apud Pringle, Pl. Mexic. no. 3337! (cfr. l. s. c. p. 167) verosimiliter varietas est *Laurentiae micranthae*, lobis calycinis parum aliter formatis differens.

IV. RHIZOCEPHALUM Wedd.

Lobi calycini lineares, corollae 12–40 mm. longa, intus villosa. *Rh. Candollii.*
Lobi calycini triangulares, corolla 7–9 mm. longa, lobi corollae intus glabri. *Rh. pumilum.*

1. Rhizocephalum Candollii Wedd. Chloris Andina, **2**: 12. 1857.

a) *laciniatum* Wedd. l. c.

Syn.: *Lysipoma laciniatum* A. DC. apud DC. Prodr. **7**: Pars 2, 349. 1839.

β) *vulgare* Wedd. l. c. *tab. 46, fig. 1.*

Varietates ambae in pratis humidis vel paludosis in regione alpina in provinciis de la Paz, de Chuquisaca et de Cochabamba, l. Weddell; prov. Larecaja viciniis Sorata in regione subalpina, undique in graminosis, 3200–3600 mt. s. m. Apr.–flor. [Mandon, Plant. And. Boliv. no. 491 !], loco accuratius non indicato, l. Pentland [DC. Prodr. l. s. c.].

2. Rhizocephalum pumilum Wedd. Chloris Andina, **2**: 13. 1857.

Provinc. Larecaja, viciniis Sorata, prope Vancuiri in paludosis, 4500 mt. s. m. [Mandon, Plant. And. Boliv. no. 492 !], Unduavi 8000 ft. s. m. [Rusby, Plant. Boliv. no. 2445.]

V. HYPSELA Presl.

Folia in apice ramulorum subfasciculata	*H. subsessilis.*
Folia in ramulis sparsa	2
2. Corollae laciniiae circiter longitudine tubi vel eo vix breviores	*H. reniformis.*
Corollae laciniae dimidio tubi circiter aequilongi	*H. oligophylla.*

1. Hypsela reniformis (H. B. K.) Presl, Prodr. Mongr. Lobeliae. 45. 1836.

Lysipoma reniformis H. B. K. Nov. Gen. et Spec. Plant. **3**: 320. *tab. 266, fig. 1.* 1818. A. DC. apud DC. Prodr. **2**: Pars 2, 350. 1839.

Pratia repens Wedd. Chloris Andina, **2**: 9. 1857. Non Gandich. teste Benth. et Hook. Gener. Plant. **2**: 550. 1873.

In vicinitate de la Paz, 4000 mt. s. m. et in pratis paludosis de la Lancha [Weddell].

2. Hypsela oligophylla (Wedd.) Benth. et Hook. Gener. Plant. **2**: 550. 1873.

Pratia oligophylla Wedd. Chloris Andina, **2**: 10. *tab. 45, fig. B.* 1857.

Prov. Larecaja, viciniis Achacache, ad ripas lacus Titicaca, in regione alpina in arenosis, 3920 mt. s. m. Mart. Flor. [Mandon, Plant. And. Boliv. no. 489 !]

3. Hypsela subsessilis (Wedd.) Benth. et Hook. Gener. Plant. **2**: 550. 1873.

Pratia subsessilis Wedd. Chloris Andina, **2**: 10. 1857.

In pratis subpaludosis et ad margines rivulorum in provincia Cinti, 3500 mt. s. m. [Weddell].

VI. LOBELIA L.

Herbae repentes	2
Herbae elatae	3
2. Folia integra	*L. nana.*
Folia denticulata	*L. Boliviensis.*
3. Ovarium inferum	*L. Gardneriana.*
Ovarium superum vel semisuperum	*L. Cliffortiana* var. *Xalapensis.*

1. Lobelia nana H. B. K. Nov. Gen. et Spec. Plant. **3**: 317. *tab. 272.* 1818. A. DC. apud DC. Prodr. **7**: Pars 2, 379. 1839. Weddell, Chloris And. **2**: 13, *tab. 46, fig. A.* 1857.
Viciniis Sorata, Novbr.–flor. [Bang. Pl. Boliv. no. 1622 !]

var. flagelliformis Wedd. Chloris Andina, **2**: 13. 1857.

In regione alpestri et alpina provinc. Cochabamba [Weddell]; viciniis Sorata in graminosis 2650–3200 mt. s. m. Febr.–flor. [Mandon, Plant. And. Boliv. no. 1463!]. Bang, no. 1075 verosimiliter etiam huc spectat.

2. Lobelia Boliviensis (A. DC.) Wedd. Chloris Andina, **2**: 11. 1857.
Pratia (?) *Boliviensis* A. DC. apud DC. Prodr. **7**: Pars 2, 340. 1839.
Sine loco accuratius indicato ; l. Pentland.

3. Lobelia Gardneriana Kanitz apud Mart. Flora Brasil. **6**: Pars 4, 138. 1878. Gardner, Pl. Brasil. exs. no. 2655 !
Provinc. Velasco, 200 mt. s. m. et ad flumen Rio Yapacani 400 mt. s. m., l. O. Kuntze !

4. Lobelia Cliffortiana var. Xalapensis A. Gray, Synoptic. Flora North Amer. **2**: Part 1, 7. 1886.
Lobelia Xalapensis H.B.K. Nova Gen. et Spec. Plant. **3**: 315. 1818. A. DC. apud DC. Prodr. **7**: Pars 2, 372. 1839.
Prov. Velasco, ad vias sylvarum et prope Yapacani, l. O. Kuntze ! ; Coripata, Yungas, in sylvis ; Septbr.–flor. [Bang, Pl. Boliv. no. 2162 !]

Galium trifidum and its North American Allies.

By Karl M. Wiegand.

For many years this group of plants has seemed to the writer one of the most perplexing with which the American botanist has to deal. Two individuals would appear so distinct as to be at once taken for distinct species, but all text-books referred both to the one name *G. trifidum*, "an exceedingly variable species." Distrust was aroused more and more as to the correctness of this treatment of *Galium* since experience shows that species in other genera very rarely exhibit such a wide range of indefinite variation. The complexity of many aggregate species is found to be due to the confusion of distinct but closely related sub-groups, and not to one single unbroken and highly variable species. To distinguish and designate these sub-groups when they exist is unquestionably a benefit to our conception of the group as a whole, and it was on this account largely that the study was undertaken which led to the present paper.

It was soon apparent that this was the principal cause of the confusion in the case of *Galium*. *G. trifidum* L. which was designated as the "highly variable" species, although its components still exhibit a remarkable amount of variability, readily allows of segregation into a number of well defined species and as many good varieties which are as distinct as most of the other North Americal representatives of this genus. The following discussion is an attempt to bring the "*trifidum*" group into a more orderly condition.

There has always been considerable difference of opinion as to the taxonomic value of different characters in the genus *Galium*. We shall concern ourselves merely with those used to separate the species of the *trifidum* group. The conception of a species here as elsewhere, of course necessarily differs with the individual. It will be readily seen in the synopsis given below that the greatest importance is placed upon a so-called "internal character," namely the form that the seed presents in cross-section. Practically speaking this means the cross-section of the endosperm and does not include the carpellary coat. This character so far as known to the writer is here used for the first time, and a brief explanation may be necessary. The endosperm is closely surrounded by the seed-coat and usually does not fill the entire carpel. In the group with lunate cross-section the endosperm is more or less grooved upon the inner face, thus producing the crescent-shaped appearance. In the other group this groove is greatly exaggerated. Not only is it very deep, but the sides are extended until they meet at the inner angle of the carpel, and thus the endosperm becomes a hollow sphere filled at first with the cellular seed-coat, but at maturity entirely empty except for the air which it contains, and which probably aids in floating the seed upon the water. A complete discussion of the fruit characters in the genus *Galium* will soon appear in a separate paper, and therefore nothing more need be said here upon this subject. Curiously enough the type of inflorescence seems to supplement the fruit characters. In the writer's opinion the number of corolla lobes offers a specific character. The plants are not "either" 3- or 4-merous, but the small three-parted obtuse lobed corolla represents one group of species as is shown by the supplementary characters of a smooth stem and a peculiar general appearance; while the four-parted large and acute lobed corolla just as accurately defines another group of species, and the character is here again supplemented by other characters. Valuable characters have been drawn from the arrangement of the flowers and the nature of the pedicels, while the leaves have not as a whole yielded good results. Very little dependence could be placed upon the number of leaves in a whorl.

Linnaeus in 1753 described a species of *Galium* as *G. trifidum*, habitat Canada. It is necessary first of all to determine just what plant this name represents. Many of the earlier botanists were in doubt as to this point. Most of them, however, decided to include under it all the obtuse leaved forms treated in this present paper. Hooker, however, having in hand perhaps mostly material from the States, and not having seen the true American type, considered the European form distinct, and to the American plant gave Michaux's name *G. Claytoni*. After this time the two forms were again united and have remained so until the present time. It becomes evident, however, that the small bog form, the

G. trifidum var. *pusillum* Gray, should be considered the type rather than the larger more southern plant. That these two American forms are distinct every one must admit after an examination of numerous specimens. The habit, inflorescence and nature of the floral pedicels afford abundant characters for their separation. The *G. Claytoni* of Michaux, although somewhat ambiguous, refers without much doubt to this southern form, as may be inferred from his description, "fascicles of the branches terminal, etc." The writer has therefore adopted this as the oldest name for the species. Does the *G. trifidum* of Linnaeus refer to the slender bog plant with scabrous pedicels? This can be at once decided in the affirmative by a careful analysis of his description; "stem procumbent, peduncles often in threes, very slender, as long as the leaves, one-flowered, flower 3-parted." Willdenow says "habitat in Dania, Canada, Kalm," which makes it all the more probable that this was Linnaeus' plant, since Kalm collected only in the North. It also shows that even Willdenow considered the slender American form identical with the European. This is without doubt correct. After studying several specimens from Germany and Lapland, and inspecting OEder's plate in the Flora Danica no other conclusion can be entertained; they are identical in every essential feature. Very good descriptions are given by Wahlenburg, Roemer and Schultes and Ledebour.

Two varieties of *G. trifidum* are here described as new. Var. *Pacificum*, the more distinct, at first sight seems quite different from our eastern plant. Close examination, however, shows that the essential characters of the two are the same. Both have the diffuse habit, scabrous stems, trifid corolla and slender scabrous pedicels which in this variety are almost always axillary and lateral. The difference is mostly in the leaf. Var. *Pacificum* is the extreme of the *trifidum* series. While the type has but few lateral pedicels, this variety has those only. Somewhat intermediate between these two forms, and having a wider range than the last variety, is the var. *subbiflorum*, including western forms with narrower leaves and stouter more often glabrous pedicels than var. *Pacificum*. These pedicels often show a tendency to become 2- or 3-flowered. It has affinities on the one hand with *G. Claytoni*, and on the other in its smaller forms with *G. Brandegeei.*

G. Brandegeei was described by Dr. Gray from material collected by T. S. Brandegee in northern New Mexico. The essential features separating it from *G. trifidum* were supposed to be its peculiar matted cespitose habit, short stems, small fleshy leaves, and short mostly axillary pedicels. An examination of the type shows that many other Rocky Mountain and Pacific Coast specimens must on this basis be included in this species. Specimens from California, Wyoming, Colorado, Nevada and the Saskatchewan are practically identical with the Brandegee type. *G. Brandegeei* seems to be a good species, although rather closely related to *G. trifidum*. Its essential features are as stated above, the cespitose habit, generally smooth stem, broad and slightly fleshy leaves, and short glabrous one-flowered lateral pedicels.

G. arcuatum is here described as new. It includes a peculiar group of plants somewhat related to *G. bifolium* Wats., as well as to *G. trifidum*, but it is quite distinct from any described species. The distinguishing features are the long rather obtusely angled stem, acute leaves, and short stout recurved lateral pedicels. Specimens were distributed by Mr. Howell named *G. trifidum* var. *cuspidulatum* Gray; otherwise this species has never received a name.

G. tinctorium L. has long been an ambiguous species. Many botanists have attempted to separate it, but so far with very little success. From the description given by Linnaeus one can scarcely tell which plant is meant, but relying upon Willdenow, it is evident that this name must be applied to our large-leaved smooth eastern form with four-cleft corolla. *G. tinctorium* is perhaps the most variable of any species of this group. A careful comparison of a great many specimens, however, enables us to separate it into four well-marked and fairly distinct series, but which are too closely related to allow of specific distinction. The type is here taken to be the ordinary form of the Eastern States, with large leaves varying from linear to lance-ovate. Descriptions given by the early authors fit this better than any other, and besides it is the one most likely to be met with by the early travelers. This type includes the *G. trifidum latifolium* of Torrey and later authors. Specimens intermediate between the broad-leaved form and the narrower are more numerous than either extreme. A very distinct variety, and one that may in the future allow of specific rank, is the var. *Labradoricum*, which toward its southern limit at least inhabits only sphagnous bogs. It was first thought to be a seedling plant of the ordinary form, but material examined from many localities shows it to be quite constant and distinct. The var. *filifolium* includes a well-defined series of Atlantic coast specimens, distinguished by their diffuse habit, naked inflorescence, large flowers, and exceedingly narrow, papillose leaves. Florida specimens of *G. tinctorium* differ from the type in being slender and weak, with spatulate leaves, and a few prickles upon the stem. They are very close to *G. Claytoni*, and have been separated as var. *Floridanum*.

A certain number of American species are distinguished from those discussed above by the lunate cross-section of the seed. The most interesting of all of these is *G. palustre* L. Apparently very few botanists have suspected that this occurs in America, and yet specimens are at hand from all parts of the eastern States. In most herbaria it is labelled *G. trifidum latifolium* Torr. It grows abundantly in the marshes about Cayuga Lake, New York, where the writer has had an opportunity to watch it for several years, thinking it a new species. It was only recently that it occurred to him to compare it with the *G. palustre* of Europe, and the surprise was great indeed when it was found that the two correspond exactly. Material from all parts of the range given below has been compared with specimens from various parts of Europe, and there is now no further doubt but that they are identical. Just as there are few flowered and densely flowered specimens from America, so also specimens are found in Europe with closely cymose infloresence and others bearing only a few flowers.

The question as to whether *G. palustre* is indigenous in America or not is indeed perplexing. Specimens collected at Ithaca have always been in open places near lines of traffic, commonly along roadsides or on the shores of Cayuga Lake. The limited distribution would also suggest its being introduced. On the other hand, the earliest specimen observed was collected by Macrae at Montreal in 1842, and probably the plant referred to by Hooker as *G. tinctorium* was also this species. The question can scarcely be settled at present.

Several specimens from the northwest coast have at the same time a 3-parted corolla, cymose flowers and annular seeds. In habit they suggest *G. asprellum*, but are really quite distinct from any described species. They are here named *G. cymosum.*

There is little to be said about the other species treated in this paper, viz., *G. concinnum*, *asprellum*, *asperrimum* and *triflorum.* They are as a whole quite constant in their characters, and have already been well treated by Dr. Gray in the Synoptical Flora.

A few words might be said about the relation of these species to each other. *G. palustre*, both on account of its fruit and its inflorescence and method of branching, shows an affinity with *G. asprellum*, while the leaves are exactly like those of *G. Claytoni.* It is therefore a transition, as it were, from *G. trifidum* and *G. Claytoni* to *G. asprellum* and its closer relatives. *G. concinnum* stands somewhat alone, its affinity being with *G. asprellum.* The series then progresses through *G. asperrimum*, with slightly hispid fruits to *G. triflorum* with its large broad leaves and long-hirsute carpels, and on to *G. aparine* and its allies.

Below are given the synonomy, description and range of each species and variety discussed in this paper, together with a list of the more important specimens studied taken by States. For convenience, a synopsis of the species is also given.

The writer wishes to express his sincere thanks to Dr. Robinson and Dr. Small, who have kindly loaned him the important collections of *Galium* in their charge for use in the preparation of this paper.

Synopsis of the Species discussed.

A. Endosperm annular in cross-section; fruit glabrous.

a. *Flowers in terminal clusters of three, or axillary and solitary.*

* Corolla 4-parted, lobes acute; stem smooth or nearly so.

Leaves linear, acute, mostly in 4's; plant large, stem long and weak; branches 2 or 3 at each node; flowers axillary and solitary on short recurved pedicels; corolla lobes acuminate. Western species. *G. arcuatum.*

Leaves lance-linear, obtuse, mostly in 4's, scabrous on the margin and midrib; plant smaller, stem more strict and (except in one variety) mostly erect; branches commonly solitary; flowers on slender straight pedicels in terminal clusters of three; corolla lobes acute. Species of the Great Plains and eastward. *G. tinctorium.*

* * Corolla 3-parted, small ($1\frac{1}{2}$ mm. or less in diam.), lobes obtuse; stem retrorse-hispid, or in *G. Brandegeei* smooth; branches of the plant commonly in 2's or 3's.

Pedicels stout, glabrous; flowers lateral, solitary; plants low and cespitose, stem 4–10 cm. high, mostly glabrous; leaves small, in 4's, broadly spatulate, slightly fleshy, glabrous, veins indistinct; flowers of medium size. Western species. *G. Brandegeei.*

Pedicels slender, scabrous, often almost capillary, solitary and lateral or in terminal clusters of three; stems slender, diffuse, weak and reclining, retrorse hispid; leaves narrowly linear or larger and broadly spatulate, commonly in 4's, scabrous on the margin and midrib; flowers minute. Northern and western species. *G. trifidum.*

Pedicels stout, glabrous, in terminal clusters of three; plants diffusely branched, stem mostly erect, retrorse-hispid; leaves linear, obtuse, scabrous on the margin and midrib, mostly in 5's and 6's, flowers small. Species of the Great Plains and eastward. *G. Claytoni.*

b. *Flowers cymose (pedicels irregularly branching); corolla large, 2 mm. in diam., lobes ovate-triangular, obtuse; leaves commonly in 5's or 6's, obtuse; branches spreading; stem slightly roughened. Western species.* *G. cymosum.*

B. ENDOSPERM LUNATE IN CROSS-SECTION; FLOWERS WHITE, PURPLISH OR GREENISH, NUMEROUS IN TERMINAL AND LATERAL CYMOSE CLUSTERS; COROLLA 4-PARTED; BRANCHES OF THE PLANT IN TWOS OR THREES.

a. *Leaves obtuse, mostly thin and dull, in 2's to 6's; flowers numerous on slender pedicels; corolla white, lobes acute; fruit glabrous. Northeastern species.* *G. palustre.*

b. *Leaves acute or cuspidate.*

Fruit glabrous, pedicels capillary; corolla white, lobes acute or acuminate; leaves linear, slightly mucronate, mostly in 6's; stem low and nearly smooth. Eastern species. *G. concinnum.*

Fruit glabrous on slender pedicels in a very large compound cyme; corolla white, lobes acuminate; leaves short, elliptic-linear, strongly cuspidate, mostly in 6's; stem long and ascending, very retrorse-hispid. Northeastern species. *G. asprellum.*

Fruit minutely uncinate-hispid, pedicels long and capillary; corolla whitish or purplish, lobes acuminate; leaves mostly in 6's, large, linear to broadly elliptic-linear, acute at each end, strongly cuspidate; stem long and weak, very rough. Pacific Coast species. *G. asperrimum.*

Fruit strongly uncinate-hispid; inflorescence few-flowered, pedicels stout, mostly in threes; corolla purplish or greenish, lobes acuminate; leaves mostly in 6's, large, broadly elliptic-linear, cuspidate, more flaccid than in the other species of this section; stems prostrate or rarely ascending, glabrous or hirsute. Distribution general. *G. triflorum.*

1. GALIUM ARCUATUM n. sp.

G. trifidum cuspidulatum Gray, ined.

Perennial, very large; stems ascending or reclining, 3–12 dm. high, glabrous, rather obtusely angled, diffusely branched, branches two or three at each node; leaves elliptic-linear, acute at each end (7–22 mm. by 1–4 mm.), 1-nerved, thin, commonly in 4's, unequal, scabrous on the margin and midrib; flowers axillary (rarely terminal), solitary at each node, on mostly stout glabrous recurved pedicels which are much shorter than the leaves (2–7 mm. long); corolla white, rather large (3 mm. diam.), 4-parted, lobes acuminate; fruit glabrous, mature fruit not seen.

A well-defined form quite distinct from other western species. Specimens distributed by Mr. Howell were named *G. trifidum cuspidulatum* Gray. This species varies considerably in size, some plants being much more slender than the type.

Northern California.

California, Holder, no. 2580 (1863); Rattan, no. 544b (1866); Trinity Co., Rattan (1883); Siskyou Co., Howell, no. 137 (1886).

2. GALIUM TINCTORIUM L. Sp. Pl. 106. 1753.

DC. Prod. 4: 597. 1830. Torr. Fl. N. & Mid. States, 78. 1826. Pursh, Fl. Am. Sept. 102. 1814.

G. trifidum (in part) of American authors.

G. trifidum latifolium Torr. Fl. N. & Mid. States, 78. 1826.

G. obtusum Bigelow, Fl. Bost. ed. 2, 55. 1824.

Perennial, erect, 15–25 cm. high, usually rather stiff, much branched almost to the base, branches commonly solitary, strict (not irregularly diffuse), several times forked; stem 4-angled, glabrous or very nearly so; leaves commonly in 4's, linear to lanceolate (15–25 mm. long) broadest below the middle, obtuse, cuneate at the base, 1-nerved, margin and midrib slightly scabrous, dark-green and dull, not papillose; flowers terminal in clusters of 2–3, pedicels slender, not conspicuously divaricate even in fruit; corolla white, large (2–3½ mm. diam.), 4-parted, lobes oblong, acute; fruit smooth; endosperm spherical, hollow, annular in cross-section.

A form occurs along the coast and in Oswego, Co., N. Y., differing from the type in being more slender and weaker, leaves linear, inflorescence naked and larger flowered; perhaps distinct.

An examination of fresh material obtained at Ithaca, N. Y., shows that *G. tinctorium* differs also from all other species here treated except *G. asprellum* (*G. arcuatum*, *Brandegei*, *cymosum* and *asperrimum* not examined) in having a much larger disc at the base of the corolla.

Damp shady places and swamps: Canada to North Carolina and Tennessee, westward to Michigan, Nebraska, Indian Territory and Arizona.

Canada: Macoun, no. 77 (1877); Scott (1890); Holmes.
Massachusetts: Oakes.
New York: Petit; Sartwell; Torrey; Ouray (1834); Dudley.
New Jersey: Leggett (1868); Torrey.
North Carolina: Torr. Herb.
Tennessee: Bain, no. 294 (1893).
Kentucky: Short (1831); Peter (1893).
Illinois: Patterson.
Ohio: Kofoid (1891).
Michigan:
Minnesota: Ballard (1891).
Nebraska: Clements, no. 2554 (1895). In part.
Kansas: Norton, no. 204 (1895).
Arkansas: Harvey, no. 88.
Indian Territory: Bush, no. 1134 (1895).
Arizona: Palmer, no. 514 (1890).

GALIUM TINCTORIUM FILIFOLIUM n. var.

More slender than the type and often more diffuse; leaves almost filiform (2 mm. or less broad), not broader below the middle, strongly cellular papillose; inflorescence more open, pedicels slender, bracts minute; flowers in twos or threes, corolla larger.

Sandy places in swamps; Virginia to Florida along the coast.

Type in Herb. Cornell Univ; Bladen Co., N. C., Beadle no. 479 (1896).

Virginia: Curtiss (1855).
North Carolina: Schweinitz.
South Carolina: Hexamer and Maier (1855).
Georgia: no collector.
Florida: Rugel (1843).

GALIUM TINCTORIUM FLORIDANUM n. var.

A weak slender form decumbent at the base; leaves spatulate-linear, of medium size, flaccid; stem slightly hispid; flowers 4-parted (rarely in a few flowers 3-parted), on slender pedicels, occasionally axillary and solitary.

Florida.

Type in Herb. Cornell Univ.; Florida, Nash, no. 152 (1894); Pierce (1887); Curtiss, no. 4711 (1894); Straub, nc. 104 (1895).

Galium tinctorium Labradoricum n. var.

Low and strictly erect, 5–25 cm. high; branches few, ascending, mostly from the upper nodes; stem as in the type; leaves small (7–8 mm. long), linear, reflexed; flowers large.

In sphagnous bogs; Connecticut, New York and Wisconsin, northward to Labrador.

Type in Herb. Cornell Univ.; Oswego Co., N. Y., Rowlee and Wiegand (1895).

Connecticut: Torr. Herb.

New York: Torr. Herb.

Wisconsin: Lapham.

Lake Superior: Lorings.

Newfoundland: Waghorne (1893).

Labrador: Storer.

3. Galium Brandegeei Gray, Proc. Amer. Acad. **12**: 58. 1877.

Perennial and cespitose forming dense mats; stems low and prostate or ascending (5–12 cm. long), slender and rather densely leafy, smooth or nearly so; branches when present solitary; leaves in fours, unequal, obovate-spatulate, small (10 mm. or less), rounded at the apex, cuneate at the base, somewhat fleshy, dull on both surfaces, veins indistinct, margins and midrib glabrous; flowers lateral, commonly gemmate, on glabrous arcuate pedicels which are as long or longer than the leaves; corolla of medium size, white 3-parted, lobes broadly oval, obtuse; fruit glabrous, endosperm spherical, hollow, annular in cross-section.

This species is closely related to *G. trifidum subbiflorum*, but is distinguished by its peculiar matted habit, commonly glabrous stem, thicker leaves and stouter glabrous pedicels. In one of the Colorado plants the corolla shows a tendency to become 4-parted. Some California specimens have rough stems.

Northern New Mexico and Arizona to California and the Saskatchewan.

New Mexico: Brandegee (1875) type.

Arizona:

California: Lemmon, no. 1217 (1875); Bolander, no. 5025 (1866); Parish, no. 3320 (1894).

Colorado: Crandall, no. 281 (1894).

Wyoming: Nelson, no. 1763 (1895).

Saskatchewan: Macoun (1885).

4. Galium trifidum L. Sp. Pl. 105. 1753.

Fl. Dan. *pl. 48.* Wahl. Fl. Lap. 47. 1812. Roem. & Schul. Syst. Ledeb. Fl. Ross. Big. Fl. Bost. ed. 2, 56. 1824. DC. Prod. 4: 597. 1830.

G. trifidum pusillum Gray, Man. ed. 5, 209. 1867.

Perennial from slender rootstocks, very slender and weak, ascending, 40 cm. or less long, much branched and intertangled; stem sharply 4-angled, rough; branches commonly in twos; leaves in fours, linear-spatulate, 5–13 mm. long, obtuse, cuneate at the base, 1-nerved, dark-green and dull on both surfaces, scarcely papillose, margins and midrib retrorse-scabrous; flowers solitary on lateral or terminal pedicels which are capillary, scabrous and arcuate at the apex, much longer than the leaves, commonly two at each node or three terminal; corolla very small, white, ½ mm. long, trifid, lobes broadly oval, very obtuse; fruit glabrous; endosperm spherical and hollow, annular in cross-section.

Sphagnous bogs and cold swamps. Maine to southern New York, Ohio, Nebraska, Colorado and northward.

Maine: Fernald, no. 412 (1895); Parlin (1885).

Vermont: Grout and Eggleston (1894).

Central New York: Dudley and others; Britton (1886).

Ohio: Werner (1891).

Nebraska: Rydberg, no. 1418 (1893).

Michigan: Britton (1886).

Colorado: Wolf, no. 16–17 (1873).

Galium trifidum subbiflorum n. var.

Stems less scabrous than in the type, somewhat stouter; leaves larger, very unequal (8–10 mm. by 2 mm.), flaccid and nearly smooth; pedicels capillary and as long as the leaves, or sometimes rather stout; rarely two or even three-flowered, nearly glabrous.

This variety approaches *G. Claytoni* and *G. Brandeegei.* The specimens examined are nearly all much discolored as if the leaves might be slightly fleshy.

Arizona and California to Oregon and the Saskatchewan.

Type in Herb Cornell Univ. Colorado, Hall and Harbour, no. 230 (1862).

Arizona: Palmer.

Utah: Watson, no. 485 (1869).

California: Kellogg (1866); Bolander, no. 5348 (1866); Parish. no. 1505 (1882); Eastwood (1894).

Oregon: Lyall (1858); Cronkhite (1864); Cusick no. 1397 (1886).

Colorado: Patterson (1892).

Wyoming: Nelson, no. 1115 (1894).

Saskatchewan: Bourgeau (1858).

GALIUM TRIFIDUM PACIFICUM n. var.

Larger and stouter than the type; leaves unequal, mostly in 4's, large and broadly oblong-spatulate, obtuse, cuneate at the base (15–23 mm. by 3–5 mm.), thin and flaccid; pedicels lateral, capillary, scabrous and arcuate as in the type, 1-flowered, equalling the leaves or shorter; corolla minute, 3-parted.

Some Washington specimens have nearly glabrous pedicels.

California to Washington.

Type in Herb. Cornell Univ.; Placer Co., Cal., Carpenter (1892), Bottom lands of the Columbia River, Suksdorf, no. 1661 (1893).

5. GALIUM CLAYTONI Michx. Fl. Bor. Am. **1**: 78. 1803.

Roem. & Schul. Syst. Hooker, Fl. Bor. Am.

G. trifidum Pursh, Fl. Am. Sept. 103. 1814. Torr. Fl. N. & M. States, 78. 1826. Darl. Fl. Cest.

G. trifidum (in part) T. & G. Fl. N. A. **2**: 22. 1841. DC. Prodr. **4**: 597. 1830.

G. tinctorium Bigelow, Fl. Bost. ed. **2**, 54. 1824.

Perennial; erect or ascending, becoming more diffuse when old, 15–60 cm. high; stem slender, or in some specimens quite stout, sharply 4-angled, more or less rough, the diffuse branches in 2's; leaves of medium size (8–15 mm. long), commonly in 5's or 6's, linear-spatulate or spatulate-oblong, obtuse, cuneately narrowed into a short petiole, rather firm in texture, scabrous on the margin and midrib, dark-green and dull above, not papillose, discolored in drying; flowers in clusters of 2's or 3's, terminal, provided with 1 or 2 minute bracts; pedicels straight, in fruit strongly divaricate, glabrous and rather stout; corolla minute, white, 3-parted, lobes broadly oval, obtuse; fruit glabrous; endosperm spherical and hollow, annular in cross-section.

This species, heretofore confounded with *G. trifidum*, embraces all the eastern forms with trifid corolla and scabrous stems not included under *G. trifidum*. Although somewhat variable, no varieties can be distinguished. It forms, however, a fairly well defined species. Its closest relative is *G. trifidum*, from which it differs in its more robust habit, clustered terminal flowers and stouter glabrous pedicels. The southern Atlantic specimens have broader leaves and more slender pedicels than the type.

Swamps, Massachusetts and New York to North Carolina, Texas, Michigan and Nebraska.

Massachusetts: Boott (1853).

New York: Dudley and others.

Virginia: Small (1892); Heller (1893); Britton (1892).

North Carolina: Beardslee and Kofoid (1891); Torr. Herb.

Ohio: Sullivant.

Michigan: Farwell, no. 758 (1890).

Illinois: Eggert (1891).

Nebraska: Rydberg, no. 1840; Clements no. 2554 (1893). In part.

Texas: Reverchon (1876).

New Mexico: Wright, no. 1115 (1851).

6. GALIUM CYMOSUM n. sp.

Perennial; erect or ascending, 3–8 dm. high; stem 4-angled, more or less roughened, internodes long (4–6 cm.), diffusely branched, branches in 2's or 3's; leaves in 5's or 6's, linear, 10–17 mm. long, obtuse, thin, scabrous on the margin and midrib, scarcely papillose; flowers numerous, in terminal and lateral cymes; bracts foliaceous, small; pedicels short and slender, in flower mostly divaricate, in fruit strongly so; corolla white, large (2 mm. diam.), 3-parted, lobes triangular-ovate, obtuse; fruit glabrous; endosperm spherical and hollow, in cross-section annular.

Plant with an aspect intermediate between *G. Claytoni* and *G. asprellum*.

Oregon to British Columbia.

Type in Herb. Cornell Univ. Tacoma, Washington, J. B. Fleet (1896).

Oregon: Hall, no. 232 (1871).

British Columbia: Scouler.

7. GALIUM PALUSTRE L. Sp. Pl. 105. 1753.

Fl. Dan. *pl. 423*. *G. trifidum* (in part) and *G. tinctorium* (in part) of American authors.

? G. trifidum bifolium Macoun, Cat. Can. Plants, 202. 1884.

Perennial, erect and rather slender, about 40 cm. high; internodes very long (middle 6–7 cm. long), short branches mostly in

2's, stem sharply 4-angled, glabrous or slightly scabrous; leaves in typical specimens rather small, in 2's to 6's, linear-elliptic or spatulate, cuneate at the base, obtuse (7–10 mm. by 2–3 mm.), rather firm, margins and midrib slightly scabrous, not papillose, reduced to two at the upper nodes; flowers numerous in terminal and lateral cymes; bracteoles in the inflorescence minute; pedicels in flower ascending, 3–5 mm. long, in fruit strongly divaricate; corolla large, white (2½–3¼ mm. diam.), 4-parted, lobes oblong, acute; disk at the base almost obsolete; fruit glabrous; endosperm grooved on the inner face, in cross-section lunate.

Typically with small leaves and densely cymose inflorescence, but varying into large-leaved forms with few flowers, seemingly dependent upon the habitat. Many of these latter have most of the upper leaves in 2's, and although Prof. Macoun's type has not been seen, it seems probable that his var. *bifolium* is to be referred here. *G. palustre* grows mostly in patches, and late in the season creeping branches are sent out, forming dense green mats which remain green until covered by the snow. When in flower it is quite showy, the pure white patches being very conspicuous.

In damp shady or open places along roadsides and ditches, or in the margins of swamps. Newfoundland, Prince Edward's Island, and Canada to Massachusetts and New York.

Newfoundland: Robinson & Schrenk, no. 214 (1894).
Prince Edward's Island: Macoun (1888).
Canada, at Montreal, Macrae (1842).
Maine: Fernald (1891).
Massachusetts: Sears (1887).
Central New York: Dudley and others.

8. Galium concinnum T. & G. Fl. N. A. 2: 23. 1841.

Endosperm deeply grooved.

Dry hillsides; Pennsylvania to Virginia, and westward to Minnesota, Iowa and Arkansas.

9. Galium asprellum Michx. Fl. Bor. Am. 1: 78. 1803.

DC. Prod. 4: 598. 1830. T. & G. Fl. N. A. 2: 23. 1841.
G. Pennsylvanicum Muhl. Cat.
G. spinulosum Raf. Prec. Decouv. 40. 1814.
G. micranthum Pursh, Fl. Am. Sept. 103. 1814. Except fruit.
Endosperm with a shallow groove.

Alluvial river banks and swamps; Newfoundland and Ontario to Pennsylvania and west to Wisconsin.

10. GALIUM ASPERRIMUM Gray, Mem. Amer. Acad. 4: 60. 1849. Bot. Calif. 1: 284. 1880.

G. asperrimum asperulum Gray, Bot. Calif. 1: 284. 1880.

Endosperm with a shallow groove. A variable species. The type and also other specimens from New Mexico and Arizona have small very scabrous leaves and a very large diffuse panicle. The type of variety *asperulum* Gr. (Watson, Nevada) is nearly glabrous with thinner leaves and few flowered inflorescence; other specimens from Washington, Oregon, California and Arizona have large and broad rather firm leaves. No distinct variety can be separated.

Washington to California, Utah, Arizona and New Mexico.

11. GALIUM TRIFLORUM Michx., Fl. Bor. Am. 1: 80. 1803.

Pursh, Fl. Am. Sept. 104. 1814. DC. Prod. 4: 601. 1830. Hooker, Fl. Bor. Am. T. & G. Fl. N. A. 2: 23. 1841.

G. cuspidatum Muhl. Cat.

G. brachiatum Pursh, Fl. Am. Sept. 103. 1814.

G. Pennsylvanicum Bart, Comp. Fl. Philad. 83.

Endosperm almost spherical, groove nearly obsolete. Specimens from Nebraska, New York, Connecticut and Massachusetts are more or less hirsute. The southern plants are somewhat smaller leaved, while some of the Pacific coast specimens have long slender pedicels (1½–4 cm.); others from Oregon and British Columbia have narrower leaves than the type.

Damp shady places; Labrador and Northern Canada to Florida and Louisiana, across the continent, south to northern California and Colorado.

CORNELL UNIVERSITY.

Two new Violets.

By Charles Louis Pollard.

Viola Porteriana n. sp.

Mature plant 2–3 dm. high, robust, acaulescent, from a stout branching rootstock; leaves long petioled, evidently exceeding the peduncles; blade glabrous or besprinkled with scattered hairs, in the early leaves cordate-oblong, obtuse, regularly but not prominently crenate; in the latter leaves deltoid-triangular, the base inclined to be cordate, obviously decurrent upon the petiole; apex obtuse or more often acute; margin ciliate, remotely and very irregularly crenate or dentate, the base sometimes with a few marked incisions; petiole pubescent below, 13–18 cm. long, the blade in the mature leaves 13 cm. long and 7 cm. wide at the base; flowers deep purple, as seen in a single withered specimen; cleistogamous flowers on ascending or erect peduncles; capsule obscurely 3-angled; seeds pale, not mottled nor pitted. (Plate 314.)

Type specimen collected in the vicinity of Bushkill Falls, Pennsylvania, May 31, 1897, by Mr. Joseph D. Crawford and the writer; additional specimens, in a later stage of development, were obtained by Mr. Crawford, July 15, near Hamburg, Pa. The species is dedicated to Professor Thomas C. Porter, who acted as guide on the very delightful Decoration Day excursion of the Torrey Club, and who was among the first to express an opinion of its distinctness. In fact there was substantial agreement among the botanists then present that the plant could not well be referred to any known species of the *sagittata* group, although the dried specimens may easily deceive those whose conceptions of *V. sagittata* and *V. cucullata* are of the elastic order. It may be distinguished from *V. ovata* Nutt., an abundance of which was collected on the same excursion, by its much greater size, absence of hirsute pubescence and the relative differences in the length of petioles and peduncles. From the true *V. sagittata* it may be known by the broadly triangular leaves, which are quite without the characteristic lobes and incisions of that species, and also by its habitat, which is dry sandy soil. Very probably it hybridizes or even intergrades with *V. ovata*, although I have never seen anything approaching it in the hundreds of ovata plants examined, including the typical specimens in the herbarium of the Philadelphia Academy of Sciences.

VIOLA FLAVOVIRENS n. sp.

Mature plant 2–3 dm. high, subcaulescent, from a slender rootstock; leaves of a yellowish-green hue, long-petioled, oblanceolate or oblong, very obtuse at apex, tapering at base, and decurrent upon the petiole; margins ciliate, remotely and obscurely denticulate; both surfaces of the blade, particularly along the veins, clothed with fine white hirsute pubescence, which is also prominent on both petioles and peduncles; flowers borne well above the leaves (peduncles 1–3 dm. long), bright yellow, faintly veined with purple, the lateral petals slightly bearded; diameter of flower 2½ cm.; sepals narrowly linear, finely ciliate; capsule not observed.

Types collected by A. A. Heller, at Lake Waha, Nez Perces County, Idaho, June 3d and 4th, 1896 (no. 3106), also by Messrs. Sandberg, Heller and MacDougal, at the same locality May 22, 1892 (no. 222). In both cases distributed as *V. Nuttallii*, a diminutive species to which it is scarcely at all related. Specimens collected by L. F. Henderson, at Julietta, Idaho, and by Howell, at Hood River, Oregon, 1880, are evidently referable also to *V. flavovirens.*

The Genus Oxytria of Rafinesque.

BY CHARLES LOUIS POLLARD.

There is a small genus of delicate Liliaceous plants in the South Atlantic and Gulf States, known in our manuals under the name of *Schoenolirion*, in which the synonymy is exceedingly confused, and the species have passed under a variety of generic appellations. Michaux established the name *Phalangium croceum** for a plant with "pyramidal raceme" and saffron yellow flowers, native of southern Georgia. As *Phalangium* Juss. is a synonym of *Anthericum* L., it was necessary to give the plant another generic appellation, and Elliott, having what he supposed to be Michaux's plant,† although the flowers were white, transferred the species to *Ornithogalum* with a question mark. (Bot. S. C. & Ga. 1: 397. 1821.) Rafinesque, in Fl. Tell. 2: 26, 1836, established two genera, *Oxytria* and *Amblostima*, basing the former on *Pha-*

* Fl. Bor. Amer. 1: 196. 1803.

† Dr. Gray has already made this point clear. See Amer. Nat. 10: 427. 1876.

langium croceum Nutt., not Michx., and the latter on *P. croceum* Michx. and *Ornithogalum croceum* of Elliott which he renamed *Amblostima albiflora.* Nuttall calls attention to the incorrectness of the term "pyramidal" as applied to the inflorescence, but in other respects his plant is that of Michaux, as Dr. Gray has already testified. Rafinesque's species are thus seen to be congeneric, and *Oxytria*, by priority of place, should stand as the designation for the genus, which was first named *Schoenolirion* by Durand (Proc. Acad. Nat. Sci. Philad. new series 3: 103, 1855), who obtained it from Torrey's manuscript of the Wheeler report. Durand here also published as *Schoenolirion album* the Californian plant afterward distinguished by Watson as *Hastingsia alba.*

Revising the genus *Schoenolirion* for the American Naturalist in 1876 (1. c. p. 427), Dr. Gray disregarded Rafinesque's *Amblostima albiflora*, taking up Dr. Feay's manuscript name of *S. Elliotti* for the plant with white flowers. He recognized in addition three species, *S. croceum*, *S. album* and *S. Texanum*, the latter being *Ornithogalum Texanum* of Scheele. The same treatment is observed by Watson in his treatment of the Liliaceae three years later. The arrangement of species will then stand as follows, excluding the Californian plant, which seems to be best kept generically distinct:

OXYTRIA Raf. Fl. Tell. 2: 26. 1836.

[SCHOENOLIRION Durand, Proc. Acad. Nat. Sci. Philad. (III) 4: 103, 1855, in part] and all later authors. Characters of the genus as defined by Watson, Proc. Amer. Acad. 14: 216. 1879.

1. O. CROCEA (Michx.) Raf. l. c.

Phalangium croceum Michx. Fl. Bor. Amer. 1: 196. 1803.
Schoenolirion croceum Gray, Amer. Nat. 10: 427. 1876.
Southern Georgia and Florida.

√ 2. O. ALBIFLORA (Raf.)

Amblostima albiflora Raf. l. c.
Ornithogalum croceum Ell. Bot. S. C. & Ga. 1: 397. 1821.
Schoenolirion croceum Chapm. Fl. S. States, 483. 1863.
Schoenolirion Elliottii Feay; Gray. l. c.
Southern Georgia and Florida, probably also in Alabama.

3. O. TEXANA (Scheele)

Ornithogalum Texanum Scheele, Linnaea, 23: 146.
Schoenolirion Texanum Gray, l. c.
Texas and Louisiana.

Observations upon a Clearing in July.

BYRON D. HALSTED.

During the past winter a piece of woodland about four miles from New Brunswick, N. J., along the trolley line to South River has been chopped over, the wood removed and the brush left in large piles. No attempt has been made to clear the field of stumps or shrubs, and this piece offers a good opportunity for the study of the effect upon the smaller species of plants of the removal of the larger ones. The lot, of possibly five acres, somewhat irregular in outline, is quite uneven, and being in some parts high and in others low, with a small stream running through it, a large variety of conditions obtain and a rich flora results.

In general, it was an ordinary mid-Jersey forest of possibly the third cutting. Among the trees are oaks, chesnuts, and some pines in the higher ground, while near the bog, magnolias are present and birches and alders. In the lower part the *Rhus Vernix* and a tangle of *Smilax rotundifolia* line the wet portion where *Habenaria lacera* and *Osmunda cinnamomea* give place to the skunk cabbage.

The clearing was first visited in May with a class of a dozen students in quest of specimens for their plant collections. Upon this trip nothing unusual was noted, only the flowering herbs engaged the attention, and these were found upon the cleared lot, although in less abundance than in the woods, presumably only because the felling of the trees, and other tramping incident to the removal of the wood, had destroyed many of these tender humble plants.

A second visit was made upon July 5th, at the time when in the low ground an occasional *Azalea viscosa* was white with its highly fragrant blooms.

In the wooded portion the huckleberries of at least three species and the squaw berry, *Vaccinum stamineum*, abounded, and were well laden with green half-grown berries. These shrubs were few in the cleared land, browned as if sun burned, while the scattered berries were ripening and some fully ready for the pickers. The remarkable reduction in the number of these Ericaceous shrubs might be largely due to the harsh treatment in connection with the removal of the trees, but there seemed to be unmistakable evidence that the specimens that had escaped the ravages of the woodman were suffering from the added exposure that the clearing of the trees had brought them.

Among the herbaceous plants none were more strikingly affected by the removal of the trees than the skunk cabbage. While in the shade of the trees the leaves were broad and green as in their wont to be, in the clearing the foliage had a yellow sickly cast with not more than half the size of the blades of the shaded plants. A long slender-leaved sedge neither in bloom nor fruit stopped short at the clearing as if cut down by a scythe. A sphagnum that had its usual vigor in the shade was brown and dry-topped in the sun, and gave unmistable signs of disliking tne new situation. In the clearing many of the oak sprouts were scalded at the tip. Ferns were much smaller in the sun than in the shade, and this was particularly true of *Osmunda cinnamomea* which in the shade spread out its great fronds into large " eagle nests," while those in the sun were nearly upright, and besides being dwarfed were browned as if in late autumn. The *Osmunda regalis* was found only in the shade.

On the other hand the grape vines, of a slender growth in the woods, run rampant over the large brush piles, due to the greater freedom as much perhaps as to the increased sunlight they now enjoy. The *Parthenocissus quinquefolia* behaved similar to its kind in the shade with a striking difference in the shorter petioles in the sunned plants.

Over all these five acres there was a striking absence of plants common to the open. At one point about two rods from a public road there were found two plants of *Bidens frondosa* and one small one of *Ambrosia artemisifolia*. A half-dozen solidagos not yet in bloom, probably *S. Canadensis* were taken. The only striking instance of open air vegetation was two small tufts of *Holcus lanatus* upon a knoll, where seed of this velvet grass got a foothold no one can tell how.

Nomenclatural Notes.

1. *Cheilanthes gracilis* (Fée) Metten. This specific name, adopted in the A. A. A. S. "Check-list," dates only from Fée's Genera Filicum, 1850–52, while the name *Cheilanthes gracilis* was applied by Kaulfuss (Enum. 209. 1824) to the *Pteris gracilis* of Michaux (*Pellaea gracilis* of Check-list, *Pellaea Stelleri* of Britton and Brown's Flora). Moore, to avoid producing a homonym of Kaulfuss' name, in transferring Fée's *Myriopteris gracilis* to *Cheilanthes*, called it *C. Feei*, which is the oldest available name for this species. *Cheilanthes lanuginosa* Nutt. was not published until the following year. The synonymy of this species thus stands as follows:

CHEILANTHES FEEI Moore, Ind. Fil. xxxviii. Mr. 1857.

Myriopteris gracilis Fée, Gen. Fil. 150. 1850–52.

Cheilanthes lanuginosa Nutt.; Hook. Sp. Fil. 2: 99. 1858.

Cheilanthes gracilis Metten. Abh. Senck. Nat. Gesell. 3: [reprint 36]. 1859. Not Kaulf. 1824.

2. *Epifagus* (*Epiphegus*) Nutt. This name is clearly antedated by *Leptamnium* Raf. Rafinesque's name was published in February, 1818. The date of publication of Nuttall's Genera is not exactly known, but it must have been later than the middle of May of that year. The title was deposited to secure copyright on April 3; the preface is dated May 27; and it is quite certain that the work was all issued at the same time. It is true that Barton, in his Compendium Florae Philadelphicae, published before the end of the same year (1818) repeatedly cites Nuttall's work, but in his preface he acknowledges Nuttall's kindness in permitting its use, and it is by no means certain which work was offered to the public first. In any event, it appears to me, the priority of Rafinesque's names, published in the January and February numbers of the *American Monthly Magazine*, is unquestionable. The synonymy of this monotypical genus is given here.

LEPTAMNIUM Raf. Am. Month. Mag. 2: 267. F. 1818.

[EPIFAGUS Nutt. Gen. 2: 60. 1818.]

LEPTAMNIUM VIRGINIANUM (L.) Raf.; A. Gr. Syn. Fl. 2: Part 1, 314. 1878. As syn.

Orobanche Virginiana L. Sp. Pl. 633. 1753.

Epifagus Americana Nutt. Gen. 2: 60. 1818.

Epifagus Virginiana Bart. Comp. Fl. Philad. 2: 50. 1818.

3. *Lepachys* Raf. In his paper published in the *Journal de Physique* in 1819, Rafinesque erected two species of *Rudbeckia* into new genera, under the names of *Ratibida* and *Lepachys*. Since that time nearly all writers have considered these two species distinct from *Rudbeckia*, yet congeneric, and the resulting genus has been known as *Obeliscaria* Cass. (a later name) or *Lepachys* Raf. It is indeed strange that no one appears to have noticed that, in the *Journal de Physique*, *Ratibida* is described before *Lepachys*. However, *Ratibida* has a better claim to priority than mere position, for it was duly published in the preceding year in the *American Monthly Magazine*. The synonymy of the entire genus, as now understood, is appended here.

RATIBIDA Raf. Am. Month. Mag. 2: 268. 1818.

[LEPACHYS Raf. Journ. Phys. 89: 100. 1819.]
[OBELISCARIA Cass. Dict. Sci. 35: 372. 1825.]

RATIBIDA PINNATA (Vent.).

Rudbeckia pinnata Vent. Jard. Cels. *pl. 71*. 1800.
Lepachys pinnatifida Raf. Journ. Phys. 89: 100. 1819.
Obeliscaria pinnata Cass. Dict. Sci. 35: 373. 1825.
Lepachys pinnata Torr. & Gr. Fl. N. Am. 2: 314. 1842.

RATIBIDA TAGETES (James).

Rudbeckia Tagetes James in Long's Exped. 2: 353. 1823.
Rudbeckia globosa Nutt. Journ. Acad. Philad. 7: 79. 1834.
Obeliscaria Tagetes DC. Prodr. 5: 559. 1836.
Lepachys columnaris Tagetes A. Gr. Pl. Wright. 1: 106. 1852.
Lepachys Tagetes A. Gr. Pac. R. R. Rep. 4: 103. 1856.

RATIBIDA COLUMNARIS (Sims) D. Don; Sweet, Brit. Fl. Gard II. 361. 1838.

Rudbeckia columnaris Sims, Bot. Mag. *pl. 1601*. 1813.
Ratibida sulcata Raf. Journ. Phys. 89: 100. 1819.
Obeliscaria columnaris DC. Prodr. 5: 559. 1836.
Lepachys columnaris Torr. & Gr. Fl. N. Am. 2: 315. 1842.

RATIBIDA PEDUNCULARIS (Torr. & Gr.)

Lepachys peduncularis Torr. & Gr. Fl. N. Am. **2**: 315. 1842.
Obeliscaria peduncularis Walp. Repert. **2**: 979. 1843.

4. *Balduina* (*Baldwinia*) Nutt. This name is a homonym of Rafinesque's *Baldwinia*, published a few months earlier in the American Monthly Magazine (**2**: 267. F. 1818). Elliot, retaining Nuttall's name *Balduina*, proposed to separate one of the two species as a separate genus, under the name *Actinospermum*, and this name must now be applied to both species if they are to be retained in the same genus, as is done in the synonymy given below. If the two species are held as constituting distinct genera, as is done by Torrey and Gray, Darby and Chapman (even in the last edition of his Flora, recently published), the name *Actinospermum* belongs to *A. angustifolium*, and the other species must receive a new generic appellation, in which case *Endorima* Raf. seems to be eligible, with *Balduina uniflora* Nutt. as its type, though the name was not properly published by Rafinesque. *Mnesiteon* Raf. (Fl. Ludov. 67. 1817) is given by the Kew Index as a synonym of *Baldwinia* Nutt., but it certainly is more than doubtful if this is correct. The only apparent ground for this view is that Rafinesque notes a resemblance between the type of his *Mnesiteon* and *Buphthalmum angustifolium* Pursh.

ACTINOSPERMUM Ell. Bot. S. C. & Ga. **2**: 448. 1824.

[BALDUINA Nutt. Gen. **2**: 175. 1818. Not *Baldwinia* Raf. F. 1818.]

[ENDORIMA Raf. Am. Month. Mag. **4**: 195. Ja. 1819. Without synonymy or description.]

ACTINOSPERMUM UNIFLORUM (Nutt.)

Balduina uniflora Nutt. Gen. **2**: 175. 1818.

ACTINOSPERMUM ANGUSTIFOLIUM (Pursh) Torr. & Gr. Fl. N. Am. **2**: 389. 1842.

Buphthalmum angustifolium Pursh, Fl. Am. Sept. 564. 1814.
Balduina multiflora Nutt. Gen. **2**: 176. 1818.

JOHN HENDLEY BARNHART.

TARRYTOWN-ON-HUDSON, July, 1897.

Local Cryptogamic Notes.

BY HENRY C. BENNETT AND SMITH ELY JELLIFFE.

From observations made upon the local distribution of diatoms it would appear that *Amphipleura pellucida* is not a common diatom. Its occurrence in a recent gathering from Van Cortland Lake has prompted the following note upon other forms found in the same gathering. The following forms have been determined:

Amphipleura pellucida Kg.
Amphora ovalis Kg.
Cocconeis scutellum Ehr.
C. oblonga Kg.
Cymbella cistula Brun.
C. gastroides Kg.
C. leptoceros Kg.
Diatoma tenue Kg.
D. vulgare Bory.
Epithemia gibba Kg.
E. turgida Kg.
Eunotia lunaris Ehr.
E. monodon Ehr.
E. pectinalis Rab.
E. firma ?
E. tridentula Ehr.
Fragilaria construens (Ehr.) Grun.
F. capucina Demaz.
F. virescens Ralfs.
Gomphonema acuminatum Ehr.
G. capitatum Ehr.
G. constrictum Ehr.
G. cristatum Ralfs.
G. dichotomum Kg.
G. germinatum Ag.
Melosira granulata Ehr.
M. crenulata Kg.
M. scalaris Grun.
Meridion circulare Ag.
M. intermedium H L.S.
Navicula Anglica Ralfs.
N. ambigua Ehr.
N. cuspidata Kg.
N. gracilis Ehr.
N. rhyncocephala Kg.
N. spaerophora Kg.
N. viridis Kg.
Nitzschia scalaris Sm.
Odontidium hyemale Kg.
O. mutabile Sm.
Stauroneis punctata Kg.
S. phoenicenteron Ehr.
Surirella recedens A.S.
Synedra pulchella Kg.
S. radiata (Kg.) Grun.
S. ulna Ehr.
Tabellaria fenestrata Kg.
T. flocculosa Kg.

A number of forms from the same gathering are still under study. We hope to report these at the earliest opportunity.

NEW YORK, April, 1897.

Circular of the Sub-Commission of the Pan-American Medical Congress on Medicinal Flora of the United States.

SMITHSONIAN INSTITUTION.

Washington, D. C., July 1, 1897.

AMERICAN MEDICINAL FLORA.

DEAR SIR: The Smithsonian Institution has undertaken to bring together all possible material bearing on the medicinal uses of plants in the United States. Arrangements have been made with a body representing the Pan-American Medical Congress (the Sub-Commission on Medicinal Flora of the United States) to elaborate a report on this subject, and the material when received will be turned over to it for investigation.

The accompanying detailed instructions relative to specimens and notes have been prepared by the Sub-Commission.

All packages and correspondence should be addressed to the Smithsonian Institution, Washington, D. C., and marked on the outside *Medicinal Plants, for the U. S. National Museum.* Franks which will carry specimens, when of suitable size, together with descriptions and notes, free of postage through the mails, will be forwarded upon application. Should an object be too large for transmission by mail the sender is requested, before shipping it, to notify the Institution, in order that a proper authorization for its shipment may be made out.

Respectfully,

S. P. LANGLEY,

Secretary.

INSTRUCTIONS RELATIVE TO MEDICINAL PLANTS.

The Pan American Medical Congress, at its meeting held in the City of Mexico, in November, 1896, took steps to institute a systematic study of the American Medicinal Flora, through the medium of a General Commission and of special Sub-Commissions, the latter to be organized in the several countries. The Sub-Commission for the United States has been formed and consists of Dr. Valery Havard, U. S. A., chairman; Mr. Frederick V. Coville, Botanist of the U. S. Department of Agriculture; Dr. C. F. Millspaugh, Curator of the Botanical Department of the Field Columbian Museum, Chicago; Dr. Charles Mohr, State Botanist of Alabama; Dr. W. P. Wilson, Director of the Philadelphia Commercial Museums; and Professor H. H. Rusby, of the New York College of Pharmacy. This Sub-Commission solicits information concerning the medicinal plants of the United States from every one in a position to accord it. The principal points of study are as follows:

1. Local names.
2. Local uses, together with historical facts.
3. Geographical distribution and degree of abundance in the wild state.
4. Is the plant collected for market, and if so,
   (a) At what season of the year?
   (b) To how great an extent?
   (c) How prepared for market?
   (d) What is the effect of such collection upon the wild supply?
   (e) What price does it bring?
   (f) Is the industry profitable?
5. Is the plant, or has it ever been, cultivated, and if so, give all information on the subject, particularly as to whether such supplies are of superior quality, and whether the industry has proved profitable.
6. If not cultivated, present facts concerning the life history of the plant which might aid in determining methods of cultivation.
7. Is the drug subjected to substitution or adulteration, and if so, give information as to the plants used for this purpose.

While it is not expected that many persons will be able to contribute information on all these points concerning any plant, it is hoped that a large number of persons will be willing to communicate such partial knowledge as they possess.

It is not the important or standard drugs alone concerning which information is sought. The Sub Commission desires to compile a complete list of the plants which have been used medicinally, however trivial such use may be. It also desires to collect all obtainable information, historical, scientific and economic, concerning our native and naturalized plants of this class, and, to that end, invites the co-operation of all persons interested. Poisonous plants of all kinds come within the scope of our inquiry, whether producing dangerous symptoms in man, or simply skin inflammation, or, as "loco-weeds," deleterious to horses, cattle and sheep. In this respect the general reputation of a plant is not so much desired as the particulars of cases of poisoning actually seen, or heard from reliable observers. It is believed that much interesting knowledge can be obtained from Indians, Mexicans and half-breeds, and that, consequently, Indian agencies and reservations are particularly favorable fields for our investigation. Such knowledge will be most acceptable when based upon known facts or experiments.

In order to assist in the study of the habits, properties and uses of medicinal plants, the Sub-Commission undertakes to furnish the name of any plant-specimen received, together with any desired information available.

Owing to the diversity in the common names of many plants, it will be necessary for reports, when not furnished by botantists or others qualified to state the botanical names with certainty, to accompany the same with some specimen of the plant sufficient for its identification. While the Sub-Commission will endeavor to determine the plant from any portion of it which may be sent, it should be appreciated that the labor of identification is very greatly decreased, and its usefulness increased, by the possession of complete material, that is, leaf, flower and fruit, and in the case of small plants the underground portion also. It is best to dry such specimens thoroughly, in a flat con dition under pressure, before mailing. While any convenient means for accomplishing this result may be employed, the following procedure is reccmmended: Select a flowering or fruiting branch, as the case may be, which, when passed, shall not exceed sixteen inches in length by ten inches in width. If the plant be an herb two or three feet high, it may be doubled to bring it within these measurements. If it possess root leaves, some of these should be included. Lay the specimen flat in a fold of newspaper and place this in a pile of newspapers, carpet felting, or some other form of paper which readily absorbs moisture, and place the pile in a dry place under a pressure of about twenty to thirty pounds, sufficient to keep the leaves from wrinkling as they dry. If a number of specimens are pressed at the same time, each is to be separated from the other by three or four folded newspapers or an equivalent in other kinds of paper.

In twelve to twenty-four hours these papers will be found saturated with the absorbed moisture and the fold containing the specimen should be transferred to dry ones. This change should be repeated in from two to five days, according to the state of the weather, the place where the drying is done, the fleshiness of the specimens, etc. The best way to secure the desired pressure is by means of a pair of strong straps, though weights will do. The best place for drying is beside a hot kitchen range. When dry the specimens should be mailed between cardboards or some other light but stiff materials which will not bend in transit.

It is a most important matter that the name and address of the sender should be attached to the package and that the specimens, if more than one, should be numbered, the sender retaining also specimens bearing the same number, to facilitate any correspondence which may follow. The Sub-Commission requests that, so far as practicable, all plants sent be represented by at least four specimens.

H. H. RUSBY. M. D.,
Chairman of the General Commission.

NEW YORK COLLEGE OF PHARMACY.

VALERY HAVARD, M. D.
Chairman of the Sub-Commission.

FORT SLOCUM, DAVIDS ISLAND, NEW YORK.

Reviews.

Nomenclaturregeln für die Beamten des Königlichen Botanischen Gartens und Museums zu Berlin. (Notizblatt. Konigl. Bot. Gart. 1: 245–250. 6 Je. 1897.)

The staff of the Royal Botanical Garden and Museum of Berlin have framed a set of rules for their guidance in nomenclature, and orthography of names, of which the following is a translation with annotations:

1. The principle of priority in the choice of names of genera

and species of plants is, in general, firmly maintained; the beginning of the establishment of priority is considered to be 1753–54.*

2. A generic name will, however, be allowed to fall, if it has not been in general use during fifty years from the date of its establishment. But if the name has been taken up in the elaboration of monographs, or in large floras, in following the "Laws of nomenclature of the year 1868," it shall remain in use by us.†

3. In order to obtain unity of form in the designations of groups of the vegetable kingdom, we will employ terminations as follows: The orders (Reihen) in *ales*, the families in *aceae*, the subfamilies in *oideae*, the tribes in *eae*, the subtribes in *inae*; the terminations being appended to the root of the typical genus, thus Pandan(us)-ales; Rumex, Rumic(is)-oideae; Asclepias, Asclepiad-(is)-eae; Metastelma, Metastelmat(is)-inae; Madi(a)-inae. (Some exceptions, as Coniferae, Cruciferae, Umbelliferae, Palmae, etc., remain correct.)‡

4. Relative to the gender of generic names, we are guided, in the case of classical designations, by correct grammatical custom

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* Priority of publication is to be regarded as the fundamental principle of botanical nomenclature. (Canon I, Rochester Code.)

The botanical nomenclature of both genera and species is to begin with the publication of the first edition of Linnaeus's "Species Plantarum" in 1753. (Canon II, Rochester Code.)

The German procedure thus agrees with the American, except in the double date 1753–54; the advantage of the double date is certainly questionable, as it fixes no definite point of departure, and would lead to different interpretations and consequent nonuniformity. On the other hand, the selection of the first edition of Linnaeus' "Species Plantarum" as the starting point permits no uncertainty.

† The application of the ideas embodied in this paragraph would lead to great uncertainty in very many cases, and we do not believe that the Berlin botanists will long maintain them. How they can consistently decide on what is "general use," as compared with what we may term "special use," is more than we can imagine; and who is to determine what descriptive volume is a "monograph" or what flora a "large" one is equally difficult to understand; and how are they to determine in many cases, whether the author has or has not followed the Paris code of 1868? Or will calling a brochure a "monograph" make it one? But it is to be remembered that these rules have been framed for the special use of the Berlin botanists, and we shall be interested in observing the results.

‡ This is, we believe, the first serious attempt to unify group nomenclature, and we heartily approve it. That anything is to be gained in the end by admitting exceptions may be questioned.

as to later names and barbarisms we follow the "Natürlichen Pflanzenfamilien." Alterations in endings or in the word itself are not, as a rule, approved. Notorious errors in those derived from personal names must, however, be removed; for example, *Rülingia* is to be written in place of *Rulingia* as used by the English and imported by us.*

5. Generic names, which have been remanded to synonymy are better not used again in an altered sense to designate a new genus, or a section, etc.†

6. Priority is to determine the choice of specific names, unless objections to their maintenance have been made in a monograph. If a species is transferred to another genus it must there retain its oldest specific name.‡

7. The author who first named the species even if under another genus must always remain knowable, and to this end his name (Zeichen = sign) is to be placed in a parenthesis before the name of the author who has effected its transfer to the new genus, thus *Pulsatilla pratensis* (L.) Mill = *Anemone pratensis* L. In case the author of a species has himself later transferred it to another genus the parenthesis will be omitted. (In continued works where the parenthesis has not been employed, this rule need not be followed.)§

8. As regards the methods of writing names of species the

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* "Notorious errors" are likely to be variously understood.

† The publication of a generic name or a binomial invalidates the use of the same name for any subsequently published genus or species respectively. (Canon IV, Rochester Code.)

In the rejection of generic homonyms the German rule is not as definite and exact as the American, and is thus the more likely to be inconsistently employed and variously understood. The German rules do not definitely refer to specific homomyms, though from the practice of some of the subscribers to them we infer that the matter is in mind.

‡ In the transfer of a species to a genus other than the one under which it was first published the original specific name is to be retained. (Canon III., Rochester Code, as amended at Madison.)

The German and American principles here agree, save the exception of objections made in "monographs." How many descriptions or how many pages constitute a "monograph?"

§ In the case of a species which has been transferred from one genus to another, the original author must always be cited in parenthesis, followed by the author of the new binomial. (Canon VIII., Rochester Code.)

practice of Linnaeus has been introduced into the Botanical Garden and Museum. This will still be maintained, and we therefore write all specific names with a small initial letter, except those derived from personal names and those which are substantives (generic names still or formerly in use); for example, *Ficus indica*, *Circaea lutetiana*, *Brassica Napus*, *Solanum Dulcamara*, *Lythrum Hyssopifolia*, *Isachne Buttneri*, *Sabicea Henningsiana*.*

9. When generic or specific names are formed from proper names we add the letter *a* for the genus to such names ending in a vowel or in *r*, and *i* for the species, thus *Glazioua* (from Glaziou), *Bureaua* (from Bureau), *Schützea* (from Schütze), *Kernera* (from Kerner), also *Glazioui*, *Bureaui*, *Schützei*, *Kerneri*; if the name ends in *a* we change this vowel for euphony to *ae*, thus from Colla, *Collaea*; in all other cases we add *ia* or *ii* to the name, thus *Schützia* (from Schütz), *Schützii*, etc. This applies as well to names terminating in *us*, thus *Magnusia*, *Magnusii* (not *Magni*), *Hieronymusia*, *Hieronymusii* (not *Hieronymi*); the adjective forms of proper names are formed in a corresponding manner, thus *Schützeana*, *Schütziana*, *Magnusiana*. To make a difference in the application of the genitive and adjective forms is not practicable at the present time.†

10. In forming compound Latin or Greek substantives or adjectives the connecting vowel between the roots is to be written *i* in Latin, *o* in Greek; we thus write *menthifolia*, not *menthaefolia*.‡

11. We recommend the avoidance of such combinations of names as produce tautology, as *Linaria Linaria* or *Elvasia elvasioides*; it is permitted to deviate from priority in the cases of such names which have arisen from gross geographical errors by the author, as, for example, *Asclepias syriaca* L. (which originated in

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* Specific or varietal names derived from persons or places, or used as the genitive of generic names or substantives, are to be printed with a capital initial letter. (Committee on Nomenclature, Botanical Club, A. A. A. S.)

The American rule calls for wider capitalization than the German. The matter is of little consequence as regards nomenclature; the increasing tendency to decapitalize all specific names seems to us, however, unfortunate.

† We infer from this that specific names such as *Schützei* and *Schützeana* would not be maintained in the same genus, and this is highly desirable.

‡ This will, we think, be generally approved.

the United States), *Leptopetalum mexicanum* Hook. & Arn. (from the Liu-kiu Islands).*

12. Hybrids are indicated by connecting the names of the parents by ×, the alphabetical order of the specific names being preserved, thus *Cirsium palustre × rivulare.* In the position of the names, no difference is made as to which is "father" and which "mother." We do not favor the binary nomenclature for hybrids.†

13. Manuscript names have under no circumstances a right of maintainance, even if they appear on printed labels of exsiccatae. This is also true of gardener's names and those of trade catalogues. The recognition of the species requires a printed description, which may, however, appear on an exsiccata label.‡

14. An author has no right to change a generic or specific name once given, except for very important reasons, such as those cited in rule no. 11.§

It is very interesting to remark how nearly, after long-continued discussion, the Berlin botanists have approximated the principles of the Rochester code. In fact, their rules for guidance include practically all the principles enunciated by the American botanists and zoölogists, and differ from them mainly in admitting exceptions; we believe that they will find in practice that the exceptions will give them more trouble than if they had not been allowed, and we confidently look to their abandonment.

N. L. B.

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* As to "duplicate binomials" (as *Catalpa Catalpa*), the German rule is put in the form of a recommendation, not as a fixed principle, and it may be remarked that they have been used by several of the monographers of the "Natürlichen Pflanzenfamilien." The fact of their being tautological does not seem to us to be a good reason for abandoning them, and in such names as *Elvasia elvasioides*, who is to determine whether they are tautological or not? Again, the rejection of supposed or certainly misleading geographical names is open to many objections. A number of species bearing the names, *Canadense*, *Pennsylvanicum*, *Missouriense* do not occur in the Canada, Pennsylvania or Missouri of to-day, owing to changes of territorial extent. It would be as well to reject the name *Dioscorea villosa*, for example, because the plant is not villous, and there are many such cases. The recommendations are not conducive to uniform practice.

† We think this will meet with general approval.

‡ Publication of a species consists only (1) in the distribution of a printed description of the species named; (2) in the publishing of a binomial, with reference to a previously published species as a type (Canon II, Rochester Code).

§ Here again we note an unfortunate indefiniteness which is not conducive to stability.

A Text Book of General Lichenology. With descriptions and figures of the Genera occurring in the Northeastern United States. By Albert Schneider, M.S., M.D. Willard N. Clute & Co., Binghamton, N. Y. 1897.

There has been a demand for years for a text book on lichens and, though valuable contributions have been made from time to time, there has been no complete or general work. In Tuckerman's life-work we have a classic guide for the learned; but even the experts admit that the technical difficulties of the "General Synopsis" defeat its end, for the amateur student at least.

The well printed and copiously illustrated volume on the subject with Dr. Schneider has just brought out is far from popular, but it is clear, terse and to the point, and will prove a practical working hand book for those botanists or amateurs that desire to take up the study of these plants.

The historical sketch of the development of the study of lichenology is the best, we believe, that is to be obtained in English. From it one gathers a fair conception of the battles of hypotheses fought in the European laboratories for the past hundred years or so, and comes away with a clear idea of the most modern views upon symbiosis and the morphology and physiology of the lichens.

With reference to the author's idea that the spores are not reproductive organs, we fail to see that his arguments win his point; for the reason that a lichen spore does not develop a lichen is that it does not find a suitable host. In laboratory work characteristic growths of other forms of parasitic life cannot be obtained for similar reasons.

The teachings of Reinke are strong in the systematic part of the work, and due attention has been given to the algae.

The illustrations have been well drawn and, though somewhat schematic, are a valuable addition to the volume, which is in so many ways to be recommended as a practical text book.

S. E. J.

Proceedings of the Botanical Club, A. A. A. S.--Detroit Meeting, August, 1897.

TUESDAY, AUGUST 10TH.

In the absence of all officers elected at the last meeting, the Club organized by the election of Dr. J. J. Davis, President, and Mr. A. F. Woods, Secretary.

Professor C. E. Bessey described an extensive epidemic of *Erysiphe communis* on *Polygonum aviculare* about Lincoln, Neb. In the ensuing discussion the same occurrence was reported from Michigan and Wisconsin.

Professor Bessey also described a phosphorescent mosquito (*Chironomus* sp.).

Professor Beal exhibited a number of photographs of the Botanical Garden of the Michigan Agricultural College; also charts of fungi and mounted sheets of weeds for lecture-room purposes.

WEDNESDAY, AUGUST 11TH.

Mr. Rodney H. True presented "Notes on the Genus *Dicranum.*"

Dicranum spurium in America consists of two forms, the genuine species and a form differing in many important characteristics from any described; the latter has probably a wide distribution in eastern America. *Dicranum rhabdocarpum* in abundant fruit has been found on Pikes Peak by Professor J. M. Holzinger. Its affinities ally it closely with *D. Bonjeani* DeNot. and not, as stated in the L. & J. Manual, with *D. Mühlenbeckii.* Mr. A. J. Grout has collected, probably for the first time in America, *Dicranum longifolium* var. *subalpinum* on Mt. Mansfield, Vt.

Dr. C. E. Bessey spoke on sensitive stamens in *Opuntia fragilis*; in bright sunlight they were very noticeable, quite as much so as in *Portulaca*, and were subsequently observed in another species. Dr. Britton remarked on similar sensitiveness in the stamens of the eastern *Opuntia Opuntia.*

Professor C. F. Wheeler remarked on two interesting species of oaks, discovered by Mr. S. L. Alexander in the vicinity of Birmingham, Mich., deferring critical determination of the species.

Remarks were made by Professor Britton, Mr. Alexander and Mr. Moseley.

Mr. Albert F. Woods presented a note on a method of preserving the green color of plant tissues especially to show contrasts between green tissues and those of other colors. The method is briefly to soak the material in a dilute glycerine solution containing a little copper sulphate for several days or weeks, then, after washing out the extra copper, mount the material in glycerine gelatine hardened with formalin.

THURSDAY, AUGUST 12TH.

The President appointed a committee to nominate officers for the ensuing meeting, and on the report of the committee the folling were unanimously elected: President, Professor Conway MacMillan; Vice-President, Professor C. B. Waldron; Secretary, Mr. A. B. Seymour.

Professor A. D. Selby noted winter injury of plum and peach trees in Ohio during the past winter. Plum trees that had been defoliated in summer by *Cylindrosporium Padi* were severely damaged by freezing; more than 75 per cent. of three-year-old trees of certain varieties were killed to the snow line; eight-year-old trees had the bark separated from the trunk, chiefly on the south and west sides.

Professor Selby also remarked that leaves of *Ailanthus* dropped prematurely in June during and following the severe hot weather. Angular areas became discolored and subsequently dropped out. No parasite was found. It appeared referable to secondary effects of insect puncture.

Professor V. M. Spaulding spoke of the formation of a botanical garden at the University of Michigan at Ann Arbor, on the campus, where some 300 herbaceous species are now in cultivation.

Dr. Rodney H. True discussed the causes of the nodding of moss capsules.

Preliminary experiments directed toward determining the causes and directive influences controlling the nodding of capsules showed that in *Minum cuspidatum* the weight of the capsule has no noticeable influence. The curvature seems to be a response to gravitation, and the direction of the plane in which the capsule falls is determined by the direction of strongest illumination, the capsule falling toward such source of illumination.

The Club then adjourned to meet next year with the Association as usual.

Botanical Notes.

The Plant World, an illustrated monthly Journal of Popular Botany. The first number of this new serial will be issued October 1, 1897. It will be a 16-page octavo, and will occupy an intermediate position between the technical botanical journals and the smaller amateur publications. It will present the facts of plant life in simple, popular language, and aim to interest those who desire acquaintance with plants and their life history, but who have no inclination for a systematic course of study. The editorial staff is as follows: Editor-in-chief, F. H. Knowlton, Ph.D., U. S. National Museum, Washington, D. C.; associates, Mr. Charles Louis Pollard, Miss Clara E. Cummings, Mr. Walter Hough, Mrs. N. L. Britton, Miss Josephine E. Tilden, Mr. A. W. Evans. The subscription price is $1.00 a year. The publishers are Willard N. Clute & Co., Binghampton, N. Y.

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vision of the Claopodiums.*

By G. N. Best.

Claopodium as a subgenus under *Hypnum* was established by Lesquereux and James† to include a few species found only in the northwestern portion of the United States and the extreme southwestern portions of British America.

The *Claopodiums* occupy a position midway between the *Anomodons* on the one hand and the *Thuidiums* on the other, differing from the former by their hypnoid capsules, from the latter by the absence of filamentose paraphyllia and from both by their thickened-papillate leaf-cells. Although closely related to both of these genera it seems impossible to connect *Claopodium* with either without doing injustice to its affinities. The better way therefore is to allow it generic rank, as has already been done by Renauld & Cardot, which it deserves equally as well as either *Anomodon* or *Thuidium*.

CLAOPODIUM Ren. & Card. Musc. Am. Sept. 50. 1893.

Plant small to quite large, growing on the ground, stones, rocks or base of trees. Stems creeping, radiculose, stoloniferous; paraphyllia when present squamiform; stem leaves triangular to broadly ovate, long and narrowly acuminate, margins plane, den-

* Based chiefly on specimens furnished by Columbia University, the Geological Survey of Canada and by Mr. M. A. Howe. I am indebted to Mrs. Britton for valuable assistance in verifying synonyms and citations and in securing types.

† Mosses of North America, 327. 1884.

tate-serrate, costa translucent; leaf-cells small, round-hexagonal to rhombic, thickened-papillate on both surfaces; dioicous; pedicels roughened; capsule horizontal; annulus compound; cilia one to three; operculum long-conic to conic-rostrate; calyptra cucullate; spores small, smooth.

Key to Species.

Plants small; leaf-cells rhombic; leaves not hair-pointed.
  Plants dark green; leaves of terminal branches loosely spreading, two-ranked. 1. *Whippleanum.*
  Plants yellow-green; leaves of terminal branches erect spreading, not two-ranked. 2. *leuconeurum.*
Plants larger; leaf-cells round-hexagonal; leaves hair-pointed.
  Leaf-cells stoutly unipapillate. 3. *crispifolium.*
  Leaf-cells pluripapillate; papillae small. 4. *Bolanderi.*

1. Claopodium Whippleanum (Sulliv.) R. & C.

Hypnum Whippleanum Sulliv. Pac. R. R. Rep. 4: 190. 1856.
Thuidium leskeoides Kindb. Bull. Torr. Club, 17: 277. 1890.
Claopodium Whippleanum R. & C. Musc. Am. Sept. 50. 1892.

In spreading mats, deep to dark green; stem 2–4 cm. long, creeping, stoloniferous, flagellate, irregularly pinnately branched; stem leaves triangular to ovate-lanceolate, narrowly acuminate, subdecurrent; margins plane, dentate below, sharply serrate above; costa subpercurrent; leaf cells linear-rhomboidal below, irregularly quadrate-oblong at basal angles, indistinctly rhombic above, usually densely thickened-papillate; marginal curvilinear, echlorophyllose; paraphyllia absent; terminal branches complanate-foliate, leaves loosely spreading, narrowly lanceolate, indistinctly two-ranked; perichetial bracts oblong-lanceolate, filiform acuminate, flexuous, denticulate-serrate, inner lightly costate; pedicel roughened, subcygneus; capsule oblong-oval, rough, collum distinct, horizontal, subpendant when empty; annulus early deciduous; teeth whitish; cilia 1–3, nearly or quite as long as teeth; operculum broadly conic, short beaked; spores .009–.011; matures in spring.

Shady clay ground, rarely on base of trees. Vancouver Island (Macoun); California, coast ranges (Bigelow, Bolander, Howe)!

Type from California in Coll. Sullivant, Gray herbarium.

Illust.—Sulliv. Pacif. R. R. Report, 4: *pl. 9.* In part. 1856.

Exsic.—S. & L. Musc. Bor. Am. ed. 2, no. 407.

REM.—Rudimentary leaves, nearly destitute of papillae, with leaf-cells linear-rhomboidal and costa vanishing in the middle, are not infrequent on stolons and flagellae.

2. CLAOPODIUM LEUCONEURUM (S. &. L.) R. & C.

Thuidium leuconeurum S. & L. in Sulliv. Icon. Musc. Supp. 104. 1874.

Hypnum leuconeurum L. & J. Mosses of N. A. 328. 1884.

Claopodium leuconeurum Ren. & Card. Musc. Am. Sept. 50. 1892.

In compact spreading tufts, yellow-green; stems 2–3 cm. long; leaves of terminal branches appressed when dry, erect-spreading when moist, lanceolate, not two-ranked; inner perichetial bracts scarcely costate; pedicel minutely roughened (smooth ?); capsule small, oval; operculum long conic; in other respects as in *Claopodium Whippleanum*, of which it appears to be a depauperate form, growing in drier situations; matures in early spring.

On the ground and base of trees. California (Bigelow, Bolander, Howe).

Type locality California. Type in Coll. Sullivant, Gray Herbarium.

ILLUST.—Sulliv. Pacif. R. R. Report, 4: *pl. 9*, in part (1856); Sulliv. Icon. Musc. Supp. *pl. 80* (1874).

EXSIC.—S. & L. Musc. Bor. Am., 2 ed. No. 407^b.

REM.—A careful study of considerable material, including Nos. 407 and 407^b of S. & L. Musc. Bor. Am., and also the types of *C. Whippleanum* and *C. leuconeurum*, kindly loaned me by Dr. B. L. Robinson, from the Sullivant Collection in the Gray Herbarium, shows but little ground for their separation. In the notes which accompany the types Sullivant admits that "they are very similar," "they grow mixed together," "*Hypnum Whippleanum* may have an annulus," and that "it is difficult to distinguish them without the fruit." The character on which he puts most stress is, as he claims, the rough pedicel of the former and the smooth pedicel of the latter. I have been unable to verify the correctness of this observation, as I find the pedicels in both more or less roughened, simply a difference in degree; in the types this difference is inappreciable.

Sullivant also claims that the leaves in *C. leuconeurum* are not "bifariously disposed" as in *C. Whippleanum.* The leaves of the stems and primary branches are not bifarious in either, but somewhat evenly distributed; it is only the true terminal branches that show this peculiar phyllotaxis. In the less developed forms these are either absent, which is rarely the case, or so small as to be easily overlooked, giving them a more strict appearance than they would otherwise have.

In this connection reference may be made to a letter, which accompanies the types, from Lesquereux to Sullivant, calling his attention to the discrepancies to be observed in *pl. 9*, 4, of the Pacif. R. R. Reports, suggesting that the lower figures represent quite closely his *Hypnum Bolanderi* and the upper something else. On the back of this letter Sullivant writes that while the four upper figures do represent his new species, *Hypnum leuconeurum*, the others are those of the true *Hypnum Whippleanum*, "which Lesquereux never saw!" It is difficult to decide whether Lesquereux was right in his contention or not, but one thing is certain: the figures to which Sullivant refers as the *true Hypnum Whippleanum* are not drawn with his accustomed accuracy.

3. Claopodium crispifolium (Hook.) R. & C.

Hypnum crispifolium Hook. Musc. Exot. 1818.

Hypnum ramulosum Hampe in Muell. Syn. Musc. **2**: 486. 1851.

Claopodium crispifolium R. & C. Musc. Am. Sept. 50. 1892.

Thuidium crispifolium Kindberg in Cat. Can. Plants, 6: 186. 1892.

In spreading mats, rufescent below, yellow-green above; stems 5–8 cm. long, creeping, stoloniferous, closely pinnately branched; branches simple or pinnate, spreading, attenuate, paraphyllia few, squamiform, serrate; stem leaves densely imbricated, when dry crispate-incurved, when moist erect-spreading, incurved, abruptly contracted above a broadly ovate auriculate-cordate decurrent base, linear-lanceolate, crowded with a long serrate hyaline point; margins serrate-dentate, undulate-rugose; costa narrow, vanishing in the acumen; leaf-cells small, round-quadrate, stoutly unipapillate on both surfaces; branch leaves similar but smaller; perichetial bracts loose, scarious, oblong to oblong-lanceolate, abruptly long loricate-filiform acuminate, margins bordered below by a narrow band of rhombic-hexagonal cells, lightly costate; pedicel 2½–3 cm. long, tuberculate, capsule narrowly oval-oblong, horizontal; annulus of three rows of cells, deciduous; teeth pale yellow; segments open; cilia two to three; operculum conic, long rostrate; spores .011–.013 mm.; matures in spring.

On rocks, stones and the ground, from British Columbia (Macoun) southward to California (Howe) and eastward to Idaho (Leiberg).

Type locality, west coast of North America (Menzies). Type in the Hooker Herbarium at Kew!

ILLUST.—Hook. Musc. Exot. **1**: *pl. 31.* 1818. Schwaeg. Supp. **2**: pt. 1, *pl. 143.* 1824.

REM.—It is impossible to make satisfactory references to exsiccatae because of the confusion existing between *Hypnum ramulosum* and *H. crispifolium.* Generally speaking, those bearing the former name are *Claopodium Bolanderi*, but not invariably so. In the set at hand, no. 405 S. & L. Musc. Bor. Am., Ed. 2, is this species. Macoun Can. Musc. no. 275, in two sets, is *C. crispifolium.*

4. CLAOPODIUM BOLANDERI n. sp.

In thin spreading mats, rufescent below, green above; stems 3–5 cm. long, creeping, stoloniferous, pinnately branched; branches simple, spreading, turgid, paraphyllia small, squamiform, serrate; stem leaves loosely imbricated, when dry crispate-incurved, when moist erect-spreading, incurved, contracted above a broadly ovate or triangular subauriculate-cordate decurrent base, lanceolate, crowned by a long serrate hyaline point, margins crenulate-serrulate, costa vanishing in the acumen; leaf-cells quadrate-hexagonal, indistinct, thickened-pluripapillate on both surfaces, papillae small, rounded, 2–5 to each cell; branch leaves smaller, ovate-lanceolate, hair pointed; perichetial bracts erect-spreading, flexuous, oblong-lanceolate, long loricate-filiform, acuminate, bordered below by a narrow band of irregular cells; pedicel 1½–2 cm. long, tuberculate; capsule short, broadly oval to suborbicular; annulus broad, deciduous; teeth pale yellow; cilia two to three, usually poorly developed; operculum conic-rostrate; spores .010–.012 mm.; matures in late winter or early spring.

On rocks, stones, rarely on the ground, from Alaska (J. M. Macoun) southward to California (Bolander) and eastward to Idaho (Leiberg).

Type locality, Marin Co., California (Bolander). Type in the Herbarium of Columbia University!

Rem.—A less developed form of the preceding but easily separated from it by its smaller size, pluripapillate leaf-cells, shorter pedicel, shorter and broader capsule and imperfect cilia. The leaves are usually not so abruptly contracted above the base, broadly ovate-lanceolate, the margins not rugose.

Comparisons kindly made by Mr. Gepp, of the British Museum, verify the statement of Renauld & Cardot * as to the identity of *Hypnum ramulosum* Hpe. and *H. crispifolium* Hook., the types of both being unipapillate. The type of *Leskea laxifolia* Hook. (*H. laxifolium* Schwaeg.), loaned Mrs. Britton by the authorities at Kew, is *Brachythecium reflexum* (W. & M.) Br. & Sch.

Rosemont, N. J.

Mesophyl of Ferns.

By Mary Elgin Gloss.

While making a comparative study of the chlorophyl bearing cells of plants, including ferns, I noticed what appeared to me to be a marked resemblance between the sections of the leaves of two species of *Adiantum*. As some species of *Nephrolepis*, *Dryopteris*, and *Polypodium* show also peculiarities of structure characteristic of each genus, I have tabulated the results of observations made from February to May, 1897.

A study of the mesophyl of ferns made from material from the greenhouses near Evanston, and from the Missouri Botanical Garden, affords some characteristic differences and resemblances. In the species studied these seem to give a means of distinguishing one genus from another, as the presence of chlorophyl in the epidermis, the form and arrangement of the cells of the mesophyl, the size of the air spaces, the number of cells in thickness of the mesophyl, the presence of palisade tissue, and the number of cells in its depth, seem to be constant through a genus.

Species were examined from the following genera: *Adiantum*, *Dryopteris*, *Asplenium*, *Nephrodium*, *Nephrolepis*, *Polypodium*, *Pteris*, *Scolopendrium*, and *Blechnum*. The sections were cut perpendicular to the smaller veins of the fresh frond, and the comparison

* Musc. Am. Sept. 50. 1892.

made of parts midway between two well developed fibro-vascular bundles.

In five species of *Adiantum* I found no palisade tissue. The cells of both upper and lower epidermis contain chlorophyl. The cells of the upper epidermis are irregular in shape toward their lower side, extending down into the mesophyl. The air spaces are relatively large and numerous. The number of cells in thickness of the mesophyl is two. I examined six species of *Dryopteris* and found a palisade tissue of two layers of cells, sometimes arranged perpendicular to the epidermis. Both layers of the epidermis contain chlorophyl. The cells of the upper are sometimes irregular in shape, where the palisade tissue is not arranged with its longer axis perpendicular to the epidermis as in *A. tripteron.* The air spaces are very large, extending through a depth of two or even three cells. There are small air spaces all through the palisade tissue. The number of layers of cells of the mesophyl is five.

In seven species of *Nephrolepis* the layers of palisade cells have their longer axes parallel to the epidermis. There is no chlorophyl in the epidermis except in *N. molle.* There are a few small air spaces in the palisade layers, while the air spaces directly over the stomata are not deeper than one cell, and in each case are covered by one long cell or the protrusions of two. The cells of the spongy parenchyma are about twice as long as the palisade cells and lie parallel to them. The number of layers in the mesophyl is six, except *N. molle* which has two, and *N. Phillipinensis*, five.

Three species of *Polypodium* have a palisade tissue of two layers of cells. There is no chlorophyl in the epidermis, almost no air spaces in the upper layers and very large spaces below, often extending to the upper layer. There is no sharp distinction between the upper and lower layers of cells in shape and size. The number of layers of cells in the mesophyl is four.

In eight species of *Pteris* there is a palisade tissue of one layer, in *P. Cretica* of three layers. In four species chlorophyl is present in the epidermis, and in four there is no chlorophyl in the epidermis. The air spaces are very large and numerous. The cells of the lower layers of the mesophyl are sinuous and very irregular in shape and size. The number of layers of cells in the depth of the mesophyl is from four to six, except in *P. cretica* which has ten.

Scolopendrium has no palisade tissue; has chlorophyl in the epidermis; has many large air spaces and irregularly shaped cells; and nine layers of cells in the mesophyl.

Sachs says, "According to Stahl the palisade cells constitute that form of assimilating tissue, which is especially produced by intense light striking the leaf directly, and leaves grown in the shade produce chiefly or only spongy parenchyma." In the ferns I have examined the form of the cells of the mesophyl does not seem to depend on the intensity of the light, as most ferns grow naturally in diffuse light and the cultivated species which I have sed were grown in the shade. In some of these ferns a marked palisade structure is apparent as in *Dryopteris falcata* where it consists of two layers of cells, of rectangular section; *Pteris aquilina* has also two layers; *Pteris sagittifolia* has one layer; *Pteris Cretica*, three and *Blechnum serrulatum*, two. Intermediate between this evident palisade structure and none at all, I find some which have one or more layers of closely placed cylindrical cells, with axes nearly equal. *Polypodium aureum* has two layers of these cells. *Polypodium vulgare*, grown in bright sunlight, and *Nephrolepis exaltata* have also two layers. *Dryopteris Mexicana*, *D. Filix-mas*, *Asplenium fabianum*, *Pteris serrulata*, and all the five species of *Adiantum* which I examined have no palisade parenchyma. The palisade tissue could not have been formed by intense sunlight, but rather it seems that the presence or absence of palisade parenchyma is very nearly constant throughout each genus, that is, it is a generic characteristic.

The ferns which have no palisade cells possess chlorophyl in the epidermis. It may be that this chlorophyl in the upper epidermis takes the place of a palisade layer. Terlitaki in a paper on *Struthiopteris* and *Pteris* says that ferns are distinguished by the presence of chlorophyl in the epidermis. Many of the ferns which which I examined had chlorophyl in the epidermis layers, as the genus *Dryopteris*, which had also a palisade tissue, and four species of *Pteris*, *Blechnum serrulatum*, *Scolopendium* and *Asplenium* There are, however, many which have no chlorophyl in the epidermis, as the genus *Nephrolepis*, *Polypodium* and four species of *Pteris*. These have without exception a palisade structure.

From the species I have examined it appears, first, that in any one genus the number of cells in thickness of the mesophyl is constant; *Adiantum*, 2; *Dryopteris*, 5; *Nephrolepis*, 6; *Polypodium* 4. Second, the presence of chlorophyl in the epidermis is characteristic of a genus. *Adiantum* and *Dryopteris* possess chlorophyl in epidermis and *Nephrolepis* and *Polypodium* do not. Third, the relative size and shape of the air spaces is constant throughout a genus. Fourth, the shape and arrangement of the cells are somewhat constant. Fifth, the presence of palisade tissue and the number of cells in its depth are constant through a genus.

These characteristics taken one with the other appear to form a means sufficient to distinguish one genus from another.

	No. Cells in Mesophyl	No. Cells in Palisade	Depth of Frond	Chlor. in Epidermis	Air Spaces
Adiantum					
Capillus-veneris	2	0	106	Chlor.	Large
tenerum	2	0	77	Chlor.	Large
pedatum	2	0	70	Chlor.	Large
trifidum	2	0	77	Chlor.	Large
Nephrolepis					
molle	2	0	110	Chlor.	Small, very
Phillipinensi	5	2	110	Chlor.	Small, 1 cell
tuberosa	6	2	198	No Chlor.	Small, 1 cell
davalloides	6	2	185	No Chlor.	Small, 1 cell
Collengerii	6	2	176	No Chlor.	Small, 1 cell
exaltata	6	2	176	No Chlor.	Small, 1–2 cells
Polypodium					
aureum	4	2	176	No Chlor.	Large, very
vulgare	4	2	198	No Chlor.	Large
reptans	4	2	132	No Chlor.	Large
Dryopteris					
Mexicana	5	2	171	Chlor.	Large, very
Filix-mas	5	2	146	Chlor.	Large, very
Thelypteris	5	2	143	Chlor.	Large, very
triptera	5	2	114	Chlor.	Large, very
falcata	6	2	440	Chlor.	Large, very

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A new Species of Bidens.

By Karl M. Wiegand.

Field observations convinced me some time ago that there were at least two distinct species included under *B. connata* Muhl. In order to determine accurately if this was indeed the case, considerable material was collected during the summer of 1896, which was carefully studied in connection with herbarium material from various parts of the United States. The original supposition proved to be correct, and in addition to the difference in general appearance several less obvious but quite as important distinguishing characters were discovered through the close examination of the material. It is possible, therefore, at present to separate from *B. connata* the form first noticed long ago by Dr. Gray and named by him *B. connata comosa* in the fifth edition of the Manual, but which was again later abandoned as not being sufficiently distinct from the type. The difference in general appearance between *B. connata* and *B. comosa* is very striking, the stramineous color of the stem, foliaceous involucre and pale yellow flowers of the former being quite in contrast to the purple stem, small involucre and orange flowers of *B. connata*. Mr. E. P. Bicknell writes me that he has observed practically the same differences between the two species, and I am much indebted to him for the use of his valuable field notes. The following description has been prepared to bring out more in detail the characters of this neglected species:

Bidens comosa (Gray) n. sp.

B. connata var. *comosa* Gray, Manual, ed. 5; 261. 1867.

Stem 2–10 dm. high, rather strict and stout, stramineous, as well as the comparatively short simple branches; leaves simple, lanceolate or elongate-lanceolate, coarsely serrate with mostly smaller and more ascending teeth than in *B. connata*, pale, dull green, gradually tapering toward each end; petioles short and broadly margined, connected at the base by a narrow ring, the acute or slightly acuminate apex mostly entire and blunt, glabrous except the margin, veins parallel, ascending, terminating either in the teeth or sinuses; heads cymosely arranged on short stout branches, therefore often appearing clustered, large (12–15 mm. high by 15 mm. broad), densely flowered; outer involucre very large, the obtuse bracts spatulate or lanceolate, entire, serrulate or dentate, 2–4 times the length of the head (in one case 5 cm. long); corolla 4 mm. long, mostly 4-lobed, pale greenish-yellow, narrowly funnelform, tapering gradually to the base; stamens and style included; achenes rather large (body 7–9 mm. long by 3 mm. broad), evenly cuneate, very flat, scarcely carinate, glabrous and smooth except the margin on which the retrorse hairs extend to the base, dark greenish-yellow and often minutely dark dotted, flat or convex at the summit; awns commonly three (two long and one shorter), long, straight and stout (⅓–¾ length of achene), equaling or longer than the corolla.

Eastern States, westward to Illinois.

The stem and more slender branches of *B. connata* are purplish, leaves more slenderly petioled, often 3-parted, more acuminate and darker green; heads smaller, bracts of the involucre fewer, twice the length of the heads or less, narrower; corolla deep orange yellow, abruptly contracted below the middle and commonly 5-cleft; stamens often exserted; achenes smaller, darker, often strongly carinate, commonly hairy and tuberculate, margins with mixed upwardly and downwardly directed or entirely erect hairs; awns 2–4, shorter (¼–½ length of achene).

Cornell University.

Shrubs and Trees of the Southern States.—II.

By John K. Small.

I. New and Noteworthy Species.

Tsuga Caroliniana Engelm. Coult. Bot. Gaz. **6**: 223. 1881.

Last fall I received specimens of this very ornamental hemlock from two new localities in North Carolina. Mr. A. M. Huger found groves of it at Banner's Elk, Watauga County, at an elevation of 1300 meters and in the Linville Gorge, Burke County, at about 575 meters above sea-level, the latter station, together with that at Tallulah Falls, Georgia, and the New River, Virginia, representing the lowest altitudes at which the species has been found.

Hicoria glabra (Mill.) Britton, Bull. Torr. Club, **15**: 284. 1888.

Among the many unique things that Stone Mountain affords are some dwarf hickory trees, usually less than two meters in height, bearing quite an abundance of fruit.

Quercus minima (Sarg.)

Quercus virens var. *dentata* Chapm. Fl. S. States, 421. 1860. Not *Q. dentata* Bartr. 1794.

Quercus Virginiana var. *minima* Sarg. Silva N. A. : 101. 1895.

A low shrub forming wide patches by the extensive spreading of the underground stems. Branches erect or ascending, less than 1 meter tall, solitary or several together, simple, or branched above; leaves firm, obovate or sometimes oblong to oblanceolate, 3–10 cm. long, acute or apiculate at the apex, repand-serrate, or the upper ones sometimes entire, those of the shoots often lobed, all glabrous or finely tomentose beneath, gradually or abruptly narrowed into short petioles which vary from 2–5 mm. in length; staminate aments very slender, 1–4 cm. long, tomentose; acorns solitary or several at the ends of peduncles which vary from 1–3 cm. in length, or sometimes sessile; cups turbinate-hemispheric, about 1.5 cm. broad, white-tomentose, the bracts appressed, thickened on the back, except near its edge where they form a fringe; nuts ovoid or elliptic, 1.5–1.8 cm. long, dark brown, glabrous.

Sandy sterile pine barrens, Florida, chiefly near the coast. Flowers in March and April; matures its fruit in the fall.

This peculiar oak cannot pose as a variety of *Quercus Virginiana* under any reasonable considerations. It may be of interest to note that it bears much the same relation to *Quercus Virginiana* as *Castanea nana* does to *Castanea pumila* or *Castanea dentata.* The habit of *Quercus minima,* with its underground stems, and low erect branches which are usually much less than one meter in height, is enough to separate it specifically from the gigantic forest tree *Quercus Virginiana.* In addition to the differences in habit just mentioned, the leaf types are characteristic and the nerves in the leaves of *Quercus minima* are much more prominent than they are in the live oak. The cups seem to furnish a diagnostic character, those of the *Quercus minima* being of a turbinate type, while those of *Quercus Virginiana* are hemispheric.

Quercus geminata n. sp.

A shrub or small tree, 2–5 meters tall, with a maximum trunk diameter of about 15 cm. Leaves narrowly oblong, elliptic, or oblong-oblanceolate, 3–6 cm. long, entire, obtuse or apiculate, strongly revolute, mostly gradually narrowed at the base, glabrous and parchment-like above, finely tomentose and conspicuously rugose by the prominent nerves beneath; petioles 2–6 mm.

long; flowers not seen; acorns usually 2 at the end of a peduncle, which varies from 1–4 cm. in length; cups turbinate, 1 cm. broad, tomentose, the bracts appressed, slightly thickened near the base of the cup, fringed at the edge; nuts ovoid or narrowly oval, 1–1.7 cm. long, twice or thrice as long as the cups.

Sandy soil, chiefly in the scrub, Florida. Flowers in spring and matures its fruit in the fall.

Mr. Nash, who collected and observed this plant during the seasons of 1894 and 1895, assures me that it is perfectly distinct from its relatives. This is doubtless a fact, and both the foliage and fruit furnish excellent characters. The very prominently rugose lower leaf-surfaces and the strongly revolute leaf-margins have no parallel in *Quercus Virginiana*. The acorns are always borne in pairs at the ends of short stout peduncles; the turbinate cups with their constricted bases are diagnostic.

✓Celtis Georgiana n. sp.

A diffuse shrub with slender often 2-ranked branches, the leafy twigs more or less pubescent. Leaves ovate, 2–5 cm. long, averaging 2.5 cm. in length, or those on vigorous shoots sometimes 6 cm. long, acute, entire or sharply serrate above the middle, inequilateral, rounded or truncate at the oblique base, dark green, scabrous and occasionally sparingly pubescent above, paler and glabrous beneath, except for a few hairs on the nerves; petioles 1.5–4 mm. long, pubescent; pedicels usually slightly curved, 1.5–4 mm. long, pubescent; drupes subglobose, sometimes broader than long, 6–7 mm. in diameter, tan-color, smooth and glabrous, or sometimes glaucous; seeds obovoid-globose.

Along or near streams, north-central Georgia. Flowers in the spring; matures its fruit in September.

Collected by the writer, first in the Yellow River Valley, near McGuire's Mill, Gwinnette County, in 1893, and in succeeding years at many points about Stone Mountain and the contiguous region.

A low species related to *Celtis pumila*, from which it may be distinguished by its smaller merely acute leaves, the very short pedicels and the smaller tan-colored drupes.

✓Celtis Helleri n. sp.

A much branched, wide spreading tree, sometimes 10 meters tall with a maximum trunk diameter of 1.5 meters. Bark of the trunk and main branches with numerous corky warts; leaves rather firm, the blades ovate to oblong, 4–7 cm. long, obtuse or acute, crenate-serrate, especially above the middle, rounded or subcordate at the base, deep-green and scabrous-pubescent above, pale and tomentose beneath, slightly inequilateral, oblique at the base; petioles stout, 3–4 mm. long, tomentose; pedicels sparingly pubescent, curved, 1–1.5 cm. long; drupe subglobose, 7–9 mm. in diameter, light-brown, translucent, smooth and shining; seeds globose, strongly 4-ribbed, prominently reticulated.

In dry ground near San Antonio, Texas.

A rather low tree with a short stout trunk varying from .5–1.5 meters in diameter, and a wide spreading top. The branches are numerous and bulky. The original specimens were gathered by Mr. Heller from trees growing in a strip of woodland between the city of San Antonio and the San Antonio River, Texas, no. 1587.

TOXYLON POMIFERUM Raf. Am. Month. Mag. **2**: 118. 1817.

Years ago the osage orange was planted on Paris Mountain, South Carolina, for hedges and for ornamental purposes. For many years the settlements have been neglected and deserted and the tree has spread and established itself in an astonishing manner, now appearing as if indigenous.

ALBIZZIA JULIBRISSIN Durazz. Mag. Tosc. 3: 11. 1772.

Although not indigenous, this tree now appears as if it were native in the southern states. It grows along roadsides and here and there through the pine woods much as the honey locust (*Gleditsia triacanthos*) does in many localities. It ranges from North Carolina to Georgia, Florida and Alabama, where Prof. Underwood collected specimens during the past summer. It is quite abundant in southern Georgia.

AMORPHA VIRGATA Small, Bull. Torr. Club, **21**: 17. *pl. 171.* 1894.

In the spring of 1896 Dr. Charles Mohr sent me a specimen of *Amorpha virgata* from the mountains of Madison county, Alabama, thus extending the known geographic range of the species from Stone Mountain, Georgia, to northern Alabama. Dr. Mohr gives the altitude of this locality as 350 meters. While collecting at different points along the eastern section of the Blue Ridge during the summer of 1896, I was surprised to find the species both on the slopes and summit of Paris Mountain near Greenville, and on the slopes of Table Mountain. At the former locality it occurred at an altitude of about 500 metres, and on Table Mountain it ranged from 800–900 meters. Its characters hold perfectly.

LONICERA FLAVA Sims. Bot. Mag., *pl. 1318.* 1810.

About two years ago I recorded* several new localities for this handsome honeysuckle. Further exploration of the southern end of the Blue Ridge has revealed additional stations. In the summer of 1894 I found some bushes on the upper slopes of Currahee Mountain, an isolated peak near Toccoa, Georgia, and a little later noticed several bushes on Stone Mountain. During the past summer I collected it on Paris Mountain, South Carolina, the original locality, where it grows at several points along the rocky summit, and later discovered a new station on the precipitous cliffs of Table Mountain, in the same state. At the latter place the shrubs were more robust and vigorous than at any of the other stations.

The finest flowering specimens I have ever seen were sent me by Mr. A. M. Huger, who secured them on Tyron Mountain, Polk County, North Carolina, last spring. Mr. Huger's discovery extends the range of the species into another state, but although we now have specimens showing the species to range from North Carolina to Georgia, it is not common at any of the localities, a few bushes only existing at the different places.

II. THE GENUS GAYLUSSACIA IN THE SOUTHERN STATES.

During several seasons I have had ample opportunity to study this imperfectly understood group in the field and have made observations on all except one of the species recognized in the appended revision. As far as I can see, the forms hitherto considered as varieties of other species are abundantly distinct and should be treated as species. Mr. Nash came to the same conclusion during his field-work in Florida. The diagnostic characters are brought out in the following key and descriptions.

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* Bull. Torr. Club, 21: 305.

Corolla campanulate or globose campanulate; leaves destitute of sticky resin.
  Stems horizontal, underground, the branches erect.
    Pubescence consisting of gland-tipped hairs.
      Twigs and racemes pilose. — 1. *G. dumosa.*
      Twigs and racemes bristly-hispid. — 2. *G. hirtella.*
    Pubescence consisting of simple non-glandular hairs.
      Leaves glaucous, glabrous or nearly so. — 3. *G. nana.*
      Leaves densely tomentose, especially beneath. — 4. *G. tomentosa.*
  Stems erect, the branches spreading.
    Leaves leathery, obtuse or retuse; drupe glaucous. — 5. *G. frondosa.*
    Leaves thin, acuminate and apiculate; drupe black. — 6. *G. ursina.*
Corolla conic; leaves sticky with a resinous secretion. — 7. *G. resinosa.*

1. Gaylussacia dumosa (Andr.) T. & G.

Vaccinium dumosum Andr. Bot. Rep. **8**: 112. 1794.

Gaylussacia dumosa T. & G.; A. Gray, Man. 259. 1848.

A low shrub, 1–5 dm. tall, with underground stems and erect solitary or tufted branches; the twigs, leaves and inflorescence glandular-pilose. Leaves leathery, the blades oval, obovate or oblanceolate, rarely linear-oblanceolate, 2–4 cm. long, apiculate at the apex, ciliate, short-petioled, deep green above, paler beneath; calyx glandular, about 5 mm. broad, the segments triangular or triangular ovate, acute, about as long as the tube; corolla campanulate, 5–6 mm. long, white or pink, wax-like, the segments broadly ovate, more or less recurved and revolute; filaments short, pubescent; anthers longer than the filaments, prolonged into filiform tubes; drupe globose, black, 6–8 mm. in diameter, commonly somewhat pubescent.

In sandy soil, Newfoundland and along the coast to New York, south to eastern Pennsylvania, North Carolina, Florida and Louisiana. Spring; matures its fruit in the summer.

2. Gaylussacia hirtella (Ait.) Klotzsch.

Vaccinium hirtellum Ait. Hort. Kew. Ed. 2. **2**: 357. 1811.

Gaylussacia hirtella Klotzsch, Linnaea, **14**: 48. 1840.

Gaylussacia dumosa var. *hirtella* A. Gray, Man. 259. 1848.

A shrub, with underground stems, the branches, twigs and inflorescence bristly-hispid, the tips of the hairs with minute glands; leaves firm, the blades oblanceolate-spatulate or elliptic, 3–6 cm. long, apiculate, glandular-ciliate sparingly hispid above, short-petioled; racemes many-flowered; calyx hispid, 6 mm. broad, the segments triangular, rather acuminate, about as long as the tube; corolla broadly campanulate, 7–8 mm. long, the segments broader than long, the tips recurved, the edges revolute; filaments short, pubescent; anthers longer than the filaments, prolonged into filiform tubes; drupe not seen.

In sand, Florida to Louisiana. Spring; fruit ripe in the summer.

Certainly distinct from *Gaylussacia dumosa*, from which it differs in habit, size and leaf characters. The pubescence is always diagnostic, the corolla is larger and much thinner than that of *G. dumosa*, while the calyx-segments are longer and usually acuminate.

3. Gaylussacia nana (A. Gray).

Gaylussacia frondosa var. *nana* A. Gray, Syn. Fl. N. A. Ed. 2. 2: Pt. 1, 396. 1886.

A low glaucous shrub 1–4 dm. tall, spreading by underground stems. Leaves leathery, the blades elliptic, obovate or nearly spatulate, 2–3 cm. long, obtuse or minutely apiculate at the apex, glaucous on both sides, becoming bright green above, prominently rugose and sprinkled with amber-colored resin beneath, short-petioled; racemes few-flowered; pedicels slender, puberulent when young; calyx glabrous, 3 mm. broad, the segments triangular, acute, about as long as the tube; corolla globose-campanulate, 3 mm. long, the segments ovate, acutish, longer than broad; filaments short, glabrous; anthers longer than the filaments, prolonged into slender tubes; drupes subglobose, 6–7 mm. in diameter, rather dry, glaucous.

In sandy pine barrens, Georgia to Florida and Alabama. March to April; matures its fruit in the summer.

Easily distinguished from *Gaylussacia frondosa*, with which it has been associated, by its very glaucous foliage and strongly rugose and much smaller leaves, besides its peculiar underground stems.

4. Gaylussacia tomentosa Pursh.

Gaylussacia frondosa var. *tomentosa* A. Gray. Syn. Fl. N. A. 2: Pt. 1, 19. 1878.

Gaylussacia tomentosa Pursh; A. Gray. Syn. Fl. N. A. 2: Pt. 1, 19. As synonym. 1878.

A low shrub, spreading by underground stems, the foliage tomentose with brownish hairs. Leaves leathery, the blades oblong or elliptic, often slightly broadest above the middle, 2.5–7 cm. long, obtuse and apiculate at the apex or sometimes notched, brown-tomentose on both sides, densely so beneath, short-petioled;

racemes few-flowered; pedicels 1–1.5 cm. long, much longer than the bracts; calyx glabrous, about 3.5 mm. broad, the segments ovate, acute, about as long as the tube; corolla campanulate, 3.5 mm. long, the segments ovate, obtuse, about as long as broad, the tips recurved, the edges revolute; filaments dilated, glabrous; anthers longer than the filaments, prolonged into slender tubes; drupes depressed-globose, 8–9 mm. in diameter, glaucous.

In sandy soil, Georgia and Florida. Spring; matures its fruit in the summer.

Like the preceding species, *Gaylussacia tomentosa* has underground stems, but it differs from it in the brown-tomentose foliage, more robust habit, larger leaves and different leaf-form. The fruit of *G. tomentosa* is larger and much more fleshy than that of *G. nana.*

5. Gaylussacia frondosa (L.) T. & G.

Vaccinium frondosum L. Sp. Pl. 351. 1753.

Gaylussacia frondosa T. & G.; Torr. Fl. N. Y., 1: 449. 1843.

An irregularly branched shrub 1–2 meters tall, with puberulent twigs and young leaves. Leaves firm, the blades oblong-oblanceolate, ovate, oval or obovate, obtuse or notched at the apex, delicately revolute, short-petioled, bright green and glabrate above, glaucous and sprinkled with minute golden globules of resin beneath; racemes loose; pedicels long and slender; calyx glabrous, 3–4 cm. broad, the segments triangular, acute or acutish, about as long as the tube; corolla globose-campanulate, about 4 mm. long, green to purplish, the segments triangular, broader than long, recurved and revolute; filaments dilated, glabrous; anthers longer than the filaments, prolonged into slender tubes; drupe globose, 8–10 mm. in diameter, with a pale bloom.

In sandy soil, New Hampshire, south to Florida, Kentucky and Louisiana. Spring; matures its fruit in the summer.

6. Gaylussacia ursina (M. A. Curtis) T. & G.

Vaccinium ursinum M. A. Curtis, Am. Journ. Sci. 44: 82. 1843.

Gaylussacia ursina T. & G.; A. Gray, Mem. Am. Acad. (II.) 3: 49. 1846.

A straggling branching shrub, 6–15 dm. tall, with sparingly pubescent twigs and young foliage. Leaves thin, the blades oblong, elliptic or oblanceolate, usually rhomboidal, 4–10 cm. long, usually short-acuminate; apiculate, ciliate, deep green above, paler beneath, pubescent on the nerves on both sides, obtuse or rounded at the base, short-petioled; flowers few, in lateral somewhat drooping racemes; calyx with numerous golden glands, about 3 mm.

broad, its 5 segments very low, obtuse, several times shorter than the tube; corolla globose-campanulate, greenish-white or tawny-red, about 4–5 mm. long, its segments triangular, acutish, recurved, revolute; filaments dilated, pubescent, incurved at the apex, longer than the anthers which have short tubes at the apex; drupe globose, 10–12 mm. in diameter, black, shining, sweet.

In deep forests on the mountains, North Carolina to northern Georgia. Spring; matures its fruit in the late summer.

7. GAYLUSSACIA RESINOSA (Ait.) T. & G.

Vaccinium resinosum Ait. Hort. Kew. 2: 12. 1789.

Gaylussacia resinosa T. & G.; Torr. Fl. N. Y. 1: 449. 1843.

A rigid branching shrub 3–12 dm. tall, its twigs and foliage more or less pubescent and sticky with a resinous secretion when young, leaves firm, the blades elliptic, oval or oblong, sometimes broadest above the middle, firm, obtuse or apiculate, entire, ciliolate, short petioled; flowers in lateral drooping racemes; pedicels 2–8 mm. long, usually with two narrow bracts; calyx about 2 mm. broad, its 5 segments ovate, obtuse, about as long as the tube; corolla obconic, red or reddish-green, 5–6 mm. long, more or less constricted near the apex, the segments ovate, spreading or recurved, revolute, obtuse; filaments winged, pubescent, shorter than the anthers, each cavity of which is prolonged into a tube; drupes globose, 6–10 mm. in diameter, black or rarely white, sweet.

In rocky woods and hillsides, Newfoundland to the Saskatchewan, south to Georgia. Spring; matures its fruit in the summer.

New Species of Lichens from Southern California as determined by Dr. W. Nylander and the late Dr. Stizenberger.

BY H. E. HASSE.

PARMELIA SUBOLIVACEA Nyl.

Thallus similar to *P. olivacea* (L.) Ach., but differing in size of spores, these being 8–9 by 5 mic., and also in the spermatia.

On rocks, San Gabriel Mountains at 1500 meters alt. July, 1894.

HEPPIA TERRENA Nyl.

Thallus monophyllous, round, olive green, with repand border; apothecia single in the fronds, circular, depressed, dull red; spores colorless, globular, 4 mic. in diameter.

On earth, San Gabriel Mountains, ascending to 1500 meters alt.; also near Santa Monica. August, 1896.

LECANORA PLEISTOSPORA Nyl.

Thallus of separate pruinose rounded squamules light brown; apothecia from urceolate to open, flat, black or pruinose with cinerescent-scales that also cover the thick prominent entire or crenulate margin; spores minute and numerous; paraphyses thick, agglutinated, with round light brown apices; hypothecium colorless. Hym. Gel. J. + faintly yellow.

On clay soil near Soldiers' Home, Los Angeles Co. May, 1896.

LECANORA PLEOISPORA Nyl.

Thallus of rounded, separate or approximate and angular squamules, dull brown, with whitish furfuraceous scales; apothecia from urceolate to open, flat, disk dull black and the thick margin clothed, as is the thallus, with cinerescent scales; spores about 40 in asci, globular, 10 to 12 mic. in diameter; paraphyses slender, separate, with yellowish apices; hypothecium colorless. Hym. Gel. J. + faintly yellow.

On clay. Original locality San Gabriel Mountains, at 700 meters. August, 1896.

LECANORA REDIUNTA Stiz.

Thallus crustaceous, rimose, areolate, whitish and cinerescent; apothecia black, pruinose, convex; margin entire, prominent or finally nearly disappearing; spores fusiform, blunt-pointed, colorless, 3-septate, slightly convex, 24 by 5–6 mic.; hypothecium brown. Hym. Gel. J. + yellowish.

On various barks. Original locality Santa Catalina Island. January, 1895. Also on the mainland near the coast on *Umbellularia Californica.*

LECANORA OBPALLENS Nyl.

Thallus cartilaginous of small rounded separate rugulose squamules, light chestnut, K—CaCl—; apothecia flat, black, with a prominent crenulate thalline margin; spores minute and numerous.

On earth. Santa Monica Range, near Soldiers' Home, Los Angeles Co. November, 1896.

LECANORA (PLACODIUM) SUBPYRACEELLA Nyl.

Thallus pulverulent, ochroleucous scaly, or evanescent; apothecia small, disk dull orange, with a thin entire raised margin of lighter color; spores 20–24 mic., 1-septate with approximate cells.

On earth near Santa Monica. November, 1896.

LECANORA STENOSPORA Stiz.

Thallus cartilaginous, in the centre of separate rounded or approximate, then angular convex squamules; those at the circumference extending into short broad contiguous rounded lobules, citrine yellow; apothecia small depressed becoming flat and superficial, immarginate; spores minute and numerous; paraphyses short, thick, agglutinated. Similar to *L. chlorophana* Tuck. but this has a thalline margin and long slender separated paraphyses.

On granite, San Gabriel mountains, from 1600 meters upward. July, 1894.

RINODINA ANGELICA Stiz.

Thallus cartilaginous, rimose-areolate, the areoles ample and at the circumference lobed, light grayish flesh colored, upon a black hypothallus; apothecia prominent with a thick entire or crenulate thalline margin, disk brown-black; spores 1-septate, brown, blunt, ellipsoid, 28 by 12 mic.; hypothecium colorless.

Rocks, frequent, ascending to 1800 meters altitude.

LECIDEA DOLODES Nyl.

Thallus of small convex distinct squamules, becoming crenate and imbricated, light chestnut color; apothecia black with a raised somewhat lighter colored margin, flat to slightly convex and immarginate; spores simple, globular, in tubular asci, 7–9 mic. in diameter; paraphyses distinct, capillary.

On bark of *Abies*, San Gabriel mountains, at 2000 meters alt. August, 1896.

LECIDEA SUBPLEBIA Nyl.

Thallus pulverulent, rimose-areolate, dull white, K—CaCl—; apothecia from flat to slightly convex, black, with a thin crenulate black margin, this finally disappearing; spores 10–12 by 6–7 mic., simple; hypothecium colorless; paraphyses articulate with small globular heads.

On earth and calcareous pebbles near Santa Monica. November, 1896.

LECIDEA CATALINARIA Stiz.

Thallus of subglobular entire or crenulate globules, distinct or approximate, pale citrine yellow; apothecia small to middling, flat, with a thin entire or slightly sinuate margin, becoming convex, conglomerate, and the margin disappearing; spores ovoid, ellipsoid, 14–18 by 9–10 mic., colorless; paraphyses with dark globular agglutinated heads; hypothecium brown.

On sandstone, Catalina Island. January, 1895.

LECIDEA (BIATORA) PHAEOPHORA Stiz.

Thallus pulverulent, dirty white, rimose; apothecia slightly convex, contiguous and angular by approximation, dull flesh color, the thin lighter margin disappearing; spores blunt, ellipsoid, colorless, 16 by 7 mic.; hypothecium colorless.

Rocks, Catalina Island. January, 1895.

LECIDEA SQUALIDA PERSIMILANS Nyl.

Thallus of turgid convolutions forming rugulose cushions, light olive green; apothecia prominent, flat and medium size with a thin margin, becoming large, convex, subglobular, contorted and lobed, the margin disappearing, black with a brownish bloom; spores acicular, thickened at one end, straight or slightly curved, 60 by 5–6 mic., 5–8-septate, colorless.

Earth on rocks. San Gabriel Mountains at 1800 meters alt. August, 1896.

ARTHONIA SUBDISPUNCTA Nyl.

Thallus whitish, cinerescent, finely furfuraceous; apothecia roundish or oblong, slightly elevated, black; spores 1-septate, obovate, colorless, 11 by 4 mic.

On the stalks of *Leptosyne gigantea* Kellogg, at Point Dumas near Santa Monica. (This is also a new station for that composite in Los Angeles county, it being heretofore accredited solely to Catalina Island.)

VERRUCARIA PLUMBARIA Stiz.

Thallus of white appressed scales, forming an ashy gray, smooth surface, bordered by a narrow rim of black hypothallus; apothecia black, small, shining, subglobular with a minute orifice at apex; perithecium dimidiate; spores ellipsoid, acute at both ends, 14–16 by 5 mic., each spore-cell constricted, colorless, in tubular spore-sacs; paraphyses eapillary, distinct.

On *Quercus agrifolia* and other barks, abundant. Near Santa Monica.

VERRUCARIA INDUCTULA Nyl.

Thallus smooth, rimose-areolate, dull brownish; apothecia elevated, pustular, entirely covered by thalline structure; perithecium dimidiate; spores colorless, muriform 32 by 14 mic; paraphyses capillary; hypothecium colorless, K—, CaCl—, J+; spores yellow.

On shale, Santa Monica Range.

VERRUCARIA SUBMURALIS Nyl.

Thallus rimose-areolate, dull olive green to blackening; apothecia prominent, the bases covered by thallus; perithecium black, exposed at apex, with minute aperture, dimidiate; amphithecium brown; spores obovoid, ellipsoid, colorless, simple, 32 by 14 mic. Hym. Gel. J. + vinous; spores yellow.

On granite, San Gabriel Mountains at 1500 meters alt. July 1884.

VERRUCARIA SQUAMELLA Nyl.

Thallus of small crenate lobulated imbricated dull greenish squamules; apothecia innate, one to several in each squamule, the orifice indicated by a minute dark dot; spores simple, oblong, ellipsoid, colorless, 20–24 by 8 mic.; paraphyses indistinct.

On shaded earth among moss near Santa Monica. February, 1897.

The Botanical Society of America.

The third annual meeting was held at the University of Toronto on Tuesday and Wednesday, August 17 and 18, 1897, under the presidency of Prof. J. M. Coulter.

The address of the retiring president, Prof. C. E. Bessey, on "The Phylogeny and Taxonomy of the Angiosperms," was delivered on Tuesday evening.

The following were elected active members: Bradley Moore Davis, University of Chicago; Sir William Dawson, Montreal; Dr. James Ellis Humphrey, Johns Hopkins University; Prof. Daniel T. MacDougal, University of Minnesota; Prof. Frederick C. Newcombe, University of Michigan; Prof. Henry H. Rusby, New York College of Pharmacy; Prof. Harry L. Russel; University of Wisconsin; Dr. Joseph N. Rose, U. S. National Museum; Mr. Walter T. Swingle, U. S. Department of Agriculture.

The report of the Treasurer showed a balance of $684.15.

Titles of the papers read are as follows:

"A Case of Ecblastesis and Axial Prolification in *Lepidium apetalum*," by B. L. Robinson.

"Movement of Protoplasm in coenocytic Hyphae," by J. C. Arthur.

"The Pollen Grain and the Antipodal Region," by John M. Coulter.

"The Transition Region in the Caryophyllales," by Frederick E. Clements, presented by Prof. C. E. Bessey.

"A Revision of the Species of *Picea* occurring in Northeastern North America," by D. P. Penhallow.

"Account of a recent Visit to the Island of Jamaica, and a Discussion of the Availability of that Island as a Location for a proposed Botanical Laboratory," by D. T. MacDougal and D. H. Campbell.

"Spermatozoids in *Zamia*," by H. J. Webber (by invitation of the Council).

"Bibliographical Difficulties," by Edward L. Greene.

Officers for the next year were elected as follows: President, N. L. Britton; Vice-President, J. C. Arthur; Secretary, Charles R. Barnes; Treasurer, Arthur Hollick; Councillors, B. L. Robinson, F. V. Coville. It was resolved that the next meeting be held in Boston, Mass., in August, 1898.

Titles of Papers read before the Section of Botany, A. A. A. S., Detroit Meeting, August, 1897.

The Section organized with Prof. G. F. Atkinson, Vice-President, in the chair, and Prof. F. C. Newcombe, Secretary.

Trillium grandiflorum (Michx.) Salisb.; its Variations, normal and teratological. By Prof. Charles A. Davis, Alma College, Alma, Mich.

A Discussion of the Structural Characters of the Order Pezizinae of Schroeter. By Dr. E. J. Durand, Cornell University, Ithaca, N. Y. (By title.)

The Taxonomic Value of Fruit Characters in the Genus *Galium*. By K. E. Wiegand, Cornell University, Ithaca, N. Y. (By title.)

Report upon the Progress of the Botanical Survey of Nebraska. By Prof. Chas. E. Bessey, University of Nebraska, Lincoln, Neb.

Changes during Winter in the Perithecia and Ascospores of certain Erysipheae. By B. T. Galloway, Department of Agriculture, Washington, D. C. (By title.)

The Erysipheae of North America: a preliminary account of the distribution of the species. By B. T. Galloway, Department of Agriculture, Washington, D. C. (By title.)

Some Contributions to the Life-History of *Haematococcus*. By Prof. L. R. Jones, University of Vermont, Burlington, Vt. (By title.)

Bacteriosis of Carnations. By Albert F. Woods, U. S. Dept. of Agriculture, Washington, D. C.

Wakker's Hyacinth Bacterium. By Dr. Erwin F. Smith, Dept. of Agriculture, Washington, D. C.

Notes on some new Genera of Fungi. By Prof. George F. Atkinson, Cornell University, Ithaca, N. Y. (By title.)

Are the Trees receding from the Nebraska Plains? By Prof. Charles E. Bessey, University of Nebraska, Lincoln, Neb.

Reproductive Organs and Embryology of *Drosera*. By C. A. Peters, Normal School, Edinboro, Penn.

Development of some Seed-coats. By Dr. J. O. Schlotterbeck, University of Michigan, Ann Arbor, Mich.

Contributions on wild and cultivated Roses of Wisconsin and bordering States. By J. H. Schuette, Green Bay, Wis.

Morphology of the Flower of *Asclepias Cornuti*. By Fanny E. Langdon. Reported by Prof. V. M. Spalding, University of Michigan, Ann Arbor, Mich.

Comparison of the Pollen of *Pinus*, *Taxus* and *Peltandra*. By Prof. George F. Atkinson, Cornell University, Ithaca, N. Y.

Some Characteristics of the Foothill Vegetation of Western Nebraska. By Prof. Charles E. Bessey, University of Nebraska, Lincoln, Neb.

On the Distribution of Starch in woody Stems. By Prof. Bohumil Shimek, University of Iowa, Iowa City, Iowa. (By title.)

Mechanism of Root Curvature. By Dr. J. B. Pollock. Reported by Prof. V. M. Spalding, University of Michigan, Ann Arbor, Mich.

The toxic Action of Phenols on Plants. By Prof. R. H. True and C. G. Hunkel, University of Wisconsin, Madison, Wis.

Cellulose-Ferment. By Prof. F. C. Newcombe, University of Michigan, Ann Arbor, Mich.

Is the characteristic Acridity of certain Species of the Arum Family a mechanical or a physiological Property or Effect? By Chas. Porter Hart, M.D., Wyoming, Ohio.

How Plants flee from their Enemies. By Prof. W. J. Beal, Michigan Agricultural College, Agricultural College P. O., Mich.

Stomata on the Bud-scales of *Abies pectinata*. By Dr. Alex. P. Anderson, Botanist of Exp. Station, Clemson College, South Carolina.

Comparative Anatomy of the normal and diseased Organs of *Abies balsamea* (L.) Miller, affected with *Aecidium elatinum* (Alb. et Schwein.) By Dr. Alex. P. Anderson, Botanist of Exp. Station, Clemson College, South Carolina.

On a new and improved Self-Registering Balance. By Dr. Alex. P. Anderson, Botanist of Exp. Station, Clemson College, South Carolina.

The Correlation of Growth under the Influence of Injuries. By Dr. C. O. Townsend, Columbia University, New York, N. Y.

The Botanical Collection of the Cornell Arctic Expedition of 1896. By Prof. W. W. Rowlee and K. M. Weigand, Cornell University, Ithaca, N. Y. (By title.)

Description of *Bacillus Phaseoli* n. sp., with some Remarks on related Species. By Dr. Erwin F. Smith, Vegetable Pathologist, Washington, D. C.

Notes on Jamaica. By Prof. Douglas H. Campbell, Stanford University, Cal.

On the Nature of certain Pigments, produced by Fungi and Bacteria with special reference to that produced by *Bacillus solanacearum*. By Dr. Edward F. Smith, Vegetable Pathologist, Washington, D. C.

Reviews.

Laboratory Practice for Beginners in Botany. By William A. Setchell. Macmillan Company. 1897.

The increased attention that has been given to botany in recent years has naturally resulted in greatly adding to our knowledge of plant-life, and the attempt to keep the student in school and university abreast of this information, has necessitated many text-books. So rapidly is the science advancing that what is along the out-post to-day, may become the rear-guard of to-morrow, and teachers in seeking the best methods of imparting information to the students under their charge have often devised plans of presentation that seemed adopted to wider audiences. This little book by Professor Setchell is an example of such conditions. After experimenting with a number of classes of beginners, both in the preparatory schools and in the university, he has come, as he tells us in the preface, to the conclusion that botany should be taught "1. As a science, to cultivate careful and accurate observations, together with the faculty of making from observations the proper inferences; and 2. As a means of leading the mind of the student to interest itself in the phenomena of nature for its own further development and profit." Along these lines the book seems to be fairly well executed. It is devoted almost exclusively to the higher plants, and, beginning with the seed, follows the familiar practise of directing the student's attention to the salient features of plant-organs and plant-phenomena through the complete life cycle. It suggests what the student shall look for, but does not aim to tell what will be seen. The student must reach and record the observations for himself, and will of course be benefited by the process. It will prove a useful book in the grades for which it is intended.

F. H. K.

Botanical Notes.

Fasciation.—Perhaps owing to the unusual amount of rain in New England, there has been this season a frequent manifestation of fasciation. I have observed it in two genera of which I have no previous record, viz.: *Solidago* and *Saxifraga*. A specimen of *Solidago nemoralis* so affected was sent me about August 30th. It exhibited the usual phenomena of a flattened stem bearing many branches of abnormal inflorescence. I did not notice that any individual flowers were affected.

The *Saxifraga Virginiensis*, similarly fasciated, was collected near Providence in May.

WM. WHITMAN BAILEY.

BROWN UNIVERSITY,
Providence, September 7, 1897.

Pods and Seeds of Leguminosae wanted.—Prof. L. H. Pammel asks us to state that he desires to obtain fresh material of mature or nearly mature pods and seeds of the Leguminosae of the northeastern United States.

Index to recent Literature relating to American Botany.

Abbott, R. G. Electrical Attraction of Trees. Gard. & For. **10**: 297. 28 Jl. 1897.

Ashe, W. W. A new Hickory, *Hicoria pallida*. Gard. & For. **10**: 304–305. *f. 39*. 4 Au. 1887.
From the southern states.

Dock, M. L. *Viburnum dentatum*. Gard. & For. **10**: 332. *f. 43*. 25 Au. 1897.

Fernald, M. L. An undescribed *Antennaria* from New England. Gard. & For. **10**: 284. 21 Jl. 1897.
Antennaria Parlinii.

Galloway, B. T. A *Chrysanthemum* Disease. Gard. & For. **10**: 293. *f. 37*. 28 Jl. 1897.

Gibson, W. H. The Milkweed. Harper's Month. **95**: 517–520. *figs.* S. 1897.

Greene, E. L. Flora Franciscana, Part 4: 353–480. 5 Au. 1897.
Contains Valerianeae, Dipsaceae and Compositae.

Greene, E. L. Corrections in Nomenclature—I. Pittonia, **3**: 186–188. 20 Jl. 1897.
Atamasco as prior to *Zephyranthes*.

Greene, E. L. New or Noteworthy Species.—XVIII. Pittonia, **3**: 154–172. Ap.–My. 1897.

New species of *Cardamine, Arabis, Sidalcea, Lupinus, Solidago, Erigeron, Senecio, Geranium* and *Geum.*

Greene, E. L. New Western Plants. Pittonia, **3**: 195–198. 20 Jl. 1897.

New species of *Astragalus* and *Mertensia.*

Greene, E. L. Ranunculaceous Monotypes. Pittonia, **3**: 188–195. Jl. 1897.

Kumlienia, Arteranthis, gen. nov. and *Cyrtorhynca,* with plates.

Greene, E. L. Studies in the Compositae—VI. Pittonia, **3**: 172–185. My.–Jl. 1897.

Species of *Antennaria, Eupatorium* and *Pyrrocoma; Mesadenia* Raf., revised.

Greene, E. L. The Winter Hellebore, and other bibliographic Notes. Pittonia, **3**: 151–154. 9 Ap. 1897.

Cammarum prior to *Eranthis,* and *Phyllitis* to *Scolopendrium.*

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NATHANIEL LORD BRITTON,

AND OTHER MEMBERS OF THE CLUB.

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OF THE

TORREY BOTANICAL CLUB.

Vol. 24. Lancaster, Pa., October 30, 1897. No. 10.

New species of Fungi from various Localities.

By J. B. Ellis and B. M. Everhart.

Puccinia luteobasis E. & E.

On some umbelliferous plant, Dillon, Colo., June, 1897. (Bethel, no. 319.)

On the petioles and on the lower side of the leaves, the parts affected being slightly swollen and of a bright, light yellow color. Sori small, about ½ mm., orbicular, scattered on the yellow spots, chestnut-color, at first immersed, soon erumpent and surrounded by the ruptured epidermis which forms a little cup, enclosing them with the semblance of an *Aecidium*; spores oblong-elliptical, yellow-brown, more or less irregular, rounded or obtusely pointed or even flattened at the summit, mostly rounded also at the base, slightly constricted, epispore smooth, not thickened above, contents granular, $20–32 \times 15–20\ \mu$; pedicels hyaline, about as long as the spores.

Ustilago funalis E. & E.

U. Sporoboli E. & E. Bull. Torr. Bot. Club, **24**: 282. 1897.

Investing the culms with a thin, olivaceous coat of globose light-brown spores about 5 μ diam., extending continuously from one node to another.

We have changed the specific name "*Sporoboli*" to "*funalis*" on account of the homonymous *U. Sporoboli* Tracy & Earle, which takes precedence, but is a very different thing from this.

This same *Ustilago* (*U. funalis*) also occurs on *Oryzopsis cuspidata* in Colorado (Bethel, no. 279).

PYRENOMYCETES.

Hypocrea aurantio-cervina E. & E.

On bark, Louisiana (Langlois), Comm. C. G. Lloyd, no. 3049.

Stroma effused, orbicular, 1–2 cm. diam., thin (1 mm. or less), orange-red when fresh, stag-color when dry, with a pale-red layer just beneath the surface, the lower layer slaty black, margin appressed; perithecia in a single layer, oblong-elliptical, 300×200 μ, black, crowded, seated on the black, carnose basal layer, their minute punctiform ostiola barely visible under the lens as black dots in the surface of the stroma; asci slender, p. sp. 50–55×5–6, or including the slender stipe, 100–110 μ long; sporidia uniseriate, subnavicular, brown, obtuse, 2-nucleate, 7–9×3–3½ μ, mostly overlapping.

From *H. bicolor* E. & E. it differs in the character of the stroma and smaller perithecia.

Thyronectria sambucina E. & E.

On dead stems of *Sambucus*, Buena Vista, Colo., June, 1897. (Bethel, no. 315 *a*.)

Perithecia 6–12 in a cortical stroma, globose, about ⅓ mm. diam., brown and coriaceous, their minute papilliform inconspicuous ostiola united in a flat or slightly concave dark-brown disk which raises the whitened epidermis into distinct pustules and soon bursts through it; asci cylindrical, p. sp. 130–150×18–20 μ, 8-spored, short-stipitate, with abundant but evanescent filiform paraphyses; sporidia uniseriate, oblong-elliptical, about 7-septate, and muriform, slightly constricted in the middle, straw-yellow, 20–25×12–14 μ.

In company with *Coryneum sambucinum* E. & E. and *Tubercularia Sambuci* Cda.

Sordaria ostiolata E. & E.

On rabbit's dung, Rooks County, Kansas, August, 1897. (Bartholomew, no. 2424.)

Perithecia scattered, immersed, then semiemergent, glabrous, ovate, brown, 200–250 μ diam., the black, conical or short-cylindrical ostiolum erumpent; asci cylindrical, short-stipitate, paraphysate, 80–190×12 μ, 8-spored; sporidia uniseriate, elliptical, 12–15×8–10 μ.

Allied to *S. leucoplaca* B. & R. but asci and sporidia larger.

Melanopsamma alpina E. & E.

On decaying spruce wood, San Juan Mountains, Colorado, July, 1897. (Bethel, no. 352 partly.)

Perithecia erumpent-superficial, gregarious, depressed-globose, ¼ to ½ mm. diam., thin walled and rather fragile, with an obscure or papilliform ostiolum; asci clavate-cylindrical, 75–85×8–10 μ, paraphysate, 8-spored; sporidia overlapping-uniseriate, or subbiseriate, fusoid-navicular, 3–4-nucleate, hy aline, constricted-uniseptate in the middle, 15–20×3½–4 μ.

Allied to *M. boreale* E. & E. and, like that species, having perithecia quite variable in size, but distinguished by its differently shaped and narrower sporidia.

Teichospora Opuntiae E. & E.

On dead stems of *Opuntia arborescens*, Pueblo, Colo., July, 1897. (Bethel, no. 3299.)

Perithecia superficial, scattered or gregarious, ovate, small (¼ mm. or a little over), minutely roughened, except the papilliform or conic-papilliform smooth, black ostiolum; asci cylindrical, short-stipitate, 8-spored, 75–80×9–10 μ; sporidia uniseriate, obovate-elliptical, 3-septate, scarcely constricted unless at the middle septum, one or two of the cells divided by a longitudinal septum, brown, 12–14×5½–6 μ.

The perithecia are about the same as in *Cucurbitaria minima* E. & E. but scattered, and the sporidia are smaller and quite constantly only 3-septate.

Teichospora infuscans E. & E.

On an old cottonwood log, Rooks County, Kansas, August, 1897. (Bartholomew, no. 2422.)

Perithecia gregarious in elongated groups, blackening the surface of the wood, erumpent-superficial, subhemispherical, collapsing to cup-shape, 110–200 μ diam., with a distinct papilliform ostiolum; asci clavate-cylindrical, short-stipitate, paraphysate; sporidia biseriate, narrow, oblong-elliptical, very slightly curved, a little narrower below, 3–5-(exceptionally 6–7) septate, scarcely or only slightly constricted, with a longitudinal septum running through one or more of the cells, pale yellowish brown, 18–22×6–8 μ.

Differs from *T. pygmaea* E. & E. in its gregarious habit and collapsed perithecia.

Teichospora strigosa E. & E.

On dead branches of *Symphoricarpus*, Baldwin, Colo., June, 1897. (Bethel, no. 274.)

Perithecia superficial, gregarious, globose, ⅓ mm. diam., collapsing above, clothed, especially below, with brown spreading hairs ; asci cylindrical, short-stipitate, paraphysate, 8-spored, $100-110 \times 12-15\,\mu$; sporidia subbiseriate, oblong- or ovate-elliptical, yellow, 5–7-septate, with a longitudinal septum running through most of the cells, often constricted in the middle but not at the other septa, $20-27 \times 11-13\,\mu$.

Differs from *T. crossata* E. & E. in its much larger, 5–7-septate sporidia and strigose coat.

Cucurbitaria Quercina E. & E.

On dead limbs of *Quercus undulata*, Greenhorn, Pueblo Co., Col., July, 1897. (Bethel, no. 337.)

Perithecia gregarious or subcespitose, seated on the bare wood or erumpent through cracks in the bark, depressed-globose, inclining to ovate-globose, $400-500\,\mu$ diam., minutely roughened, becoming slightly collapsed around the papilliform ostiolum, so as to appear flattened above ; asci short-stipitate, cylindrical, paraphysate, 8-spored ; sporidia uniseriate, ovate-elliptical, 3–5-septate, sometimes constricted in the middle, yellow-brown, $18-20 \times 8-10\,\mu$.

Cucurbitaria minima E. &. E.

On dead stems of *Artemisia tridentata*, near Gunnison, Colo., June, 1897. (Bethel 311*e*.)

Perithecia subcespitose, 3–6 together, or subseriate, small, about ⅓ mm., ovate-conical, often with 1–4 furrows or grooves extending from the apex down ; ostiolum papilliform ; asci cylindrical, short-stipitate, paraphysate, 8-spored, $75-85 \times 10-12\,\mu$; sporidia overlapping, uniseriate, oblong, 5–7-septate, scarcely or only slightly constricted, straight, $18-20 \times 6-7\,\mu$.

Lophiotrema incisum E. & E.

On dead shoots of *Ribes prostratum*? Empire, Colorado, May, 1897. (Bethel, no. 257 *a*.)

Perithecia thickly scattered, sunk in the bark with the cleft or quadrisulcate apex erumpent in a small tubercle, white and solid inside, $300-350\,\mu$ diam., often 2–3 lying close together and covered by the same tubercle, not penetrating to the wood ; ostiolum subcompressed ; asci cylindrical, $75-100 \times 10-12\,\mu$, short-stipitate, paraphysate ; sporidia uniseriate or quite as often biseriate, cylindrical, obtuse, 3–4-nucleate, constricted between the nuclei, uniseptate and more deeply constricted in the middle, $15-20 \times 5-6\,\mu$.

Approaches *Dothidea* and *Didymella*.

Sphaerella stenospora E. & E.

On dead stems of *Sphaeralcea*? northern Colorado, July, 1897. (Baker, no. 413.)

Perithecia erumpent, abundant, thickly scattered over the stems, 100–150 μ diam., perforated above; asci oblong, 45–55 × 10–15 μ, short-stipitate, often swollen on one side towards the base; sporidia biseriate, oblong-fusoid, uniseptate, scarcely or not at all constricted, 14–16 × 3–4 μ.

This comes near *S. spinarum* Awd., but besides the peculiar habitat of that species, the sporidia in the fig. in Rab. Mycol. Eur. are represented as distinctly curved, while in the present species they are straight. *S. Vincetoxici* Sacc. has sporidia oblong-clavulate.

Sphaerella (Dermatostroma) frigida E. & E.

On bleached limbs and weather-beaten wood, San Juan Mountains, Colo., July, 1897. (Bethel, no. 361.)

Perithecia globose, subastomous, black, membranous, 100–110 μ diam., seated on a thin white membrane overspreading the surface of the host; asci clavate-cylindrical, 35–40 × 8–10 μ, subsessile, aparaphysate, 8-spored; sporidia biseriate, fusoid-oblong, uniseptate and slightly constricted, straight or very slightly curved, obtuse, 12–15 × 3½–4½ μ, smoky-hyaline.

Differs from the usual type of *Sphaerella* in the membranous stroma.

Leptosphaeria microspora E. & E.

On dead stems of *Lespedeza capitata*, London, Canada, August, 1897. (Dearness, no. 2474.)

Perithecia scattered or loosely gregarious, subcuticular, depressed-globose; 150–250 μ diam., subcollapsing, with a papilliform ostiolum; asci clavate-cylindrical, sessile, paraphysate, 55–60 × 7–8 μ; sporidia subbiseriate, narrow-elliptical, 1–3-septate, slightly constricted, 10–12 × 3–3¼ μ.

The sporidia are oftener only 1-septate, in this respect approaching *Didymosphaeria*.

Leptosphaeria monticola E. & E.

On dead leaves and petioles of *Trifolium Kingii*, San Juan Mountains, Colorado, altitude 10,000 feet, July, 1897. (Bethel, no. 388.)

Perithecia covered by the epidermis which is raised into distinct pustules pierced by the papilliform conical or short-cylindrical ostiolum, 300–400 μ diam., membranous, black; asci oblong-clavate, mostly curved, paraphysate, 8-spored; sporidia fasciculate, cylindric-fusoid, 5–7-septate, scarcely constricted, second cell from the upper end moderately swollen, $45–55 \times 7\ \mu$.

EUTYPELLA SARCOBATI E. & E.

On dead stems of *Sarcobatus vermiculatus*, Alamosa, Colorado, July, 1897. (Prof. E. Bethel, no. 324.)

Stroma cortical, orbicular, 1½ mm. diam., circumscribed by a narrow black line, the surface of the wood being also blackened; perithecia 3–8, sunk to the wood, globose, ½mm. diam., with coriaceous walls, black and shining inside, contracted abruptly into slender necks enlarged above into the erumpent, connate conical quadrisulcate ostiola; asci (p. sp.) clavate cylindrical, $25–30 \times 4–5\ \mu$; sporidia subbiseriate, allantoid, curved, hyaline, $4–5 \times 1–1\frac{1}{4}\ \mu$.

VALSARIA COLORADENSIS E. & E. Am. Nat. 342. 1897, is a synonym of *V. allantospora* E. & E. Proc. Phil. Acad. 343. 1894, and *Asteroma ivaecolum* E. & E. is the same as *A. infuscans* E. & E. Proc. Phil. Acad. 431. 1895, N. A. F. 3359.

In Bull. Torr. Club, 285, 1897, change *Phyllosticta Eucalypti* E. & E. to *Phyllosticta extensa* E. & E. on account of the homonymous species of Thümen, Contr. Fl. Lusit, no. 374, from which the California species differs in its amphigenous growth and larger sporules.

HYSTEROGRAPHIUM INCISUM E. & E.

On dead limbs of *Rhus aromatica*, Gunnison, Colo., June, 1897, (Bethel, no. 289.)

Perithecia oblong, partly sunk in the wood, lying parallel, $1–2 \times 1$ mm., ends subacute, sides faintly longitudinally striate, lips closed, leaving a slight furrow between them; asci oblong-cylindrical, short-stipitate, paraphysate, 8-spored, $75–80 \times 12–13\ \mu$; sporidia biseriate, ovate-oblong or ovate-elliptical, brown, 3–4-septate, with or without a partial longitudinal septum, $18–20 \times 5–7\ \mu$. Many of the perithecia have a transverse furrow across the middle as if cut across with a knife.

HYSTEROGRAPHIUM INSIDENS (Schw.)

On weatherbeaten wood of spruce, San Juan Mountains, Colorado, July, 1897. (Bethel, 352 partly.)

Perithecia gregarious, mostly lying parallel, elliptical, $1 \times \frac{1}{2}$ mm. or sometimes elongated (by confluence?), 2–3 mm. long, lips partially open, sides faintly striate; asci oblong, short-stipitate, $75-90 \times 15-20\ \mu$; sporidia crowded-biseriate, oblong-fusoid, 7–10-septate, mostly constricted near the middle, one or more of the cells divided by a longitudinal septum, $26-40 \times 8-12\ \mu$.

This is certainly *Hysterographium* and probably not distinct from *H. elongatum* (Wahlenb.), and was so considered by Fries.

Aposphaeria condensata E. & E.

On dead stems of *Bigelovia*, Colorado, July, 1897. (Prof. E. Bethel.)

Perithecia superficial, densely gregarious so as to form here and there an almost continuous crust, depressed-globose, 150–250 μ, diam., with a broad-papilliform black shining ostiolum, the smaller ones collapsing; sporules minute, allantoid, hyaline, $2\frac{1}{2}-3 \times \frac{1}{2}-\frac{3}{4}\ \mu$.

A. allantella Sacc. has sporules $5-6 \times 1-1\frac{1}{2}\ \mu$. *A. alpigena* E. & E. has sporules $3-3\frac{1}{2} \times 1\frac{1}{2}\ \mu$ and the perithecia do not collapse.

Hypoderma abietinum E. & E.

On decorticated limbs of *Abies*, San Juan Mts., Colo., July, 1897. (Bethel, no. 351.)

Gregarious, elliptical, rough, $\frac{3}{4}-1\frac{1}{4} \times \frac{1}{2}-\frac{3}{4}$ mm., lips partially closed; asci clavate, $100-110 \times 8-10\ \mu$; paraphyses linear, mostly curved at the tips; sporidia narrow-fusoid, nucleate, slightly curved, hyaline, $20-22 \times 1\frac{1}{2}-2\ \mu$.

Sphaeropsis Comptoniae E. & E.

On dead stems of *Comptonia*, Newfield, N. J., summer and autumn, 1897.

Perithecia buried in the inner bark, ovate-globose, acutely papilliform, $\frac{1}{4}-\frac{1}{3}$ mm. diam., either gregariously scattered with their apices barely erumpent, or crowded in transverse cracks of the bark, forming rings partly or entirely surrounding the stem with the perithecia semi-erumpent; sporules oblong-elliptical, brown, $16-22 \times 8-12\ \mu$, occasionally imperfectly septate, but very indistinctly so.

Pyrenochaeta graminis E. & E.

On dead leaves of *Chloris verticillata*, Rooks County, Kansas, September, 1897. (E. Bartholomew, no. 2294.)

Perithecia mostly hypophyllous, superficial, membranous, astomous, 150 μ diam., collapsing above, black, clothed, especially below, with short, spreading, continuous, brown, tapering hairs $20–40 \times 3\ \mu$; sporules abundant, globose or ovate, 8–14 (mostly 10–12 μ) in the longer diameter, hyaline.

Haplosporella microspora E. & E.

On bark of dead *Quercus undulata*, Greenhorn, Col., July, 1897. (Bethel, 335.)

Perithecia minute, ovate, crowded in a black pulvinate elliptical or orbicular stroma 1–2 mm. diam., their apices slightly prominent above; sporules oblong-elliptical, subacute, $6–7 \times 3\ \mu$.

Botryodiplodia betulina Ell. & Dearness.

On birch bark, London, Canada, Aug., 1897. (Dearness, no. 2496.)

Perithecia seated on the inner bark and erumpent through the epidermis in crowded clusters of 4–10 together, or here and there solitary, depressed globose, 400–500 μ diam., with a papilliform ostiolum; sporules elliptical, slightly constricted at the septum, $15–22 \times 10–12\ \mu$ (sec. Dearness reaching 25–30 μ long).

B. valsoides (Pk.) also on birch bark, is said to have the perithecia buried in the inner bark, with the ostiola elongated and joined in an olivaceous stroma and must be different from this.

Ascochyta Hanseni E. & E.

On leaves of *Arbutus Menziesii*, Amador Co., Calif. (Geo. Hansen, no. 1507.)

Spots amphigenous, irregular, definite, 2–10 mm. diam., livid-purple above, paler and subrufous below; perithecia hypophyllous, erumpent, convex, papillate, 120–150 μ diam.; sporules oblong-cylindrical, slightly curved, brownish, obtuse, uniseptate, not constricted, occasionally 2-septate, $15–20 \times 6\ \mu$.

Ascochyta Fraserae E. & E. Bull. Torr. Bot. Club, 289. 1897. Specimens from Mt. Richtophen, Colo. (C. F. Baker, no. 414), have the perithecia larger, reaching nearly ½ mm. diam., and clothed around the base with a fringe of coarse short rudimentary hairs.

Camarosporium roselliniodes E. & E.

On dead branches of *Bigelovia* or *Gutierrezia*, Colo., June, 1897. (Bethel, no. 310 partly.)

Perithecia erumpent-superficial, scattered or subseriate in cracks of the bark, globose, papillate, about ½ mm. diam.; sporules oblong-elliptical, 12–22×8–12 μ, 3-septate with one or two of the cells divided by a longitudinal septum.

The perithecia are mostly fringed around the base with pale-brown hyphae.

Camarosporium vetustum E. & E.

On dead stems of *Artemisia borealis*, Malachite, Colo., July, 1897. (Bethel, no. 327.)

Perithecia scattered or in cespitose clusters erumpent, through cracks in the bark, hemispherical or subelongated, papillate, ½–¾ mm. diam.; sporules 12–20×8–12 μ, 3-septate, with a longitudinal septum running through one or all of the cells. The smaller sporules are regularly elliptical or subglobose and not constricted; the larger ones more irregular in shape and often constricted in the middle.

Apparently near *C. subfenestratum* B. & C.

Dichomera Juglandis E. & E.

On dead limbs of *Juglans cinerea*, Ohio (Morgan).

Stromata densely gregarious, flat, black, suborbicular, about 1 mm. diam., closely surrounded by the appressed lobes of the ruptured epidermis; perithecia monostichous, small (100–120 μ), entirely buried in the stroma; sporules globose, cruciate-septate or ovate, 10–12×7–8 μ, 2–3-septate and muriform, brown.

Associated with *Diaporthe bicincta* (C. & P.).

Septoria angustifolia E. & E.

On leaves of *Kalmia angustifolia*, Newfield, N. J. Erroneously issued in N. A. F. 2661 as *Septoria Kalmiaecola* (Schw.) B. & C. See Proc. Acad. Nat. Sci. Phil. **1893**: 454. 1893.

Spots suborbicular, rusty-brown, with a slightly raised border, 2–3 mm. diam., paler below; perithecia epiphyllous, minute, scattered, not numerous; sporules filiform, curved, septulate and nucleolate, 25–45×2–2½ μ.

Schizothyrella Fraxini E. & E.

On fallen leaves of *Fraxinus viridis*, Rooks County, Kan., September, 1897. (Bartholomew, 2439.)

Perithecia epiphyllous, innate-erumpent, membranous, orbicular, 300–550 μ diam., for a long time closed but finally opening by an irregular slit across the summit, convex when fresh, collapsing when dry; disk dull orange; sporules cylindrical, fasciculate, 80–100 $\times$ 3 μ, tardily separating into segments 11–13 $\times$ 3 μ, truncate at each end, hyaline.

CRANDALLIA Ell. & Sacc.

New genus of Leptostromaceae. Perithecia scutellate, carbonaceo-membranous, of nearly homogeneous texture, not radiate-cellular, pierced in the centre with a single minute round opening; sporules bacillary, catenulate. Has the perithecia of *Leptothyrium* with the fructification of *Schizothyrella*.

CRANDALLIA JUNCICOLA Ell. & Sacc.

On the dead stems of *Juncus Drummondii*, Cameron Pass, Larimer Co., Colo., alt., 11,300 ft., July, 1894. (Prof. C. S. Crandall).

Perithecia 400–500 μ diam., wrinkled when dry, often with a single ridge across the centre, the central opening about 5 μ diam.; sporules cylindrical, continuous, hyaline, 8–10 $\times$ 1½–2 μ, at first concatenate, soon separating.

This appears to be the spermogonial stage of *Duplicaria acuminata* E. & E.

GLOEOSPORIUM ERIOGONI E. & E.

On *Eriogonum umbellatum*, Gunnison, Colo., June, 1897. (Bethel 299.)

Spots indefinite, reddish-brown, 3–4 mm. diam., leaf more or less tinged with red; acervuli thickly scattered on the spots, subepidermal, punctiform, collapsing; conidia elliptical, hyaline, 8–13 $\times$ 5–8 μ.

GLOEOSPORIUM SPINACIAE E. & E.

On leaves of *Spinacia oleracea*, Cote d' Or, France (F. Fautrey).

Spots suborbicular, subindefinite, 2–3 mm. diam., soon confluent, occupying the greater part of the leaf which becomes of a light brown color, dead and dry; acervuli punctiform, amphigenous, but more abundant above, covered by the epidermal cells which are raised into conical pustules, pale at first but soon becoming black and resembling minute perithecia; sporules oblong, obtuse, 5–10 $\times$ 2–2½ μ, hyaline, continuous.

This is a very different thing from *Colletotrichum Spinaciae* Ell. & Halst., though outwardly hardly distinguishable from it On the same leaves is also a *Macrosporium*.

COLLETOTRICHUM SOLITARIUM E. & B.

On leaves of *Solidago radula,* Rooks Co., Kansas, Aug., 1897. (Bartholomew, no. 2426.)

Spots amphigenous, round, dull-white, 1–1½ mm. diam., with a narrow erect border; acervuli amphigenous but mostly hypophyllous, solitary in the centre of the spot or sometimes several smaller punctiform ones around a larger central one; bristles rather numerous, 65–75×2–3 μ, mostly a little curved; conidia fusoid-oblong, slightly curved, hyaline, subobtuse, 12–14×2½–3 μ.

CORYNEUM SAMBUCINUM E. & E.

On *Sambucus* (dead stems), Buena Vista, Colo., June, 1897. (Bethel, 315.)

Acervuli acutely elliptical, black, subcuticular, 3–4×1½–2 mm., soon erumpent, but still partly covered by the ruptured epidermis, often containing 3–4 sporiferous nuclei; conidia elliptical, slightly narrowed towards the ends, 3-septate and generally constricted at the septa, olive-brown, 35–45×15–20 μ, on stout, septate basidia 25–35×4–5 μ.

Found with *Thyronectria sambucina* E. & E., of which apparently it is the macrostylosporous stage.

DISCOMYCETES.

LACHNELLA ALBOLABRA E. & E.

On dead shoots of *Ribes prostratum*? Empire, Colo., May, 1897. (Bethel, no. 257*b*.)

Ascomata sessile, 1–1¼ mm. diam., depressed-globose and nearly closed at first, finally nearly plane, clothed with a villose-tomentose dirty olive brown coat, the incurved margin fringed with dull-white loosely interwoven, smooth septate hairs 300–400×3–4 μ; disc cup-shaped at first, livid, nearly slate-color; asci attenuate-stipitate, oblong-cylindrical, 50–55×7 μ; paraphyses wanting? sporidia mostly biseriate, clavate-oblong, hyaline, continuous, with a small nucleus at each end, 6–10×2–2½ μ.

Allied to *L. cenangioides* Ell. and *L. Meleagris* Ell., but differs from the former in its smaller sporidia and from the latter in color; differs from *L. albido-fusca* Sacc., in its cup-shaped ascomata and broader sporidia, and from *Trichopeziza leucostoma*, Rehm in its much larger size.

LACHNELLA SYMPHORICARPI E. & E.

On dead stems of *Symphoricarpus*, Baldwin, Colorado, June, 1897. (Bethel, no. 274*b*.)

Gregarious, sessile, $\frac{3}{4}$–$1\frac{1}{2}$ mm. diam., at first globose, then expanding to shallow cup-shaped, with the short-fimbriate margin narrowly incurved, outside dark brown, appressed-hirsute, when dry the opposite margins are incurved in a hysteriiform manner; the substance of the ascoma is carnose-coriaceous; disk concave, dull white with a distinct rosy tint; asci clavate-cylindrical, 40–45 $\times$6–7 μ; paraphyses stout, cylindrical, about as long as the asci, scarcely thickened at the tips; sporidia biseriate, allantoid, hyaline, continuous, moderately curved, 8–10$\times$$1\frac{1}{2}$ μ.

Cenangium alpinum E. & E.

On decorticated limbs of *Abies*, San Juan Mts., Colo., alt. 10,000 ft., July, 1897. (Bethel, no. 348.)

Ascomata scattered, erumpent, black, $\frac{3}{4}$–1 mm. diam., closed at first, then with a small round opening, margin permanently incurved, fimbriate, disk dull white, urceolate; asci closely packed, cylindrical, sessile, 50–55$\times$6–7 μ; paraphyses filiform, not thickened at the tips; sporidia subbiseriate, allantoid, hyaline, slightly curved, 2–3-nucleate, 10–14$\times$$2\frac{1}{2}$ μ.

C. laricinum (Pass.) has asci and sporidia broader.

Cenangium aureum E. & E.

On dead stems of *Ceanothus velutinus* Dougl., mountains bordering Bear Valley, Colo., July 13, 1897, alt. 7000 ft. (Prof. C. S. Crandall, no. 12.)

Erumpent, mostly through transverse cracks in the bark, solitary or 2–3 together; ascoma golden yellow, shallow cup-shaped, 2–3 mm. across, floccose-furfuraceous becoming nearly glabrous, the paler subfimbriate-floccose incurved margin more tardily so; stipe short, stout, 1 mm. long; asci clavate-cylindrical, 90–110 $\times$7–8 μ, 8-spored, gradually narrowed toward the base; paraphyses filiform, about as long as the asci, scarcely thickened above; sporidia uniseriate, ovate or pyriform, continuous, hyaline, 7–10$\times$ $3\frac{1}{2}$ μ. The hymenium is a little paler than the outside of the ascoma.

Allied to *C. rubiginellum* Sacc. (*C. rubiginosum* Cke.).

Erinella cervina E. & E.

On decaying birch limbs, Dillon, Colo., June, 1897. (Bethel, no. 288.)

Gregarious, sessile, subglobose, urceolate, $\frac{3}{4}$ mm. diam., stag-color, short-tomentose, striate above, with subfimbriate margin paler; seated on the wood and partly covered by the loosened bark, margin thin, incurved so as to leave only a small round opening; disk pallid; asci cylindrical, short-stipitate, paraphysate, 8-spored, 75–85×7–9 μ; sporidia fasciculate, acicular, hyaline, attenuated towards each end, continuous, faintly nucleolate, 50–60×2–2½ μ; paraphyses stout, rather longer than the asci, 2–2½ μ thick, tips scarcely swollen but slightly undulate or bent.

Resembles overgrown *Solenia anomala* Hoff.

CRYPTODISCUS ANDERSONI E. &. E.

On dead stipes of *Pteris aquilina*, Newfield, N. J., May 10, 1890. (F. W. Anderson.)

Ascomata pale flesh-color, elliptical, ½ mm. long, covered by the epidermis which is soon split with an acutely elliptical slit exposing the hymenium; asci clavate-cylindrical, 27–30×4 μ, sessile, 8-spored; paraphyses filiform, subramose at the tips and bearing subglobose hyaline conidia 2 μ diam.; sporidia biseriate, fusoid-cylindrical, 3-septate, 11–14×1½–2 μ.

STICTIS SERPENTARIA E. & E.

On decorticated *Salix*, Mt. Paddo, Wash., alt., 7,000 ft., September, 1894. (W. N. Suksdorf, no. 481.)

Ascomata erumpent, orbicular or elliptical, 1–2 mm. in the longer diam., cinereous-gray inside, disk slate-color, suburceolate, margin gray, dentate-lobed, revolute; asci cylindrical, subsessile, 300–350×15 μ; paraphyses filiform, scarcely thickened, but slightly colored at the tips; sporidia 8 in an ascus, fusoid-cylindrical, multiseptate (50–60 or more), slightly constricted at the septa, nearly as long as the asci in which they lie straight and parallel, but when free, loosely coiled in a serpentine manner, 4–5 μ thick.

S. pachyspora Rehm, is on *Abies* and the ascomata are only 300–400 μ diam., with asci 220×27 μ, but the sporidia are the same as in the Washington specimens. What we here propose as *Stictis serpentaria* is certainly very near Dr. Rehm's species, differing principally in size.

SCHIZOXYLON BICOLOR E. & E.

On decorticated wood of *Salix*, Empire, Colo., May, 1897. (Bethel, 360 and 285.)

Ascomata erumpent, 1–2 mm. diam., closed at first by a thin, olive-gray membrane, then with a round opening bordered by the horizontally incurved, white pulverulent, subfimbriate margin; disk shallow-urceolate, bright orange-yellow; asci cylindrical, attenuated above, 200–250×6–8 μ, subsessile, with filiform paraphyses; sporidia filiform, nearly as long as the asci, multinucleate, then multiseptate, involute, $1\frac{1}{2}$–$2\,\mu$ thick, separating into semicircular or variously curved segments 15–$30\,\mu$ long.

Karschia impressa E. & E.

On living stems of *Symphoricarpus*, San Juan Mountains, Colorado, July, 1897. (Bethel, no. 356.)

Ascomata superficial, gregarious, flat, thin, black, round, about $\frac{1}{2}$ mm. diam., with a thin narrow margin, fringed around the base with creeping brown hairs; disk marked with minute hemispherical indentations, or papillose; asci oblong, sessile, 40–45×8–$10\,\mu$; paraphyses more or less thickened and bent at the tips, sometimes sparingly branched; sporidia ovate-oblong, uniseptate, the septum mostly nearer one end, not constricted, yellowish, 8–$10\times5\,\mu$.

Near *K. patinelloides* (S. & R.).

AGYRIELLA Ell. & Everhart. n. gen.

Differs from *Agyrium* in its linear many-celled sporidia.

Agyriella Betheli E. & E.

On dead stems of *Bigelovia*, mountains of Colorado, July, 1897. (Bethel, no. 340*a*.)

Ascoma orbicular, convex-discoid, carnose-gelatinous, smoky-gray, lighter inside and around the margin, $\frac{1}{2}$–$\frac{3}{4}$ mm. diam., the entire under surface attached to the matrix; asci cylindrical, sessile, 120–150×10–$12\,\mu$; paraphyses filiform, $2\,\mu$ thick, sparingly branched above but not thickened at the tips; sporidia linear, 50–$60\,\mu$ long, made up of a series of globose or elliptical cells about $4\,\mu$ diam. or 5–$6\times3\frac{1}{2}$–$4\,\mu$, loosely attached to each other and easily separating even while yet in the asci.

HYPHOMYCETES.

Oospora heterospora E. & E.

Parasitic on *Xylaria polymorpha*, Missouri. (Demetrio, no. 402.)

Effused, thin, white. Sterile hyphae obscure or wanting; conidia oblong-cylindrical, obtuse, hyaline, 5–$7\times1\frac{1}{2}$–$2\,\mu$, briefly concatenate, arising from a larger, globose or short-elliptical, 6–8×5–$6\,\mu$, basal cell, without any distinct fertile hyphae, unless the large basal cells are to be considered as hyphae.

Differs from *O. hyalinula* Sacc. in the absence of any true fertile hyphae.

Ovularia rhamnigena E & E.

On leaves of *Rhamnus tomentella*, Ashland, Oregon, June, 1895. (Dr. J. J. Davis, no. 956.)

Spots amphigenous, 1–2 mm. diam.; suborbicular, rusty brown. with a dark and mostly slightly raised border; hyphae hypophyllous, cespitose, erect, hyaline, continuous, geniculate above, simple, $35–45 \times 3$ μ; conidia narrow-elliptical, granular, hyaline, subacute below, more obtuse above, $12–20 \times 5–7$ μ, continuous in the specc. seen.

Ovularia bullata E. & E.

On leaves of *Stachys bullata*, Monterey, Calif., June, 1895. (Davis, no. 9527.)

Hypophyllous, in definite patches bounded by the veinlets, the leaf on the upper side marked with rusty-brown spots opposite the fertile areas below; fertile hyphae fasciculate, simple, $10–12 \times 3–3\frac{1}{2}$ μ; conidia ovate-globose, $8–12 \times 6–8$ μ, continuous, with granular contents, hyaline, occasionally oblong-elliptical, reaching $20–22 \times 8–10$ μ.

This is distinct from *Ovularia Stachydis* Bres. in Krügers F. Sax. in the presence of the spots on the upper side of the leaf and the ovate-globose conidia. The spec. in F. Sax. have oblong conidia $12–20 \times 3\frac{1}{2}–4$ μ.

Ovularia ? globifera E. & E.

On leaves of *Lupinus Stiversi*, Wawona, Calif., June, 1895. (Davis, no. 951.)

Spots hypophyllous, orbicular, 4 mm. diam., yellowish with a belt of black erumpent immature perithecia around the margin and beyond this a narrow pale-yellowish aureole; the upper surface of the leaf, opposite the spots, is also stained light yellow. Tufts of hyphae hypophyllous, evenly effused, giving the central portion of the spots an olive gray color; hyphae clavate, smoky-hyaline, $20–25 \times 4–6$ μ, collected in tufts 75–80 μ across; conidia globose, 8–12 μ diam., with a thick subechinulate epispore.

The conidia somewhat resemble the spores of *Tilletia*. An anomolous species.

Didymaria Symphoricarpi E. &. E.

On leaves of *Symphoricarpus*, Gilroy, Calif., July, 1895. (Dr. J. J. Davis.)

Spots irregular, 2–4 mm. or by confluence more, dirty brown, margin concolorous; hyphae amphigenous but more abundant below, cespitose, hyaline, simple, continuous, 10–12×3–3½ μ; conidia terminal, ovate-elliptical, uniseptate, scarcely or but slightly constricted, hyaline, 15–22×6–9 μ.

Much resembles *Ramularia Astragali* Ell. & Holw., but is readily distinguished by its very short, almost obsolete hyphae. The *Ramularia* referred to is a true *Ramularia*, the conidia becoming finally 2–3-septate. By a mistake of the printer the hyphae in Journ. Mycol. 1: 6, are made 8–4 μ thick instead of 3–4 μ as they should have been.

Ramularia Helianthi E. & E.

On leaves of *Helianthus exilis*, Jackson, Amador Co., Calif., 1896. (Geo. Hansen, no. 1505.)

Hypophyllous on reddish- or yellowish-brown spots 2–3 mm. diam., often subconfluent, prominent below on account of the thickening of the substance of the leaf; hyphae subfasciculate, short, 10–15×3 μ, toothed above; conidia oblong-fusoid, or the shorter ones obovate, hyaline, 2–3-nucleate, subcatenulate, 10–20×3–4 μ.

Allied to *R. Heraclei.*

Ramularia Lophanthi E. & E.

On leaves of *Lophanthus scrophulariaefolius*, Yosemite, Calif., June, 1895. (Davis, no. 9511.)

Spots amphigenous, irregular, subangular and partly limited by the veinlets, rusty brown above, paler beneath, subconfluent, definite, 3–5 mm. diam.; hyphae amphigenous, but more abundant below, cespitose, simple, continuous, hyaline, 20–30×3 μ, toothed or sublobate at the apex; conidia oblong-elliptical, or fusoid-oblong, 15–30×5–7 μ, hyaline, continuous or uniseptate.

Has the general aspect of *Peronospora sordida.*

Clasterisporium sigmoideum E. & E.

On dead limbs of *Castanea*, Nuttallburg, West Va., March, 1896. (L. W. Nuttall, no. 819.)

Hyphae effused, crooked, septate at intervals of about 15 μ, forming an olive-black stratum on the bark for many cm. in extent, subcespitose, 300–400×6–7 μ; conidia broad-fusoid, sigmoid (ends curved in opposite directions), 4-(exceptionally 5-) septate and slightly constricted at the septa, intermediate cells brown, end cells hyaline, 40–70×12–15 μ, mostly subtruncate above.

HELMINTHOSPORIUM TOMATO Ell. & Barthol.

On decaying fruit of tomato, Rooks Co., Kansas, September, 1897. (E. Bartholomew, no. 2433.)

Forming definite round black patches 1½–2 cm. diam., scarcely distinguishable externally from *Macrosporium tomato* Cke.; fertile hyphae erect, olive-brown, septate, geniculate and crooked, often with 1–2 short, rudimentary, hyaline branches (rudimentary conidia)? at their tips, 40–60×3½–4 μ, arising, in part at least, from prostrate creeping threads; conidia oblong, brown, 1–3-septate, not constricted, obtuse at the ends, mostly a little curved, 15–27×8–13 μ.

The well developed erect fertile hyphae indicate *Helminthosporium* rather than *Clasterisporium*.

CLASTERISPORIUM PULVINATUM E. & E.

On dead stems of *Bigelovia* or *Gutierrezia*, Baldwin, Colo., June, 1897. (Bethel, no. 309.)

Forming pulvinate, orbicular, black flattened tufts, ½–1 mm. diam., closely embraced by the margin of the ruptured epidermis; conidia erect, sparingly branched, 12–15-septate, scarcely constricted, 100–120×12–15 μ, narrowed at intervals.

CERCOSPORELLA HELIANTHELLAE E. & E.

On leaves of *Helianthella quinquenervis*, Deep Creek Lake, Colo., August 11, 1894. (Prof. C. S. Crandall, no. 194.)

Spots light brown, irregular, subangular, subconfluent, 2–3 mm. diam.; hyphae epiphyllous, densely tufted, tufts crowded so as to form a white granular coat on the spots, 20–30×4 μ, simple or with a short rudimentary branch or nodule near the tip, or subdentate, hyaline; conidia cylindrical, hyaline, uniseptate, slightly attenuated towards the ends, 30–60×2½ μ.

CERCOSPORA MACROCHAETA E. & E.

On leaves of *Quercus chrysolepis*, Jackson, Amador County, Calif. (Geo. Hansen, no. 1334.)

Hypophyllous. Hyphae rudimentary, consisting merely of aggregations of brown cells seated on the stellate hairs scattered over the lower surface of the leaf; conidia flagelliform, clear, light brown, 100–190 μ long, the lower end for 15–20 μ in length swollen and 3–5-septate, often constricted at the septa, the upper part gradually attenuated to the subobtuse extremity, slightly curved.

CERCOSPORA STACHYDIS E. & E.

On *Stachys palustris*, Ames, Iowa, June, 1895. (Coll. Geo. W. Carver; Comm. Prof. L. H. Pammel.)

Spots numerous, small, pale rust-color, 1 mm. diam., with a narrow dark border; hyphae amphigenous, cespitose, few in a tuft, slender, septate, brown, subgeniculate, mostly narrowly undulate or crisped above, 60–75×3½–4 μ; conidia not well matured and mostly still attached to the hyphae.

Has the general outward appearance of *Cylindrosporium Stachydis* Ell. J. M., 7 : 277. 1893, but is a very different thing.

CERCOSPORA INCARNATA E. & E.

On leaves of *Asclepias incarnata*, Oberlin, Ohio, August, 1895. (Kelsey, no. 880.)

Amphigenous; spots orbicular, 2-3 mm. diam., dirty white with a dark border above, brown below; hyphae cespitose, short, 18–25×4 μ, entire or slightly toothed above; conidia slightly colored, attenuated and often shrivelled above, 5–10-septate, 25–60×3½–4 μ.

CERCOSPORA GAYOPHYTI E. & E.

On *Gayophytum diffusum*, Yosemite, Calif., June, 1895. (Dr. J. J. Davis, no. 9510.)

Spots brownish, indefinite, extending along the sides of the leaf or across the upper part, finally occupying the entire surface and killing the leaf; hyphae amphigenous, cespitose, subhyaline, continuous, simple, subdenticulate and subgeniculate above, 20–30×3½–4 μ; conidia oblong, smoky-brown, nucleate, uniseptate, 20–35×5–6 μ.

CERCOSPORA COLEOSANTHI E. & E.

On *Coleosanthus Californicus*, Jackson, Amador Co., Calif. (Geo. Hansen, no. 1396.)

Spots suborbicular, grayish brown, 2–4 mm. diam., often confluent, margin narrow, darker; tufts amphigenous, thickly scattered over the spots, gray; conidia cylindrical, sub-obtuse, nucleate, 30–40×2½–3 μ, sometimes attenuated above and longer (50–60 μ).

CERCOSPORA TRAGOPOGONIS E. & E.

On leaves of *Tragopogon porrifolius*, Emma, Mo., September 22, 1897. (Rev. C. H. Demetrio, no. 613.)

Spots suborbicular, rusty brown, and finally whitening out in the centre, 1–3 mm. diam., or by confluence more; hyphae cespitose, short, abundant, 20–30×3 μ, smoky hyaline, continuous, subundulate and obscurely toothed above; conidia clavate-cylindrical, 30–60×3 μ, 1–3-septate.

STEMPHYLIUM SUBRADIANS E. & E. Proc. Acad. Nat. Sci. Philadelphia, **1895**: 441. 1895.

Specc. on *Bigelovia* or *Gutierrezia* from Baldwin, Colo., differ from the type in the conidia varying from globose, 12–20 μ, to oblong or oblong-elliptical, 15–30×12–15 μ, this latter form of conidia being most abundant.

STIGMELLA CRATAEGI E. & E. N. A. F., 3492; F. Col., 995.

On leaves of *Crataegus parvifolia*, Newfield, N. J., Aug.–Sept 1895.

Hypophyllous. Tufts punctiform, subeffused, black; prostrate hyphae hyaline, branched, bearing the globose, elliptical, or oblong-elliptical dark olive-brown 1–3-septate and submuriform conidia on short lateral pedicils.

Outwardly resembles *Hirudinaria macrospora* Ces. on the same host (see N. A. F., 373), but is really very different.

ISARIOPSIS MEXICANA E. & E.

On dead shrubby stems, Monterey, Mexico, March, 1897. (Dr. B. F. G. Egeling.)

Hyphae simple, brown, septate at intervals of about 35 μ, loosely compacted into erect stipitiform tufts 300–400 μ high and 100 μ thick, thickly scattered over the stems and appearing like the cylindrical ostiola of some *Diaporthe*. The tips of the hyphae are paler above and recurved and swollen, developing at length into brown, multi-septate, 70–100×10–12 μ conidia.

Differs from *I. griseola* Sacc. in its septate, longer hyphae and conidia; from *I. Grayiana* Ell., in its coarser hyphae and multi-septate, much longer conidia and from *I. Linderae* E. & E., only in its habitat and much longer hyphae.

DENDRODOCHIUM COMPRESSUM E. & E.

On rotten wood, Orono, Maine. (Prof. F. L. Harvey.)

Erumpent, tuberculiform, about 1 mm. diam., light, yellow, becoming nearly amber color, soft and subgelatinous when fresh, becoming hard like horn; fertile hyphae slender, 200 μ long, 1½ μ thick, trichotomously or subverticillately branched above, branches

20–30 μ long; conidia terminal, compressed, elliptical, 4–4½×3 μ when viewed in front, 4–4½×1½ when seen edgewise.

The sporodochia resemble *Cylindrocolla*, but the structure is that of *Dendrodochium*.

HELICOSOPORIUM PILOSUM E. & E.

On decaying wood, Louisiana. (Langlois, no. 2453.)

Fertile hyphae erect, simple, septate, tapering above, straight or nearly so, 200–400 μ long, 5–6 μ thick below, forming a thin grayish-black pilose coating on the surface of the wood; conidia filiform, hyaline, nucleate, forming about 3 coils which incline to straighten out, about 2½ μ thick and about 100 μ long, arising from small (3 μ), hyaline subglobose lateral tubercles on the hyphae.

Allied to *H. fuscum* Morgan, but that has the thread of the conidia thicker and a greater number of coils.

CYLINDROCOLLA BIGELOVIAE E. & E.

On dead stems of *Bigelovia*, Golden, Colorado, Jan., 1897. (Bethel, no. 177.)

Sporodochia gregarious, depressed-hemispherical or strongly convex, yellowish amber-color, ½–¾ mm. diam.; sporophores dendroidly branched, filiform, hyaline, 50–60×1 μ; conidia terminal, catenulate, cylindrical, 6–7×1¼ μ.

DENDRODOCHIUM HELOTIOIDES E. & E.

On dead bark of Kukiu tree, Sandwich Islands (Kauai), 1895. (A. A. Heller, no. 2678.)

Sporodochia seriately erumpent through cracks in the bark, crowded, subconfluent, of irregular shape, orange-yellow, finally concave-discoid, the disk deep orange, the sides whitish; sporophores sparingly branched, erect, slender, 30–40 μ long; conidia oblong-elliptical, hyaline, 5–7×2½–3½ μ.

Bears a striking resemblance to crowded forms of *Helotium citrinum* (Hedw.) Fr.

FUSARIUM ALEURINUM E. & E.

On wheat flour spilt on the ground and left exposed four months, Nuttallburg, West Va. (L. W. Nuttall.)

Sporodochia compact, subtuberculiform-effused and subconfluent, reddish-orange, mycelium white; fertil hyphae erect, much branched, branches erect; conidia terminal, fusoid, slightly curved, continuous or faintly 1–3-septate, nucleate, 35–45×2½–3 μ.

FUSARIUM OXYDENDRI E. & E.

On *Oxydendron arboreum*, Nuttallburg, West Va., March, 1896. (L. W. Nuttall, no. 827.)

Sporodochia tuberculiform, about 1 mm. diam., slate-color, subcartilaginous, truncate or concave above, erumpent through, and closely surrounded by the ruptured epidermis; hyphae branched, hyaline, nucleolate (olivaceous in the mass); conidia arcuate, nucleate, continuous (as far as seen), $40–60 \times 2\frac{1}{2}–3\ \mu$.

Allied to *F. Schweinitzii* Ell. & Hark, but that has conidia oblong, obtuse, $20–30 \times 6\ \mu$.

Notes on Plants of New Mexico.

BY A. A. HELLER.

Nine weeks of the season of 1897, or from May 10th to July 17th, were spent in northern New Mexico by Mrs. Heller and myself. We were located at Santa Fe, the bulk of the collecting being done in the vicinity of that town. In all, some two hundred and forty numbers were collected, among them a dozen or more new species, and many rare ones. Among the latter are a large number of authentic specimens of the types of Fendler's plants. Part of the collection has already been distributed, the new species bearing on their labels the names under which they will be described as soon as a full report can be published. The following notes are preliminary to this intended report:

EDWINIA nom. nov.

[JAMESIA T. & G. Fl. N. Am. 1: 593. 1840. Not Raf. 1832.]

It appears that the name given to this beautiful shrub is not tenable on account of the older *Jamesia* of Rafinesque. That the name of Edwin P. James, who did much to advance the interests of botany during the first half of the century, should be altogether dropped, does not seem fair, and with this idea in view, I assign to the genus the name *Edwinia*.

EDWINIA AMERICANA (T. & G.).

Jamesia Americana T. & G. Fl. N. Am. 1: 593. 1840.

The specimen upon which the genus was founded was imperfect and scanty, and the exact locality from which it was obtained is not known, but it is supposed to have come from "along the Platte or the Canadian River." Fendler re-discovered it on the "banks of Santa Fe Creek, near the water, where the stream is walled in on both sides by high rocks." It is plentiful along Santa Fe Creek in favorable situations, usually growing on rocks or on talus. No. 3710.

✓ EDWINIA WRIGHTII (Engelm. & Gray).

Fendlera rupicola var. *Wrightii* Engelm. & Gray, Pl. Wright. 1: 77. *pl.* 5. *f.* 2. 1852.

The two plants figured in the plate referred to above, undoubtedly belong to different species. Our plant, no. 3513, was collected in flower at Embudo, Taos County, on the rocky banks of the Rio Grande river, on the 10th of May. It is an erect bush, four or five feet high, covered in the flowering season with an abundance of large, pink tinged flowers. The original is Wright's 228a, found in "crevices of rocks on the San Pedro river," Texas.

OXYPOLIS FENDLERI (A. Gray).

Archemora Fendleri A. Gray, Mem. Am. Acad. (II) 2: 56. 1849.

The original of this species is Fendler's no. 272, collected on "margins of Santa Fe Creek, in fertile soil." Our no. 3801 was obtained in similar situations, always growing on the very edge of the stream, or in wet, marshy places. It was first noticed at a point eight miles east of Santa Fe, and is scattered at intervals along the upper part of the stream, which rises in the mountains some twenty miles from the town.

✓PHLOX STANSBURYI (Torr.).

Phlox speciosa var. *Stansburyi* Torr. Bot. Mex. Bound. Surv. 145. 1859.

This species differs in a number of particulars from *Phlox longifolia*, to which it was referred by Gray, as a variety. Its geographical range is also different, as it belongs to the southwest, while *longifolia* is a northern plant. Collected on the plateau west of the Rio Grande river, at Barranca, Taos County, no. 3589. The original localities are "gravelly hills near the Organ mountains, New Mexico; Bigelow," and "San Luis Mountain; Capt. E. K. Smith."

CONANTHUS ANGUSTIFOLIUS (A. Gray).

Nama dichotoma var. *angustifolia* A. Gray, Proc. Am. Acad. **8**: 284. 1870.

This abundantly distinct species does not in the least resemble the South American plant to which it has been referred as a variety. The original was collected by Fendler somewhere near Santa Fe, no. 644, but the exact locality is not given. Our specimens, no. 3846, were collected in a meadow nine miles east of Santa Fe. The meadow in which it was growing had evidently been under cultivation a year or two ago.

CONANTHUS HISPIDUS (A. Gray).

Nama hispida A. Gray, Proc. Am. Acad. 5: 339. 1861.

A species found only in sandy places west and north of Santa Fe, at about 6,000 feet elevation, no. 3737.

Senecio compactus (A. Gray,) Rydberg, Mem. Torr. Club, 5: 342. 1894.

Senecio aureus var. *compactus* A. Gray, Syn. Fl. 1: Pt. 2, 391. 1878.

Recent writers have shown that *S. aureus* is a plant which belongs to the eastern part of the United States, and even if it were found so far west as the Rocky Mountains, the plant under consideration should not be referred to it. *S. compactus* is a much smaller, stouter plant, with thick leaves, of an entirely different shape. Specimens referable to it, were collected near Colorado Springs, Colorado, May 8th, no. 3508.

√ SENECIO MICRODONTUS (A. Gray).

Senecio Toluccanus var. *microdontus* A. Gray, Syn. Fl. 1: Pt. 2, 388. 1878.

Apparently distinct from the coarsely dentate leaved Mexican species of DeCandolle. The obovate spatulate leaves are minutely serrate or entire in our specimens, no. 3648, collected in a meadow along Santa Fe creek, nine miles east of Santa Fe. Fendler's 437, collected at the same place, was referred to *S. exaltatus* by Gray.

TARAXACUM LIVIDUM (Waldst. & Kit.).

Leontodon lividus Waldst. & Kit. Pl. Rar. Hung. 2: 120. 1805.

Taraxacum palustre var. *latifolium* A. Gray, Mem. Am. Acad. (II) 2: 115. 1849.

A large flowered, broad and almost entire leaved plant which is certainly specifically distinct from the common Dandelion, if indeed it be the same as the European plant. No. 3642, collected along Santa Fe creek, nine miles east of Santa Fe, and also on the Pecos river. Fendler collected it on the "banks of Santa Fe creek."

UNIVERSITY OF MINNESOTA,
Minneapolis, Minn.

Some Cryptogams found in the Air.

BY SMITH ELY JELLIFFE.

The writer has been studying the yeasts and moulds found as contaminations upon the bacterial plates in the laboratories of the College of Physicians and Surgeons, Columbia University, New York.

These organisms have been isolated and studied in pure cultures upon Petri dishes and a list of the forms thus far found is here given. The study here recorded extends over a period of three months, January, February and March, 1897:

SACCHAROMYCETES.

Saccharomyces cerivisiae Meyen. Rare.
S. albicans Robin. Rare.
S. glutinis Fres. Common.
S. niger Marp. Rare.

MUCORINI.

Mucor racemosus Fres. Abundant.
M. circinelloides Van Tiegh. Rare.
M. spinosus Van Tiegh. Rare.
Circinella spinosa Van Tiegh. Rare.
Rhizopus nigricans Ehren. Not rare.

HYPHOMYCETES.

Oospora lactis (Fres.) Sacc. Rare.
O. porriginis (Mont. et Berk.) Sacc. Rare.
Monilia candida Bon. Rare.
M. racemosa Pers. Common.
Aspergillus repens DeBary. Common.
A. herbariorum Wiggers. Common.
Sterigmatocystis nigra Van Tiegh. Rare.
S. sulphurea ochracea Will. Common.
S. glauca Bain. Rare.
S. butyracea Bain. Rare.
Penicillium crustaceum Link. Common.
P. digitatum (Fr.) Sacc. Rare.
Botrytis.
Cephalothecium roseum Corda. Common.
Torula.
Hormodendron cladosporioides (Fres.) Sacc. Common.
Alternaria tenuis Nees. Common.
Macrosporium commune Rab. Rare.
Fusarium roseolum (Steph.) Sacc. Rare.

These forms being still under cultivation, the writer would be pleased to exchange cultures. Nutrient glycerine agar has been found to be the best medium for the majority of the forms.

231 W. 71st St., N. Y.,
March 27, 1897.

Botanical Notes.

Specimens of Hicoria wanted.—An examination of western *Hicoria* material has shown that the tree described in Garden and Forest* as *Hicoria pallida* Ashe is identical with the *H. glabra villosa* of Prof. Sargent,† or at most a variety of that tree, and the name should be *Hicoria villosa* (Sarg.). The tree is common in eastern Missouri, and is found as far south as northern Mexico.‡

* 10: 305.
† Silva, 8: 167.
‡ A specimen of Pringle's in the U. S. Nat. Herb. labeled *Carya myristicaeformis*.

It occurs northward to Delaware, and is to be looked for in southern New Jersey in the pine barrens. To more exactly determine the distribution of the several trees popularly known as pignuts (including *H. microcarpa* or *odorata*) I would be glad to get specimens of these trees, especially from Michigan, central New York, New Jersey, Pennsylvania and Delaware, and from all of the southwestern States.

The essential parts of a hickory specimen are vigorous twigs with well developed buds, and fruit and leaves. I will return any material sent if desired, and will determine any for persons wishing it. W. W. Ashe.

Raleigh, N. C.

The Botanical Society of Pennsylvania.—This Society was recently instituted at the University of Pennsylvania. Under its auspices a fortnightly series of popular meetings and of scientific meetings will be held during the session, dates will be arranged for the study of plants in evening classes, while during the next Spring and Summer a course of laboratory demonstrations and field excusions will be planned, to all of which members will be freely eligible.

Programme for the First Regular meeting, Oct. 23, 1897:

1. "The Life-history of some Insects injurious to our Trees." (Illustrated by a suite of specimens presented by Mrs. C. C. Harrison.) Dr. H. C. Schmucker.

2. "Our minutest Plants." Dr. A. C. Abbott.

3. "Native and foreign Pitcher-Plants." (Illustrated by lantern slides and specimens from the garden and greenhouse.) Prof. J. M. Macfarlane.

4. "Our Forest Trees." (Illustrated by lantern slides.) Dr. J. T. Rothrock.

5. "Seaweeds from New England." (With microscopic demonstration.) Dr. Adeline F. Schively.

6. "Microscopic Photography." Prof. J. F. Macfarlane.

7. "The Micro-Lantern and Its Uses." Dr. J. W. Harshberger.

The first number of "The Plant World" was issued in October, as already announced. Three of the editors contribute articles to this number. Mrs. Britton leads with an account of the Sword Moss, telling briefly its history, how and where it was first found fruiting, illustrating its structure, and offering specimens for study. Mr. Pollard begins a series of short papers on the Families of Flowering Plants, introduces his readers to the two divisions of the Angiosperms, and promises for the next number a study of six families of the Monocotyledons, including the pondweeds, arrowheads, and cat-tails. Prof. Knowlton gives some interesting statistics as to the sensitiveness of the sundew. The ferns of the Yosemite and the neighboring Sierras are described by S. H. Burnham, who spent seven weeks with a party of students from Stanford University collecting in this region. Mr. Clute describes collecting some sand-barren plants on the Shinnecock Hills, Long Island, noting the gregariousness and isolation of the patches of plants that find an ungenerous sustenance in this sandy region. In his editorial, Prof. Knowlton cordially welcomes all botanists and those interested in any branch of the vegetable kingdom to contribute to its pages. The notes and news, which conclude the number, furnish many items of interest. The journal is published by Willard N. Clute & Co., Binghamton, N. Y.; the subscription price is one dollar per year.

Index to recent Literature relating to American Botany.

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The Club meets regularly at the College of Pharmacy, 115 West 68th Street, New York City, on the second Tuesday and last Wednesday of each month, except June, July, August and September, at 8 o'clock, P. M. Botanists are cordially invited to attend.

MEMBERS OF THE CLUB will please remit their annual dues for 1897, now payable, to Mr. Henry Ogden, Treasurer, 11 Pine St., New York City.

BULLETIN

OF THE

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Studies in the Botany of the Southeastern United States.—XII.

By John K. Small.

(Plate 315.)

I. Noteworthy Species.

Tradescantia montana Shuttl.; Britton, in Britton & Brown, Ill. Fl. 1: 377. *fig. 911.* 1896.

Mr. C. D. Beadle has distributed specimens of this Alleghenian *Tradescantia* from the Biltmore Herbarium, which match the original specimens of Rugel more closely than any others that I have seen. The plants from Biltmore are somewhat larger and more advanced than the specimens on which the species was founded but come from the same general region. The original specimens are accompanied by the following record: "In preeruptis reg. med. mont. Broad River Ms., Carolina Sept. legit Rugel, Jun. 1841.

Sisyrinchium graminoides Bicknell, Bull. Torr. Club, 23: 133. 1896.

After describing this *Sisyrinchium* Mr. Bicknell gives a general distribution for the species, but notes the "exact distribution not well made out." I can now record two definite southern stations: the first, Stone Mountain, Georgia, where I collected the plant at an altitude of about 550 meters, in 1895, and Auburn, Alabama, where Prof. Underwood gathered specimens in 1896.

Oxalis grandis Small, Bull. Torr. Club, 21: 474. 1894.

Mr. C. D. Beadle has lately sent me specimens of this, our most robust species of *Oxalis*, from the Biltmore herbarium, collected in thickets at Biltmore, North Carolina. This collection extends the geographic range of the species somewhat further southward than was heretofore known.

OXALIS RECURVA Ell. Bot. S. C. & Ga. **1**: 526. 1821.

As the exploration of the Southern States progresses, Elliott's beautiful and delicate recurved-styled *Oxalis* is being found at various points. Mr. Beadle has sent me ample specimens, showing the extensive rootstock system, and the first specimens gathered bearing mature fruit. The species grows in woodlands at Biltmore.

HEDERA HELIX L. Sp. Pl. 202. 1753.

The common European ivy must be admitted to the flora of the Southern States as an introduced species. It is frequent about old dwellings and similar places and I have found it perfectly naturalized on the steep, rocky banks of the Ocmulgee River, above Macon, Georgia, where it has escaped from a cemetery higher up on the hill.

LIMONIUM AUGUSTATUM (A. Gray).

Statice Brasiliense var. *augustata* A. Gray, Syn. Fl. **2**: part 1, 54. 1878.

Perennial, slender, acaulescent; leaves basal, few, the blades linear, 4–7 cm. long, cuspidate, 1-nerved, narrowed into petioles which are somewhat shorter than the blades, their bases dilated; scapes erect, about 3 dm. tall, with several scale-like clasping bracts, sparingly branched above; bracts subtending the flowers broadly oblong, 4 mm. long, acute; calyx about 5 mm. long, the tube glabrous, the 5 teeth ovate, the connecting membranes eroded.

In salt marshes, Pine Key, Florida.

The best treatment of our North American *Limonia* that has thus far appeared is that by Dr. Gray in his Synoptical Flora, **2**: Part 1, 54; but one distinct species was there admitted as a variety and one was overlooked. (See page 491.)

The plant just described is apparently rare and I call attention to it hoping that some of the botanists of southern Florida may be able to find it and collect specimens. Heretofore it has been made a variety of *Limonium Brasiliense* (Boiss.) (*Statice Brasiliensis*

Boiss.), but is readily distinguished by its more slender habit, the linear leaf-blades, the oblong acute bracts which subtend the flowers, and the ovate calyx-segments.

GENTIANA QUINQUEFOLIA L. Sp. Pl. 230. 1753.

Mr. A. M. Huger has sent me specimens of this gentian from the vicinity of Waynesville, North Carolina, noting that the plants often produce a prodigious number of flowers, he having counted over three hundred and sixty on some specimens. He has also observed the extensive altitudinal range of the species, recording that it grows from the "bottoms" to "balds," in this case from about 300 meters to nearly 1500 meters. I have noticed the same occurrence in northern Georgia.

IPOMOEA BARBIGERA Sweet, Brit. Fl. Gard. *pl. 86.* 1818.

Dr. Mohr has lately published an interesting note on this species in this journal;* the plant has apparently not been collected many times since its discovery and it would be desirable to know more of its geographic range. Prof. Carl F. Baker has sent me specimens collected near Auburn, Alabama, in the fall of 1896.

IPOMOEA PURPUREA (L.) Roth, Bot. Abh. 27. 1787.

Prof. Baker has also sent me this morning glory, collected near Auburn, Alabama, thus giving us a station between the Atlantic States and Texas; this break in its range is indicated in the Synoptical Flora.†

MENTHA ROTUNDIFOLIA (L.) Huds. Fl. Angl. 221. 1762.

Only one station in the Southern States, namely, "near Wilmington, North Carolina,"‡ has been recorded for this mint. However the species is spreading; in 1891 Miss K. A. Taylor collected specimens in a wet meadow near Columbia, South Carolina, and in 1895 I found it abundant near Trader's Hill in southeastern Georgia.

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* Bull. Torr. Club, 24: 26.

† Syn. Fl. N. A. 2: 210.

‡ Chapm. Fl. S. St. Ed. 2. 313.

TEUCRIUM NASHII Kearney, Bull. Torr. Club, 21: 483. 1894.

Mr. A. H. Curtiss has added another station for *Teucrium Nashii.* The specimens are from near Jacksonville, Florida, and are numbered 5040.

LONICERA JAPONICA Thunb. Fl. Jap. 89. 1784.

In a former note * I have spoken of the abundance of this foreign plant in certain localities. Mr. A. H. Curtiss now sends it from Florida (number 4690) saying, "In moist thickets where this gets a foothold it grows and fruits more freely than does *L. sempervirens* on dry land. I do not know that either grow from seed." I may add that it has become a very troublesome weed in many parts of the country.

II. NEW SPECIES.

VICIA HUGERI.

Annual, very slender, bright green, minutely and sparsely pubescent, or glabrate in age. Stems ascending, decumbent or reclining, solitary or several together, 3–7 dm. long, wire-like, more or less angled, sometimes branched above, rarely branched below; leaves 4–8 cm. long, the tendril simple or forked; leaflets usually 10–12, linear, 2–3.5 cm. long, mucronulate, straight or slightly curved, short-petioled; peduncles 5–8 cm. long, ascending; flowers white or sometimes pinkish, 10–14 in secund racemes, small; pedicels 1.5–2 mm. long; calyx campanulate, 1.5 mm. long, the teeth triangular, ¼–⅓ as long as the tube, acute; corolla about 5 mm. long; pods linear-oblong, 2 cm. long.

In open woods, Georgia and Alabama. March to May.

Lately several specimens of this peculiar species of *Vicia* have reached me from different points in the Southern States. The plant first came to my notice on the slopes of Stone Mountain, Georgia, in 1895. The species stands between *Vicia Caroliniana* and *V. micrantha*, possessing the general habit of the latter and the inflorescence of the former.

From *Vicia micantha* it differs in its elongated many-flowered racemes, longer peduncles and glabrous or glabrate calyx with the segments as broad as long or broader, while from *Vicia Caroliniana* it can easily be distinguished by its more slender habit,

* Bull. Torr. Club.

narrower leaves and the smaller flowers, these being hardly one-half as large as those of *Vicia Caroliniana.* I take pleasure in naming the species for my friend Mr. A. M. Huger, a very thorough explorer of the flora of the Southern States. I have specimens before me as follows:

Georgia: Stone Mountain, May 1–18, 1895, J. K. Small; Americus, March 1, 1897; Atlanta, April, 1897, and Gainesville, April, 1897, A. M. Huger.

Alabama: Auburn, March 28 and April 18, 1896, L. M. Underwood and F. S. Earle.

Samolus cuneatus.

Perennial, fleshy. Stems solitary or tufted, 1–3 dm. long, ascending or reclining, simple or usually branched; leaves opposite or mainly so, obdeltoid-spatulate or broadly spatulate, 4–12 cm. long, truncate or coarsely mucronate at the apex, the bases decurrent as broad wings; racemes 1–3 dm. long, their peduncles longer than the stems, together with the racemes glandular-pilose; pedicels slender, spreading or ascending, 1–3 cm. long; calyx campanulate, the triangular acute segments longer than the tube, or at maturity shorter; corolla white, 4–5 mm. broad, the 5 lobes broadly cuneate, flattish or truncate at the apex, toothed, as long as the tube; stamens included; capsules depressed-globose, 3–3.5 mm. in diameter; seeds .4 mm. thick.

On limestone rocks or soil, Texas. Spring.

A study of the genus *Samolus* has revealed this hitherto undescribed species; it is related to *Samolus alyssoides* and *S. ebracteatus*, from both of which it may be distinguished by the glandular-pilose peduncles and smaller corollas. The corollas of specimens of *Samolus alyssoides* and *S. ebracteatus* which I have examined vary from 6–9 mm. in breadth, while those of *S. cuneatus* are only 4–5 mm. broad. The corolla-segments of the new species are broadly cuneate as contrasted with the suborbicular segments of the two older ones.

The following specimens belong to *S. cuneatus:*

Texas: Kerrville, Kerr county, May 14–21, 1894, A. A. Heller, no. 1751 (type); Waco, 1887, Miss Sara Trimble.

Limonium Nashii.

Perennial by branching rootstocks, glabrous. Leaves basal, the blades oblong or elliptic, sometimes varying to narrowly obovate, 4–10 cm. long, rounded or notched at the apex, occasionally mucronate, narrowed into petioles which are shorter than the blades or longer; scapes erect, 3–7 dm. tall, furnished with scale-like bracts, widely branching above, the tips of the spreading branches recurved; bracts subtending the flowers oval, about 4 mm. long, obtuse; calyx 6–7 mm. long, the tube sparingly pubescent with soft hairs at the base only, the 5 segments triangular, slightly acuminate, more than 1 mm. long; corolla deep blue.

In salt marshes, Florida. Summer and fall.

Specimens of a beautiful and previously undescribed species of *Limonium* have been in our herbaria for some years; they are from northern and eastern Florida and represent a species of more slender and more graceful habit than that of *Limonium Carolinianum.*

The following synopsis and comparison of the diagnostic characters of *Limonium Nashii* and *L. Carolinianum* will serve to make clear the difference between the two species:

Limonium Nashii. Branches of the panicle spreading, the tips recurved; bracts subtending the flowers oval; calyx-tube sparingly pubescent at the base; calyx-segments triangular, slightly acuminate.

Limonium Carolinianum. Branches of the panicle ascending, the tips curved upward; bracts subtending the flowers suborbicular; calyx-tube bristly-pubescent; calyx-segments ovate.

The species has been collected as follows:

Florida: Chapman; St. Marks, Aug. 1843, Rugel; Titusville, Brevard County, July 31, 1895, Nash. no. 2305.

Eupatorium petalodium Britton.

Perennial, bright green. Stems erect, 3–7 dm. tall, simple below, corymbosely branched above, somewhat rough with rigid hairs; leaves mainly opposite (a few of the upper ones alternate), oblong to lanceolate, 2–8 cm. long, obtuse or rarely acutish, bluntly serrate or crenate-serrate, except the entire more or less cuneate base, glabrous or sparingly pubescent on the nerves beneath, sessile; peduncles and pedicels pilose; involucres trumpet-shaped, 9–10 mm. high, the bracts linear-spatulate, the outer ones abruptly acuminate, the inner ones mucronate, slightly surpassing the flowers, petal-like, white; corolla 3 mm. long, the segments ovate, spreading; pappus about equalling the corolla; styles exserted; achenes black, nearly 3 mm. long, 5-angled.

In dry pine barrens, Florida. Summer and fall.

Florida: Chapman; Duval County, N. E. Florida, Curtiss, no. 1190; near Jacksonville, Curtiss, nos. 4437 and 5162.

A showy species hitherto confused with *Eupatorium album* and not yet found without the State of Florida. The general habit of the species is that of its nearest relative, *E. album*, but in place of an acute leaf-blade there is an obtuse apex. However, the crucial character lies in the inner involucral bracts; these, instead of being long-acuminate, are linear-spatulate and conspicuously mucronate, the dilated portions of a white or creamy-white color.

Chrysopsis Ruthii.

Perennial, slender, silvery-pubescent, stoloniferous. Stems diffusely branched, 1–3 dm. long, the branches ascending or decumbent, very leafy, densely so above; leaves linear or some linear-lanceolate, 2–5 cm. long, acuminate, entire, sessile, the old ones becoming longitudinally ribbed; heads solitary, or corymbosely disposed, about 1 cm. high; peduncles 1.5–2 cm. long, densely glandular; involucral bracts linear or linear-lanceolate, in 4–5 series, glandular on the back, the pale edges ciliate, the apex bearded; rays bright yellow, elliptic-spatulate, 7–8 mm. long, slightly notched at the apex; corolla 5 mm. long, yellow, the segments triangular, sparingly ciliate, nearly erect; pappus dirty white, slightly shorter than the corolla; filaments and anthers glabrous; style glabrous, except the very sparingly glandular top; achenes pubescent.

Rocks in the Hiawassee Valley, eastern Tennessee.

A low stoloniferous species related to *Chrysopsis graminifolia* from which it differs conspicuously in being low, diffusely branched and bushy. Besides the very slender habit, the small acuminate leaves, the glandular peduncles and narrower and more acuminate involucral bracts distinguish *Chrysopsis Ruthii* from *C. graminifolia*. The species is named for Prof. A. Ruth, of Knoxville, Tenn.

Silphium Mohrii.

Perennial, coarse, very hispid throughout with shaggy hairs. Stem erect, 6–12 dm. tall, simple below, branched above, finely channelled in age; leaves alternate, ovate-lanceolate to narrowly ovate, 5–14 cm. long, acuminate, remotely serrate with prominent teeth, except near the base and apex, sessile or nearly so; heads 3.5–4.5 cm. broad, peduncled; involucres broadly campanulate, the bracts lanceolate or ovate-lanceolate, 8–14 mm. long, acute or somewhat acuminate; corolla about 4 mm. long, the segments ovate, rather obtuse; rays yellow, elliptic-oblong, 10–14 mm. long, undulately 3-toothed at the apex; achenes obovate, more or less constricted at both ends, about 6 mm. long, winged (Plate 315).

In dry or rocky soil, Cullman, Alabama, October, 1885.

A very distinct species of the confused genus *Silphium*, related to what I take to be *S. asperrimum* Hook., hitherto usually called *S. scaberrimum*. It is at once distinguished by the copious shaggy pubescence of its foliage as against the short retrorse pubescence of its relative. The peculiarly toothed leaves with their less rounded bases, and the smaller heads with their narrower bracts and shorter rays are additional distinguishing characters.

The species is named in honor of the veteran botanist of Alabama, Dr. Charles Mohr, who for many years has furnished our collections with rare and unique plants from that interesting region.

III. The True Position of Viola tripartita Ell.

The record of the occurrence of *Viola hastata* in Florida has always been a puzzle to me, for that plant is as typical an Alleghenian species as our flora affords.

During my field work in the Southern States I have had opportunity to study the forms under consideration in their native habitats and have been led to the following conclusions, namely: That *V. tripartita* is specifically distinct from its relatives, and that it is closely related to *V. pubescens* and *V. scabriuscula* and not to *V. hastata*. It seems strange that Dr. Gray, and even the sagacious Le Conte failed to observe the latter fact, for a casual glance at the foliage and flowers is sufficient to prove this position correct, the sepals and petals of *V. tripartita* being much more similar to those of *V. pubescens* than to those of *V. hastata*.

The question that naturally arises is: How was *V. tripartita* ever confounded with *V. hastata*? As far as I can see this was brought about through observations on simple-leaved plants of *V. tripartita*; it is on simple-leaved specimens of this plant that *V. hastata* is admitted to the flora of Florida. The leaf form of the latter species is so distinct and unique that it need not be further considered in this connection. On the other hand the leaf form of *V. tripartita* in its simple state, which is quite frequent, closely resembles that of *V. pubescens* but differs in size, shape, proportionate width and length and the toothing. It may be of interest to note that I have seen the type of *V. tripartita* on several occasions and have collected specimens almost identical with it on Stone Mountain, which is no great distance from the original locality, Athens, Georgia. I have also received excellent and typical specimens from Mr. A. M. Huger, collected in Polk County, North Carolina, and a series of specimens showing all degrees of gradation from the simple-leaved state to the trifoliolate leaf, from Mr. E. R. Memminger, who independently came to the conclusion that the affinities of *V. tripartita* are with *V. pubescens* and not with *V. hastata.*

I append a description taken from living plants.

VIOLA TRIPARTITA Ell. Bot. S. C. & Ga. 1: 320. 1817.

Viola hastata var. *tripartita* A. Gray, Bot. Gaz. 11: 291. 1886.

Perennial by a short rootstock and numerous coarse roots, usually stoutish, puberulent or minutely pilose and glandular above, bright but often deep green. Stems mostly clustered, erect, 1.5–5 dm. tall, usually branched above, often purplish and glabrate below, greenish, glandular, and somewhat glandular near the top; leaves 3-parted or sometimes entire, 4–10 cm. long, their petioles 2–3 cm. long; stipules ovate, ciliate, 6–8 mm. long; leaflets usually short-petioled, puberulent, undulate or crenate-serrate, the terminal one lanceolate or oblanceolate, the lateral ones inequilateral lanceolate to ovate; flowers golden yellow, 1.2–1.5 cm. broad; pedicels slender, nearly erect, 3–10 cm. long; sepals lanceolate or oblong-lanceolate, nearly 6 mm. long, 3-ribbed, acute or obtuse, with hyaline ciliolate margins; petals spatulate, about 1 cm. long, the upper ones recurved, purplish on the back, with one conspicuous black vein, the lateral ones with two black veins and a patch of glands, the lower one with numerous conspicuous black veins; stigma bearded; capsule oblong, 1–1.2 cm. long, acutish; seeds pale, obovoid, 3 mm. long.

IV. MELOTHRIA GRANDIFOLIA T. & G., AND ITS TRUE POSITION.

Melothria grandifolia, published by Torrey and Gray in 1840, soon disappeared from the pages of succeeding botanical works and in Prof. Cogniaux's Monograph of the Cucurbitaceae* we find the name in an appended list of doubtful species. The apparent rarity of the species, or at least the scarcity of speci-

* DC. Monog. Phanerog. 3: 948.

mens in herbaria may account for the way in which the plant was excluded from botanical literature by later authors; an examination of the original specimens of the plant in question, however, shows that it is not a *Melothria* in the modern sense and hereafter may be known as

CAYAPONIA GRANDIFOLIA (T. & G.).

Melothria grandifolia T. & G. Fl. N. A. 1: 541. 1840.

The species is closely related to *Cayaponia Boykinii* of the Southern States, but differs in the more robust habit, the larger leaves and in the larger and more elongated fruit.

The Santa Monica Diatomaceous Deposit with List of References to Figures of Species.

BY E. A. SCHULTZE AND C. HENRY KAIN.

Probably no fossil diatomaceous material ever excited greater interest than that from Santa Monica, California. A paper upon the deposit by Mr. Charles Stodder was read before the San Francisco Microscopical Society, December 5, 1878. At that meeting, Mr. Thomas P. Woodward, who found the original piece of material, stated that he discovered it in the tidal refuse left by the waves at high water mark. The locality was about two miles south of a lagoon situated several miles southeast of Santa Monica. He also stated that there were no evidences of any other diatomaceous earth in the vicinity.

A few years since, Mr. F. H. Dunning, of Battle Creek, Michigan, discovered that the true source of the material was at Redonda Beach, some twenty-five or thirty miles south of Santa Monica. At this place the material occurs abundantly in a bluff situated on the beach, and pieces of it which have been broken off by the action of the waves can be picked up at low tide, at the foot of the cliff.

Mr. Silas L. Schumo, of Philadelphia, who has recently visited the locality, states that the diatom cliffs begin about ten miles south of Redondo Beach and extend southward for several miles, at least as far as San Pedro. There is some difficulty in getting at the material, however, as the foot of the cliff is only accessible at low tide. The deposit is so interesting that it is to be hoped microscopists on the Pacific coast will explore it more thoroughly.

Those who have made a study of the matter are aware of the extreme difficulty of tracing out the species through the literature of the Diatomaceae, and will doubtless find of great service the following list of references to the figures of species contained in the famous deposit :

Actinoptychus	*splendens*	Ralfs. V. H., 119, f. 1, 2, 4.
"	*vulgaris*	Schum. V. H., 121, f. 5, 6; var. *Monicae*, 121, f. 9.
"	*undulatus*	Ehr. Atlas, 91, f. 5; *Atlas, 132, f. 16.*
"	*glabratus*	Grun. Atlas, 154, f. 2, 3, 4; V. H., 120, f. 6.
"	*spinifer*	Grun. Atlas, 153, f. 23.
"	*Mölleri*	Grun. *Atlas, 132, f. 14.*
"	*hispidus*	Grun. *V. H., 123, f. 2.*
"	*Stella*	A. S. *Atlas, 90, f. 1, 2.*
"	*Bismarckii*	A. S. Atlas, 91, f. 4.
"	*Gründleri*	A. S. Atlas, 100, f. 3, 4.
"	*Asiaticus*	Temp. & Br. *Atlas, 156, f. 10; Diatoms of Japan, p. 11, 3, f. 9.*
"	*laevigatus*	Grun. *V. H., 122, f. 7; Atlas, 132, f. 15.*
"	*nitidus*	Grev. *Atlas, 1, f. 7.*
"	*Clevei*	A. S. *Atlas, 91. f. 1.*
Aulacodiscus	*Comberi*	Arn. *Atlas, 36, f. 11; 103, f. 5.*
"	*angulatus*	Grev. *Atlas, 34, f. 7, 8; 103, f. 2; 105, f. 7, 8.*
"	*convexus*	Gr. & St. *J. Q. C., Aug. '87, 12, f. 32.*
"	*margaritaceus*	Ralfs. *Atlas, 37, f. 1–8; 92, f. 12; 103, f. 6–9; 105, f. 1.*
"	*amoenus*	Grev. *Atlas, 34, f. 6; 40, f. 13; 134, f. 7; var. sparsi-radiata, 133, f. 4-6.*
"	*pulcher*	Norm. *Pritch, 8, f. 28.*
"	*Oreganus*	Bail. Atlas, 107, f. 7.
"	*Kittoni*	Arn. *Atlas, 36, f. 5–7.*
"	*Huttonii*	Gr. & St. *Atlas, 124, f. 6; 146, f. 8; J. Q. C., Aug., '87, 12, f. 31.*
"	*Crux*	Ehr. *Atlas, 105, f. 5; 124, f. 1.*
"	*Rattrayi*	Gr. & St. *J. Q. C., Aug., '87, 11, f. 29.*
Auliscus	*speciosus*	A. S. Atlas, 108, f. 3; 80, f. 5.
"	*punctatus*	Bail. Atlas, 89, f. 14–17.
"	*Hardmanianus*	Grev. Atlas, 67, f. 1; 89, f. 4; var. Atlas, 108, f. 1.
"	*Biddulphia*	Kitt. Atlas, 67, f. 3; var. Atlas, 89, f. 2.
"	*Stockhardtii* (*A. racemosus* Ralfs)	Jan. Atlas, 67, f. 6.
"	*pruinosus*	Bailey. *Atlas, 31, f. 6; 108, f. 10;* var. *sub-reticulata* Grun., Atlas, 89, f. 5, 6.
"	*ovalis*	Arn. *Atlas, 30, f. 16, 17.*
"	*mirabilis*	Grev. Atlas, 89, f. 13.
"	*confluens*	Grun. *Atlas, 31, f. 16; 32, f. 6–8.*

Auliscus	*caelatus*	Bail. *Atlas, 32, f. 14, 15.*
"	*sculptus*	Ralfs. *Atlas, 30, f. 8; 32, f. 21, 22; V. H., 117, f, 1.*
Actinocyclus	*subocellatus*	Rattr.
"	*radians*	Rattr.
"	*incertus*	Grun. V. H., 125, f. 4.
"	*Ehrenbergii*	Ralfs. V. H., 125, f. 1; var. *intermedia* Grun. V. H., 124, f. 5.
"	*Ralfsii*	Sm. *V. H., 123, f. 6*; var. *Monicae*, Grun. V. H., 124, f. 3; var. *Janischii* Schum. V. H., 125, f. 1.
"	*fasciculatus*	Cast. *Cast, 4, f. 8.*
"	*subtilis*	Ralfs. *V. H., 124, f. 7.*
Arachnoidiscus	*Indicus*	Ehr. *Atlas, 68, f. 6; vars. Atlas, 68, f. 7–10; 73, f. 2.*
"	*ornatus*	Ehr. *Atlas, 73, f. 4–6; vars. Atlas, 73, f. 7–10.*
"	*Ehrenbergii*	Bail. *Atlas 68, f. 1; vars. 68, f. 2, 3, 4.*
"	*Grevilleanus*	Hardm. *Atlas, 68, f. 5; 73, f. 3.*
Amphora	*crassa*	Greg. *vars. Atlas, 39, f. 30, 31; 28, f. 12; Leus, p. 75, pl. 2, f. 5.*
Asterolampra	*rotula*	Grev. *T. M. S., 1860, p. 120, 3, f. 5;* (*Moebius, 32, f. 5*).
"	*Brebissonii*	Grev. *T. M. S., 1860, p. 114, 3, f. 9;* (*Moebius, 32, f. 9*).
"	*Darwinii*	Grev. *T. M. S., 1860, p. 116, 4, f. 12, 13;* (*Moebius, 33, f. 12, 13*).
"	*variabilis*	Grev. *T. M. S., 1860, 111, 3, f. 68;* (*Moebius, 32, f. 6–8*).
"	*Humboldtii*	Ehr.
"	*Brookei*	Grev. *T. M. S., 1860, p. 119, 4, f. 16;* (*Moebius, 33, f. 18*).
Amphitetras	*Graeffeana*	Witt. *Atlas, 79, f. 1, 9.*
Biddulphia	*multicornis*	Grun. *V. H., 102, f. 7;* var. Atlas, 173, f. 13, 14.
"	*pulchella*	Gray. *V. H., 97, f. 1–3; Atlas, 118, f. 26–32; 120, f. 22; 121, f. 1, 2.*
"	*Tuomeyi*	Bail. Atlas, 119, f. 15.
"	*capucina*	A. S., *Atlas, 113 f; 13, 14.*
"	*polyacantha*	Brun.
"	*aurita*	Breb. *V. H., 98, f. 4–9;* Atlas, *120, f. 5–8; 122, f. 1–9; 122, f. 28.*
"	*longispina*	Grun. V. H., 102, f. 6.
"	*tridentata*	Ehr. Deby, p. 41, pl. 3, f. 21.
"	*Grundlerii*	A. S. *Atlas, 118, f. 22–24.*
Campylodiscus	*adornatus*	A. S. *Atlas, 51, f. 5; 52, f. 3.*
"	*Coronilla*	Brun. Deby, p. 42, pl. xiv., f. 69; also, pl. xiii., f. 66.

Campylodiscus	*concinnus*	Grev. *Atlas, 18, f. 16, 17; 53, f. 9.*
"	*Rabenhorstianus*	Jan. *Atlas, 53, f. 12, 14.*
"	*imperialis*	Grev. *Atlas, 17, f. 20; 15, f. 11; 52, f. 7; 53, f. 6, 7.*
"	*bimarginatus*	A. S. *Atlas, 16, f. 7; 18, f. 15–17.*
"	*Californicus*	(Grove) Deby. Deby, 42, pl. xiv., f. 70.
"	*Pfitzeri*	A. S. *Atlas, 17, f. 5, 6.*
"	*ecclesianus*	Grev. *Atlas, 16, f. 5, 6, 8–11.*
"	*biangulatus*	Grev. *Atlas, 14, f. 18–22*
Campyloneis	*Grevillei*	A. S. *V. H., p. 134, 28, f. 10, 12.*
Coscinodiscus	*elegans*	Grev. *Atlas, 58, f. 7.*
"	*lineatus*	Ehr. *V. H., 131, f. 3; Atlas, 114, f. 13.*
"	*curvatulus*	Grun. *Atlas, 57, f. 30, 33;* var. *latius-striata,* Atlas, 57, f. 34.
"	*obscurus*	A. S. *Atlas, 61, f. 16–18; V. H., 129, f. 4.*
"	*debilis*	Grove. *Atlas, 163, f. 4.*
"	*Asteromphalus*	Ehr. Atlas, 113, f. 23; var. *eximia* (Rattray); Atlas, 63, f. 12.
"	*Odontodiscus*	Grun. *Grun,* Diat. of Franz Joseph Land *1884, p. 29, 3, f. 23.*
"	*Gigas*	Ehr. *Atlas, 64, f. 1.*
"	*robustus*	Grev. *Atlas 62, f. 5, 6, 16, 17.*
"	*apiculatus*	Ehr. *Atlas, 64, f. 5–10;* var. *Monicae* (Rattray), Atlas, 63, f, 10.
"	*pilosus*	A. S. Atlas, 148, f. 8.
"	*polyacanthus*	Grun. *Cleve, 1880. 7, f. 127.*
"	*micans*	A. S. *Atlas, 139, f. 213.*
"	*excentricus*	Ehr. *Atlas, 58, f. 49; V. H., 130, f. 4, 7, 8.*
"	*luctuosus*	Grove. *Atlas, 148, f. 3.*
"	*radiatus*	Ehr. *Atlas, 113, f. 8.*
"	*concavus*	Ehr. *Atlas, 59, f. 16.*
"	*Diorama*	A. S. Atlas, 64, f. 2.
"	*borealis*	Bail. Atlas, 63, f. 11.
"	*tenuis*	Grun.
"	*crassus*	Bail. *Atlas, 61, f. 19.*
Cocconeis	*cruciata*	Pant. *Pant. Vol. 1, 16, f. 148.*
"	*formosa*	Brun. *Atlas, 193, f. 42–47.*
"	*voluta*	Brun. Var. *singularis* A. S.; Atlas, 196, f. 25, 26; var. 196, f. 19.
"	*Oculus-Cati*	Brun. Atlas, 198, f. 29; *Atlas, 198, f. 22, 23.*
"	*costata*	Greg. *V. H., 30, f. 11–17; Atlas, 189, f. 6, 7.*
"	*dirupta*	Greg. *V. H., 29, f. 13–15; Atlas, 197, f. 1, 31.*
"	*regalis*	Grev. *V. H., 28, f. 13, 14; var. 8, 9; M. J., 1889, p. 156, 7, f. 1 = Moebius 21, f. 1.*
"	*pseudo-marginata*	Greg. *Atlas, 194, f. 8; 196, f. 5–8; V. H., 29, f. 20, 21.*

Cocconeis	*interrupta*	Grun. *Atlas, 194, f. 17; V. H., 30, f. 3, 4.*
"	*cyclophora,* var. *Californica*	Brun. *V. H., 30, f. 24, 25; var. Atlas, 198, f. 1–3.*
"	*nitida*	Greg. *G. D. C., p. 20–1, f. 26; V. H., 36, f. 33.*
Cerataulus	*turgidus*	Ehr. *V. H., 104, f. 1, 2; Atlas, 116, f. 1–3; var. Atlas 115, f. 12–14.*
"	*Hungaricus*	Pant. *Pant. Vol. II., 26, f. 375; (a variety of C. Thumii).*
"	*Kinkeri*	A. S. Atlas, 191, f. 37.
Climacosphenia		
Craspedodiscus	*coscinodiscus*	*Atlas, 66, f. 3, 4.*
Eupodiscus	*argus*	Ehr. *V. H., 117, f. 3–6; Atlas, 92, f. 7–11.*
"	*oculatus*	Grev. *Atlas, 117, f. 9.*
Eupleuria.		
Euodia	*Janischii*	Grun. V. H., 127, f. 1–4.
"	*gibba*	Bail. *Prit. 852–8, f. 22 (= Hemidiscus cuneiformis) ; T. M. S., 1860, p. 42, 2, f. 3, 4 (= Moebius 31, f. 3, 4).*
Endyctia	*oceanica*	Ehr. *Atlas, 65, f. 10, 13.*
Glyphodesmis	*Williamsonii*	W. Sm. *V. H., 36, f. 14.*
Grayia.	Probably *Grayia Argonauta*	Grove and Brun. *Atlas, 172, f, 11.*
Goniothecium	*odontella*	Ehr. *V. H., 105, f. 11, 12; Moebius, 8, f. 47, 48.*
"	*obtusum*	Ehr. *Microgeologie, 18, f. 95.*
"	*Rogersii*	Bail. *Mic. Dict. 42, f. 30; M. J., 1856, 7, f. 43, 46; (= Moebius, 8, f. 43, 46).*
Grammatophora	*arctica*	Cl. *V. H., 53, bis f. 3.*
"	*Tabellaris*	Brun.
"	*stricta*	Ehr. *Witt. 1888, p. 16, 3, f. 7, 14; Jeremie, Hayti.*
"	*robusta*	Dippel. *Pant, Vol. I, 30, f. 312, 315, 316.*
"	*maxima*	Grun. *V. H., 53, bis f. 12*
Gephyria	*gigantea*	Grev. *Grev. T. M. S,. 1866, 122, 11, f. 7, 8; (Moebius 74, f. 7, 8); Challenger, p. 42, 15, f. 10.*
Glyphodiscus	*stellatus*	Grev. V. H., 118, f. 3. *Atlas, 117, f. 11.*
Hyalodiscus.		
Isthmia	*nervosa*	Kg. *Atlas, 136, f. 5; 135, f. 1–6.*
Lithodesmium	*minusculum*	Grun. *V. H., 116, f. 1–6.*
Melosira	*clavigera*	Grun. *V. H., 91, f. 1, 2; Atlas, 175, f. 21–24.*
"	*radiata*	Bright.
"	*Sol*	Kg. *V. H., 91, f. 7–9.*
"	*sulcata*	Kg. *Atlas, 178, f. 1–4; 7, 8, 9, 16, 17, 18, 19, 22, 23, 24; 25–36;* var.
Mastogonia	*polygona*	Ehr.

Navicula	*Taschenbergi*	A. S. Atlas, 174, f. 8, 9.
"	*sideralis*	Brun. Atlas, 174, f. 3.
"	*pedalis*	Brun. Atlas, 174, f. 15.
"	*Apis*	Ehr. *Atlas, 12, f. 16–25; 69, f. 41, 43, 44; Donkin, p. 48 f. 3.*
"	*interrupta*	Kütz. *Atlas, 12, f. 10, 11; 12, f. 3–7, 8; 45, f. 72. V. H., 9, f. 7. Donkin, p. 47, 7 f. 2.*
"	*Eudoxia*	A. S. *Atlas, 8, f. 39, 40; 70, f. 71.*
"	*elliptica*	Kütz. *Atlas, 7, f. 27–32, 33, 34, 54, 55; V. H., p. 92, 10, f. 10.*
"	*aspera*	Ehr. *Atlas, 48, f. 2–6; var. 48, f. 14, 15.*
"	*pennata*	A. S, *Atlas, 48, f. 41–43.*
"	*praetexta*	Ehr. *Atlas, 129, f. 7; 3, f. 30–32–34; V. H., p. 92, 9, f. 13.*
"	*Angelorum*	*Cleve, Some new and little known Diatoms, p. 8, 2, f. 20.*
"	*Oswaldii*	Jan. *Atlas, 70, f. 46.*
"	*spectabilis*	Grev. *vars-Atlas, 2, f. 31; 3, f. 20, 21, 24; Grun, 1860, p. 533, 1, f. 11 (N. Grunowii, Atlas, 70, f. 73.)*
"	*Lyra*	Ehr. *Atlas, 2, f. 24, 25, 32; 3, f. 11, 12; V. H., p. 93, 10, f. 1.*
"	*gelida*	Cl. *Diat. Franz Joseph Land, 1, f. 27, 28; Cleve., Vega ex., p. 473, 37, f. 42.*
"	*Hennedyi*	Sm. *Atlas, 3, f. 18; V. H., p. 93, 9, f. 14.*
"	*clavata*	Greg. *Donkin, 2, f. 8; Greg., M. J., 1888, p. 46, 5, f. 17; (Moebius, pl. 10, f. 17.)*
"	*Basilica*	Brun.
"	*Dirrhombus*	A. S. *Atlas, 11, f. 21, 22; 69, f. 9.*
"	*gemmata*	Grev. *Var. spectabilis, Atlas, 8, f. 38 (N. Grunowii); Grev, New species of Naviculae in Californian Guano, p. 30, 4, f. 7.*
"	*ornata*	A. S. *Atlas, 69, f. 5.*
"	*splendida*	Greg. *Atlas, 12, f. 31–35; 13, f. 31–34; 69, f. 22.*
"	*Crabro*	Ehr. Var. Atlas, 69, f. 2; *vars. Atlas, 69, f. 3, 4; V. H., 9, f. 1, 2; Atlas, 129, f. 17, 18.*
"	*robusta*	Grun. *Atlas, 50, f. 1, 2.*
"	*Californica*	Grev. *Vars. Atlas, 3, f. 15, 16, 19; 3, f. 6.*
"	*forcipata*	Grev. *Atlas, 70, f. 17; V. H., p. 94, 10, f. 3.*
Nitzschia	*Formica*	Hantzsch. *Diat. of East Indian Archipelago, p. 21, 2, f. 8.*
Orthoneis	*splendida*	Grun. *V. H., 28, f. 1, 2.*
Peponia	*Barbadensis*	Grev. *Atlas, 144, f. 48, 49.*
Porpeia	*quadrata*	Grev. V. H., 95, bis f. 15.
"	*quadriceps*	Bail. *Atlas, 142, f. 46–57; (Moebius, 68, f. 13); T. M. S., 1865, p. 52, 6, f. 18, 19.*

Porpeia	*ornata*	Grev. *T. M. S., 1865, p. 53, 6, f. 21.*
Pantocsekia		
Podosira.		
Pleurosigma	*affine*	Grun. *V. H., p. 115, 18, f. 9.*
Pyxilla	*Americana*	Grun. V. H., 83, bis f. 3.
"	*dubia*	Grun. *V. H., 83, f. 7, 8.*
Plagiogramma	*pulchellum*	Grev. *M. J., 1859, p. 209, 10, f. 4, 6 (‖ Moebius, 24, f. 4, 6); Prit., p. 774, 4, f, 32.*
Raphoneis	*Rhombus*	Ehr. *M. J., 1854, 6, f. 10 (= Moebius, 4, f. 10); Microgeologie, 18, f. 84, 85; 33, 13, f. 15; 35, A, 11, f. 3.*
Rutilaria	*hexagona*	Grun. V. H., 105, f. 8; Atlas, 183, f. 17.
"	*longiformis*	Temp. & Br.*
Rhabdonema	*Adriaticum*	Kg. *V. H., 166, 54, f. 11, 13.*
"	*Japonicum*	Temp. & Br. *p. 53, 1, f. 6; Diat. Japan.*
"	*valdelatum*	Temp. & Br. *p. 53, 1, f. 4; Diat. Japan.*
Stauroneis	*pulchella*	Sm. = *Nav. aspera, which see.*
Synedra	*superba*	Kg. *O'Meara, p. 199, 28, f. 9; S. B. D., 12, f. 102.*
"	*longissima*	Smith. *O'Meara, p. 307, 28, f. 27; S. B. D., p. 72, 12, f. 95.*
Stephanopyxis	*appendiculata*	Ehr. *Several varieties; Atlas, pl. 130.*
"	*rudis*	Grev. Atlas, 164, f. 9.
"	*Grunowii*	G. & St. *Atlas, 130, f. 1, 5.*
"	*Weissflogii*	A. S. *Atlas, 123, f. 2.*
"	*Corona*	Grun. Atlas, 123, f. 19, 20.
Stictodiscus	*Californicus*	Grev. *Atlas, 74, f. 4, 5; vars. pl. 74; pl. 147, f. 10.*
"	*nitidus*	G. & St. *Atlas, 131, f. 7, 8.*
"	*Kittonianus*	Grev. *Atlas, 74, f. 16, 18; 131, f. 4.*
Systephania	*Corona*	Ehr. *See Stephanopyxis corona.*
Skeletonema.		
Stephanogonia	*actinoptychus*	Ehr. *V. H., 83, ter f. 2, f. 4; = Mastogonia actinoptychus*
Triceratium	*formosum*	Bright. *Atlas, 79, f. 2.*
"	*arcticum*	Bright. *Atlas, 79, f. 12, 13;* var. Californica, Grun., forma tetragona, Atlas, 81, f. 4; *var. Californica, Grun., Atlas, 79, f. 5, 6.*
"	*Montereyi*	Bright. Atlas, 94, f. 1, 2, 3.
"	*consimile*	Grun. V. H., 108, f. 2; *Atlas. 84, f. 13, 14.*
"	*quinquelobatum*	Grun. *Atlas, 79, f. 8.*
"	*parallelum*	Grev. *Atlas, 75, f. 3–5.*
"	*heteroporum*	Grun. V. H., 112, f. 2.

* Brun & Tempere give *R. epsilon* var. *longicornis.* Atlas, 183, f. 16; *vars. 13, 14, 15.*

Triceratium	*punctatum*	Bright. *Atlas, 76, f. 19, 20; M. J., 1856, p. 275, 17, f. 18;* (*Moebius, 9, f. 18*;
"	*Browneanum*	Grev. *T. M. S., 1861, p. 72, 8, f. 16.* (*Moebius, 38, f. 16*).
"	*Brightwellii*	West. *T. M. S., 1860, p. 149, 7, f. 6; vars, V. H., pl. 114.* (*Moebius, 34 f. 6*).
"	*inelegans*	Grev. Atlas, 81, f. 16.*
"	*elegans*	Grev. V. H., 109, f. 1; forma *pusilla*, V. H., 109, f. 3; *Atlas, 99, f. 10–13.*
"	*favus*	Ehr. *Atlas, 126, f. 5–7; 82, f. 13, 14; V. H., 107, f. 1–4.*
"	*cellulosum*	Grev. *Atlas, 95, f. 28–32.*
"	*trisulcum*	Bail. *Atlas, 78, f. 5–8; 112. f. 17, 18.*
"	*quadrangulare*	Grev. Atlas, 81, f. 3.
"	*antediluvianum*	Ehr. *V. H., 109, f. 4, 5.*
"	*subcornutum*	Grun. *Atlas, 99, f. 15–18.*
"	*constellatum*	Temp. & Br. *Diat. of Japan, p. 61, 6, f. 12.*
Xanthiopyxis	*umbonatus*	Grev. *T. M. S, 1866, 2, 1, f. 5;* (*Moebius, 70, f. 5*).

In addition to the preceding, which are on slides belonging to J. D. Möller and E. A. Schultze, the following species are figured as existing in the Santa Monica deposit:

Cosc. marginatus Ehr.	Atlas, 62, f. 5; 62, f. 7.
" " " var. *intermedia.*	" 62, f. 6.
" (*apiculatus* var.) Monicae Rattray.	" 63, f. 10.
Navicula demta A. S.	" 69, f. 34.
Triceratium receptum A. S.	" 81, f. 10.
Auliscus Grunowii A. S.	" 89, f. 7; 30, f. 14.
" *textilis* A. S.	" 89, f. 9.
" *incertus* A. S.	" 89, f. 18.
Eupodiscus Californicus Grun., forma *bioculata.*	" 89, f. 20; V. H., 118, f. 7.
Triceratium validum Grun.	" 94, f. 5.
Actinoptychus Thumii A. S.	" 102, f. 8.
Aulacodiscus Kinkeri A. S.	" 106, f. 4, 5.
Auliscus intestinalis A. S.	" 108, f. 2.
Campylodiscus trapezoidalis Deby.	Deby, pl. xiv., f. 72.
Coscinodiscus oculus iridis Ehr.	Atlas, 113 f. 20.
Coscinodiscus floridulus.	" 113, f. 16.
Stephanopyxis spinosissima Grun.	" 123, f. 18.
" ?	" 138, f. 14.
Cosc. incretus A. S.	" 139, f. 1.
Podosira variegata A. S.	" 140, f. 3.
Porpeia ?	" 142, f. 53–56, 57.

* Varieties: V. H., 110, f. 2, var. *araeophora* Grun.; V. H., 110, f. 3 var. *microphora* Grun.; V. H., 110, f. 4, 5, var. *Yucatensis* Grun.

Stictodiscus ?	"	147 f. 8.
Pseudauliscus sp. ?	"	149, f. 10.
Triceratium quadrinotatum A. S.	"	152, f. 31.
Actinoptychus spinulosus A. S.	"	153, f, 24.
Auliscus albidus Brun.	"	171, f. 3, 4; 171, f. 5.
" var. *boccata* Brun.		
Chaetoceros Monicae Grun.		V. H., 82 bis f. 4.
" *Californicus* Grun.	"	82 bis f. 8.
Pterotheca (*Pyxilla ?*) *subulata* Grun.	"	83 bis f. 6.
Stephanopyxis limbata Ehr.	"	83ter, f. 13, 14.
Zygoceros circinus Bail.	"	105, f. 13.
Tric. (*Odontella*) *Californicum* Grun.	"	108, f. 1.
Tric. (*Biddulphia*) *obliquum* Grun.	"	110, f. 11.
Actinoptychus ? pulchellus Grun.	"	123, f. 5.
" *? alienus* Grun., var. *Californica* Grun.	"	125, f. 10.
Coscinodiscus impressus Grun.	"	132, f. 5.

KEY TO REFERENCES.

V. H. = Van Heurck's Diatoms of Belgium.
Atlas = Schmidt's Atlas der Diatomaceen-kunde.
J. Q. C. = Journal Quekett Club.
M. J. = Quarterly Journal of Micros. Science.
T. M. S. = Transactions of Royal Microscopical Society. London.
Pritch. = Pritchard's History of the Infusoria. London, 1861.
Cast. = Diatomaceae of the Challenger Expedition by Count Castracane, 1887.
Deby = Analysis of the genus Campylodiscus. Sir Julian Deby.
Pant. = Beitrage zur kentniss der fossilen Bacillarian Ungarns.
Microgeologie = Ehrenberg. 1854.
Mic. Dict. = Micrographic Dictionary.
Donkin = History of British Diatomaceae. H. S. Donkin.
O'Meara = Report on the Irish Diatomaceae. Rev. E. O'Meara.
Diatoms of Japan = Brun & Tempere.
S. B. D. = Synopsis of the British Diatomaceae. Rev. Wm. Smith.
Moebius = A reproduction of plates of diatoms, by B. Moebius, principally from the Transactions of the Royal Microscopical Society.

No attempt has been made to give a complete reference of species, but to give references preferably to such works as are generally easiest of access. It will be noticed that most of them are referred either to Schmidt's Diatom Atlas, or to Van Heurck's synopsis. The references in roman mention Santa Monica as the locality. The references in italic indicate other localities.

Mycological Notes.

By Byron D. Halsted.

A Pineapple Mould.—Some specimens of decayed pineapple obtained in the market when sliced and placed in moist chambers in the laboratory developed in 36 hours a profuse and pure culture of a beautiful mould, which at first sight might have been mistaken for the common *Penicillium*. When microscopically examined, however, it was determined that it was a species of Chalara, and agrees quite closely with *Chalara paradoxa* (de Seynes) Sacc., described in Sylloge Fungorum, **10**: 595, and recorded for decaying pineapple in Paris, France.

The fungus as it appears upon the sliced pineapple may be quite completely divided into two portions. One consisting of hyaline perpendicular threads giving the mould in its early stages a frosty appearance not unlike that of *Peronospora* upon the leaf surface of their hosts, only much more magnified. Below and close to and even within the substance of the pineapple there soon follow a second spore development, which is also profuse, and on account of the prevailing olive color of the spores the whole appearance suggests, as before stated, that of the *Penicillium*.

The two forms of spores are very different, both as to their size and color and their method of formation. The first form of spore is usually hyaline, cylindrical, obtuse, and from 4–5 by 6–10 μ, while the second form is ovoid, oblong, olive brown and 8–9 to 16–18 μ.

The hyaline form of spore, which may be called the microspore, is formed endogenously and new spores are pushed out from the open end of a tip with considerable rapidity. The *Chalara* admits of easy cultivation in Van Teighem cells and the exogenous formation of these spores may be readily seen under higher powers of the microscope.

Before any spores have become separated from the long, straight tip of the filament there is a rounding off and a separation of the contents in the upper 10 μ of the tip. Following this there is a rupturing of the cell wall at the end of the hypha, and shortly after a spore pushes its way out and becomes free. This is followed by the abjunction of masses of the hypha contents so that usually there may be seen from 3–5 of the double cross walls in the mother cell. One of the peculiarities noticed in this study of spore formation was the size of the first spore produced, it being uniformly, almost, exactly double that of the succeeding spores that were pushad out of the tube. The rapidity with which these spores are formed may be judged from the fact that a culture 18 hours old had on an average of 10 spores at the tip of each tube, and in many instances the number was as high as 23. The time required for the production of the hypha themselves is not known exactly in this case; but by actual timing of the production of some of the spores it is determined that from 20 to 30 minutes is all sufficient for the pushing out of a spore and the taking of its place at the mouth of the tube by its successor, and in some cases the time required is reduced from 15–20 minutes. It is not usual for these spores to form and remain in rows after they have escaped; but under the circumstances under which they were observed they formed little irregular groups at the ends of the mother tubes. While this form of spore production is not new it is nevertheless infrequent. My first personal knowledge of it was in connection with the study of the sweetpotato black rot fungus *Ceratocystis fimbriata* Ell. & Hals. The observation first being made with this species by Mr. Fairchild, who at the time was investigating the potato decay in my laboratory. This method of spore production is treated in a paper upon the *Ceratocystis* in the Journal of Mycology, Vol. 7, No. 1, and the endogenous form of the conidia is given on pages 5 and 6 with several references to previous articles bearing upon this peculiar formation of spores. A plate given in *Botanische Zeitung*, 1847, there referred to, shows very well this peculiar method of spore formation. However, I do not observe that any mention is made of the double size of the first spore, and there is no indication in the figure of adjunction of the spores within the tube. Dr. Zopf, in like manner in "Die Pilze," Figure 61, shows the same method of spore formation as taking place in *Thielavia basicola* Zopf.

The second form of spore has been studied, and there is not the slightest indication of endogenous form. In this respect it differs materially from the macroconidia of the *Ceratocystis* which Mr. Fairchild demonstrated was produced in the same way by abjunction within the mother cell as above demonstrated for the microconidia. On the other hand, these spores are produced in chains of remarkable length and beauty in the Van Teighem cultures, there being sometimes 50 or more of the olive brown spores exceedingly uniform in size and holding together, even when the chains of spores have been distorted into extravagant shapes.

That these two forms of spores belong to the same plant was demonstrated beyond question, because sometimes from the same hypha there was given off upon the right hand a branch which developed endogenously the microconidia, while a few micromillimeters above or below and the opposite side a branch segmented into a chain of the macroconidia.

By taking portions of the *Chalara* from beneath the surface of the pineapple it was easily demonstrated that spores were produced from the subterranean filaments, which, while probably belonging to the macroconidia, differed from them both in shape and color, they being much longer and narrower, and of an almost pale blue color, besides these were formed at the tip of the hypha, and usually singly or, at the utmost, in chains of two or three spores. What was perhaps of more interest still is a form of spore agreeing in color quite closely with the macroconidia, but in size more nearly those of the hyaline microconidia. These were produced in long chains which easily fell apart and were associated with both the other above-mentioned forms. At first sight it would seem as if the hyaline, cylindrical, somewhat abrupt ended microconidia had become rounded and taken on a thicker cell wall and brown coloration ; but the formation of these spores is by ordinary fission of the hypha, and agrees in that respect with the macroconidia.

It would seem, therefore, that in our *Chalara* there are three quite well defined kinds of spores, not counting the ones that are produced within the mass of the host, and as far as this goes it well bears out the specific name of the species, *paradoxa.* With a knowledge of the fact that associated with the two forms of conidia in the *Ceratocystis* there is a pycnidia development, search was made for this structure in the pineapple cultures; but nothing of the sort has appeared. It is, however, true that the pycnidial development in the *Ceratocystis* was shy and not met with but a few times during the study of the sweetpotato black rot. Therefore realizing the great similarity between the microconidia in form and in method of production in the two genera and of the macroconidia in their structures, but not in their origin, one is inclined to continue the search for a pycnidial form of fungus in the case of *Chalara paradoxa*.

Notes upon Peach Root Galls.—After a study of the root knot or gall of the peach, chiefly from the standpoint of possible remedies, for the past two seasons, it may be well to put on record the fact that a fungus similar to the one noted above upon the pineapple is associated with the enlargements at the crown and elsewhere upon the roots of the peach.

The microconidia are hyaline and 10–15 by 3–4 μ, produced endogenously as for *Chalara* and *Ceratocystis*. The microconidia are olive-brown, oval 10–13 μ and formed by ordinary fission, and in that feature agree with *Chalara* and not with *Ceratocystis*. In its habitat it agrees with the latter in that both are soil fungi, the ceratocystis, as stated in the proceeding note, feeding upon the roots of the sweetpotato, and this one is upon the roots of the peach.

The fungus has been frequently met with upon crown and roots of seedling peaches while only a few weeks old and before any galls had started, and also at the end of the season, when galled roots were examined closely, the fungus being upon the surface of the knots and producing a dark color from the multitudes of dark macroconidia.

It remains to demonstrate, if possible, the causal connection of the fungus with the formation of the galls.

Natural Enemies of the Asparagus Rust.—The season of 1896 was the first one in which the genuine rust of the Asparagus (*Puccinia Asparagi* DC.) had been observed in this country outside of California. Since last year the disease has widened its range greatly and has become so severe that asparagus growers have full cause for alarm.

This fungus is one of the Uredineae having its three forms of spores produced upon the same host and, therefore, the student does not need to look elsewhere than upon the Asparagus for the aecidial, uredo, and teleutosporic forms of fruitage.

During the season now closing the cluster cups were first found upon specimens sent to the experiment station June 3d. An examination of these plants showed that the aecidial cups are in oval clusters. Frequently the cups were arranged as a border to the oval sorus and all within were spermagonia. Other sori are entirely spermagonial with no signs of aecidia. The spermagonia are easily distinguished by their small size and the watery appearance they give to the diseased spot.

The uredo form is frequently associated with the aecidia and its spores are produced in longitudinal slits in the epidermis in such abundance as to give the brownish color characteristic of the rusted plant. When associated with the clusters of aecidia the uredo sori are usually near to, but just outside of, the oval orange area devoted to cups and spermagonia.

The teleutospores when with the cluster of aecidia are quickly distinguished by the dark color due to the spores and their elevation above the level of the host. The sori of teleutospores occur anywhere in the aecidial cluster; thus, there may be one dark rift in the center of the cluster of cups or it may be close to the border, where it is often quite long.

It is seen from this that the asparagus rust appears in all of its forms almost simultaneously and often in the same disease spot. In short, several rust spots exhibited only spermagonia, others a mixture of these and the aecidia, while others had these two and the uredo or the teleutospore or both, so that a single diseased patch half the size of the little finger nail may contain all four forms. This matter of observation admits of the interpretation that all forms develop from the same unit of hyphae.

The aecidial form is the first one in the fungus life cycle, it being met with as early as June 3d, before stated, upon asparagus plants sent to the station from a center of the asparagus industry in the State. At that time the cutting of the beds was at its height and the rust was confined to the young plants that were allowed to form "brush" and gain strength for cropping in future years. The first specimens of all were found upon plants that sprang up and were allowed to grow in land that had been in asparagus but rooted out and used for other crops. These vigorous volunteer shoots were covered with the aecidia, and doubtless produced a large crop of spores in readiness to inoculate the plants that came later in the season upon the regular beds.

It is interesting to note that while they were looked for throughout the season, and upon thousands upon thousands of plants, not an aecidium was ever met with except upon the volunteer plant, on those that starting early and unmolested produced brush long before the regular bed plants had shown above the surface. It would seem from this that the cluster cups need to form early in the season or they will not appear at all.

Associated with *Puccinia Asparagi* DC. there are at least two natural enemies in which the growers of asparagus may have some hope of assistance. One of these is associated particularly with the aecidial form and is the *Tubercularia perisicinia* Ditt., which is quickly recognized in the sorus by its purple color. This fungus is recorded for the Uredineae generally and it is a pleasure to find it in an economic rôle.

A second fungus, *Darluca filum* Cast., quite frequently infests the puccinia. It produces its mycelium in the rifts sometimes to the exclusion from view of all the spores of its host, transforming the sori bearing the orange powder into those filled with blackish, shining, minute, bead-like bodies. From these pycnidia the spores at maturity issue in fine white coils and frequently give the whole asparagus plant an appearance of being the victim of a downy mildew.

It is not known how much good this parasite may do, but judging from the present season it has a large field in which to operate.

OCTOBER 28, 1897.

New southwestern Compositae.

BY EDWARD L. GREENE.

The following species, hitherto undescribed, occur in considerable fascicles of miscellaneous Compositae collected in various parts of New Mexico and Arizona by Mr. E. O. Wooton, and submitted to me for determination :

COLEOSANTHUS WOOTONI.

Pale with a short cinereous pubescence; leaves coriaceous, lanceolate, serrate, 2 inches long, longer than the internodes, spreading or recurved, short-petioled or subsessile; cymes subsessile in the axils of all the upper leaves and terminal; involucres about five lines high, little imbricated, the short outer bracts ovate, or oblong-ovate, the others oblong-linear, all finely striate and less pubescent than the leaves: achenes pubescent; pappus very fine, barely scabrous.

Organ Mountains, Dona Ana Co., New Mexico, Sept., 1892.

ERIGERON CONDENSATUS (Eaton).

Erigeron concinnus von *condensatus* Eaton. Bot. King Exp. 151. 1871.

Perennial, subacaulescent, the subscapiform merely bracted monocephalous tufted stems only a few inches high; the densely tufted spatulate but very narrow leaves an inch long; bracts of the hemispherical involucre subequal, hispidulous; rays numerous, rather broad, white or pinkish; pappus of few and slender barbellulate bristles and an outer series of oblong paleae, these toothed or lacerate at the rather obtuse summit.

Species not uncommon in southern Nevada and adjacent Arizona, wearing much more the aspect of *E. pumilus* than of *E. concinnus;* very distinct from either in the character of its pappus. Mr. Wooten's fine specimens are from the base of Mt. San Francisco, Arizona.

MACHAERANTHERA LINEARIS.

Perennial, the stem 3 to 5 feet high, puberulent but not viscid, the branches leafy below, narrowly paniculate above; leaves linear, or the lowest lance-linear, 3 or 4 inches long, glabrous, 3-nerved, remotely and sharply dentate and scabrous-ciliolate; heads of the somewhat thyrsoid panicle numerous; broadly turbinate involucre about 4 lines high, the multiserial closely imbricated bracts scarcely glandular, firm and chartaceous, with conspicuous short and appressed green tips ; purple rays narrow and numerous, ½ inch long.

Sandy fields of the Mesilla Valley, New Mexico, flowering in autumn. A distinct and beautiful species.

Gaillardia multiceps.

Less than a foot high, the numerous very leafy stems from an apparenty suffrutescent base, whitish and merely puberulent; the numerous leaves also puberulent, rather fleshy and deeply impressed-punctate, the lowest narrowly oblanceolate, obtuse, the others linear, all entire, mostly 2 or 3 inches long; peduncles short, slender; bracts of the involucre ovate, caudate-acuminate; rays yellow ; teeth of the disk-corolla short and obtuse; ovaries very villous at base, more delicately pubescent above ; pappus of elongated lanceolate paleae, and a short awn, but this quite surpassing the disk-corolla.

South of Woodruff, Arizona. A member of the group to which belong *G. spathulata* and G. Parryi (*i. e.*, *G. acaulis*, Gray, not Pursh).

The North American Species of Porella.

By Marshall A. Howe.

The name *Porella* first appears in the Historia Muscorum of Dillenius,* where it is applied to a genus of "Musci" from Pennsylvania, falling in his arrangement between *Lycopodium* and *Selaginoides.* In the generic characterization, the plant is described as bearing naked "antheraceous" capsules, without operculum or pedicel, dehiscing by several pores through the sides, and emitting a farinaceous powder. Following this is a diagnosis of the only species known to Dillenius, which we quote in the original, inasmuch as there is an opportunity for differences of opinion as to the exact translation in one or two particulars. His words are: "*Cui rami alterni, folia in nervo rigidiusculo alternatim opposita,*

* Historia Muscorum, 459. *pl. 68.* 1741.

obtuse pinnata, pellucida, viridia, altera parte convexa (vid. ram. e.) altera (vid. ramos reliquos) concava, qua parte capsulae ad pinnarum alas enascuntur parvae, oblongae, turgidae, exiguis aliquot ad basin squamis cinctae, tenui membrana constantes, quae luci obversae tres in singulo latere globulos ostentant, totidem foraminibus exilibus (duobus superius, reliquis per latera hiscentibus) farinam fundentes ; semina non comparent."

He further remarks that the plant revives when immersed in water, but in the dry state is contracted and convolute, not showing its structure ; that his figure was made too black in the course of the work [presumably by the engraver]; and that his specimen was sent from Pennsylvania by Jo. Bartram, who had indicated that it grew in humid places.

The principal figure given by Dillenius represents fairly well what we now know as *Porella pinnata,* though rather too stout and with leaves too closely set ; smaller accessory figures show the leaves in natural size and the "farinaceous capsules" "*aucta magnitudine*." The latter are ellipsoidal or obovoid in form and exhibit a few perforations.

The identity of the plant thus described and figured long remained a puzzle to botanical writers. In the Species Plantarum of Linnaeus it appears under the Musci between the genera *Lycopodium* and *Sphagnum.* Linnaeus here bestows the specific name *pinnata,* quotes the "*Porella pinnis obtusis*" of Dillenius, refers to description and figure in the Historia Muscorum, gives the habitat as Pennsylvania, and states that he has never seen the plant and that Kalm has been unable to find it on its native soil. Mr. James Dickson was the first to detect that the *Porella* of Dillenius belonged to the Jungermaniaceae, and it may be worth while to quote his narrative of the circumstances, especially as M. Le Jolis has somewhat recently* given the impression that the discovery was wholly a chance affair and also that Dickson considered his *Jungermannia Porella* to be different from the *Porella* of Dillenius. Mr. Dickson's statements are as follows : †

"The genus *Porella,* first established by Dillenius and from

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* Rev. Bryol. 19 : 99. 1892.

† Trans. Linn. Soc. 3 : 238. 1797.

him copied by Linnaeus, who never saw the plant, had long appeared to me to be very doubtful. I had, however, an opportunity, some time ago, of satisfying myself on this subject. I happened to receive some mosses as package to plants from America; and, upon examining them, found a *Jungermannia* and a *Splachnum* in fructification. I suspected the *Jungermannia* to be the same with the *Porella* of Dillenius; but this could not be ascertained without actually comparing the two specimens, which I had an opportunity of doing by the indulgence of Dr. Sibthorp, of Oxford, who permitted me to compare my mosses with Dillenius's original collection; and, upon the most careful examination, I found my *Jungermannia* to agree exactly with his *Porella*, but could find no fructification upon his specimens.

"As I have no doubt that my *Jungermannia* and his *Porella* are one and the same plant, I shall next endeavor to trace how Dillenius has fallen into this error; for the plant has exactly the habit of a *Jungermannia*. This was, probably, by receiving an imperfect specimen; as the vagina, when damaged either by the weather or by insects, after the tender flower had fallen off, would very much resemble the capsule which he has figured.

His figure of the plant is too much crowded with leaves; but in his original drawings, in the possession of Sir Joseph Banks, the leaves, so far as they are represented, are placed in the same manner as in the annexed figure. I shall now subjoin a description of it under the name of *Jungermannia porella*."

The subjoined description and "annexed figure," though somewhat incomplete according to modern standards, are very clearly based upon the plant of the eastern United States known as *Madotheca Porella* Nees, or, more recently, as *Porella pinnata* L.

In 1822 Dumortier established the genus *Madotheca*, based upon *Jungermannia platyphylla*, *J. thuja*, and *J. laevigata*. This name was taken up by Nees, who included in the genus the *Jungermannia Porella* of Dickson, and *Madotheca* came into general use as the appellation of this very natural generic group. Lindberg, in 1869, restored the Dillenian and Linnaean *Porella* and has been followed in this by Stephani (in some, at least, of his papers), Spruce, Massalongo, Underwood, Pearson, Evans, and others.

Schiffner,* however, though rejecting *Madotheca*, considers *Porella* of Linnaeus a *nomen nudum* and adopts *Bellincinia*, Raddi (1818), reinstated by Otto Kuntze.

Lindberg supposed the "antheraceous capsules" to be the ♂ branches, but we are inclined to accept Dickson's explanation of the Dillenian error. We are assisted to this view by detecting in the larger figure† given by Dillenius what we believe to be two or three "antheraceous capsules," which have the general appearance of perianths, and also by the form of the detached and enlarged "capsules." M. Le Jolis has somewhat lately, in a second‡ paper on the nomenclature of the Hepaticae, expressed the opinion that the figure in the Historia Muscorum would apply to a *Selaginella* as well as to one of the Jungermaniaceae and that it is easier for him to believe that a *Madotheca* has by some chance been fastened to the sheet previously occupied by the enigmatical *Porella* than that Dillenius could have made such blunders in interpreting its morphology and affinities. Against this view may be urged a portion of the Dillenian description concerning which M. Le Jolis, in his two elaborate papers, is silent. The "*Aquae immersa planta reviviscit, sicca contracta et convoluta est, structuram non monstrans*" is not applicable to any *Selaginella* of the eastern United States, but does apply in a significant way to the hepatic in question, a form of which, with leaves strongly convolute and stem subcircinate in drying, was given the specific name *involuta* by Hampe. Moreover, Dickson's statement that in the "original drawings in the possession of Sir William Banks, the leaves, so far as they are represented, are placed in the same manner as in the annexed figure" should have much weight. Neither M. Le Jolis nor any one else will question the meaning of Dickson's "annexed figure."

The objection that *Porella* is a *nomen nudum* with Linnaeus would apply equally well to *Targionia hypophylla* or *Blasia pusilla*, so far as any "specific phrase" in the Species Plantarum is con-

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*Engler & Prantl, Nat. Pfl. Fam. 1: Abt. 3, 115. 1895.

†We have had access to the Edinburgh reprint of the Historia Muscorum (1811) and the abridged edition of 1763. Of these, the figures in the 1763 edition, in the Columbia University copy, at least, are much the clearer.

‡Mém. Soc. nation. Sci. nat. et Math. Cherbourg, **29**: 142–147. 1894.

cerned. These had the good fortune to have been more accurately figured and described by the predecessors whom he quotes, to be confessedly European, and to be understood by his contemporaries. But now that there is not the least manner of doubt as to what the *Porella* of Dillenius and Linnaeus was, there seems to be no good reason why it should not stand as the name of the genus. Professor Underwood has this last summer examined the specimen in question in the Dillenian Herbarium at Oxford and adds his testimony to that of others to the effect that the plant is congeneric with the traditional *Jungermannia platyphylla* of Linnaeus and clearly identical specifically with the common hepatic of the eastern United States, known to Nees and his followers as *Madotheca Porella.*

PORELLA L. Sp. Pl. 2: 1106. 1753. Ex. Dill. Hist. Musc. 459. *pl. 68.* 1741.

Plants large, dark-green to yellowish-brown, mostly somewhat regularly bi- or tri-pinnate, rarely subsimple; root-hairs in tufts at the base of the underleaves, usually sparingly developed. Leaves very deeply 2-parted; the dorsal lobes large, incubous, obliquely orbicular-ovate to oblong, entire, repand or somewhat dentate; ventral lobes much smaller than the dorsal, sometimes nearly discrete, ovate, lingulate, oblong, linear, or lanceolate, nearly parallel with the stem, entire or toothed, margins plane or revolute. Underleaves large, somewhat similar in form to the ventral lobes but usually broader, entire or dentate, often long decurrent on both sides. Antheridia spherical, very short-stalked, single in the axils of saccate, densely imbricate, nearly equally bilobed opposite leaves, these connate with the underleaves and forming short, lateral, oval to linear-oblong spikes. Archegonia generally numerous, terminal on very short (most rarely a little elongated) lateral branches. Perianth oval to obovate, flattened dorso-ventrally toward the mouth, from a more or less obconical base, much longer than the bracts, two-lipped after elevation of the capsule or sometimes irregularly torn, mouth ciliate, dentate, or subentire. Bracts usually a single pair with a single bracteole in addition to the underleaf at the base of the branch, the latter underleaf united with the subtending cauline leaf and functioning as its ventral lobe, or free, leaving the cauline leaf unlobed. Capsule spherical to oval-oblong, on a short seta, yellowish-brown, opening, usually not quite to the base, by four often irregularly split valves; cell-walls of the valves mostly with irregular nodulose thickenings. Elaters commonly 2-(1–3-) spiral; spores several times broader, more or less echinulate.

Key to the Species.

Stems subsimple or somewhat fasciculately branching, short, tumid; underleaves caudate-lacinulate at base. 8. *P. Bolanderi.*

Stems more or less regularly 1–3-pinnate.

- Ventral lobes lingulate-oblong to linear-oblong, often somewhat falcate, closely appressed to stem or to dorsal lobes.
  - Dorsal lobes and underleaves entire, length of ventral lobes ⅓–⅖ the width of the dorsal. 1. *P. pinnata.*
  - Dorsal lobes entire, underleaves ciliate-dentate at base, length of ventral lobes ½–⅔ the width of the dorsal. 2. *P. Swartziana.*
  - Leaves and underleaves repand-dentate. 3. *P. Wataugensis.*
- Ventral lobes broadly ovate to oblong.
  - Usually shining.
    - Ventral lobes more or less spurred outwardly at base, mostly linguiform or ovate-oblong, margins plane or lightly recurved. 7. *P. Roellii.*
    - Ventral lobes regularly rounded outwardly at base, ovate, margin recurved. 6. *P. navicularis.*
  - Usually dull.
    - Rather flaccid, dorsal lobes subimbricate, ventral lobes long-decurrent, underleaves distant. 4. *P. rivularis.*
    - Somewhat rigid, dorsal lobes rather densely imbricate, ventral lobes scarcely decurrent, underleaves approximate or subimbricate. 5. *P. platyphylla.*

1. PORELLA PINNATA L. Sp. Pl. **2**: 1106. 1753.

Porella pinnis obtusis Dill. Hist. Musc. 459. *pl. 68.* 1741.

Jungermannia Porella Dicks. Trans. Linn. Soc. **3**: 239. 1797.

Jungermannia distans Schwein. Spec. Fl. Am. Sept. Crypt. 9. 1821.

Madotheca Porella Nees, Naturgesch. Eur. Leberm. **3**: 201. *p. p.* 1838.

Madotheca involuta Hampe, Lehm. & Lindenb. in Lehm. Pugillus, **7**: 10. 1838.

Madotheca Sullivantii Aust. Bull. Torr. Bot. Club, **3**: 15. 1872.

Dark or yellowish-green, rarely whitish, dull: stems usually bipinnate, sometimes tripinnate or subdichotomous, 4–11 cm. long, rather laxly matted; branches obtuse, often subfastigiate: dorsal lobes of leaves somewhat distant, contiguous, or slightly imbricate, horizontal, commonly deflexed or convolute in drying, oblong or ovate, rounded-obtuse, 1–2.5 mm. × .65–1.7 mm., margins plane or the inferior slightly inflexed, entire, cells mostly with inconspicuous trigones; ventral lobes minute, closely appressed to the stem or to the dorsal lobes, very nearly or wholly discrete, lingulate-oblong or subfalcate, flat, with plane margins or slightly concave ventrally, obtuse, entire, not decurrent, .25–.68 mm. × .1–.27 mm., length usually equaling $\frac{1}{3}-\frac{2}{5}$ the width of the dorsal lobe; underleaves subquadrate or short-oblong, distant, appressed, scarcely decurrent, equaling stem in width or occasionally twice as broad, margins plane, entire, apex rounded or rarely repand-emarginate: dioicous: perianth obovate-pyriform, 4–5 times the length of the bracts, slightly crenulate at mouth; lobes of bracts entire or subrepand-crenulate; bracteole oblong, entire; spores 30–42 μ, papillate; elaters 2-(3–4-) spiral, 170–240 $\mu \times 9$–14 μ.

Exsicc. Drumm. Musc. Am. (Southern States) 167, 168 (both as *Jungermannia platyphylla*).

Musc. Allegh. 264.

Hep. Bor-Am. 92, 92[b], 93 (as *Madotheca involuta*), 94 (as *Madotheca Sullivantii*).

Hep. Am. 9, 115 (as *Porella involuta*), 175.

Can. Hep. 85.

On banks of shaded streams and on rocks and logs subject to overflow. Common in eastern North America from Nova Scotia to Louisiana. Owen Sound, Ontario (Macoun); Indiana (Underwood); Illinois (Schneck); Missouri (Demetrio); Arkansas (Coville); Cuba (Wright).

Type from Pennsylvania—in the Dillenian Herbarium at Oxford, England.

Usually collected in a sterile condition. *Jungermania distans* Schwein. is a form with rather remote leaves, found especially in the Southern States. *Madotheca involuta* Hampe differs from the typical form only in unimportant and wholly inconstant characters. The leaves are a little more imbricate, their inferior margins sometimes more inflexed; in drying, the leaves are closely wrapped about the stem or decurved and the branches often subcircinate. It produces sporogonia more freely than the type and evidently grows in somewhat drier situations. What is apparently a portion of Hampe's original plant is to be found in Herb. Underwood. All the specimens from the Rocky Mountain region and the Pacific coast that have been referred to *Porella pinnata* belong, so far as we have seen them, to *Porella rivularis*.

2. PORELLA SWARTZIANA (Web.) Trevis. Mem. r. Ist. Lomb. III. 4: 407. 1877.

Jungermannia Swartziana Web. Prod. 18. 1815.

Madotheca Swartziana Lindenb. G. L. N. Syn. Hep. 271. 1845.

Sordid-green or slightly fulvous, dull, opaque: stems procumbent, irregularly pinnate or subbipinnate, 3–5 cm. long; branches obtuse, mostly short: dorsal lobes of leaves subimbricate, circumvolute when dry or spreading, ovate, obtuse, 1–1.7 mm. × .7–1.2 mm., entire or slightly repand, inferior margin decurved or subinflexed, occasionally a little undulate-crisped, the leaf-cells with prominent trigones; ventral lobes narrowly falcate or linear-oblong, erect, or commonly with the falcate apex introrse and appressed to the underleaves, flat with plane margins or somewhat concave ventrally, obtuse, rarely acuminate, entire or subrepand above, bearing at the base 1–3 cilia on the inner margin and sometimes a single cilium on the outer, not decurrent, .5–.85 mm. × .08–.17 mm., length ½–⅔ the width of the dorsal; underleaves oblong, erect-appressed, rarely exceeding stem in width, obtuse, truncate, or emarginate-repand, margins plane, entire above, ciliate-dentate at base, subdecurrent.

In low ravines, Opelousas, Louisiana (Rev. A. B. Langlois, no. 228 and, in part, no. 529).

The Louisiana plants agree very closely with a West Indian specimen of *P. Swartziana* in Herb. Underwood. Mexican specimens referred to this species differ in several respects. Weber supposed his original (which we have been unable to locate) to have been collected in Jamaica. We have seen no perianths or ♂ branches and these parts are not described by authors.

3. PORELLA WATAUGENSIS (Sulliv.) Underw. in herb.

Madotheca Porella var. ? Sulliv. Musc Allegh., no. 265. 1845.

Madotheca Wataugensis Sulliv. in A. Gray, Man. Bot. 700. 1856. [2d ed.]

Similar to *Porella pinnata*, of which it is perhaps a variety—differing in being smaller and more delicate (dorsal lobes of leaves .85–1.2 mm. × .5–.85 mm.), and in the subrepand-dentate margins of dorsal and ventral lobes and underleaves.

Exsicc. Musc. Allegh. 265.

Adhering to decayed logs, bank of the Watauga River, near the base of Grandfather Mt., North Carolina (Sullivant). Collected but once. The ventral lobe often appears to be inserted a little lower upon the stem than the dorsal. The fascicles of rootlets mentioned by Sullivant as a distinguishing character are sometimes better developed in the true *Porella pinnata* than in this.

4. Porella rivularis (Nees) Trevis. Mem. r. Ist. Lomb. III. **4**: 407. 1877.

Madotheca rivularis Nees, Naturgesch. Eur. Leberm. **3**: 196. 1838.

Porella dentata Lindb. Act. Soc. Scien. Fenn. **9**: 342. 1869.

Dull, or very rarely a little polished, opaque, commonly dark green, sometimes yellowish, mostly soft and flaccid: stems irregularly pinnate or subdichotomous, 3–10 cm. long, prostrate or ascending, forming loose or more dense mats, branches somewhat obtuse, scarcely diminishing in width toward apex: dorsal lobes of leaves usually subimbricate or approximate, sometimes distant, rarely closely incubous, obliquely ovate to orbicular-ovate, rounded-obtuse, 1–2 mm. × .8–2 mm., entire or subdenticulate, flat or slightly concave beneath, only a little decurved at the apex, trigones mostly small; ventral lobes small, obliquely ovate, acute, .35–.7 mm. × .12–.4 mm., length $\frac{1}{3}$–$\frac{2}{5}$ the width of the dorsal, about one-half as broad as the underleaves, margins, especially the outer, for the most part broadly revolute, often giving the lobe a twisted appearance, long decurrent, usually dentate or subciliate at base internally and sometimes unindentate externally but scarcely spurred; underleaves distant, quadrate, orbicular to broadly ovate, about twice the width of the stem, apex rounded-obtuse, sometimes reflexed, margins repand-undulate, very long decurrent, the wing sometimes exceeding the free portion in length and usually acutely dentate or subciliate: dioicous: ♂ spikes oval to oblong, 1.5–2.5 mm. in length; ♀ branch short; ventral lobes of the single pair of bracts acute or subobtuse, entire or repand, the dorsal obtuse, bracteole ovate-linguiform, repand; perianth ovate, with lateral margins deflexed, deeply bilabiate, the lips subentire or repand-dentate, usually plane: spores 27–45 μ, papillate-echinulate; elaters 180–290 $\mu \times$ 8–10 μ, rather obtuse, 2-(3-) spiral.

EXSICC. Hep. Bor-Am. 91 b.

Hep. Am. 96 (as *Porella platyphylla*), 150 (as *Porella Roellii*, var.).

Can. Hep. 99 (as *Porella dentata*).

On moist rocks, stones in streams, and bases of trees in densely shaded places. Widely distributed and extremely variable according to habitat. Apparently rare in eastern North America, but common on the Pacific Coast. Connecticut (Eaton); Ohio (Sullivant); Texas and New Mexico (Wright); Montana (R. S. Williams); Idaho (Leiberg); British Columbia (Macoun); Alaska (Miss Grace E. Cooley); California (Bolander, Parish, Howe).

Our determination is based upon the drawing (acccompanying G. & R. Hep. Eur. no. 371) of the original plant from the bed of the river Bober, near Hirschberg, Silesia, and upon European specimens and the descriptions of authors.

The name *dentata*, applied by Hartman in 1832 (Skand. Fl. 354, 2d ed.) to what he considered a variety of *Jungermania platyphylla* was taken up for the above species by Lindberg in 1869, but was abandoned by him ten years later without explanations. Hartman's description of his variety *dentata* is quite inadequate for its proper identification and as we have failed in our efforts to see his original specimens, if such exist, we prefer to adhere to the first name which was accompanied by an intelligible diagnosis.

5. PORELLA PLATYPHYLLA (L.) Lindb. Act. Soc. Scien. Fenn. **9**: 339. 1869.

Jungermannia platyphylla L. Sp. Pl. **2**: 1134. 1753.

Jungermannia platyphylloidea Schwein. Spec. Fl. Am. Sept. Crypt. 9. 1821.

Madotheca platyphylla Dumort. Comm. Bot. 111. 1822.

Madotheca navicularis Nees, Naturgesch. Eur. Leberm. **3**: 176. *p. p.* 1838.

Porella thuja Lindb. Act. Soc. Scien. Fenn. **9**: 337. 1869.

Dull or most rarely with a slight lustre, opaque or a little pellucid, yellowish to very dark green, rather rigid: stems somewhat regularly or irregularly 1–3-pinnate, 3–8 cm. long, procumbent, usually in compact mats, branches obtuse, very rarely subattenuate: dorsal lobes of leaves rather densely imbricate, appressed, or with the superior margin ascending or slightly reflexed, obliquely ovate to obliquely orbicular-ovate, rounded-obtuse, .85–2.1 mm. × .65–1.7 mm., apex more or less decurved, superior margin repand-dentate or subentire, the inferior sometimes a little undulate-crisped, cells at inferior basal angle scarcely smaller, trigones distinct; ventral lobes somewhat obliquely ovate to oblong, obtuse, rarely subacute, .4–1.2 mm. × .25–.85 mm., length about $\frac{3}{5}$ the width of the dorsal, nearly equaling underleaves in width or only one half as broad, margins, especially the outer, recurved, entire or with a single acute tooth at base, scarcely decurrent; underleaves approximate or subimbricate, semiorbicular to quadrate-oblong, rounded-obtuse, margins reflexed especially at apex, long-decurrent, sometimes repand or sparingly denticulate at base, otherwise entire: diocious: ♂ spikes oval to oblong, 1.2–3 mm. in length; ♀ branch short; dorsal lobes of bracts obtuse, more rarely acute, the ventral lobes usually acute, margins of both entire or denticulate; perianth oval, inflated ventrally along median line especially when young, narrowed above, the lips denticulate or subciliate, plane, or often lightly revolute, especially toward the lateral margins: capsule oval, light brown, the valves often irregularly split; spores 32–45 μ, echinulate, elaters 180–250 μ × 7–10 μ, 2-(1-) spiral.

Exsicc. Drumm. Musc. Am. (Southern States) 169.

Musc. Allegh. 263.

Hep. Bor-Am. 89, 90, and 91 c (as *Madotheca rivularis* var. ?).

Hep. Am. 29.

Can. Hep. 9.

On tree-trunks, logs, rocks, and soil. Very common in eastern, northern, southern and central North America. Wyoming (Mayhew); Idaho (Leiberg, no. 8, 1888); Vancouver Island, near Victoria (Macoun, May 15, 1893, on young fir trees, no. 29); Ontario (Mrs. Roy, Macoun); Quebec (Faxon); Nova Scotia (ex. herb. James, collector unknown).

Extremely variable. Most of the American specimens belong to *Porella thuja*, as defined by Lindberg, characterized by the somewhat regular pinnate branching, closely appressed obliquely rotund-ovate dorsal lobes, and oblong ventral lobes, the latter nearly or quite as broad as the underleaves. This appears to be identical with the *Jungermannia platyphylloidea* of Schweinitz, of which we have seen authentic specimens both in his own herbarium preserved at Philadelphia and in that of Torrey at Columbia University. The more common European form of *P. platyphylla*, marked by irregular branching, yellower color, obliquely ovate dorsal tubes with the superior margins ascending or reflexed, and by the obliquely ovate ventral lobes, which are only about half as wide as the underleaves, is rare in America, but as such may be cited specimens collected by Mr. Faxon on Owl's Head, Canada (near Lake Memphremagog), June 27, 1885, and by Professor Underwood at West Goshen, Conn., July, 1887, and at Natural Bridge, Va., Sept., 1887. Transitional conditions occur so frequently that we believe nothing is gained by an attempt at separation.

6. PORELLA NAVICULARIS (Lehm. et Lindenb.) Lindb. Act. Soc. Scien. Fenn. **9**: 337. 1869.

Jungermannia navicularis Lehm. et Lindenb. in Lehm. Pugill. **6**: 38. 1834.

Madotheca navicularis Nees, G. L. N. Syn. Hep. 277, *p. p.* 1845.

Shining or more rarely dull, brownish-yellow, large: stems somewhat regularly bipinnate, 4–12 cm. long, procumbent-caespitose, or subpendulous with apices ascending when moist, branchlets gradually narrowed, subacute, convex on drying and slightly deflexed: dorsal lobes of leaves densely imbricate, appressed, for the most part closely wrapped about the stem when dry, obliquely orbicular-ovate to oblong-ovate, 1.2–2.5 mm. × 1–1.8 mm., rounded-obtuse, apex decurved, subcucullate, inferior margin slightly undulate-crisped, the superior decurrent, its wing sometimes laciniate-crispate, otherwise very entire, the inferior basal angle composed of numerous small thick-walled cells ¼–½ the diameter of the remainder, trigones conspicuous throughout; ventral lobes ovate, obtuse, most rarely subacute, regularly rounded outwardly at base, .5–1 mm. × .33–.75 mm., a little smaller than the underleaves, length somewhat more than ½ the width of the dorsal, margins entire, recurved, decurrent, apex often deflexed; underleaves approximate, quadrate-oblong, rounded-obtuse, margins entire, recurved, long-decurrent, apex occasionally deflexed: dioicous: ♂ branches oval to oblong, 1½–2½ mm. in length;

♀ branch short, lobes of the single pair of bracts minutely denticulate or entire, the ventral usually acute, the dorsal obtuse, bracteole wide; perianth broadly obovate from an obconic somewhat inflated base, scarcely narrowed above, deeply bilabiate, the lips at first subciliate-denticulate, later obsoletely crenulate-dentate or nearly entire, strongly revolute, giving perianth the appearance of being squarely or obliquely truncate: capsule ovoid, yellowish-brown, exserted by about its own length; spores 50–85 μ, echinulate, bright yellowish-green; elaters 275–325 $\mu \times$ 9–10 μ, obtuse, 2-(3-) spiral.

Exsicc. Hep. Bor-Am. 91.

Hep. Am. 30.

Can. Hep. 7.

Common on trunks and branches of trees and more rarely on rocks throughout the Pacific Coast from California to Alaska; as far east as Idaho (Leiberg); Mexico (*fide* Gottsche).

The original specimens were collected by Menzies on the western coast of North America, exact locality unknown. The European plants referred by some authors to *Porella navicularis* probably all belong with *P. platyphylla* or *P. laevigata*. This species in a fertile condition can always be very easily distinguished from any simulating form of *P. platyphylla* by the broadly obovate perianth, scarcely narrowed at the mouth, and by the twice larger spores. When sterile, if more obvious characters fail, the numerous, small, thick-walled cells filling the inferior basal wing of the dorsal lobe are of importance; these are ¼–½ the diameter of the cells in the middle of the lobe while in *P. platyphylla* the cells are nearly of a uniform size throughout the lobe or slightly smaller at the basal margin.

7. Porella Roellii Steph. Bot. Centralb. **45**: 203. 1891.

Green or yellowish-brown, usually shining: stems procumbent, rather flaccid, densely depressed-caespitose, 4–8 cm. long, subdichotomous below, the primary branches for the most part simply and remotely pinnate, branchlets short, often attenuate-deflexed: dorsal lobes of leaves densely imbricate, appressed, obliquely ovate, patent-divergent, .85–1.7 mm. $\times$ .65–1.5 mm., apex narrowed, subtruncate, obtuse, or most rarely apiculate, inferior margin more or less undulate-crisped, the superior repand, cells at basal angles slightly smaller, all with evident trigones; ventral lobes ovate, linguiform or ovate-oblong, usually much narrowed toward the obtuse or subacute apex, suberect or patent, scarcely connate with the dorsal, commonly about ½ as wide as the underleaves, length ⅔ the width of the dorsal, somewhat concave ventrally, margins plane or slightly recurved, a little decurrent, very rarely dentate above, more or less strongly spurred at the base, especially at the outer angle, the spur entire or dentate, rarely subciliate; underleaves approximate, ovate-linguiform, rounded-obtuse, the margins recurved, long-decurrent, entire or most rarely subdentate, the wings sometimes crisped: dioicous: ♂ spikes 1–2 mm. long; ♀ branch somewhat elongated, bearing 3–8 leaves (or "bracts") (usually 2 pairs) nearly similar to the cauline; inmost bracts a little larger, the lobes subacute, entire, repand-dentate, or sparingly denticulate, bracteole ovate, subentire or denticulate; perianth large, somewhat goblet-shaped or broadly obovate, undulate-concave ventrally, here and there inflated, scarcely narrowed or lobed at the wide truncate dentate mouth, the oral margins plane or slightly deflexed at the sides.

Exsicc. Can. Hep. 11 (as *Porella Bolanderi* var.).

Under shelving rocks and on moist shaded cliffs, rarely on tree-trunks. Washington: Kitchelos Lake (Roell, June 12, 1888); Olympia (Henderson, 1892, no. 2594). British Columbia (Macoun): Cascades, Yale (May 1875, also at Yale, May 17, 1889, no. 61); Mt. Benson, Vancouver Island, June 8, 1887; near Victoria (May 12, 1893, no. 7, and May 30, 1893, no. 63). Oregon (Pringle, 1881, no. 502, in part). California (Howe): Mill Valley (no. 1168) and Mt. Tamalpais (no. 1171), Marin Co.; near Cazadero (no. 1170), Sonoma Co.; Ukiah (no. 759) and Navarro (Miss Edith S. Byxbee), Mendocino Co.; Blue Lake (no. 994) and Deer Creek (nos. 1068 and 1073), Humboldt Co.; Hay Fork (no. 1109), Trinity Co.

Type from Kitchelos Lake, Washington (Roell, June 12, 1888) —in Herb. Stephani, Leipsic. Type duplicate in Herb. Underwood.

Porella Roellii is closely related to the forms of the European *P. laevigata* with obtuse dorsal lobes and subentire ventral lobes and underleaves, as represented, for example, in Carrington and Pearson's no. 275 Hep. Brit. Exsicc., from Scotland. This is especially true of British Columbia specimens (Macoun : Cascades, Yale, May, 1875 ; no. 63, near Victoria, May 30, 1893), and of our no. 1068, from California. These latter differ, however, from *P. laevigata* in the smaller, narrower, more pointed, and more strongly calcarate ventral lobes, and in the usually more slender fronds. They are forms like these, we take it, that have been referred by Mr. Pearson * to *P. laevigata*, but in the predominating forms in Washington, Oregon and California the plant is much less suggestive of *P. laevigata*, and we prefer to maintain Stephani's species, and to associate with it the British Columbia specimens alluded to and our no. 1068, even though, as must be admitted, they make a near approach to certain conditions of the European plant. Perianths occur only on our no. 994 from Blue Lake, Humboldt Co., California. We have been unable to compare the perianths of *Porella laevigata*, inasmuch as these organs are uniformly wanting in the somewhat extended series of European specimens that we have been privileged to examine, but the perianth of *P. laevigata* is described by Nees † as ovate, inflated, and truncate-bi-trilobed, while in *P. Roellii* the perianth is broadly obovate or goblet-shaped, and scarcely lobed at the wide truncate mouth.

No. 150, Hep. Am. (issued as *Porella Roellii*, var.) belongs with *P. rivularis*, as is evidenced by the form of the ventral lobes and underleaves, the short ♀ branches, the characters of the perianth, etc.

Professor Macoun's specimen from Yale, British Columbia, May, 1875, was labeled "*Madotheca Macounii* n. sp." and "*M. laevigata*, var. *integrifolia*," by Austin *in herb.*

8. Porella Bolanderi (Aust.) Pearson, List. Can. Hep. 7. 1890. [excluding specimens cited (?)]

Madotheca Bolanderi Aust. Bull. Torr. Bot. Club, 3 : 14. 1872.

Dark- or yellowish-green, dull : stems 1½–6 cm. long, subsimple or with a few somewhat fasciculately disposed obtuse tumid branches, often subpendulous, more or less vaulted or flexuous when dry : dorsal lobes of leaves densely imbricate, appressed or subsquarrose, dimidiate-ovate to oblong, 1.5–2.9 mm. × .67–1.8 mm., sometimes considerably narrowed toward the obtuse apex,

* List of Canadian Hepaticae, 7. 1890.

† Naturgesch. Eur. Leberm. 3 : 165. 1838.

slightly decurved when moist, circumvolute-deflexed in drying, rather distinctly margined by somewhat inflated subrectangular cells, the inferior margin more or less undulate, often narrowly inflexed, the superior repand or here and there caudate-dentate, the base long drawn out and projecting beyond the stem, trigones small; ventral lobes and underleaves approximate or more often imbricate, sometimes entirely concealing the stem; ventral lobes ovate-lanceolate to linear-lanceolate, rarely almost subulate, acute or occasionally somewhat obtuse, subfalcate, canaliculate, slightly twisted, long-decurrent, nearly discrete, .4–1 mm. × .08–.4 mm., about ½ as wide as the underleaves, length $\frac{2}{5}$–$\frac{3}{5}$ the width of the dorsal, undulate-repand above, sparingly caudate-lacinulate on inner side at base, often also on the outer; underleaves ovate-lingulate to oblong, a little wider than the stem, apex obtuse, subacute, rarely emarginate or slightly cleft, often deflexed, margins plane or recurved, undulate-repand, long-decurrent, the wings with commonly 2 or 3 cauda-like laciniae on either side toward the base: dioicous: ♂ spikes oblong to almost linear, 2–4 mm. in length; ♀ branch short; dorsal lobes of bracts subobtuse or acute, the ventral acute or often subulate-pointed, margins of both subentire or denticulate above, ciliate-caudate at base, bracteole large, ovate, usually acute, denticulate above, caudate-lacinulate below; underleaf subtending ♀ branch acutely emarginate or bifid; perianth broadly ovate from a shortly obconic base, somewhat compressed, lightly undulate-plicate dorsally, often furnished ventrally with 2 or three rarely winged carinae, narrowed at the ciliate, subtruncate, deeply bilabiate mouth: capsule oval or oval-oblong, exserted by about its own length; spores 29–40 μ, minutely echinulate; elaters 180–310 μ × 10–12 μ, 2-(3-) spiral.

Exsicc. Hep. Am. 31.

On stones, under shelving rocks, and on the bark of living trees, especially of *Quercus agrifolia.* California, apparently throughout the state (Bolander, Underwood, McClatchie, Howe).

Type in Herb. Pearson, Knutsford, Cheshire, England. We have seen no specimens of *Porella Bolanderi* from any station outside of California. Can. Hep. no. 10 (distributed as *P. Bolanderi*) is, so far as we have seen it, *Porella rivularis*—in one pocket mixed with *P. navicularis.* Can. Hep. no. 11 (issued as *Porella Bolanderi* var.), from Mt. Benson, Vancouver Island, is *Porella Roellii* Stephani.

In moist, densely shaded places, *Porella Bolanderi* assumes a more lax, flaccid habit, resembling certain forms of *P. rivularis.*

Such conditions, however, when the characteristic ciliate perianths are wanting, can usually be distinguished from any state of *P. rivularis* by the more oblong, more distinctly marginate, dorsal leaf-lobes, and by the longer and narrower ventral lobes and underleaves, which are more pronouncedly caudate at the base.

The above revision is based, outside of our own collcctions in California, chiefly upon the rich representation of this genus in the herbarium of Professor Underwood, and upon the specimens in the herbarium of Columbia University. We further gratefully acknowledge our indebtedness to the Philadelphia Academy of Sciences, for the loan of the Schweinitz collection; to Dr. A. W. Evans for the privilege of examining specimens in his own herbarium and that of Yale University, and to W. H. Pearson, Esq., of Knutsford, Cheshire, England, for the loan of the type of *Porella Bolanderi.*

COLUMBIA UNIVERSITY, DEPARTMENT OF BOTANY,
November 13, 1897.

A new Species of Wild Ginger hitherto confounded with Asarum Canadense L.

BY EUGENE P. BICKNELL.

(PLATES 316, 317.)

It has certainly much significance in its bearing on the study of our common flora that a plant so noteworthy as the familiar wild ginger, and supposedly so well understood, should now reveal itself as embracing two perfectly distinct species. Both plants are common and widely distributed, but they are so much alike in general appearance that it is scarcely a matter of surprise that they have held their secret so long. Agreeing in main features throughout, they share the same general form of rootstock, leaf and flower, are similar in habit of growth, and bloom at the same time. The differences between them are, in fact, no greater than might fairly measure the variation of a single species, and that they are of higher import has been learned only by careful field study continued through several seasons.

While the determination of dried specimens is not always easy, living plants may always be distinguished instantly by a glance at the flowers, and further comparative study cannot fail to lead to their recognition as beautifully similar yet beautifully distinct species.

The most obvious differences between these plants reside in the flowers. In one the calyx-lobes are spreading and revolute passing gradually into a slender upcurved acumination, and the interior of the tube is purple nearly down to the base; in the other species the calyx-tube is white within and the flat and reflexed lobes are abruptly acuminate at the apex into a straight obtuse point.

Fortunately there need be no uncertainty as to which one of these plants should bear the name *Asarum Canadense* L. Although the description in Species Plantarum is diagnostic of neither species the citations there given establish conclusively that the Linnaean plant was the one with gradually acuminate calyx-lobes.

The following references enter into the foundation of the Linnean species:

"Gron. Virg. 52.

Moris. hist. 3. p. 511. s. 13. *t. 7. f. 4.*

Corn. Can. 24, t. 25."

The specimen of Gronovius is perhaps no longer in existence, nor is it of any great consequence in view of the sufficiency of the remaining citations. I am indebted to Mr. Edmund G. Baker for the information that this particular type is not to be found among the Gronovian specimens in the British Museum. I have also to thank Mr. Baker for a tracing of the illustration in the rare work of Morison. This figure proves to be merely a reduced copy of the plate of "*Asaron Canadense*" in Cornuti's "Canadensium Plantarum," published in 1635, which is a crude but quite unmistakable illustration of the plant with gradually acuminate calyx-lobes, establishing perfectly the significance of the Linnaean name.

The synonomy of this plant is as follows:

ASARUM CANADENSE L. Sp. Pl. 1: 442. 1753.

A. Carolinianum Walter, Fl. Car. 143. 1788.

A. latifolium Salis. Prodr. 344. 1796.

A. Canadense β obtusum Muhl. Cat. 1813.

A. acuminatum Muhl. Cat. ed. 2. *Nomen nudum.* 1818.

A. parviflorum Raf. New Fl. 2 : 20. 1836.

A. furcatum Raf. l. c.

A. medium Raf. l. c.

"*A. villosum* Muhl. Cat." vide Duchartre in DC. Prodr. **15** : 424. 1864.

It is quite possible that one or more of these names had at least partial reference to the neglected species here discussed, but there is nothing in the definition of any one of them to justify its present revival.

The three names of Rafinesque are together passed into the synonomy of *A. Canadense* L. by this remark of Rafinesque himself in connection with his descriptions: "The *A. Canadense* differs from all these by smooth reniform leaves, calyx reflected, etc." These words evidently refer to our new species, and show that Rafinesque really knew both of our plants but made the mistake of renaming true *Canadense,* assuming that to be the one which was undescribed.

It appears probable that Muhlenberg earlier fell into the same error. His *nomen nudum, Asarum acuminatum,* may well have referred to true *Canadense,* allowing the inference that his further catalogue names, *A. Canadense* and its variety *obtusum,* really stood for the undescribed plant. This, however, is only conjecture, and as the leaves of true *Canadense* are either acute or obtuse no warrant it found for now taking up Muhlenberg's varietal name. There is little doubt that Salisbury's name, *Asarum latifolium,* is a synomym. The description of this plant as quoted by Willdenow (I have not seen the original publication) correlates it sufficiently with the Linnean species.

Walter's plant was doubtless based on a malformed example of one or the other of our species, both of which sometimes occur with "*folius * * emarginatus,*" apparently the result of accident to the growing bud; nothing in Walter's description is distinctive of either plant. It would thus appear that there is no sufficient evidence that the new plant has ever had a name. It may now therefore be called *Asarum reflexum* in allusion to its characteristically reflected calyx-lobes.

The two plants agree in the following characters:

Rootstock horizontal, branching, jointed, each internode marking one season's growth, and throwing out long fibrous roots; leaves two, rising on long, erect, pubescent petioles from the ends of the new shoots, appearing opposite by suppression of the axis; leaf-blades reniform, the innermost in the bud commonly more acute than the outer one and often with a shallow indentation on either side giving it a slightly three-lobed outline; new shoots provided with three large, membranous, alternate scale-like bracts subtending minute axillary buds which may or may not develop into branches; flower solitary, peduncled in the fork of the petioles; calyx coherent below with the six-celled, many-seeded ovary, campanulate, three-parted with spreading limb, pubescent, the tips of the valvate sepals inflexed in the bud; stamens twelve, alternating in a longer and shorter series subequal with the united styles and inserted at the base of the column, at first recurved against the surface of the ovary, each series finally rising in turn against the column, the longer series first; filaments longer than the adnate, extrorse anthers, the connective terminating in a subulate projection; styles coherent in a column 6-lobed at the apex, separating and spreading at maturity, the cells of the ovary opening loculicidally; capsule bursting irregularly and dissipating in loose mealy tissue; seeds ovoid, prominently carunculate.

Asarum Canadense L.

Rootstock short, stout, 2.5–15 cm. long, 6–10 mm. thick, short-jointed, constricted at the nodes, its branches short, spreading or reflexed, sub-opposite, often approximate, usually developed only from joints of the preceding season on rhizomes of several years' growth; joints or internodes puberulent, 1.5–4 cm. long, the lower end of each joint contracted, and narrowly scarred from the insertions of the fallen bracts; roots numerous, mostly clustered at the lower ends of the internodes, often densely matted together; bracts broadly ovate, more or less puberulent, obtuse, approximate or overlapping, finally loosely spreading and deciduous; leaves commonly reniform-cordate, little, if at all, broader than long, with a deep, often partly closed sinus, acute or obtuse at the apex, rugose-veiny, the hirsutulous-puberulent upper surface with a satiny lustre, the lower surface somewhat shining beneath the close pubescence of minute white hairs; petioles 3–6 mm. thick, at first canescent throughout or densely white-pubescent with short, spreading or slightly reflexed hairs, becoming more loosely pubescent, or puberulent, often with cinereous or somewhat rusty hairs; leaves at first 4–7 cm. broad on petioles, 2.5–5 cm. long, later becoming much larger, and reaching an extreme size of 21 cm. wide by 19 cm. long on petioles 32 cm. in length; flowers at anthesis usually reclining on the ground on short, spreading or declined peduncles, at maturity often erect or raised on ascending or erect peduncles 13–40 mm. long; freshly opened flower about 1.3 cm. long, the tube of the calyx about twice the length of the ovary, when fully grown, often 2.5 cm. long and 12–15 mm. wide, the ovary and tube of about equal length; upper half of the erect calyx-lobes spreading or ascending, somewhat crescentic in outline with revolute margins which pass into an upcurved tubular acumination 4–8 mm. long; spread of the flower across the acuminate lobes 2–3.8 cm., the opening of the tube circular; rudimentary petals almost always present as filiform bodies 2–4 mm. long, rising from the surface of the ovary opposite the sinuses of the calyx; peduncles and calyx villous-pubescent, or in age nearly canescent, the spreading purple segments densely erect-puberulent with thickish purple hairs, or sometimes greenish and nearly glabrous, probably through abrasion; inflexed tips of the calyx-lobes in the bud coherent and extending down to the tip of the column; exterior of the calyx hexagonal, the six faces plane, dull-whitish to greenish-purple, the interior of the tube deep purple more than half-way down to the white base which surrounds a hexagonal purple band enclosing the stamens; surface of ovary at maturity somewhat pyramidal, rising into the short, thick terete column which is 2–4 mm. high and rather deeply six-lobed at the summit; stigmas prominent, at anthesis pale pink and densely spiculate; stamens dull pinkish-purple, anthers dull pink; prolonged tips of the filaments slender-subulate, from one to three times the length of the anther in the longer series of stamens. (Plate 316.)

Specimens examined indicate a range from Quebec and Ontario to western Massachusetts, southeastern New York and Pennsylvania and southward in the Alleghanies to Virginia. Mr. Pollard tells me that the species is frequent about Washington.

The plant grows in rich hilly woods often in rocky situations. It begins to flower at New York from the third week in April to the first week in May; in some seasons flowers are still to be found at the end of June.

After the flower has fallen the bud for the next season's growth appears at one side of the cicatrix left by the peduncle, or sometimes an opposite bud also forms, but fails to develop. In late summer the primary bud is well developed and encloses the next season's flower and leaves perfectly formed.

Two instances of dimerous flowers have been observed, and it is recorded by Decainse (D.C. Prod. **15** : 424), that tetramerous flowers are not rare. Occasionally the plant develops undersized leaves which are oblong with rounded or slightly cordate base, or even decurrent into the petiole.

ASARUM REFLEXUM n. sp.

Rootstock slender and elongated, 1.–4.5 dm. long, about 4 mm. thick, or shorter and stouter in one form of the plant, its branches usually slender and remotely alternate, often elongated and again branched; internodes 4–10 cm. long, little if at all contracted at the joints, glabrous, the bract scars prominent, the uppermost distant; roots fewer and more slender than in *Canadense*, more scattered, or borne mainly at the forward ends of the internodes; bracts narrower and more acute than in *Canadense*, less pubescent, more or less separated or distant, early spreading and deciduous; leaves broader than long, varying from reniform and lunate-reniform with a shallow open sinus to suborbicular with a deep sinus, obtusely pointed, broadly acute or rounded at the apex, darker green, thinner and less rugose than in *Canadense*, commonly nearly glabrous above and with a satiny lustre, somewhat shining on the lower surface through the thin or sometimes close pubescence of minute hairs; a common size of the leaves is 10 cm. wide, by 8 cm. or less long on petioles 1.5 dm. long, an extreme size 1.7 dm. wide on petioles 2. dm. long; at vernation the petioles are relatively longer than in *Canadense*; petioles slender, 3–4 mm. thick, loosely or thinly tortuose-pubescent with slightly longer and softer hairs than in *Canadense*, somewhat shining on the outer surface and mostly glabrous towards the base except along the villous-pubescent inner margins, often nearly glabrous throughout in age; flowers smaller than those of *Canadense*, 8–20 mm. long, 7–14 mm. wide, spreading 16–26 mm. across the extended lobes, the tube 4–8 mm. high, at anthesis on slender ascending or erect peduncles, at maturity mostly spreading or reclined on peduncles 3.8–5 cm. long; the ovary from the first about the length of the calyx-tube; limb early reflexed, in age sometimes ascending, the lobes 8–10 mm. long, about the length of the tube, flattish and rather brittle, triangular in outline, ending abruptly in a straight obtuse point 2–4 mm. long; opening of the flower commonly more or less triangular; rudimentary petals usually wanting; peduncle and calyx densely cottony-villose, much less so in age, the outer surface of the sepals loosely pilose-pubescent, the reflected brownish-purple segments somewhat shining and minutely puberulent with dull purple hairs and faintly parallel-veined; inflexed tips of the sepals in the mature bud extending only half-way to tip of column; interior of tube white or greenish-white below the rim, the disk surrounded by a purple band as in *Canadense*; exterior of flower white to greenish-purple, the hexagonal base with prominent rounded angles and intervening depressions; surface of ovary plane or nearly so; column slender, columnar, longer than in *Canadense*, 4–7 mm. long, strongly grooved to receive the longer series of stamens, the stigmas greenish and purple, rather smaller than in *Canadense* and often merely granulose; stamens deeper purple than in *Canadense* with shorter anthers, the filaments slightly longer and closer to the column, their tips shorter and less attenuate, often less than half the length of the anther. (Plate 317.)

Rich low woods along streams or river valleys, often forming extensive beds; more rarely in upland woods; flowering at the same time as *A. Canadense*. Southeastern New York, and doubtless Connecticut, to Iowa, south to the mountains of North Carolina, Missouri and Kansas.

Aside from the notable differences of the flowers which has already been emphasized, *Asarum reflexum* differs generally from *A. Canadense* in more slender habit, sparser pubescence of rather longer hairs, and more broadly reniform leaves. The plant is also much less aromatic.

The typical form of the plant which occurs in rich woodland along the banks of streams and rivers is particularly characterized by slender elongated rootstocks loosely interlaced on and near the surface of the ground, long internodes, and broad leaf-blades with divergent sides and wide openly graduated sinus. The occasional form of drier upland woods is rather stouter and more pubescent with shorter internodes and rootstocks, the leaf-blades commonly suborbicular and more or less rounded at the apex, the sides parallel or approaching rather than divergent and rounding into or even overlapping at the sinus, which is very wide at the insertion of the petiole; the opening of the flower is nearly circular instead of more or less triangular as in the type.

This plant has been especially studied in Van Cortlandt Park, New York City, where the typical form is found in abundance in the woodland along Tibbit's Brook and the upland form also occurs. Through the kindness of Prof. Trelease I have been enabled also to examine fresh material from the vicinity of St. Louis.

A single plant bearing a 4-merous flower was collected in Van Cortlandt Park.

Type material from Van Cortlandt Park will be deposited in the Herbaria of Columbia University and the New York Botanical Garden, the Gray Herbarium and the Herbaria of the Missouri Botanical Garden and the U. S. Department of Agriculture.

The foregoing description of *Asarum reflexum* has been drawn to cover only the typical plant and its causal variations. It would appear that a geographical variety must also be recognized. Living specimens were sent to me in May, 1897, collected on the bank of the Desplaines river at Maywood, Illinois, near Chicago, which, though essentially like the type, show characters apparently never developed by the more eastern plant. As in the case of *A. reflexum* and *A. Canadense* here again the most evident differences are found in the flower, which shows especially a notable elongation of the strongly reflexed calyx-segments as denoted in the accompanying illustration (Plate II., a, b).

The variety may be characterized as follows:

ASARUM REFLEXUM AMBIGUUM n. var.

Slender, the leaf-blades short and very broad with a deep wide sinus and mostly abruptly pointed at the apex, the lower surface rather densely, even softly, pubescent; flowers often longer and narrower than in *reflexum;* exterior of calyx nearly white, very woolly tomentose, the tube 8–10 mm. long, the reflexed lobes longer and narrower than in the type with much longer points, 8–9 mm. wide at the base, 12–17 mm. long, the straight slender points 4–8 mm. long, sometimes extending back to the base of the calyx and closely appressed against it; surface of reflexed lobes light brownish-red, distinctly parallel-veined, glabrate; column short, 3–4 mm. high; hexagonal band on surface of ovary narrower than in the type and of a bright purplish-red color.

In one specimen the calyx-lobes are almost pointless, but are longer than normally and evenly graduated to the apex.

The type will be deposited in the Herbarium of the New York Botanical Garden.

A comparative histological study of *Asarum reflexum* and *Asarum Canadense* has been undertaken by Dr. Albert Schneider, now of Northwestern University, the results of which will shortly be published. Dr. Schneider tells me that his preliminary examination shows that the histological elements are structually almost identical in the two plants, but that their arrangement and relative abundance are strikingly different. In *A. reflexum* the annular and spiral vessels are much more numerous than in *Canadense,* in which tracheids predominate. The usual reaction tests for *Canadense* meet with a weaker response from *reflexum* very much as with *A. Europaeum.* Dr. Schneider is of the opinion that the new plant should probably be excluded from the Pharmacopaeia owing to the apparently deficient medical principle. A careful chemical analysis is necessary to decide this.

The drawings are reduced in engraving to about two-thirds natural size.

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* The proofs of this article came to hand a few days after the receipt of a privately printed paper by Mr. W. W. Ashe, entitled "The Genus Asarum in Eastern America," in which is described *Asarum Canadense acuminatum* nov. var. The points of distinction indicated for this new variety are "Calyx-lobes gradually acuminate, longer than the tube," *Canadense* itself being credited with calyx-lobes "as long as or somewhat longer that the tube, abruptly acuminate."

As already shown in the present paper, the one of our two common eastern plants having the longer more gradually acuminate calyx-segments is the authentic *Asarum Canadense* of Linnaeus, and the very plant, in all probability, to which Muhlenberg afterwards applied the name *acuminatum,* now again used by Mr. Ashe.

There occurs in Minnesota a form of *Asarum* having very long, slenderly acuminate calyx-lobes and apparently occupying a position between *A. Canadense* and *A. caudatum.* Having seen but a single specimen of this plant allusion to it was deferred until further material should be forthcoming. Minnesota is one of the localities named by Mr. Ashe for his new variety, which may very possibly represent a plant not found at all farther east. The matter cannot be followed to a conclusion at the present time, when this paper goes at once to press.

Botanical Notes.

A correction. In some way, a mistake was allowed to pass in my article in the October BULLETIN on "Plants of New Mexico." On page 478 the reading is "Edwinia Wrightii," when it should be as follows:

FENDLERA WRIGHTII (Engelm. & Gray).

Fendlera rupicola var. *Wrightii* Engelm. & Gray, Pl. Wright. 1: *77. pl. 5. f. 2.* 1852.

A. A. HELLER.

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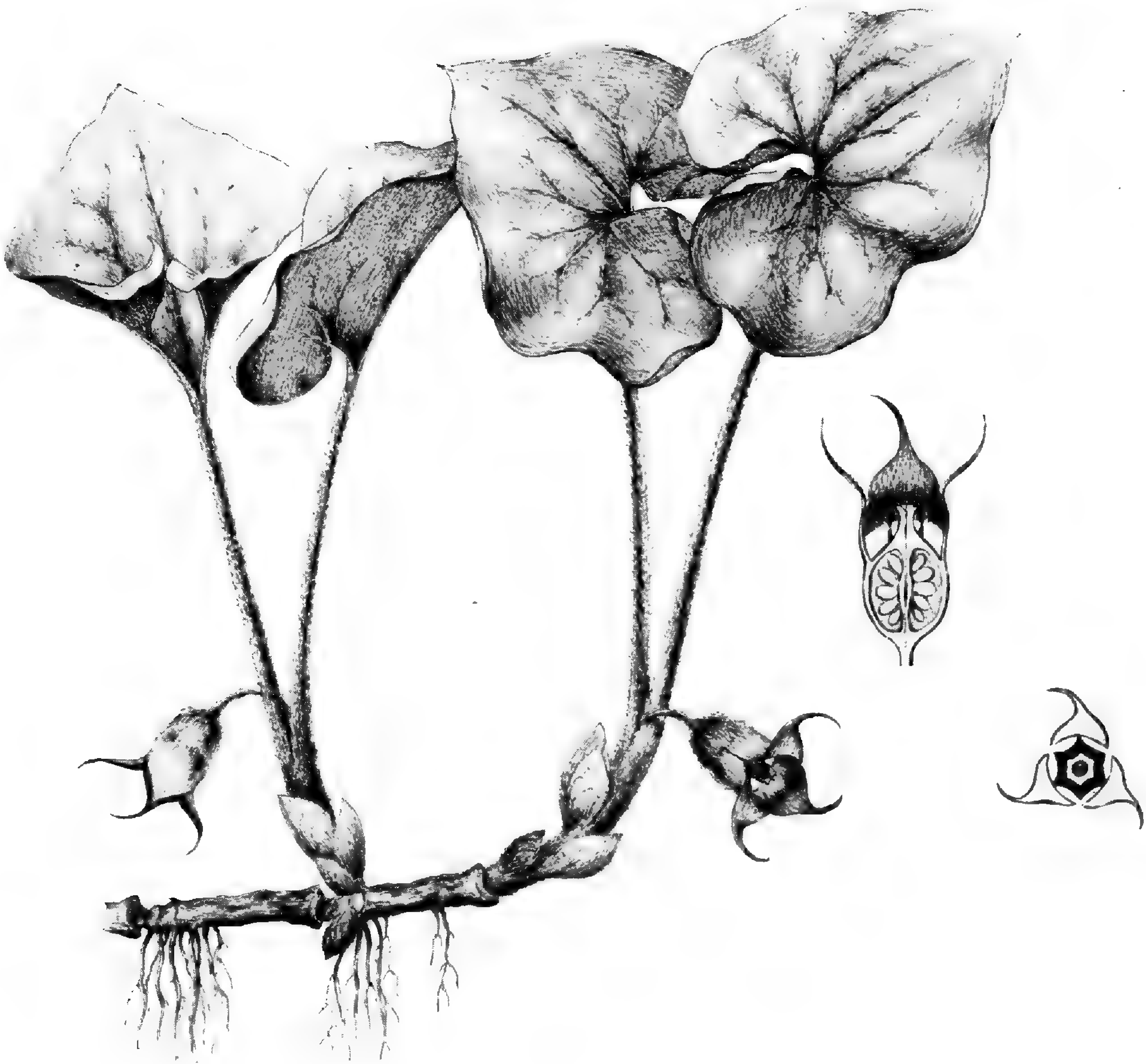

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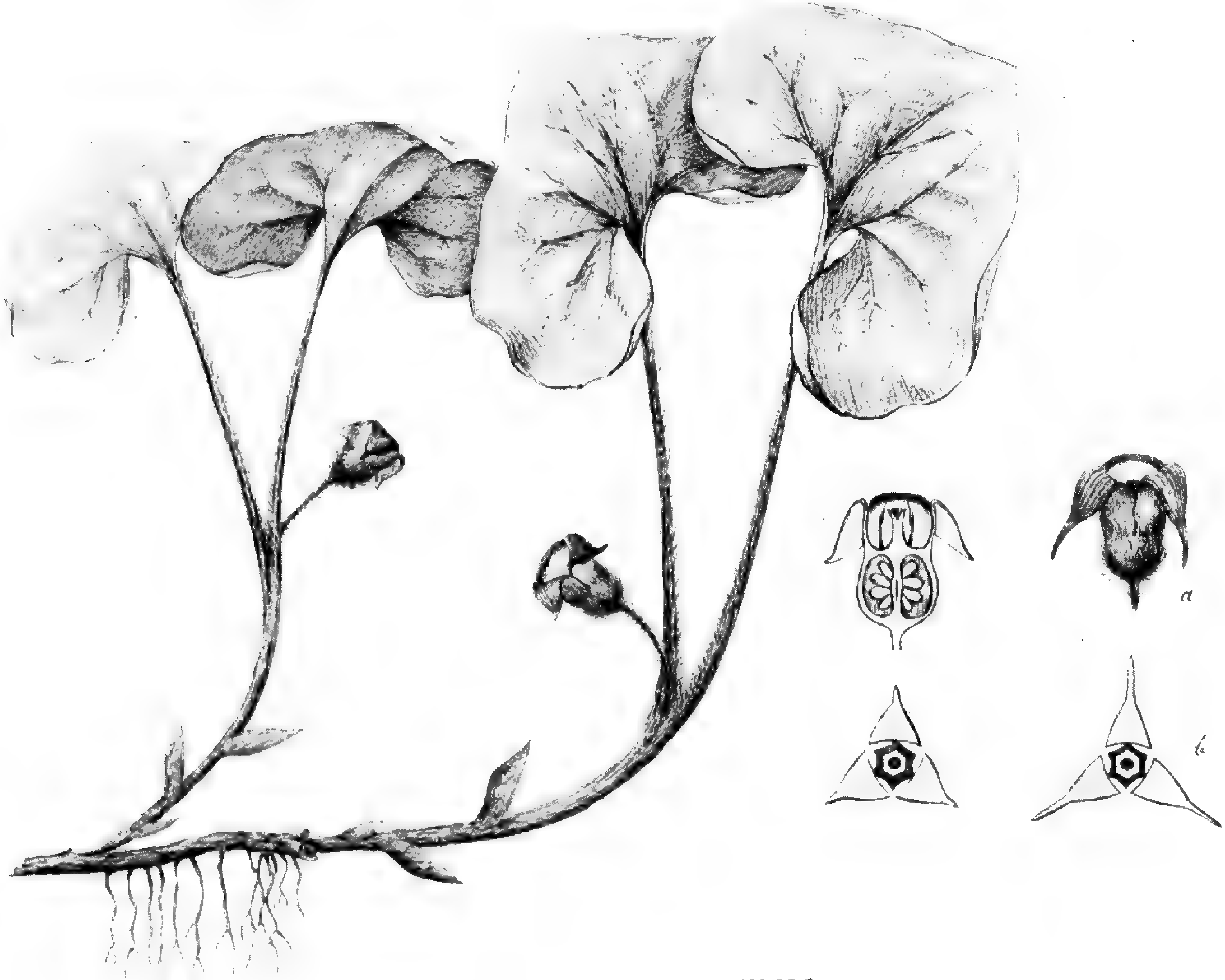

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BULLETIN

OF THE

TORREY BOTANICAL CLUB.

Vol. 24. Lancaster, Pa., December 30, 1897. No. 12.

A Revision of the North American Species of Ophioglossum.

(Plates 318–319.)

By Elizabeth G. Britton.

The Fourth of July excursion of the Torrey Botanical Club in company with the Philadelphia Botanical Club and the Washington botanists, took place at Wildwood, New Jersey, a flourishing seaside colony about 12 miles from Cape May. On the afternoon of the 3d, Mr. Joseph Crawford, in company with Mr. Pollard, and Dr. Valery Havard, found a patch of *Ophioglossum*, between Holly Beach and Wildwood, growing in open woods under holly and oak trees (*Q. nana* and *Q. falcata*), in sandy soil where the grass had been cut. This single colony was the only one found in the region, and contained hundreds of plants, all in mature condition and beginning to turn yellow, thus making the patch a conspicuous object. All of us who had seen *O. vulgatum* growing, felt positive that this was not that species nor any other with which we were familiar. I was delegated to describe and name it and decided to call it, from its habitat, *O. arenarium*. I sent a specimen to Prof. Underwood, then at Kew, for comparison; after consulting with Mr. Baker, it was decided that it belonged to the section with *O. lusitanicum*, which has a similar gregarious habit, but differs in its much smaller size and narrower frond.

Prof. Underwood has called my attention to a monograph of the genus by Prantl (Jarhb. d. K. Bot. Gart. Berlin, 3: 297–350. 1884), in which two new North American species are described, thus far not included in our text-books, *O. Engelmanni* and *O. Cal-*

ifornicum. These are perfectly distinct, and *O. Engelmanni* has a wide range, having been found in all the larger herbaria, such as those of Torrey and Gray, Eaton and Underwood, Canby and Gilbert, Engelmann and the National Herbarium. *O. Californicum* has thus far been seen only from the type locality at San Diego, California, where it was originally discovered in 1850, and specimens sent to Dr. Torrey by Dr. Parry, and from two other stations.

Through the kindness of Dr. Evans, Dr. Robinson, Dr. Rusby Prof. Underwood, Mr. Pollard, Mr. Davenport and Prof. Trelease I have been able to see a large number of specimens of this genus and have been particularly interested in studying the variations of *O. vulgatum.* Seven different forms of the sterile lamina can be named as follows: 1. Ovate-amplexicul, acute. 2. Ovate-sessile, obtuse. 3. Oval and elliptical, acute and obtuse. 4. Oblanceolate or obovate with tapering base. 5. Lanceolate and smaller. 6. Rotundate (immature). 7. Linear-lanceolate, occasional.

It seems a little difficult to tell some of the young fronds of *O. vulgatum* from the mature ones of *O. arenarium,* and yet the extremes are so different, and the habit and habitat so distinct, that I have concluded to maintain them as separate species. That *O. arenarium* has originated from *O. vulgatum,* and that intermediate forms may be found in young or poorly developed forms of *O. vulgatum* does not alter the view from the modern standpoint of evolution.

Young and immature specimens of what have been supposed to be *O. vulgatum* have been collected by a number of American botanists. In the Torrey Herbarium, unnamed, there is a sheet with six small immature specimens, two bearing fertile spikes and the following note by Dr. Gray:

Ophioglossum n. sp. I send you ½ I have and probably shall not be able to procure any more very soon. 15 or 20 specimens were found on a dry hill at Exeter (Otsego Co.) 12 of them in fruit. A few specimens are in the hands of a friend who first noticed it, Dr. Hadley has a specimen and I sent some to Beck 2 years ago (the same summer it was discovered). He has never given an opinion or said a word about it. I do not know that *O. vulgatum* or any other species has been found in this section. It appears to come near *O. pusillum* Nutt. but that species has "frond cordate acute"—this has the frond *acute at the base* and obtuse at the extremity. These specimens are as large as any that have been found.

If you think it new suppose you publish it. A. G.

Dr. Robinson sent for comparison from the Gray Herbarium the remainder of this same collection. They agreed perfectly with Dr. Torrey's in their immature condition and are labeled by Dr. Gray.

"Depauperate *O. vulgatum*, Exeter, Otsego Co. Dr. Curtiss." Inside the packet are two labels; one reads in Dr. Gray's handwriting.

"*Ophioglossum*. Can it be *O. vulgatum*? I am informed it is constantly of this size."

The other reads "It looks different, but still may be small var. of *O. vulgatum*. It would be desirable to see more specimens."

In searching Dr. Gray's letters I find in his autobiography an account of his early botanizing and collecting from 1828–1830, and that he speaks of showing plants that puzzled him to Dr. Hadley, and of beginning a correspondence with Lewis C. Beck, of Albany, and Dr. Torrey. While at Utica he spent one summer vacation collecting "down the Unadilla to Pennsylvania." The Unadilla is one of the northern tributaries of the Susquehanna, and forms the western boundary of Otsego County, where these ferns were collected by Dr. Curtiss. From the letters it would seem to have been about 1830. None of these specimens are more than 7 cm. high, the petioles 3–5 cm., the blades 2–3 cm. long by 5–10 mm. wide, lanceolate or oval, and the fertile spike is still so undeveloped that it is not more than half the length of the blade, and nearly sessile. Only two specimens at all like these have been seen from Europe, and they were found in Dr. Gray's and Prof. Eaton's herbaria, collected by Blytt at Christiania, Norway, and are labelled *O. vulgatum*. Some of them resemble the young sterile fronds of *O. arenarium*, especially those which do not bear any fertile spikes, yet the probability is that they are immature *O. vulgatum*, as similar specimens have been collected in May and June by Stewart H. Burnham at Vaughns, N. Y., and Alvah A. Eaton at Seabrook, N. H.

In the Herbarium of William H. Leggett, there were two sets of specimens collected by Mrs. Lucy A. Millington and a letter from her dated from Glens Falls, October 17, 1873, in which she says:

"I have always wished to botanize in North Elba on the sand plains and along their swamps. The sand is nearly white in some places and curiously enough there are heavy forests of deciduous trees there as well as some of larch and stunted Balsams. I enclose all the specimens of *Ophioglossum* I happen to have at present. The smallest are very poor ones, for which you may blame our growing village which runs streets into the very hiding places of our shyest plants, *Mitella nuda*, *Antigramma*, and this small fern nestling in the grass. I might, perhaps, have given you better ones. There is one more form of it which I wished you to see with the rest, where the frond is thick and clumsily shaped as if unfinished. It seems to lack the delicacy and grace of other ferns in a remarkable degree. The North Elba specimen is the first *Ophioglossum* I ever saw and I found but two. The specimens from Glens Falls are poor, as the ground having been constantly travelled over in consequence of a street being opened."

The small, immature specimen from North Elba has a broad oval frond, 2 cm. long by 1 cm. wide, and agrees with the broadest of the small ones collected by Dr. Gray. The specimens from Glens Falls are five in number; the tallest of them is 11 cm. in height with a fertile spike and pedicel 7 cm. long, and they resemble fruiting specimens of *O. arenarium*. She also sent Mr. Leggett a large specimen of *O. vulgatum* from Elizabethtown, N. Y., and she says she has found it more common than she expected.

Various intermediate stages of young *O. vulgatum* have been found in the collections examined. One of these dwarfed specimens was collected by Prof. Eaton at Brattleboro, Vermont; it is mounted with seven others, grading up in size to the normal form. Mr. Canby had one small specimen collected at Gilmanton, New Hampshire, by Joseph Blake, and two others from Norway, Maine, collected by S. I. Smith, which are much smaller than normal. Prof. Engelmann had specimens collected by E. Durand at Bethlehem, Pennsylvania, in 1853, with small lanceolate fronds, most of the plants, however, were immature; and Mr. Newlin Williams has collected in low damp woods with *Habenaria lacera*, at Solebury, Bucks Co., Pa., two specimens which are taller and larger than *O. arenarium*, but have the lanceolate leaves and narrow venation of that species. Prof. Macoun has collected on Prince Edward Island, in wet pastures near the sea, four small leathery specimens, which approach *O. arenarium* in size and shape, but five others from the same locality show them to be *O. vulgatum.* Prof. Underwood has collected at Baldwinsville, N. Y., a set of young specimens of *O. vulgatum,* on June 14, 1890, part of which he pressed and the rest he cultivated in the laboratory until they matured. The smallest ones, with the shortest petioles and pedicels, had the blade almost round, like those of Dr. Gray and Mrs. Millington. He also has specimens from White Lake, Jamesville, New York, and West Goshen, Connecticut, which might well be taken for *O. arenarium,* but at the latter station he found all the intermediate forms which connect with *O. vulgatum.* In fact, his herbarium is rich in uncommon and intergrading forms of this species. I have seen one set of small European specimens which are intermediate between *O. vulgatum* and *O. arenarium,* and these were collected near Venice by Rigo, and have small ovate-lanceolate blades, and none of them exceed 14 cm. in height.

Mr. Willard N. Clute called my attention to the notes in the Linnaean Fern Bulletin, and told me that at the time that *O. vulgatum* was distributed to the members of the Fern Chapter, he had been struck by the great variation in the size of this fern. I wrote to Mr. Stewart H. Burnham, of Vaughns, N. Y., who kindly sent me a very interesting series of variations, the youngest of which, collected in May, 1896, are the exact counterpart of Dr. Gray's small specimens from Exeter. He also collected on July 7th, in a limestone pasture, small double specimens very closely approaching the Italian specimens collected by Rigo. Other specimens from the edge of the swamp and from beech woods are the large elliptical and oblanceolate forms of *O. vulgatum.* One of them is remarkable for the extreme elongation of the fertile spike beyond the sporangia.

One of the most marked characteristics of *O. arenarium,* aside from its habitat, is its habit of growing with usually two fronds from the same rootstock. This has also been observed in specimens of what appear to be *O. vulgatum,* though, in four out of seven cases noted, the blades of the sterile frond, whether bearing fertile spikes or not, are much reduced in size and venation, becoming either short or oval, as in Chapman's specimens from Florida, and Canby's from Pennsylvania, or else bearing one normal frond and another much narrower. Prof. Eaton, however, had one double plant from Brattleboro, Vermont, with two large normal fronds, and Austin collected similar specimens at Closter, New Jersey. Prof. Macoun, however, found two and three fronds together on grassy banks at Hastings, which are quite unlike *O. vulgatum*, and yet are larger than *O. arenarium*.

All these variations suggested an inquiry as to what might be considered typical *O. vulgatum*. The description in Gray's manual reads: "Sterile frond (in the N. American form) obovate or ovate with a tapering sessile base and mostly borne below the middle of the stalk of the fertile spike." The figures given in the Manual show a large ovate-lanceolate sterile frond, 6 cm. long by 3 cm. wide. Very few American specimens have been seen which agreed with this figure, but they have been collected by Alvah A. Eaton in New Hampshire, Alfred Commons in Delaware, McCulloch in New Brunswick and Austin in New Jersey. The commonest form throughout the Northern and Eastern states, however, is like the figure given by Prof. Eaton in his Ferns of North America, which he describes as "sterile segment fleshy, sessile near the middle of the plant, ovate or elliptical, one to three inches long." His figure shows an oblanceolate frond, blunt at apex and tapering to a long narrow base. Elliptical fronds also are common, and the figure given in the Linnaean Fern Bulletin for October, 1896, fairly represents a common American variation. None of the oblanceolate fronds have been seen from Europe, though shorter and broader oval fronds occur on both continents, as well as the longer elliptical ones; a broad, blunt and distinctly ovate form is also common to both. Linnaeus describes the frond as ovate and cites Plumier's figures, which, unfortunately, I have not been able to see. The common European form, however, seems to be more acute and ovate-lanceolate, with an amplexicaul base, and is, therefore, often carinate; in American specimens it is very rare to find a leaf that is keeled owing to the tapering flat base. Specimens seen from England, France, Germany, Hungary and Switzerland are all broadest just above the base, and taper to an acute apex.

The venation varies according to the size and shape of the frond; in the ovate and oval forms the short marginal areolae, each with a single short, free veinlet, are more numerous; in the elongated elliptical or oblanceolate forms the long narrow central areolae without any free veinlets, are more numerous. The immature and smallest fronds are more fleshy and the venation less distinct, the areolae much smaller, with seldom any free veinlets. In some fronds there is rarely a distinct or continuous midvein, somewhat stronger than those on either side, but in most fronds the central part of the leaf is marked by the extremely elongated and approximate narrow areolae.

In size Prof. Eaton says they vary "from two to twelve inches." Two inches would only include such very young forms as those collected by Dr. Curtiss at Exeter and Blytt's from Christiania. The usual size varies from 6–16 inches and the relative length of the stalk above and below the leaf also varies, the younger ones being longer below; for, as the plant matures, the fertile spike elongates and often exceeds the common petiole below the leaf. In *O. arenarium* it is 2–3 times longer, the petiole being quite short and immersed; this is true also of the small European specimens in the Gray Herbarium collected near Venice by Rigo, and of Macoun's multiple specimens from Hastings.

Prantl admits that the spores vary in size and the number of meshes, the largest specimens bearing the largest spores with the greatest number of meshes, but he says he has found similar spores on smaller double specimens. I have not found any American spores having as few areolae (6–12) as he describes in *O. vulgatum;* ours often have as many as 25–30 areolae on one surface of the spore, and the outline appears as a series of indentations rather than a papillose surface, as seen in the European specimens. I have found that in *O. arenarum* the surface is marked by irregular warty protuberances, almost all traces of the polygonal areolae of *O. vulgatum* being lost, and the surface less regularly pitted like a thimble as it is in *O. vulgatum.* I have also seen small forms of *O. vulgatum* approaching *O. arenarium* which had the spores like the former.

O. vulgatum has a wide geographical range, having been collected at various stations in Europe, and also showing much variation according to Prantl. It has been found in Western Asia; Prantl has not credited it to Japan, but there is a specimen in the Gray Herbarium collected in 1891 in Japan, which certainly resembles the smaller, ovate-lanceolate forms of Europe. Prof. Eaton gives the range as follows: "Canada and New England to Texas and Arizona, also Unalaska, Europe, Asia, Madeira and the Azores." All the specimens from Texas and Arizona thus far seen have been found to be *O. Engelmanni.* I have not seen any of the Madeira specimens which Prantl describes as smaller, and approaching *O. lusitanicum.* The Azores specimens sent to me by Prof. Trelease and listed by him as *O. vulgatum polyphyllum* (8th Rept. Mo. Bot. Gard., 175. *t. 64*) have been variously recognized as a good species under the names of *O. polyphyllum* and *O. Azoricum.* They resemble our *O. pusillum* and are certainly quite as distinct. *O. vulgatum* has been collected in four Canadian stations by Macoun and Dawson; it is common in New England, and becomes rarer southward, through New York, New Jersey, Pennsylvania and Maryland, overlapping the range of *O. Engelmanni* in Virginia, Tennessee, Kentucky and Indiana. Several smaller, ovate forms have been collected in Louisiana and Florida by Hale and LeConte, and Blasdale has collected what appears to be this species in California. The specimens from Unalaska are either some unknown Asiatic species, or a new species of the *O. reticulatum* group, in which I here describe them as *O. Alaskanum.*

In habitat the North American stations vary from open woods, dry pastures, worn out mowing fields to boggy places with *Arethusa* and *Pogonia ophioglossoides.* In dry pastures it is stunted, in wet grassy places it is larger and less rigid. It is likely that most of the stations recorded in the Fern Bulletin by Miss Price from Kentucky, in dry open cedar woods belong to *O. Engelmanni,* as do all those from sterile and rocky hillsides in the Central and Southwestern States.

Prantl, in his monograph, recognizes 29 species, of which 8 have thus far been found in the United States; 27 of these are in the *Euophioglossum* section with entire sterile fronds, and all our species except *O. palmatum* of Florida belong to this section. The following key has been modified and adapted from his to include only the North American species:

I. EUOPHIOGLOSSUM.—Sterile frond simple, fertile spike I.

PARANEURA.—Sterile frond with several equal parallel veins at base, midvein seldom if at all branched, though generally anastomosing with the lateral veins by short oblique veinlets, often disappearing below the apex.

A. *Vulgata.*—Frond large, ovate to elliptic, basal veins 9–13.

Apex obtuse; areolae narrow with few veinlets. 1. *O. vulgatum.*

Apex mucronate; areolae broad with many veinlets. 2. *O. Engelmanni.*

B. *Lusitanica.*—Frond small, lanceolate; basal veins 3–7.

Plants 5–18 cm. high; peduncle 5–9 cm.; veins 7. 3. *O. arenarium.*

Plants 2–6 cm. high; peduncle 5–15 mm.; veins 3. 4. *O. Californicum.*

PTILONEURA.—Sterile frond with few or several unequal veins at base, midvein branching and generally continuous to apex.

C. *Reticulata.*—Rootstock not thickened; plants 10–30 cm. high.

Sterile lamina ovate or cuneate at base, thin. 5. *O. Alaskanum.*

Sterile lamina reniform or cordate at base. 6. *O. reticulatum.*

D. *Macrorhiza.*—Rootstock thick or globose; plants 3–8 cm. high.

Peduncle from base of the cuneate lanceolate sterile lamina; rootstock tuberous. 7. *O. pusillum.*

Peduncle from petiole; sterile lamina cordate; rootstock globose. 8. *O. crotalophoroides.*

II. CHEIROGLOSSA.—Sterile frond palmately divided, fertile spikes 5–14. 9. *O. palmatum.*

1. OPHIOGLOSSUM VULGATUM L. Sp. Pl. 2: 1518. 1753. Eaton, Ferns of N. Am. 2: 261. *t. 81. figs. 1–3.* 1880. Gray's Manual, 6th Edition t. 20. 1889.

Plants 1–4 dm. high; rootstock cylindric, sometimes quite large and tuberous, bearing 1–3 leaves; petiole partly subterranean, 3–16 cm. long; sterile lamina ovate or ovate-lanceolate, oval or elliptic, most frequently oblanceolate or spatulate, 3–12 cm. long, 1–5 cm. broad; base long and narrow, tapering into the petiole, rarely broad and clasping; apex obtuse or acute, not cuspidate; basal veins 9–11, midvein sometimes slightly stronger, lateral veins approximate and parallel, connected by short oblique veinlets, forming long narrow areolae in the middle of the leaf, and shorter hexagonal ones near the margin and apex with usually one short straight free veinlet; epidermis fleshy and wrinkled in young plants, becoming pellucid when old, with numerous stomata; peduncle arising from the base of the sterile lamina, 10–30 cm. high; spike 1.5–5 cm. long, apex prolonged beyond the sporangia which are in 11–52 pairs; spores .03–.05 mm., reticulated with angular areolae, the ridges between narrow and thickened, making an irregular outline.

Preferring loamy soil in woods or open meadows, occasionally in boggy places or dry hillsides; usually a few scattered plants are found in one locality. Ranging from Quebec and Ontario, south to Florida; also in California. Widely distributed in Europe, Madeira and the Azores and Western Asia, and Japan.

2. Ophioglossum Engelmanni Prantl.

O. vulgatum Eaton, Ferns of the Southwest, U. S. Geol. Surv. 340. 1878.

O. Engelmanni Prantl, Jahrb. d. K. Bot. Gart. Berlin, 3: 318. *pl. 8. fig. 17.* 1884.

Plants 8–22 cm. high; rootstock cylindric with long brown roots, often bearing 2–3 fruiting and 1 sterile leaf on the same plant with the sheathing base of the old leaves frequently persistent; petiole subterranean or partly exserted, 4–10 cm. long; sterile leaf elliptic or lanceolate-elliptic, obtuse but sharply apiculate, 3–9 cm. long, 1.5–5 cm. broad; fleshy, becoming pellucid when old and dry, slightly paler beneath; basal veins 13 or more, median one slightly stronger and unbranched below the middle of the frond, forking and anastomosing with the lateral ones above; lateral inner veins parallel and approximate, outer ones arcuate-erect; transverse veinlets oblique and large, forming broad oblong-hexagonal areas with numerous anastomosing or free veinlets included; cells of the epidermis flexuous, much elongated in the middle beneath, stomata numerous; peduncle starting from the petiole or the base of the sterile lamina, 3–9 cm. long; spike 1.5–2.5 cm. long, apiculate, sporangia 12–27 pairs; spores .045–.050 mm. in diameter, areolae 15–20, angular, striae not elevated.

Easily distinguished from *O. vulgatum* by the apiculate sterile frond, its broad areolae with numerous anastomosing veinlets and its shorter peduncle. Type locality in damp sterile places in the higher valleys at Comanche Spring, Texas, Lindheimer, May, 1849, no. 53. Also common on stony prairies, but very rare there with spikes; on rocks, in cedar woods near New Braunfels, Texas, Lindheimer, May, 1850, 414. It was distributed as *O. vulgatum* var. in E. Hall's Plantae Texanae, from low grounds Houston, April 16, 1871, no. 858. It had first been collected on arid rocks near the Mississippi at Jefferson Barracks, Missouri, by Riehl, May, 1841, 242; Allenton, Mo., G. W. Letterman, June, 1875; Springfield, Mo., E. M. Sheperd, 1879; Rocky hillsides, Eggert, May 31, 1887; Independence, B. F. Bush, May, 1894; 813–822; Calcareous soil, Natchitoches, Louisiana, April, Dr. Hale; wet and shady ground, 4500 ft. alt. Sanoita Valley, Arizona, Dr. Rothrock; on lime rocks, Tanner's Canyon, Huachuca mountains, Arizona, J. G. Lemmon, August 29, 1882; damp places on mesas around Mustang mountains, Arizona, C. G. Pringle, September 13, 1884. It was also distributed as *O. vulgatum mucronatum* by G. D. Butler, in 1875, from Indian Territory below the Arkansas and Red River and is abundant at the highest elevations of the Sierra de San Francisquito, Lower California, T. S. Brandegee, October 18, 1890; on the flat top of a limestone ledge in northwest Arkansas, April, 1880, F. L. Harvey; moist spot in the cedar glades at Lavigne, Tennessee, A. Gattinger, May 16, 1882; dry open woods and cedar groves, Bowling Green, Kentucky, Sadie F. Price. An unusually large and deformed specimen was collected by Prof. Underwood on the campus of Indiana University at Bloomington, Indiana, June, 1893, and W. Alphonso Murrill has collected it this year at Staunton, Virginia.

3. Ophioglossum arenarium n. sp.

Plants 5–18 cm. high, rootstock slightly thickened, bearing 1 or often 2 fertile plants and large fleshy roots; petiole 1–4 cm. long partially or rarely entirely subterranean; sterile lamina 2–5 cm. long, 5–12 mm. wide, lanceolate with a long tapering base, apex obtuse, rarely acute or apiculate, fleshy becoming wrinkled when dry, not pellucid; basal veins 5–7, the median straighter and distinct almost to apex, the lateral more or less parallel and connected by short oblique veinlets, forming long narrow areolae in the centre of the leaf with a few faint free or anastomosing veinlets, and much shorter irregular areolae toward the margin; epidermal cells sinuous, stomata numerous; peduncle arising from the base of the sterile lamina, 5–9 cm. long; spike 1–3 cm. long, often twisted, apiculate with 12–26 pairs of sporangia; spores .04–.05 mm. in diameter, reticulations indistinct or completely obliterated in the ripe spore by numerous minute irregular thickenings, forming a warty surface.

Gregarious in a single colony of hundreds of plants, forming a patch five feet in diameter, of a yellow color when mature, growing not far from the beach, under oaks, cedar and holly in sandy soil at Holly Beach, New Jersey, July 3, 1897, discovered by Joseph Crawford and Charles L. Pollard.

4. Ophioglossum Californicum Prantl.

O. vulgatum Cleveland, Bull. Torr. Club, 9: 55. 1882.

O. Californicum Prantl, Jahrb. d. K. Bot. Gart. Berl. 3: 315. *pl. 7. fig. 11.* 1884.

O. nudicaule L. fide Davenport, Bull. Torr. Bot. Club, 9: 71. 1882.

Plants small, only 2–6 cm. high; rootstock cylindric, tuberous, elongated with numerous large roots; leaves 1–2, sheathed at base by the old ones of the previous year; petioles entirely subterranean, 1–2 cm. long; sterile lamina 1–2 cm. long; .4–.7 mm. wide, lanceolate or ovate-acute, rarely obtuse, or apiculate; fleshy, rugose when dry; basal veins 3, median the stronger, lateral ones branched; transverse veinlets oblique, forming long narrow areolae with few or no free veinlets near the margin; epidermis wrinkled, cells flexuous, stomata straight; peduncle arising from the base of the sterile lamina, only 5–15 mm. long; spike 5–10 mm. long; sporangia 10–15 pairs, apex short; spores .05 mm. reticulate, areolae 20–25, rounded, striae unequal, not elevated.

In grassy, stony spots upon the high mesa near San Diego, California, Cleveland and Parry, March and April, 1882; also Mesas near San Diego, C. R. Orcutt, no. 212, March 25, 1882. Moist mesas, Lower California, April 10, 1882, C. G. Pringle; near Enemada, Mexico, April 10, 1882, M. E. Jones.

In the herbarium of D. C. Eaton there is a specimen collected by D. Cleveland, ex Herb. George E. Davenport which is labelled *O. nudicaule*, "Rediscovered by Dr. C. C. Parry in March, 1882, after a lapse of thirty-two years. A specimen in the Torrey Herbarium labelled simply "*Ophioglossum* Dr. Parry," is evidently one of the original collection, as Dr. Torrey was not living in 1882, and his specimens differ from the later collections in age and condition. Prof. Eaton had one of Dr. Parry's 1882 specimens, which is very interesting, as the sterile frond is bleached and thin, showing the venation perfectly, and the fertile spike is foliaceous and flattened, also bleached and thin, showing the veins and the cells from which the sporangia originate, with a flat, apical prolongation and immature spores, each with three ridges, radiating like spokes, as figured for other species by D. C. Eaton.

5. Ophioglossum Alaskanum n. sp.

O. vulgatum Eaton, Ferns of N. Am. 2: 261. 1880. ex. p.

Plants 6–12 cm. high; rootstock not seen; petiole subterranean in part, 2–8 cm. long; sterile lamina 2.5–6 cm. long, 2–3.5 cm. wide, ovate or ovate-lanceolate, suddenly dilated above the cuneate clasping base; apex obtuse or acute, not apiculate; frond thin or slightly fleshy, venation distinct; basal veins 9–11, midvein slightly stronger at base, distinct to apex, usually giving off 1–4 branches; lateral veins divergent from the base, forming regular hexagonal areolae, connected by short oblique veinlets, including several free or anastomosing veinlets; peduncle arising from petiole at the base of the sterile lamina, 3–9 cm. long; spike 5–20 mm. long, apiculate, sporangia 8–21 pairs, spores .027–.035 mm, trivittate, with irregular broken areolae, giving the surface a warty appearance; striae not elevated.

On hillsides in rather well-drained situations, Unalaska Id. Alaska, L. M. Turner, 1878. Distributed as *O. vulgatum* by George E. Davenport from the Massachusetts Horticultural Society, ex herb. J. Schneck. Mr. Davenport has recently sent us some fine specimens showing considerable variation in size and shape, stating that he had long been intending to re-examine this species, as he felt that it was intermediate between *O. vulgatum* and *O. reticulatum*, and that his specimens are marked "probably *O. reticulatum*." They differ from *O. vulgatum* in the branching midvein and divergent lateral veins as well as in the larger areolae with more numerous included veinlets; from *O. reticulatum*, which has not been reported north of Mexico, in the shape of the sterile frond, which is neither cordate nor reniform. Mr. Baker writes from Kew that he cannot separate the Unalaska plant in any way from *O. vulgatum* and that he looks on *O. pedunculosum* as a mere variety of that species. I cannot agree with him in either of these opinions.

6. Ophioglossum pusillum Nutt. Gen. : 248. 1818.

O. nudicaule Sturm in Mart. Fl. Bras. fasc. 23. 144. In part, not L.

O. tenerum Mett. fide Prantl. l. c. 322. *t. 8. fig. 23.* 1884.

Plants 2–9 cm. high; rootstock short, slightly thickened, bearing 2–7 fronds; petiole very short, 5–15 mm. long, subterranean; sterile lamina small, 5–15 mm. long, 5–9 mm. broad, cuneate-lanceolate or ovate, acute or acuminate, rarely broadest at the base; basal veins 3, midvein distinct to apex, branching by lateral veinlets which form narrow areolae with no free veinlets; epidermis wrinkled when dry, stomata numerous; peduncle arising from the base of the sterile lamina, 2–6 cm. long; spikes 5–10 mm. apiculate, sporangia 6–14 pairs; spores .030–.032 mm., 3-ridged, slightly and indistinctly roughened.

Type locality in South Carolina, Nuttall; sandy hills near the Savannah River, Georgia, Beyrich; sandy pastures near Mobile. Alabama, Charles Mohr, October and November; Apalachicola and Campbellton, Florida, Chapman; on damp sand along the margins of pine barren ponds, Levy Co., 1877, and near Rosewood, Florida, A. P. Garber, November, 1877; Ocean Springs, Mississippi, S. M. Tracy; New Orleans, Louisiana, Drummond, 1833.

A minute species ranging through the Southern and Gulf States to Mexico and Cuba, also in Guiana and Brazil, though many of the larger specimens in the herbarium of D. C. Eaton and probably at Kew, are referable to other tropical American species. A specimen in the herbarium of Prof. Underwood, collected in "Moist places in the Sierra Madre Mountains, Chihuahua, Mexico, by C. G. Pringle, Oct. 21–30, 1887," is certainly not this species. It is much larger and the venation is quite different. It is probably undescribed. There has been much confusion as to the proper name for this species. *O. nudicaule* L. belongs to an African species collected at the Cape of Good Hope by Thunberg, and Prantl enumerates five authors who have applied the name to seven different species, and concludes that our North American specimens should be known by a manuscript name *O. tenerum* of Mettenius. Eaton and other American authors have discarded *O. pusillum* Nutt., because he describes the frond as cordate. Some notes by J. H. Redfield in the Eaton Herbarium made from Nuttall's types at the Philadelphia Academy of Sciences, prove, however, that his specimens of *O. pusillum* are what we have been calling *O. nudicaule*, and he says that it is "scarcely ever more than an inch high." Besides he enumerated *O. bulbosum*, of which *O. pusillum* has been considered a synonym, as a distinct species.

7. Ophioglossum crotalophoroides Walt. Fl. Carol. 256. 1788.

O. bulbosum Michx. Fl. Bor. Am. 2: 276. 1803.

Plants 3–12 cm. high; rootstock globose, large, often 1 cm. in diameter, bearing few slender roots, and several fronds; petioles subterranean, 1–3 cm. high; sterile lamina 1–3 cm. long, .5–2 cm. broad, concave or carinate, broadly ovate and cordate at base, apex acute; basal veins 5, midvein slightly stronger, rarely branched and continuous nearly to apex; lateral veins freely anastomosing, forming short hexagonal areolae with no or rarely one free veinlet; peduncle slender, 1–9 cm. long, arising from the petiole; spike short, broad, 3–10 mm. long, apiculate; sporangia 4–11 pairs; spores .05 mm. diam., reticulate with raised ridges.

Carolina, Walter, l. c.; and "Bosc. Hb. Willd., no. 19422" fide Prantl; South Carolina, Michaux; Summerville, S. C., Constance G. DuBois, April, 1889; Fernandina, Florida, C. E. Faxon, 1873; Manatee, A. P. Garber, March, 1878; Apalachicola, Chapman, February, 1883; New Orleans, Louisiana, Drummond, 1832; Alexandria, Dr. J. Hale; Jackson, Dr. Ingalls, 1835; Mobile, Alabama, Chas. Mohr, 1844; Auburn, L. M. Underwood, March, 1896; Enterprise, Miss., S. M. Tracy, March, 1897; Houston, Texas, E. Hall, March, 1892. This species ranges south into Mexico, Caracas, Bolivia, Chile to Argentina, and has been credited to "Wet Pine barrens of New Jersey" ("Pursh"), in Barton's Flora N., of N. America, and Wood's Class-Book, though this is probably a mistake.

8. OPHIOGLOSSUM PALMATUM L. Sp. Pl. 1518. 1753; Eaton, Ferns of N. Am. **2**: 269. *t. 81. figs. 11–14.*

Cheiroglossa palmata Presl. Suppl. 57. ?

Plants 2–3 dm. high, bearing several fronds from a thick scaly rootstock; petiole 6–20 cm. long, blade 10–20 cm. long, usually palmately divided into 2–9 broadly spreading segments, rarely simple and lanceolate; basal veins 5–8, repeatedly branching and anastomosing, forming long hexagonal areolae without any free veinlets; peduncles arising from the petiole and the base of the sterile lamina, 1–16, short, 1–2 cm. spike 1–3 cm. long; sporangia 15–40; spores .06 mm., reticulations angular, striae slightly elevated.

A tropical species usually found on palms and palmettos in Florida, Caloosahatchee River, Chapman, 1875; hummocks of the Caloosa River, A. P. Garber, 1878; Indian River, Mary C. Reynolds, 1879; Chuckalaskee, E. W. Reasoner, 1887; Manatee, L. M. Underwood, 1891. Ranging through Mexico, and the West Indies, to Brazil.

Description of Plates.

Plate 318. Drawn by Mr. Walpole under the supervision of C. L. Pollard. *Ophioglossum arenarium*, n. sp., E. G. Britton.

Plate 319. Drawn by F. Emil under the supervision of E. G. Britton. Venation of fronds in 1. *O. vulgatum.* 2. *O. Engelmanni.* 3. *O. arenarium.* 4. *O. Californicum.* 5. *O. Alaskanum.* 6. *O. reticulatum.* 7. *O. pusillum.*

New or otherwise interesting Plants of Eastern Tennessee.

BY T. H. KEARNEY, JR.

The following notes relate, for the most part, to a collection made by the writer during August and September, 1897, in Cocke county, Tennessee. Most of the material was collected about Wolf Creek Station, and between that point and Lemon's Gap, as well as along the French Broad between Paint Rock and Del Rio. The highest elevations visited were The Bluff and Max Patch Mountains, both about 1400 m. high. Along the French Broad near Wolf Creek the height above sea-level is probably not much over 600 M.

TRADESCANTIA MONTANA Shuttlw.; Britton & Brown, Ill. Fl. 1: 377. 1896.

Common about Wolf Creek, and the only species observed there. Two well-marked forms were noted, both growing on rather fertile soil in open, hillside woods. In one the stems are several from one root, slender, rather flexuous (but not strongly zigzag as is usually the case in *T. pilosa*), about 3 dm. high, and the largest leaves are 15 cm. long and about 1 cm. wide. In the other form the stems are usually solitary, stout, not flexuous, attaining a maximum height of 9 dm., and the largest leaves measure 25 cm. long and 2 cm. wide.

DISPORUM sp.

Fruiting specimens of a *Disporum* were collected near Wolf Creek Station (no. 917) but whether of *D. maculatum* (Buckl.) Britton or of *D. lanuginosum* (Michx.) Nichols., I am unable to decide. Distinct as the two species are when in flower, I can nowhere find any characters given for differentiating them when in fruit. Careful study of the two species in the field, localities for each having first been accurately marked while the plants are in flower, may bring to light characters that will serve to distinguish them later in the season.

CELTIS PUMILA Pursh, Fl. Am. Sept. 200. 1814.

Grows on dry sandstone cliffs along the French Broad River near Wolf Creek (no. 886), accompanied by *Philadelphus hirsutus* Nutt. and *Pentstemon Smallii* Heller. The fruit, at that time (Aug. 25) apparently quite mature, was of a tawny yellow, and did not darken at all in drying. The largest stem noted was about 1 cm. in diameter just above the ground. The maximum height was about 1 m. The leaves do not agree in one particular with Pursh's description: they are extremely scabrous above, while Pursh says "foliis utrinque glabriusculis."

BUCKLEYA DISTICHOPHYLLA (Nutt.) Torr. Am. Journ. Sci. **45**: 170. 1843.

A number of plants were encountered during the past season growing in rather dry soil on a wooded bluff on the French Broad River between Wolf Creek and Paint Rock, fully 30 m. above the river. I have not before seen *Buckleya* growing so high above the surface of the water. The plants were less vigorous than those nearer the bank. The bushes everywhere fruited abundantly last season, while in 1896, I was told, scarcely any fruit could be found.

SILENE OVATA Pursh, Fl. Am. Sept. 316. 1814.

Quite abundant in places near Lemon's Gap, Cocke County (alt. about 1200 m.) growing in fertile soil in a thicket of *Rubus villosus* Ait. at the roadside, elsewhere in open woods (no. 617). In full flower Sept. 3–8. The plant has a strong and rather disagreeable odor. The largest specimen seen was 16.5 dm. high and the maximum diameter of the stem was very nearly 1 cm. The root-system is strongly developed, many of the fibers being much thickened and thus giving the plant an unusually firm hold on the soil.

CIMICIFUGA RUBIFOLIA **n. sp.**

Cimicifuga cordifolia Torr. & Gray Fl. N. Am. **1**: 36. 1838–40, in part?—Not Pursh.*

A tall long-lived perennial, with hard knotted rootstocks and solitary wand-like stems bearing one, or more often two, large biternate leaves near the base. Rootstock thick, horizontal, attaining a maximum length of 8 cm., bearing numerous strong root-fibers; stems 6–14 (mostly 10–12) dm. high, erect, rather stout

* Fl. Am. Sept. 373. 1814.

at base, but diminishing rapidly towards summit, usually dark brown-purple, rather acutely 4-angled below, almost terete towards summit, more or less sulcate on the faces, especially below, smooth and glabrous or with a few lax delicate hairs up to the inflorescence, there very sparsely to rather densely puberulent or short-pubescent; petioles 2–4 dm. long, rather stout, straight or somewhat arcuate below, angled, rather deeply sulcate on the upper face towards base, rather densely pubescent in the groove, otherwise nearly glabrous or sparsely pubescent, with lax hairs especially towards summit, somewhat dilated at apex, much enlarged and with thin wing-like margins clasping the stem at base; leaves biternate, the terminal division usually consisting of a single leaflet much larger than the others, but occasionally trifoliolate, the lateral divisions always trifoliolate; petiole of terminal division 10–12 cm. long, angled and sulcate like the main petiole, sparsely pubescent with lax delicate hairs, the groove densely so; petioles of lateral divisions 6–9 cm. long, equal or one as much as 2 cm. longer than the other; petiolules of lateral leaflets of terminal division (when present) about 5 mm. long, deeply sulcate on the upper face, very pubescent, especially in the groove; petiolules of leaflets of lateral divisions shorter, otherwise similar; terminal leaflet of terminal division 10–20 (mostly 15–16) cm. long, 12–20 (mostly about 15) cm. wide between the apices of the two largest lobes, very broadly obovate in outline, equilateral, sharp acuminate at apex, deeply cordate with a sinus of equal width throughout or widening towards the mouth, coarsely and irregularly dentate, deeply and acutely palmately three-lobed, the primary lobes themselves less deeply 2–3-lobed and the secondary lobes in turn slightly 2–3-lobed, thin, dark green above, paler beneath, smooth and glabrous above, sparsely short-ciliate, sparsely to rather densely pubescent along the veins beneath with rather long, appressed, delicate, lustrous hairs, very veiny, the veins prominent, especially below, strongly tending to anastomose, the two largest lateral ones nearly as strong as the midvein; other leaflets smaller and inequilateral, otherwise similar; inflorescence a simple panicle of 2–4 slender racemes, the terminal and much the longest one 15–30 (usually about 20) cm. long; rhachis and pedicels sparsely, or the pedicels occasionally rather densely pubescent with short straight hairs; pedicels (in flower) about 2 mm. long, rather slender, much thickened at summit, subtended by a lance-subulate bract about 2 mm. long, bearing at base 2 laterally disposed, ovate-triangular, acute, ciliolate bractlets about 1 mm. long, pedicels (in fruit) 4–5 mm. long; sepals 5, fugacious, 4.5–5 mm. long, 3–4 mm. wide, rounded at apex, narrowed at base, concave; the three outer obovate-oblong, with about 7 distinct longitudinal veins and obscure cross-veins; the two inner broadly obovate, more deeply concave, thinner in texture and whiter in color, with 5–7 longitudinal veins and distinct, somewhat reticulated cross-veins; petals none; stamens 35–65; filaments about 4 mm. long, flattened especially towards summit; anthers about .5 mm. long; pistil solitary, sessile, about 2 mm. long from base of ovary to summit of stigma, the style and stigma only slightly differentiated from the body of the ovary; ovary about .7 mm. in greatest transverse diameter, perfectly glabrous, strongly compressed latterly, the sides irregularly oblong in outline; style slightly recurved, very short; stigma minute; pods 8–10 (commonly 8) mm. long, very nearly sessile, strongly compressed laterally with sides irregular oblong, rounded towards apex on the dorsal face, rounded towards base on the ventral face, beaked by the short, blunt, hardened, apically somewhat enlarged, ascending style which departs from the ventral side of the pod, just below the summit, at an angle of about 45°, pale green, walls thin, becoming almost chartaceous, veins prominent, somewhat reticulated; seeds usually 6, the four middle ones in two rows, the other two solitary, about 3 mm. long, about 1.5 mm. wide, lenticular, somewhat flattened laterally, the sides oblong in outline, chestnut brown, covered with pale brown thin chaffy scales, especially along the edges where they form a well-developed deeply lacerate wing.

In rich soil on a wooded bluff along the Tennessee River, near Knoxville, Tennessee, where it was collected in flower by the writer early in September, 1890, and 1891, and in fruit by Prof. A. Ruth in October, 1897. The large terminal leaflet suggests the leaf of *Rubus odoratus* L.

A very distinct species of the Section *Actinospora*, most nearly allied to *C. Americana* Michx. though apparently slightly approaching *C. racemosa* (L.) Nutt. (Section *Macrotys*) in its solitary, sessile ovary, short style and partially two-ranked seeds. However it is most abundantly distinguished from that species by its bibracteolate and much shorter pedicels, much fewer stamens with filaments one-half as long and anthers one-half as large, thin-walled pods about twice as large and chaff-covered, lenticular seeds. From *C. Americana* our plant is differentiated by the following characters: bractlets of pedicel always basal (in *C. Americana* usually borne near middle of pedicel); pubescence of inflorescence rather sparse and straight, not glandular (in *C. Americana* dense, glandular, almost granular); petals none (in *C. Americana* the usually two, obovate, deeply lobed, cucullate petals are characteristic); shorter filaments (about 7 mm. long in *C. Americana*); smaller anthers (7 mm. long in *C. Americana*); sessile, solitary ovary; much shorter and straighter style; much shorter beak to the pod; and partially two-ranked seeds. From both of our well-known eastern species *C. rubifolia* differs in its biternate leaves with commonly unifoliolate terminal division, in the cut of the large, very broad, deeply cordate leaflets and in the characteristic appressed pubescence along the veins on the under leaf-surface.

Cimicifuga cordifolia Pursh is almost certainly a form of *C. Americana* Michx. Pursh's description is clearly meant for that species and he cites Michaux's name as a synonym. It is not probable that Pursh would have omitted from his Flora a plant that must have been so familiar to him as this common species of the Southern Mountains. The plant figured in Curtis' Botanical Magazine,* has much the leaf of *C. rubifolia*, but is described as having "the nauseous smell of its relatives" and "flowers in June and July." *C. rubifolia* is like *C. Americana* in its total lack of odor and its autumnal flowering. It is more likely that Curtis had a form of *C. racemosa* with broad, cordate leaflets, such as is represented in the National Herbarium by a specimen from East Tennessee, of C. C. Parry's collecting. It was doubtless some such form that Dr. Gray had in mind when he reduced *C. cordifolia* to *C. racemosa* as a variety. The description of *C. cordifolia* in Torr. and Gray may possibly include *C. rubifolia*, although this is not probable. Indeed, it is not easy to imagine upon what that description was based. Pursh's characters certainly give no warrant for the assumption that his plant had sessile ovaries.

HEPATICA ACUTA (Pursh) Britton, Ann. N. Y. Acad. Sci. 6: 234. 1891.

A specimen collected near Wolf Creek bears one normal leaf and another with rounded lobes, exactly as in our second American species. Dr. Gattinger collected a similar plant on the Big Frog Mountain, in Polk County. Dr. Charles Mohr informs me that he finds such plants occasionally in the mountains of Alabama, and that they are referrable to *H. acuta*. In East Tennessee the color of the sepals affords a good character, those of *H. acuta* being pale rose-purple or lavender, while in the other species they are always some shade of blue.

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* 46: *pl. 2069.* 1819.

CARDAMINE PARVIFLORA L. Sp. Pl. Ed. 2, 914. 1763.

Common in dry upland woods about Knoxville, often appearing where the woods have been burnt over.

ITEA VIRGINICA L. Sp. Pl. 199. 1753.

Collected near Wolf Creek Station (no. 720), growing on a shaded ledge of sandstone along the French Broad River, an unusual habitat for this plant, which ordinarily makes its home in low swamps. The specimens were small, the largest not more than 1 m. high, but seemed otherwise typical.

AGRIMONIA MOLLIS BICKNELLII n. var.

Agrimonia mollis (Torr. & Gray) Britton var., Bicknell, Bull. Torr. Club, **23**: 517. 1896.

Collected in the neighborhood of Wolf Creek, September 2d, (no. 691) where it grew in similiar situations with the type, but was more common. Mr. Bicknell's excellent characterization leaves nothing to be added, and certainly indicates that this plant should have a varietal name. As Mr. Bicknell points out, the development of tubers is stronger than in *A. mollis*, and the tubers form on shorter roots. It is rather difficult to secure specimens of *A. mollis* that show completely the tuber development, but with var. *Bicknellii* a vigorous pull is enough to bring the plant up with a number of tubers attached. The two forms are much more obviously distinct in the living state than in herbaria. It does not seem that the existence of intergradations should be regarded as an obstacle to the publication of a variety, when the majority of the specimens are so well-marked.

GEUM FLAVUM (Porter) Bicknell, Bull. Torr. Club, **23**: 523. 1897.

A few specimens with nearly mature fruit were found in deep rich mountain woods along Wolf Creek, August 23, 1897 (no. 686), growing with *Agrimonia hirsuta* (Muhl.) Bicknell. This easily recognizable and very distinct species is here reported for the first time from the Southern States.

STYLOSANTHES RIPARIA n. sp.

A perennial herb, with few or several (sometimes 8) stems from a deep, strong, woody root, which attains a maximum length of 3 dm.

Stems 1–3.5 (commonly 2–2.5) dm. long, decumbent, wide-spreading, much branched, slender, the somewhat elongated internodes with a usually well-defined line of rather tomentose pubescence decurrent from the base of the stipules; petioles very pubescent, only slightly exserted from the stipular sheath, the exserted portion about 1 mm. long; stipules large, the tube 3–5 mm. long, inflated, thin, membranous, brownish, appressed-pubescent, terminating in two subulate, aristate, more or less reflexed teeth about half as long; leaves spreading, pinnately trifoliolate, rhachis 1–2 mm. long, pubescent, petiolules very short; terminal leaflet (of leaves of main stem) 10–18 (commonly 12–15) mm. long, 4–8 mm. wide, broadly or narrowly elliptical, oblanceolate or even cuneate-obovate, usually rounded at apex (sometimes truncate or even slightly retuse), conspicuously subspinescently cuspidate, acutish at base, entire, thickish, dark green above, pale beneath, smooth and glabrous, with a very few short marginal hairs; midrib impressed above, prominent beneath, veins prominent on both surfaces but especially beneath, 10 or 12 in the larger leaflets, departing from the midrib at a very sharp angle, veinlets obscure; lateral leaflets somewhat smaller; inflorescence consisting of leafy bracted compound spikes, composed of 1-flowered bracted spikelets; spikes usually terminating the main stems and most of the branches, about 6 flowered, the two or three uppermost and one or two lowest flowers ordinarily abortive; lower primary bracts commonly unifoliolate, the teeth and leaflet sparsely cilate with long rather weak setose red hairs, otherwise like the foliage leaves; upper primary bracts with gradually reduced and finally almost aborted leaflet. Secondary bract borne upon the short secondary axis,* which is adnate to the midnerve of the primary bract, 3–4 mm. long, entire, lance-subulate, usually broadest near middle and tapering thence to base and acutish apex, subhyaline, whitish, conspicuously ciliate; prophyllum borne on the tertiary axis,† closely approximate to the secondary bract and usually not obviously raised above it, about 3 mm. long, deeply cleft to or below the middle, two-nerved (the second nerve smaller and extending into the lobe), lobe as wide as blade but much shorter, both blade and lobe narrowly linear, rather obtuse or subacute, otherwise like the secondary bract; flower terminating the tertiary axis, short-pedicelled, very slightly raised above the prophyllum; calyx glabrous, conspicuously greenish-veined; tube slender, 3–4 (usually 4) mm. long; limb (from base to apex of lowest (longest) tooth) about 4 mm. long; lowest tooth ovate-oblong, acutish, 1.5 mm. wide, the other teeth shorter and narrower, more obtuse; corolla orange-yellow;

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* The "Seitenaxe erster Ordnung" of Taubert.

† The "Seitenaxe zweiter Ordnung" of Taubert, who regards it as arising from the axil of the secondary bract.

vexillum nearly or quite 5 mm. long, 4.5–5 mm. wide; wings nearly 3.5 mm. long, nearly 2 mm. wide, obovate, much narrowed towards base, tooth on vexillar side near base nearly 1 mm. long, oblong, very obtuse, straight; keel about equalling the wings; lower segment of loment very small, infertile; upper segment 3–3.5 mm. long (excluding beak), nearly to quite 3 mm. wide, inequilaterally obovoid, somewhat compressed laterally, strongly gibbous on ventral face, curved toward base and apex on dorsal face, pubescent (rather sparsely when mature) with short curved white hairs, tricostate on both lateral faces (less often bicostate, or tricostate on one face and bicostate on the other), the cross-veins few, reticulated, all strong and dark-green; beak .5–.7 mm. long, stout, strongly hooked (sometimes twice hooked in shepherd's crook fashion), almost central on the summit of the loment; seeds not seen.

In groves of *Pinus rigida* Mill, on the banks of the French Broad River near Wolf Creek, growing in dry, sandy soil, accompanied by *Lechea racemulosa*, *Meibomia viridiflora*, etc.; collected by the writer in August, 1894, and again September 1, 1897 (no. 674).

Belongs to the section *Eustylosanthes* Vog., and is most nearly related to *S. biflora* (L.) B.S.P., from which it is readily distinguished, however, by its more slender, more decumbent culms, smaller leaves with shorter and comparatively broader leaflets, more conspicuously veined calyx with longer tube, vexillum almost always longer than broad (in *S. biflora* almost always broader than long), and longer, broader, obtuse and straight basal tooth to the keel petals. In *S. biflora* this tooth is about one-half as long, slender, acute or acutish and often somewhat uncinate. The best characters, however, are afforded by the prophyllum and the loment. In *S. biflora* some thirty specimens examined showed a prophyllum always perfectly entire, while in *S. riparia* the deep lobing of that organ is equally constant. In *S. biflora* the upper segment of the loment is as long as in *S. riparia*, but it is only about 2.5 mm. wide, and has an irregularly triangular outline in strong contrast to the semi-orbicular outline of the segment in *S. riparia.* Moreover, in *S. biflora* the segment is much more gibbous on the ventral face, but is straight on the dorsal face, thus throwing the beak quite to the dorsal edge of the summit. The beak is usually considerably shorter in *S. biflora* and less strongly curved. The general aspect of *S. riparia* is much more suggestive of that of a *Trifolium* than in the case with *S. biflora*.

In the terminology of the above description I have followed that of Taubert's excellent Monographie der Gattung Stylosanthes* and have adopted his ingenious view of the morphology of the rather complicated inflorescence. In his generic description (p. 4). Dr. Taubert distinguishes the lower primary bracts from foliage leaves by the absence of lateral leaflets, and notes no exception. In *S. riparia* the lowest bract, even when flower-bearing, is occasionally trifoliate. In one case I found only one of the lateral leaflets present.

ILEX BEADLEI W. W. Ashe; Coult. Bot. Gaz. **24**: 377. 1897.

Collected in flower near Wolf Creek in May, 1893, and in fruit during the past season (633, 633½). Also on Chilhowee Mountain, Blount County, in June, 1893. Seems to be widely distributed and abundant at low elevations in the mountains of East Tennessee.

Mr. Ashe rightly segregates this plant from *I. monticola mollis* (A. Gray) Britton,† but does not point out the characters by which his species can readily be distinguished. *Ilex mollis* A. Gray‡ must be regarded as based upon the northern plant, although Gray confused with it the southern species. *Ilex Beadlei*, however, does not apparently extend into the region covered by Gray's Manual. Hence we must regard as the type of *I. mollis* the plant of the Pennsylvania mountains, which, so far as herbarium specimens show, is a mere pubescent variety of *I. monticola* A. Gray. This, too, may range southward along the higher mountains with the smooth form of *I. monticola*, but is not to be mistaken for *I. Beadlei.* The latter species, as I know it, is found only on the lower hills or down near the river-banks, always in rather dry soil,

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* Verhand. Bot. Ver. Prov. Brandenb. 23: 1–34. 1891.—*S. hamata* (L.) Taubert is here cited (p. 23) as occurring in Tennessee (no. 609 of A. H. Curtiss' distribution). As it did not seem likely that this almost strictly tropical plant should be found so far north and nowhere in the intervening region, I made inquiry of Dr. Robinson, who informs me that two species of *Stylosanthes* collected by Curtiss are deposited in the Gray Herbarium, one (no. 609) being typical *S. biflora* from Tennessee, while the other (no. 609*) is *S. hamata* from Umbrella Key, South Florida.

† Mem. Torr. Club, 5: 217. 1894.

‡ Man. Ed. 5, 306. 1867.

often growing with *Castanea pumila* Mill. It is distinguished from any form of *I. monticola* by its smaller size (usually about 2 m. high); and smaller leaves which are proportionately broader, shorter, and more abruptly pointed, thicker, firmer in texture, almost tomentose beneath, and of a characteristic light, almost yellow-green color. *I. monticola*, as it occurs in East Tennessee, prefers a rich, comparatively moist soil in deep, shady ravines at higher elevations (1000–2000 m.), where it usually grows as a small tree with slender trunk some 5–7 m. high, and thin, long-pointed leaves of a fine, deep green. It is often accompanied by such plants as *Viburnum alnifolium*, *Cornus alternifolia*, etc. The pubescence on the under surface of the leaf in all specimens of *I. monticola mollis* that I have seen is never so dense as is constantly the case in *I. Beadlei.*

EUONYMUS AMERICANUS L. Sp. Pl. 197. 1753.

Specimens collected along the French Broad, near Wolf Creek (no. 636) have broadly ovate leaves not exceeding 3.5 cm. in length, and mostly about 2 cm. wide. The plants were erect and some 12–15 dm. high, however, and none of the leaves were at all obovate.

VIOLA EMARGINATA (Nutt.) Le Conte, Ann. Lyc. N. Y. 2: 142. 1825.

Specimens of an extreme form of this species, with deeply cut leaves, were obtained near Wolf Creek. I am not aware that this violet has been heretofore reported as belonging to the Southern Flora.

RHODODENDRON MAXIMUM L. Sp. Pl. 392. 1753.

Growing among rocks at the summit of Bluff mountain is a peculiar form, only some 1.5 mm. high, with small leaves about 1 dm. long and 2 cm. wide, the margins inclined to be involute (in the living plant) and the under surface pale brown.

LEUCOTHOË RACEMOSA (L.) A. Gray Man. Ed. 2, 252. 1856.

As far as I know this shrub of the low country swamps has not been reported from the mountain region of the Southern States. I found it last season on the sandy banks of the French Broad River near Wolf Creek (no. 814) and have also collected it along the Emory in Roane County. *L. recurva* (Buckley) A. Gray is likewise frequent about Wolf Creek, but is confined to rather dry hillside woods.

VACCINIUM MELANOCARPUM C. Mohr, n. sp.

Vaccinium stamineum melanocarpum C. Mohr, Bull. Torr. Club, 42: 25. 1897.

At the summit of Bluff Mountain on the Tennessee-North Carolina line just south of the French Broad River, I collected during the past season (no. 811) specimens of a *Vaccinium* in young fruit, which Dr. Mohr identifies as his *V. melanocarpum.* The Tennessee plant differs from typical Alabama specimens, however, in its shorter, less pointed and thicker leaves with more prominent and strongly reticulated veins, and in its larger bracts. It is a shrub some 4 dm. high, with gnarled, ascending branches, and grows on the open summit of the mountain, accompanied by such plants as *Prunus Pennsylvanica* and *Sambucus pubens.* So different is its aspect from that of *V. stamineum* that it did not occur to me at first that it was related to that species.

VACCINIUM HIRSUTUM Buckley, Am. Journ. Sci. 45: 175. 1843.

Dr. Small, in a recent number of the BULLETIN,* reported his find of this little-known species at Tallulah Falls, Georgia, as "the first collection since the original discovery by Buckley." But flowering specimens were secured in June, 1891, in the Cade's Cove Mountains of Blount County, Tennessee, by Prof. A. Ruth and the writer. There it grew in some quantity on the dry south slope of the ridge, along with *Baptisia tinctoria*, *Sericocarpus solidagineus*, etc. Dr. Gattinger, in his catálogue,† reports this plant as occurring in the "High Mountains of East Tennessee."

LYSIMACHIA FRASERI Duby; DC. Prodr. 8: 65. 1844.

Found at two or three points along the French Broad River near Wolf Creek (no. 829). About one mile above Wolf Creek quite a number of plants were discovered, growing in a tangled undergrowth of *Rubus villosus* Ait., and *Vitis rotundifolia* Michx., on the river-bank. Many of the plants measured 1.5 dm. in height.

* Bull. Torr. Club, 24: 64. 1897.

† Tennessee Flora 61. 1887.

STEIRONEMA TONSUM (Wood) Bicknell; Britton & Brown, Ill. Fl. N. U. S. 2: 590. 1897.

S. intermedium Kearney, Bull. Torr. Club, 21: 263. 1894.

Specimens collected on the banks of the French Broad River near Wolf Creek, Sept. 1 (no. 830), growing in shaded sandy soil, depart from the type of *S. intermedium* not only in habitat but in having the petioles sparsely ciliate their entire length with short lax hairs. Nevertheless they are unmistakably *S. tonsum*, having the slender habit, smaller leaves with less conspicuous veins, much reduced upper leaves which give the inflorescence the aspect of a bracted panicle, comparatively longer peduncles, and calyx-lobes nearly twice as long as the capsule.

STEIRONEMA TONSUM SIMPLEX n. var.

Stems simple, 2–3 dm. high, slender; petioles short, not more than 15 mm. in length, slender, naked except at the base where a few ciliae occur; leaf-blades 1–4 cm. long, 1.5–2.5 cm. wide, broad ovate, the lowest very small and orbicular, subcordate at base, rather abruptly pointed at apex, thin and bright green; inflorescence a four or five-flowered leafy terminal panicle, occasionally with scattered peduncles from the axils of the upper foliage leaves; calyx-lobes only slightly exceeding the mature capsule (in one case merely equalling it).

A few plants collected on the shaded margin of a mountain-brook near Wolf Creek (no. 831), growing in rather moist, sandy soil, accompanied by *Habenaria clavellata* (Michx.) Spreng.

PERILLA FRUTESCENS (L.) Britton, Mem. Torr. Club, 5: 277. 1894.

Abundant about dwellings at Wolf Creek (no. 874). It was formerly cultivated as a foliage plant, but is now thoroughly naturalized and is spreading rapidly. In this form the leaves are always purple underneath, but it does not agree with Bentham's characterization of *P. ocimoides crispa** (*P. frutescens Nankinensis* (Lour.) Britton), in that the leaf margins are neither crisped nor fimbriate-lacerate.

SCUTELLARIA VENOSA n. sp.

Scutellaria saxatilis pilosior Benth.; DC. Prodr. 12: 424. 1848?

*DC. Prodr. 12: 164. 1848.

Scutellaria versicolor minor A. Gray, Syn. Fl. N. Am. 2: Pt. 1, 378. 1878.* In part, not of Chapm.† nor *S. minor* L.

A small plant with usually solitary stems from a slender creeping rootstock. Stems 5–12 cm. long, erect or ascending, rather acutely 4-angled, pubescent with short, mostly retrorse or recurved white hairs, the pubescence towards the summit glandular, denser and more spreading; petioles slender, pubescent with retrorse appressed hairs, those of lowest leaves 1.5–3 cm. long, spreading or recurved, those of uppermost foliage leaves 1 cm. long or less, ascending; largest (often the uppermost) leaf-blades 3–6 (usually 5) cm. long, 2–3 cm. wide; smallest (usually the lowest) considerably reduced; all broadly ovate, obtuse, cordate with a rather open sinus, coarsely crenate, rather sparsely ciliate with short spreading hairs, pubescent with short appressed hairs on both surfaces, but especially along the veins beneath, thin, bright green above, paler beneath, conspicuously veiny, the veins prominently reticulated and almost rugose beneath; inflorescence a simple solitary terminal raceme (less often a much-reduced, simple panicle) 2–4 cm. long, mostly 10–20-flowered; pedicels 2–3 mm. long, rather stout, glandular-pilose, ascending; bracts barely equalling the pedicels, ovate, obtusish, glandular-pubescent; calyx (in flower) about 3 mm. long, rather densely pubescent; (in fruit) about 5 mm. long, sparingly pubescent, light green; corolla about 15 mm. long, pale blue and white, puberulent; anthers minutely ciliate; nutlets 1 mm. in greatest diameter, globose, strongly depressed.

Growing with *Circaea alpina* L. just below the summit of Bluff Mountain, where it was collected August 28 (no. 873). *S. venosa* is closely related to *S. cordifolia* Muhl. (*S. versicolor* Nutt.) from which it differs in its smaller size, much shorter pubescence of leaves and inflorescence, much reduced bracts and considerably smaller calyx and corolla. *S. cordifolia* is mainly a campestrian species preferring much lower elevations, and is not known to occur anywhere in the region where *S. venosa* was collected. *S. saxatilis pilosior* Benth. may be the same plant, but is not identifiable with any certainty from Bentham's meagre description. It may very well be only a form of *S. saxatilis.*

MELAMPYRUM LATIFOLIUM Muhl. Cat. 57. 1813.

Both this species and *M. lineare* Lam. occur near Wolf Creek,

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**S. rugosa* Wood Class Book, Ed. 2, cited here by Gray as a synonym of *S. versicolor minor*, is unquestionably a form of *S. saxatilis* Riddell, to which Wood himself referred it in subsequent editions of the Class Book.

† Fl. S. U. S. 323. 1860.

Cocke County, and there exhibit a wide difference in habitat and period of flowering. *M. latifolium* was collected in May, 1893, growing in deep, rich, moist woods along a mountain brook, and was then in full flower. In September, 1897, I sought for it in the same place, but not a vestige was to be found. At that time, however, *M. lineare* was in full flower, growing on dry soil on the top of Brushy Mountain.

VIBURNUM CASSINOIDES L. Sp. Pl. Ed. 2, 384. 1763.

Along a brooklet near the summit of Max Patch Mountain, (no. 730). The specimens are hardly typical, but differ from *V. nudum* L. in their distinctly crenulate dentate leaves with dull upper surface and peduncles distinctly shorter than the cyme. The same form grows on the summit of Thunderhead, Blount County (alt. about 2000 m.), where it was collected by the writer in June, 1891.

SYMPHORICARPOS RACEMOSUS Michx. Fl. Bor. Am. 1: 107. 1803.

In waste-ground near a house at Lemon's Gap, Cocke County, where a large patch of it is well established and was loaded with its white fruit on Sept. 8 (no. 733).

SOLIDAGO ARGUTA CAROLINIANA A. Gray. Syn. Fl. N. Am. 1: Part 2, 155. 1884.

Numerous specimens of a form of *S. arguta*, probably referable to this variety, collected near Wolf Creek in August (nos. 759, 760) are entirely destitute of rays.

ASTER CURTISII Torr. & Gray, Fl. N. Am. 2: 110. 1841–43.

This beautiful plant is the most common *Aster* near Lemon's Gap, at an elevation of about 1000 m., beginning to flower about the last week in August. It varies from about 5 dm. high, with slender, unbranched stems bearing two or three heads, to a tall, stout, much-branched plant 15 dm. high, bearing as many as 150 heads.

GNAPHALIUM HELLERI Britton, Bull. Torr. Club, 20: 280. 1893.

On very dry hillsides, with *Gyrostachys simplex*, *Buchnera Americana*, *Silphium compositum*, etc., near Wolf Creek, collected September 6 (no. 781). This is a well-marked species when growing, although somewhat difficult to characterize. It is a much lower and more slender plant than *G. obtusifolium* L., of greener aspect, with looser inflorescence and fewer heads. In habitat it is strikingly different from *G. obtusifolium*, which, in East Tennessee and in the mountains of Kentucky, confines itself to low fields and fallow ground, where introduced weeds are most frequent, while *G. Helleri* is found upon the dry ridges, sometimes even on arid sandstone outcrops, amid a purely indigenous vegetation.

XANTHIUM SPECIOSUM n. sp.

A stout much-branched leafy annual herb, about 1.5 m. high. Stem about 2.5 cm. in diameter just above the tumid base, erect, straight below, zigzag above, four-angled, obtusely below, rather acutely above, striate above between the prominent angles, hard and almost ligneous in texture, with greenish cortex, sparsely papillose below with white, rather conspicuous papillae that are often extended into short stout appressed antrorse prickle-like trichomes, strongly hispidulous above with similar trichomes, interspersed with minute ones; petioles rather slender, striate, deeply grooved on upper face, especially towards the enlarged base, strongly hispidulous, minutely pubescent along the groove, the lower ones 10–15 cm. long; leaf-blades (the larger ones 17–20 cm. long, 19–22 cm. wide) very broadly triangular-ovate, rather deeply cordate with a wide rounded sinus which is interrupted by a small triangular portion of the blade included between the two primary side-veins, rather acute at apex, obtusely and not deeply 3–5-lobed, with the primary lobes themselves slightly lobed, obtusely and not conspicuously dentate, rather thick, dull green, paler beneath, strongly papillose, scabrous on both surfaces, hispidulous along the veins and margins, especially beneath, with appressed antrorse prickle-like trichomes, rather thickly besprinkled on both surfaces with minute shining resinous granules, veins and larger veinlets prominent, especially beneath, divergent at a wide angle, the midnerve and the almost equally strong primary side-veins broad, somewhat flattened, strongly striate; flowers not seen; fruiting involucres 2.5–4 cm. long, 2.5–3 cm. wide (including prickles), ovoid, light brown in color, sparsely besprinkled with shining resinous granules, rostrate at apex with two or three very stout, more or less incurved, uncinate or biuncinate beaks 10–12 mm. long, densely aculeate with long stout strongly uncinate prickles (the hook nearly horizontal to very strongly incurved), 8–9 mm. long, the lower retrorse, the middle horizontal, the upper antrorse; both beaks and prickles densely hispid (the former to near the apex, the latter for $\frac{1}{2}$–$\frac{2}{3}$ of their length from the base), with broad, flat, sharp-pointed, rather lax, spreading or slightly retrorse hairs, which are elongated-triangular in outline, and gradually diminish in size upward.

Collected by the writer September 16, near Wolf Creek Station (no. 785) where it grows on the sandy bottom-lands near the French Broad River and is almost certainly indigenous.

X speciosum finds its nearest relative in *X. Canadense* Mill., from which it is distinguished by its great size, larger and proportionately broader fruiting involucres, longer stouter and more closely set prickles, longer and stouter beaks, which are more nearly erect and more strongly incurved towards apex, and longer and larger trichomes on the beaks and prickles. *X. macrocarpum* DC.,* a species not certainly known to occur in the United States, is described by the author as having an oval-oblong fruiting involucre twice longer than broad, which would certainly not apply to *X. speciosum.* Moreover, all probably authentic specimens of *X. macrocarpum* examined showed a strong glandular puberulence upon the involucres. None of the species described by Wallroth and others from North America can be identified with the Tennessee plant.

The whole genus is in need of thorough revision, and nowhere more so than in the United States. The most cursory glance at the material in our larger herbaria is enough to show that *X. Canadense, X. strumarium* and *X. spinosum* are by no means the only species in this country. But until the Old World species are better understood, a satisfactory treatment of the genus here is impossible.

Senecio Smallii Britton, Mem. Torr. Club, 4: 132. 1894.

Rather abundant on dry banks near Wolf Creek Station, Cocke County, Tennessee, where it was collected by the writer in May, 1893. Here reported for the first time as occurring in Tennessee.

Hieracium paniculatum L. Sp. Pl. 802. 1753.

The maximum height of this species as given by Gray in the Synoptical Flora is three feet. A plant collected at Lemon's Gap, where it grew in dry upland woods, has a stem-length of 17 dm.

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* Prodr. 5: 523. 1836.

A new species of Eucalyptus from the Dakota Group of Southwestern Kansas.

By Lester F. Ward.

In a small collection of fossil plants from the Dakota group of Clark County, Kansas, which was made by Mr. C. N. Gould and myself on October 3, 1897, there occur several leaves that belong to the genus *Eucalyptus*. One of these is entirely different from any of the rest and presents a nervation which at once marks it as a new species. Although it is not generally advisable to name species from single specimens, especially from one incomplete leaf, nevertheless, so exceedingly clear is the nervation in the present case, that there is no room to doubt either its generic affinity or its specific distinctness from all other species of the genus. So much of the material that has been called *Eucalyptus*, which has been reported from various deposits throughout the world, is of a doubtful character that it is desirable that any case involving no uncertainty be brought to the attention of botanists and geologists. I regard this as such a case and therefore venture to describe it is a new species of *Eucalyptus*, which I take pleasure in naming for Mr. C. N. Gould of Southwest Kansas College, Winfield, Kansas, who not only accompanied me on this expedition, but served as my companion and guide throughout the entire region, with which he has made himself intimately acquainted.

Eucalyptus Gouldii n. sp.

Leaves slightly falcate, about 7 cm. long and 12 mm. wide 2 cm. above the base, from which point they diminish in both directions, being drawn out into a long point above (tip and base wanting in the only specimen found). Substance of the leaf firm and thick; nervation very distinct, midrib strong, secondaries about 10 on a side, rising at a very acute angle, proceeding in a zigzag course so as to meet one another and anastomose, forming elongated angular areas in two rows, the outer row smaller and bounded on the outer side by a connected series of gentle arches forming a continuous nerve generally parallel to the margin and less than 1 mm. distant from it.

Of all living species of *Eucalyptus* this approaches most closely in its nervation to that of *E. largiflorens*, first described by Baron

von Mueller in the Transactions of the Victoria Institute, 1: 24, 1854, and figured in his Eucalyptographia, Decade V, 1880.

In the accompanying cut, Fig. 1 represents the fossil leaf and Fig. 2 is a copy of one of the leaves of approximately the same size of *E. largiflorens* Muell., from the plate accompanying the description given in the work already referred to. The substantial identity of the nervation is apparent at a glance. In describing that species in the same work, Baron von Mueller devoted only two lines to the nervation as follows: "Lateral veins extremely fine, diverging at a very acute angle or not very spreading nor quite close, the circumferential vein somewhat removed from the edge." This description is, of course, very inadequate, but it is well known that botanists pay scarcely any attention to nervation and do not take the trouble to acquaint themselves with the proper terminology of the subject.*

We thus have another link in an already long chain of evidence which goes to prove that the Australian Fever Tree has had a long history, and was widely distributed over the globe in Cretaceous and Tertiary time, millions of years before man made his appearance.

Two new Species of Sanicula from the Southern States.

By Eugene P. Bicknell.

In a paper published in 1895,* describing two new species of *Sanicula* from the Eastern States, I hinted my belief in the existence of still a third unrecognized species. The single plant which

* This may be found summed up, with illustrations, in the Century Dictionary, article *Nervation*.

* Bull. Torr. Club, 22: 351–361.

gave support to this view, more strongly held than expressed, had been found in an afternoon's visit to Lookout Mountain, Tennessee, on June 21, 1894, during a short delay of the train on the way up the mountain. Since that time more complete material has come to hand which shows that the plant is entirely distinct from both *Sanicula Marylandica* L. and *Sanicula Canadensis* L., its nearest allies, with either one of which, however, it might easily be confused by anyone not possessing a true understanding of those species.

From the specimens newly in hand it appears that a year before the Lookout Mountain plant was discovered, Dr. John K. Small had collected precisely the same thing at the base of Little Stone Mountain in middle Georgia, and it now gives me pleasure to connect Dr. Small's name with this new species, more especially since he himself would doubtless have shortly distinguished it had it not been described here.

It seems that a still earlier collection of the plant was made by Mr. S. M. Bain at Jackson, Tenn., in May, 1892 (" No. 302, Plantae Tennessei Occidentalis"). This specimen, although differing somewhat from all the others, is unquestionably to be referred to the same species. The east Tennessee and Georgia plants are closely matched by specimens collected by Mr. George V. Nash in August, 1895, at Tallahassee, Florida, the southernmost point at which the plant has been found.

SANICULA SMALLII n. sp.

Root perennial, or possibly biennial; stem 1½°–2° tall, smooth, somewhat striate, simple below, or with one lateral branch, above forking into two widely spreading or ascending naked branches sometimes 8′ long, each bearing an umbel of 2–6 rays; lateral branch sometimes 12′ long, like the stem supporting two slender ray-like umbel-bearing branches; stem-leaves 3–4 up to the involucral pair, slender-petioled, two of them sub-basal on petioles 4′–6′ long; leaf-blades rather small, mostly 3′–4′ wide and 2′–3′ long, sub-coriaceous, dull green, paler on the lower surface and often above along the veins, which are distinctly in relief, reniform in general outline with a deep or shallow sinus, 3-divided or nearly 3-foliolate, the segments close together, the lateral pair deeply cleft or rarely parted; segments obovate or the lateral pair broadly rhomboid, dentate-serrate with short-aculeate teeth, or slightly incised, often cleft into three short lobes at the obtuse or sometimes acute apex especially on the lower leaves; involucral leaves very short-petioled, 3-cleft or 3-parted, the segments narrower and more acute than in the lower leaves; involucels minute, or sometimes ½′ long; rays of umbel slender, often divaricate, ¾′–1½′ long, jointed to their attachment, sharply striate, the striae often subserrulate-scabrous; a solitary ray or peduncle arises from the fork of the stem bearing a single flower cluster; fruit sessile, subglobose, somewhat compressed, 2½″–3″ high to tip of calyx-segments, spreading across bristles 3″–4″; bristles slender, at the base of the fruit minute but perfectly formed, longer above, the uppermost 1″–1¼″ long, surpassing the nearly erect calyx-segments which are ½″–¾″ long, linear-subulate, rigid and separated by distinct intervals; styles slender, diverging or slightly recurved, little longer than the calyx-segments; pericarp thin; commissural scar narrow, ½″ wide, usually covered with a whitish incrustation; oil-tubes 5, arranged nearly as in *Marylandica* but smaller; seed in cross-section suborbicular, not furrowed dorsally or but slightly so, the inner face medially concave or sulcate; sterile flowers mixed with the fertile, most numerous in the inter-rameal cluster, on pedicels 1″–1½″ long, the sepals ¾″–1″ long, linear-subulate or cuspidate, with a strong medial nerve especially noticeable on the inner side, at full maturity rigidly spreading; petals obovate-oblong, apparently shorter than the calyx segments; roots clustered, very thick or sub-tuberous.

Specimens examined:

Tennessee: Jackson, rich woods, May, 1892, S. M. Bain; in flower. Lookout Mountain, June 21, 1894, E. P. B., rocky woods; in immature fruit.

Georgia: Base of Little Stone Mountain, June, 1893, John K. Small; in fruit. Type.

Florida: Tallahassee, August 7–9, 1895, George V. Nash; in fruit.

This plant, although occupying a position somewhat intermediate between *Sanicula Marylandica* and *Sanicula Canadensis*, is in no way involved with either of these species. From the former it may be distinguished by its smaller size, three-divided coriaceous leaves, the cauline slender-petioled, widely bifurcate stem, shorter-pedicelled sterile flowers, never in separate heads and having divaricate segments, smaller fruit with thinner pericarp and shorter styles.

From *S. Canadensis* it may be known by its mostly simple stem terminating in two elongated branches, each bearing a long-rayed umbel, thicker leaves and much larger sessile fruit with longer styles.

With *Sanicula gregaria* the species has no close affinity. The minute campanulate calyx of *gregaria* separates it sharply from all our species, while its 5-divided thin leaves, umbellately branched stem and branches, trifoliolate involucral leaves and much smaller longer-styled fruit distinguish it radically from *Smallii.* The branching of *Smallii* is more like that of *Sanicula trifoliata* than any other one of our species, and selected leaves of the two may be closely matched in general shape, but the larger and thinner leaves of *trifoliata* and its oblong short-styled fruit with the remarkable arrangement of the oil-tubes denote its wide difference.

Sanicula Smallii differs from all other eastern species by styles of medium length, frequently styliferous sterile flowers and thickened roots.

In point of this new southern *Sanicula* I have carefully read Rafinesque on his alleged new genus and species "*Triclinum odoratum,*" published in 1817 (Fl. Lud. 79). Taken by itself, Rafinesque's specific description would apply with tolerable exactness to our new species, but his generic definition and added remarks, insisting on long styles recurved to the base of the ovary, positively excludes this new species and, strictly taken, all other known eastern species as well. Allowing for possible exaggeration, however, it may be well here to take the opportunity of considering further our long-styled species *Marylandica* and *gregaria.* The specific description alone scarcely bars *Marylandica* unless by the terms "*folius longe-petiolatus,*" which is distinctly not the case with the stem leaves of this species. The same objection holds against *gregaria*, while the further characterization of "*foliolus lateralibus bipartitus,*" untrue for *gregaria*, describes exactly the condition in *Marylandica* and nearly that in *Smallii.* On the other hand, there are points in the description which apparently could have applied only to *gregaria.* In perhaps the most important of these, however, viz. "*calyx urceolatus 5-fidus*, Rafinesque is himself contradictory, for he concludes by declaring that his genus "differs from *Sanicula* by divided calyx * * * !" Here is a distinction absolutely without a difference, and it would actually seem to require us to believe that Rafinesque's conception of the genus *Sanicula* as distinct from *Triclinium* was based on the species *Sanicula gregaria.*

So far as is known, *gregaria* is the only one of our species having odorous flowers, but the fragrance is of the faintest and quite unworthy to be compared with the sweet scent of *Reseda odorata* with which "*Triclinium odoratum*" is credited.

Upon the whole, therefore, we have every reason to believe that "*Triclinium odoratum*" was a composite production pretty certainly containing elements of *gregaria* and, not improbably, of *Marylandica* and *Smallii*, one or both. On this understanding it might be held that the name *Sanicula gregaria* should give place to *Sanicula odorata* (Raf.), and it would certainly be difficult to show that "*Triclinium odoratum*" was not, in part, the plant now known as *Sanicula gregaria.* To my own way of thinking, however, a resurrectionist acting under the law of priority can rightly proceed only on the authority of facts so unequivocal as to admit of no conflict of opinion whatever.

Sanicula Floridana n. sp.

Nearly allied to *Sanicula Canadensis* but commonly smaller. Stem-leaves more numerous and closer together, the basal ones especially shorter petioled, small, mostly under 2 inches wide, 3-divided, the lateral pair of leaflets parted nearly to the base; leafets thickish, obovate-cuneate, abruptly narrowed below with concave or excavated sides, adjoining leaflets thus often enclosing lenticular spaces, very acutely dentate-serrate and more or less openly cut-lobed or cleft above, the spiny-cuspidate teeth relatively fewer and larger than in *Canadensis*, their margins pale, callous and thickened and passing gradually into the rigid yellowish spine; involucral leaves and involucres usually small and laciniate; panicle widely branched and slenderly dichotomous; fruit often smaller than in *Canadensis* and more nearly sessile, the bristles, especially below the middle, rather shorter and somewhat less spreading; styles sometimes longer; commissural scar broader, pinched out at the contracted base of the fruit instead of continuing through the pedicel as in *Canadensis;* pedicels of sterile flowers stout and very short, usually not longer than the calyx.

Specimens examined:

South Carolina: Santee Canal, W. H. Ravenel.

Georgia: Savannah, June, 1895. John K. Small.

Florida: Duval Co., open Oak Woodlands, A. H. Curtiss. Type.

Lake City, Columbia Co., July 11–19, 1895, George V. Nash—Plants of Florida, no. 2244; Eustis, Lake Co., Hammock Land, June, 1894, George V. Nash—Plants of Central Peninsular Florida, no. 988.

Alabama: Auburn, Lee Co., July 8, 1896, F. S. Earle and L. M. Underwood.

Mississippi: Ocean Springs, June, 1896, L. M. Underwood.

This plant at once approves itself to the eye as different from *S. Canadensis*, notwithstanding a seeming absence of such crucial characters as subsist between other eastern species. Its distinctive appearance comes mainly from the leaves, the segments showing a marginal pattern which greatly accentuates the style of cutting characteristic of the more northern plant.

In giving to this plant the formal designation of a species, I do not wish to be understood as holding that it is totally disconnected organically from *Canadensis*. Whether it is or is not I do not know, nor is the question one which need affect the right of this positively individualized plant to bear its distinctive name. Undoubtedly, its *species quality* is of lower grade than that of *S. Smallii* or any other one of our explicit eastern species; nevertheless the quality in marked degree is there. It is doubtless a geographical derivative of *Canadensis*, and is so nearly related to it that interrelation may be expected where the ranges of the two adjoin. Certain specimens of *Canadensis* from South Carolina and Georgia appear to show an approach towards it, although typical *Canadensis* extends into Florida, as attested by several specimens, and as far south as Southern Texas as shown by Mr. A. A. Heller's "No. 1713, Plants of Southern Texas, San Antonio, May 5, 1895," which closely matches many northern specimens.

Affinities of Caulinites Ad. Brong.

By Arthur Hollick.

(Plate 320.)

In Science 1: 725, 726 (June 28, 1895) may be found an abstract of the proceedings of the Biological Society of Washington for June 1st of that year, in which Dr. Lester F. Ward calls attention to the similarity in appearance between the rhizomes of *Tripsacum dactyloides* L. and the fossil organisms known under the generic name of *Caulinites* Ad. Brong.

Recently Dr. Ward sent to me the rhizomes upon which he based his conclusions, with the suggestion that I make drawings of them and reproductions of some figures of *Caulinites*, for closer comparison, and prepare a brief article on the subject.

Authorities have differed in opinion regarding the probable affinities of this genus. Desmarest, who was the first to figure and name a specimen referable to it (Nouv. Bull. Soc. Phil. Sci. Nat. 2: 272. *pl. 11, f. 4.* 1811.)* supposed the specimen to be a polyp and called it *Amphitoites Parisiensis*, under which name it was reproduced by Cuvier and Alexander Brongniart. (Essai Géog. Minéral Envir. Paris, in Mem. Inst. Imp. France, Cl. Sci. Math. et Phys. 1810. Part 1. 165. *pl. 2, figs. 10 A, 10 B.* 1811.) Desmarest subsequently decided that it belonged in the vegetable kingdom and compared it with *Zostera*. (Ann. Sci. Nat. Paris. 1: 334. 1824.) Adolph Brongniart likewise recognized the botanical characters of similar organisms under the generic name of *Culmites*. (Descr. Géol. Envir. Paris, 359. 1828.)* He also compared *Amphitoites* with *Caulinia* DC. (*Posidonia* Kön.) and renamed the genus *Caulinites*, placing it under the Naiadaceae. (Prod. Hist. Vég. Foss. 115. 1828.) In this view he was followed in part by other authorities and finally the several described species of *Culmites* and *Caulinites* were apportioned among a number of different genera and families. Heer considered similar organisms to belong with the grasses, placing them under the genera *Arundo* L. and *Phragmites* Trin. (Fl. Tert. Helvet. 1: 62, 64. 1855.) while Lesquereux described and figured specimens from Clear Lake, California, under the name *Caulinites Beckeri* (Proc. U. S. Nat. Mus. 10: 36. *pl. 1, f. 3; 2, figs. 2–4.* 1887), placing them with the Naiadaceae. In connection with this description, however, is a footnote, consisting, in part, of a letter from the collector, Mr. G. F. Becker, suggesting that they are probably silicified fragments of "Tule" (*Scirpus lacustris* L.), which grows abundantly on the borders of the lake.

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* These two references I have not been able to verify personally. I am indebted to Mr. David White, of the United States Geological Survey, for assistance in this connection.

In Dr. Ward's paper (*l. c.*) the above description is noted, but "Tule" is referred to *Phragmites Phragmites* (L.) Karst., an error which Dr. Ward writes me arose from the fact that he believed Becker's specimens to belong to that genus and not to *Scirpus*.

In this connection a note of interest may be found in the American Naturalist, 31 : 227. 1897, in relation to stolons of *Phragmites* ,from islands in the Platte River, Nebraska, where it is stated that the long trailing stems, which are at first under ground, have become exposed by the erosion of the surrounding sand and now run over the surface as jointed stolons, with fibrous roots at the joints.

A paper relating to the same subject may also be found in a recent number of the BULLETIN, in which is described and figured the culms and rhizomes of a supposed fossil grass.* A comparison between certain of the figures which illustrate that paper and those now given are of interest and significance.

Taking all the facts into consideration there seems to be but little doubt that most of the organisms described under the genus *Caulinites* should be regarded as belonging to the rhizomes of grasses, sedges or rushes, and it is unfortunate that the generic name implies relationship with the Naiadaceae.

Explanation of Plate 320.

Figs. 1, 1 a. Rhizome of *Tripsacum dactyloides* L., from Great Falls of the Potomac, Maryland side, collected by Dr. Lester F. Ward, April 27, 1895.—Fig. 1, upper surface ; fig. 1 a, under surface of same.

Figs. 2, 3. *Caulinites digitatus* Wat. Plant. Foss. Bass. Paris, *pl. 19, figs. 7, 8.*

Fig. 4. *Arundo* (*Donax*) *Goepperti* (Münst.) Heer, Fl. Tert. Helvet. 1 : *pl. 23, fig. 5.*

Proceedings of the Club.

TUESDAY EVENING, OCTOBER 12, 1897.

The first meeting of the Club, after the summer vacation, was held in its new quarters at the College of Pharmacy. The President occupied the chair and 24 persons were present. In the absence of the Secretary, Mr. Willard N. Clute was elected Secretary pro-tem.

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* A new Fossil Grass from Staten Island. Arthur Hollick, Bull. Torrey Bot. Club, 24 : 122–124. *pl. 298.* 1897.

No regular program had been prepared for this meeting, but notes detailing some results of the summer's work were presented by Drs. Rusby and Underwood, Mr. C. Van Brunt, Mrs. E. G. Britton, Judge Brown, Mr. Eugene Smith, Mr. M. A. Howe and Miss Ingersoll.

Dr. H. H. Rusby spoke of his work at the Kew Herbarium in identifying some 2,000 plants of two Bolivian collections. As an indication of how the Columbia University has grown in the last few years, he noted that in working up a similar collection four years ago, he was able to determine but 5 or 6% by comparison with the plants in this herbarium, while of the present collection nearly 50% were identified by this means. He added that the herbarium at Kew is also growing rapidly and in four years has added to its collections nearly half as many specimens as are in the Columbia Herbarium.

Dr. L. M. Underwood supplemented these remarks by an account of his experiences at Kew during the summer. One of the objects of his visit to Kew was to see the type specimens of Berkeley's fungi, which he said were mostly described in two brief lines of Latin, and in the majority of cases the specimens were even briefer than the descriptions, and were in a very unsatisfactory condition. He was also able to clear up some vexed points in reference to common species of fungi, which had been described in England without reference to the species' nearest allies, and were wrong in consequence.

An investigation of the distribution of the ferns given by the Synopsis Filicum showed the allowance of such wide distribution, that under one name there are often several species, and in some cases as many as eight. Dr. Underwood remarked that the Kew Herbarium is superior to the Paris Herbarium even in the plants of the French provinces. Of these, many are represented at Kew and not at all at Paris.

Mr. Cornelius Van Brunt spoke of his journey to the Selkirk and Rocky Mountains of British America, during which he made many photographs of new or interesting plants.

Mrs. E. G. Britton remarked upon the abundance of *Botrychium ternatum obliquum* and *B. t. dissectum* on the Berkshire Hills of Mass., and mentioned the frequency of the fronds forking. She also described a new *Ophioglossum*, found by Dr. Crawford and Mr. Pollard, near Cape May, N. J., growing in dense, yellowish patches.

President Brown spoke of his summer at Sam's Point in the Shawangunk Mountains. It is a wild region with many precipitous ledges. He described one precipice with an altitude of 2200 feet, bearing pine trees on its summit only six inches high, but with perfectly developed cones. Throughout the region *Arenaria Groenlandica* was abundant in bloom from June to September, most copiously in July. He remarked upon the abundance and profuse bloom of *Gentiana quinquefolia*, *Kalmia latifolia*, *Rhododendron maximum*, *Ilex montana*, *Gaylussacia resinosa* and *Rhodora*.

Mr. Eugene Smith recorded the finding of *Woodwardia areolata* in Bergen Co., N. J.

Mr. M. A. Howe recorded the occurrence of *Pogonia pendula* near Battleboro, Vt. This is the only known station for that plant in the state.

Mrs. Britton reported two mosses new to the local flora, *Thamnium Alleghaniense* from Bedford, Westchester Co., N. Y., and *Bryum concinnatum*, the third time collected in America, now from Bashbish Falls, Copake, N. Y.

Miss Bertha Swalb and Miss Bernice Mayers were elected active members.

WEDNESDAY EVENING, OCTOBER 27, 1897.

There were 23 persons present; Vice-President Dr. Allen presiding.

Mr. Wm. L. Riddell was elected an active member.

The scientific program included two papers. The first paper by Mr. P. A. Rydberg, entitled "Botanical Explorations in Montana during the Summer of 1897," discussed the alpine flora of Montana, exhibiting herbarium specimens and drawings. Mr. Rydberg described a collecting trip made by him and Mr. Ernest A. Bessey to Old Hollow-top, a mountain of 10,000 feet altitude in the Pony or South Boulder Mountains. In a swamp at the foot of the peak, they had found *Ledum glandulosum*, *Kalmia microphylla*, *Cassiope tetragona* and three species of *Bryanthus*. These finds were remarkable, as ericaceous plants are rather rare in Montana. In aspect the place resembled bogs of Michigan and of Sweden.

The paper further contained a list of the more remarkable plants collected on Old Hollowtop, followed by a short description of the general nature of its flora and that of the other alpine peaks of Montana. Their characteristic plants, like those of other alpine regions, are remarkable for their small size and their brightly colored flowers. Most of them are but 2 to 3 inches high; few exceed 5 inches. The mountain side of Old Hollowtop presents a mixture of golden yellow, indigo-blue, the richest magenta, the most delicate pink, violet and snowy white, with a mat of the brightest green for a background.

The forage plants of these alpine peaks are chiefly small cespitose clovers, and include but few grasses. During the summer four or five such clovers were collected, one or two of which are undescribed. Among the trees and shrubs of the alpine peaks, the most remarkable were the five small alpine willows collected, forming a light green mat covering the mountain-side above timber line. The smaller willows of the White mountains and of the Alps and of Siberia are giants compared with these dwarfs of the Rockies. Four of these Montana willows, with *Salix rotundifolia* from the island of Unalaska, are the smallest shrubs of Salicaceae in the world. Two of these pygmies are new to science; one of which, growing often only half an inch high, is believed to be the smallest species of willow known.

In the discussion following, Dr. Britton inquired regarding the similarity or difference of circumboreal willows.

Mr. Rydberg said that *S. herbacea* apparently remains the same in both hemispheres; so does *S. arctica;* and *S. Brownii* does so through a wide range in North America.

Dr. Britton remarked that Mr. Rydberg's Montana trip was the first expedition sent out officially by the New York Botanical Garden.

Prof. Burgess referred to a supposed age of 34 years for a dwarf willow of about 6 inches stem from Alaska, and Dr. Rydberg mentioned 12 years as perhaps the age reached by the dwarfs of his present paper, their stems dying along the rooting base too rapidly to permit great age.

Dr. Rusby spoke of arctic willows as part of the food of beavers and of reindeer in northern Russia.

The second paper was by Dr. John K. Small, "On the genus *Eriogonum* north of Mexico," a genus founded by Michaux upon a single species in 1803, and increased by Pursh and Nuttall. Bentham issued its first monograph in 1837, with 28 species, and a second with 81 in 1856; Torrey and Gray in a third monograph in 1870 left the number unchanged, but with many reductions and additions. A fourth monograph by Dr. Sereno Watson in 1870, presented 95 species, since which many have been described by others, as Greene, Jones and Eastwood.

In discussing this paper, Dr. Allen contributed an entertaining description of his difficulties in bringing growing specimens of *Eriogonum Alleni* from near White Sulphur Springs to the Botanical Garden. Dr. Britton reported that the specimens then secured have done well in cultivation at Bronx Park, and have matured seeds.

Dr. Allen spoke of finding two or three species of *Eriogonum* in the Grand Canyon of the Colorado last summer, and described his descent of the Canyon by mule trail, and also his journey to California in search of Characeae.

Dr. Britton reported two cases of naturalization of escapes from greenhouses; The first that of a creeping form of *Oxalis corniculata*, now becoming a weed at Whitestone, L. I.

The second case is that of a fern, apparently an *Asplenium* from a temperate habitat, thrown out with other things as useless, four or five years ago from a greenhouse, growing discolored and sickly in the greenhouse, but now thrifty and spreading under trees on a lawn.

Other cases of fern naturalization which have been previously reported include that of an *Adiantum* in Rhode Island, by Mr. Davenport, and a *Pteris* in a rock-cut near the New York Central Railroad tunnel in our own city; noted by Mr. W. A. Clute.

TUESDAY EVENING, NOVEMBER 9, 1897.

Vice-President Rusby presided. There were 17 persons present.

The following were elected active members:

Miss Margaret A. Johnston, Mr. L. W. Pinneo, Miss Carolyn M. Grambo, Miss Emilie O. Long.

The paper of the evening by Mrs. E. G. Britton, "A Description of two new Species of *Ophioglossum*," is printed in this BULLETIN. The paper also discussed the affinities, range and type characters of our eastern species of *Ophioglossum*, with keys and specific descriptions and with exhibition of tracings and numerous mounted specimens.

In the discussion following, Dr. Rusby spoke of the growth of *Ophioglossum vulgatum* among sedges on a salt marsh at Great Island, N. J. The other nearest collections reported were those of Austin at Closter, N. J., and of Miss M. Sanial at Rockaway, L. I.

Dr. Underwood sketched the characteristics of the four distinct types of *Ophioglossum* as: 1st, the section typified by *O. vulgatum* and discussed in the paper; 2d, that by *O. palmatum* of tropical America, which extends into Florida, there growing directly under the crown of the palmetto trees, nestled among the leaf-stubs; 3d, that typified by *O. pendulum*, found in the Hawaiian Islands and Pacific regions, which is also pendulous from trees and produces a spike attached almost to the middle of the leaf. In the 4th section, with growth not over 1 inch high, the sterile and fertile fronds are distinct to the rooting base.

Dr. Underwood further remarked the necessity of experience to find forms of *Ophioglossum*, especially such as *O. crotalophoroides* only one inch high, collected by him in Alabama.

Mr. Clute spoke of the great diversity in size displayed by *O. vulgatum* in a single locality.

Professor Burgess referred to the occasional occurrence of *O. vulgatum* with its namesake *Pogonia ophioglossoides*, and to other companion plants with which he finds *Ophioglossum* associated in growth, as *Chiogenes* and especially the orchids *Microstylis ophioglossoides*, *Habenaria hyperborea* and *H. dilatata*.

Dr. Underwood then exhibited photographs of the Kew Gardens, with reminiscences of his visit of last summer. He spoke particularly of their formal decoration, dating back to royal use, and the photographs shown included one of "Queen Mary's Elm," planted by her about 1555, once 25 feet in girth, now represented chiefly by a series of shoots.

After remarks by Dr. Rusby appealing to the Club to secure the membership of all who are interested in botanical science, the Club was adjourned.

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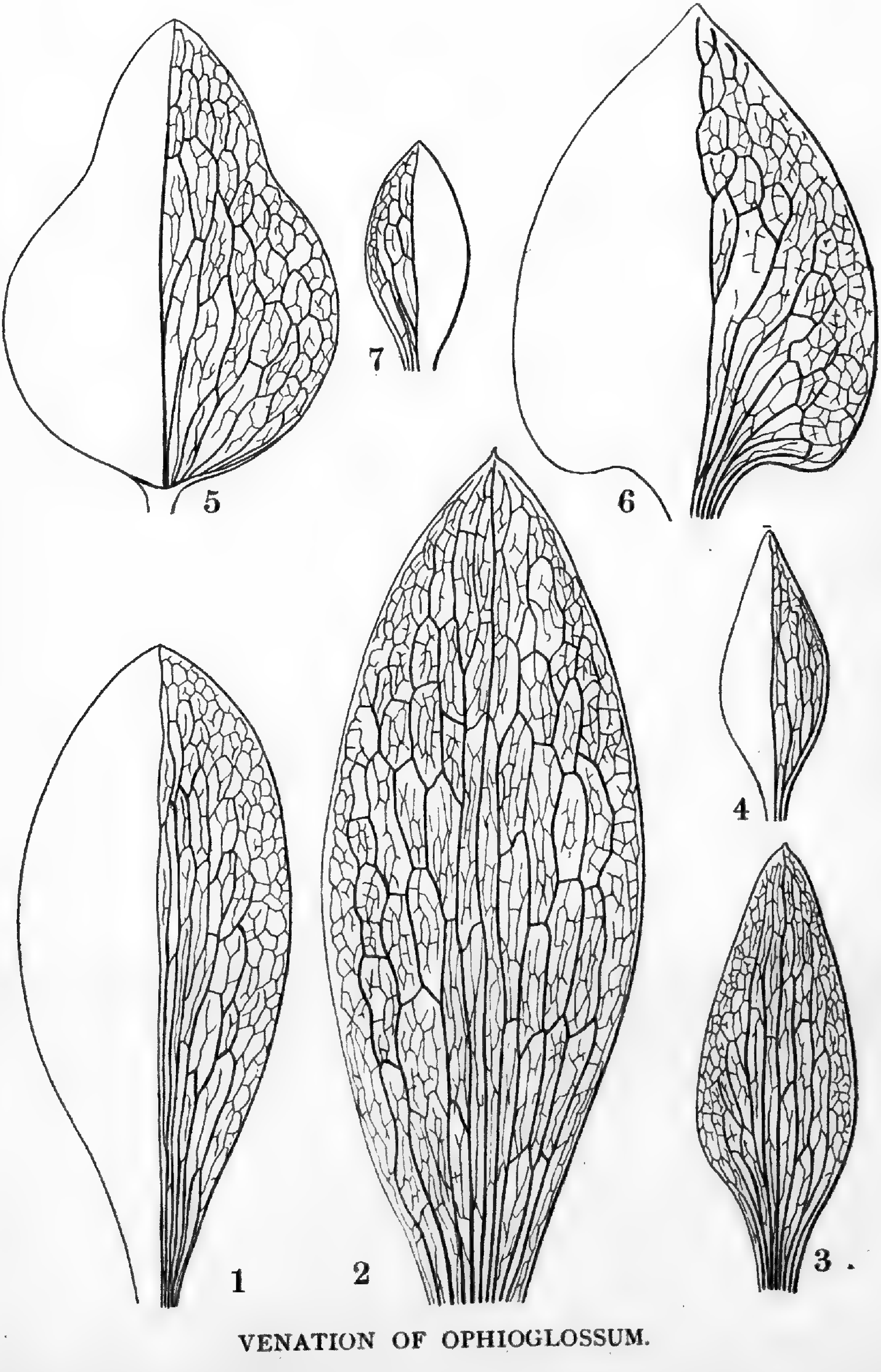

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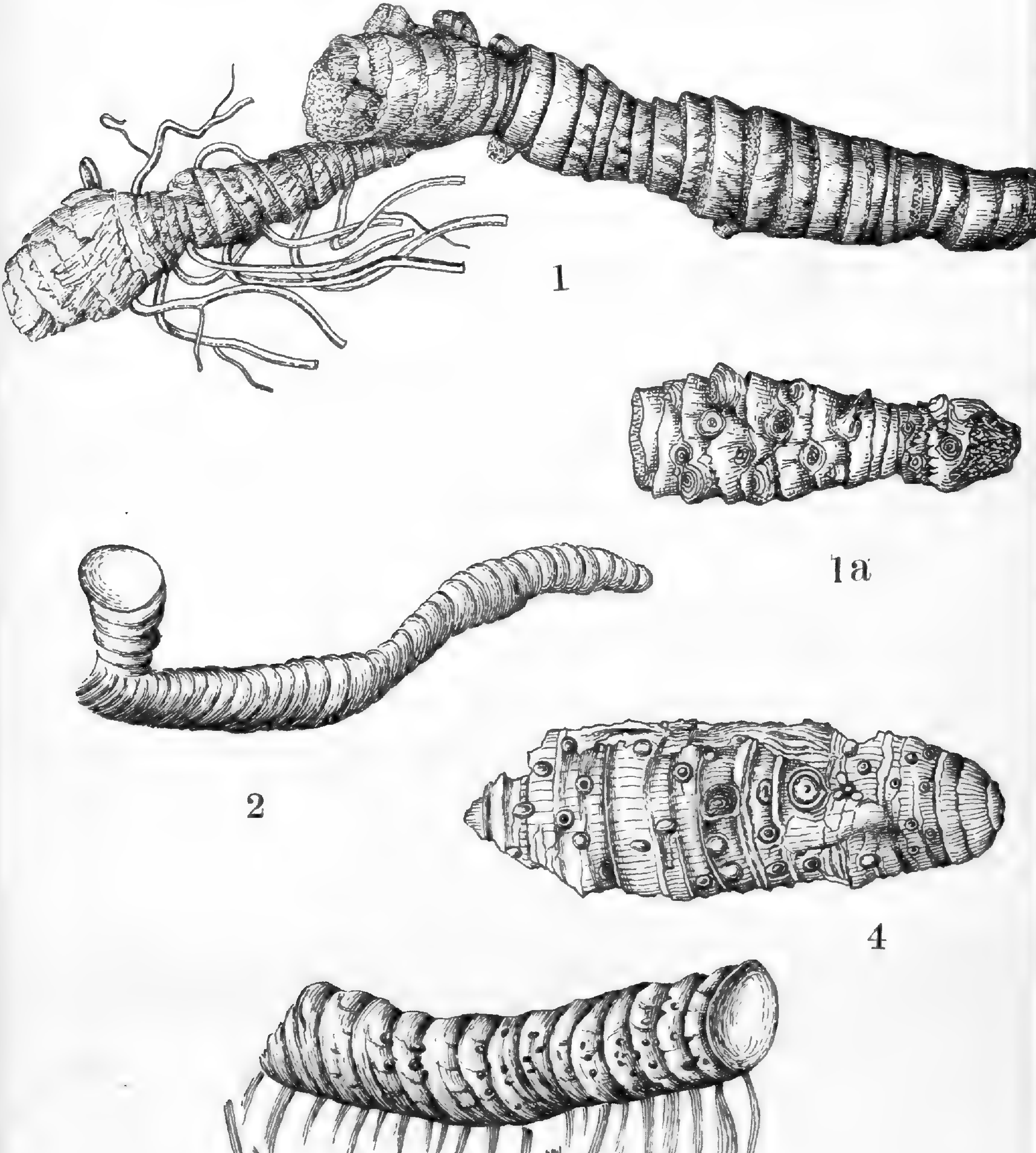

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No. 2.—A Revision of the North American Isotheciaceae and Brachythecia. By Abel Joel Grout. Price, 50 cents.

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